

NUCLEAR REGULATORY COMMISSION ISSUANCES

OPINIONS AND DECISIONS OF THE NUCLEAR REGULATORY COMMISSION WITH SELECTED ORDERS

October 1, 1977 – December 31, 1977

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PREFACE

This is the sixth volume of issuances (pages 525-1333) of the Nuclear Regulatory Commission and its Atomic Safety and Licensing Appeal Boards, Atomic Safety and Licensing Boards, and Administrative Law Judge. It covers the period from October 1, 1977, to December 31, 1977.

Atomic Safety and Licensing Boards are authorized by Section 191 of the Atomic Energy Act of 1954. These Boards, comprised of three members conduct adjudicatory hearings on applications to construct and operate nuclear power plants and related facilities and issue initial decisions which, subject to internal review and appellate procedures, become the final Commission action with respect to those applications. Boards are drawn from the Atomic Safety and Licensing Board Panel, comprised of lawyers, nuclear physicists and engineers, environmentalists, chemists, and economists. The Atomic Energy Commission first established Licensing Boards in 1962 and the Panel in 1967.

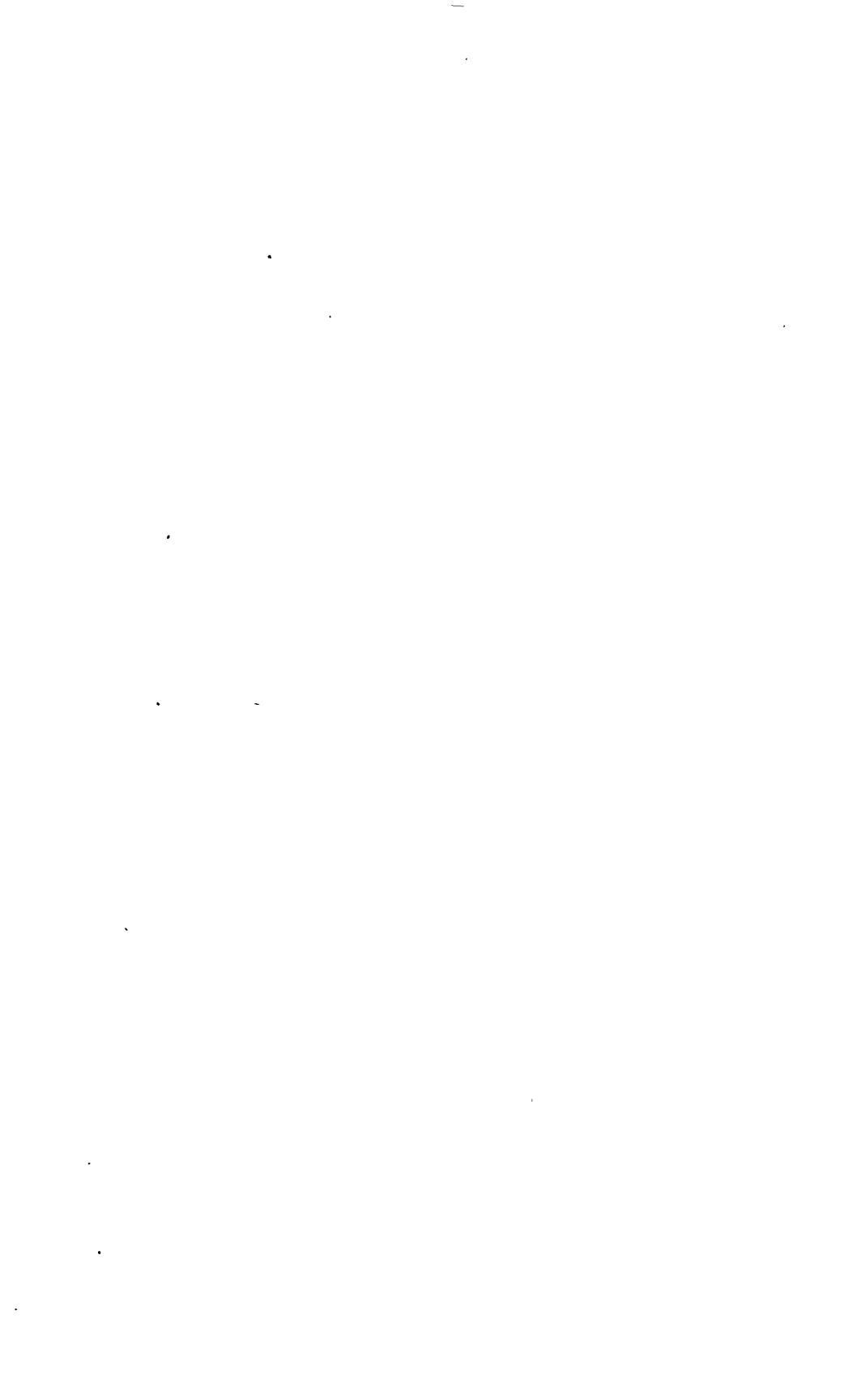
Beginning in 1969, the Atomic Energy Commission authorized Atomic Safety and Licensing Appeal Boards to exercise the authority and perform the review functions which would otherwise have been exercised and performed by the Commission in facility licensing proceedings. In 1972, that Commission created an Appeal Panel, from which are drawn the Appeal Boards assigned to each licensing proceeding. The functions performed by both Appeal Boards and Licensing Boards were transferred to the Nuclear Regulatory Commission by the Energy Reorganization Act of 1974. Appeal Boards represent the final level in the administrative adjudicatory process to which parties may appeal. Parties, however, are permitted to seek discretionary Commission review of certain board rulings. The Commission also may decide to review, on its own motion, various decisions or actions of Appeal Boards.

The Commission also has an Administrative Law Judge appointed pursuant to the Administrative Procedure Act, who presides over proceedings as directed by the Commission.

This volume is made up of reprinted pages from the three monthly issues of the Nuclear Regulatory Commission publication *Nuclear Regulatory Commission Issuances (NRCI)* for this period, arranged in chronological order. Cross references in the text and indexes are to the NRCI page numbers which are the same as the page numbers in this publication.

Issuances are referred to as follows: Commission--CLI, Atomic Safety and Licensing Appeal Boards--ALAB, Atomic Safety and Licensing Boards--LBP, and Administrative Law Judge--ALJ.

The summaries and headnotes preceding the opinions reported herein are not to be deemed a part of those opinions or to have any independent legal significance.



CONTENTS

Issuances of the Nuclear Regulatory Commission

EXXON NUCLEAR COMPANY, INC., et al.	
(Ten Applications for Low-Enriched Uranium Exports to EURATOM Member Nations), Docket 70-2614	
Memorandum and Order, CLI-77-24, October 4, 1977	525
(Low-Enriched Uranium Exports to EURATOM Member Nations), Docket 70-2614	
Memorandum and Order, CLI-77-31, December 22, 1977	849
FLORIDA POWER AND LIGHT COMPANY	
(St. Lucie Nuclear Power Plant, Unit 2), Docket 50-389	
Order, CLI-77-28, November 8, 1977	717
(St. Lucie Nuclear Power Plant, Unit 1), Docket 50-335A and	
(Turkey Point Plant, Units 3 and 4), Dockets 50-250A and 50-251A	
Order, CLI-77-26, October 25, 1977	538
(St. Lucie Plant, Units 1 and 2), Dockets 50-335A and 50-389A and	
(Turkey Point Plant, Units 3 and 4), Dockets 50-250A and 50-251A	
Order, CLI-77-30, December 9, 1977	847
MIXED OXIDE FUEL	
Dockets RM-50-5, 50-201, 50-332, 50-564, 70-1327, 70-1432, and 70-1821	
Order, CLI-77-33, December 23, 1977	861
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE, et al.	
(Seabrook Station, Units 1 and 2), Dockets 50-443 and 50-444	
Order, CLI-77-25, October 14, 1977	535
Order, CLI-77-27, November 4, 1977	715
TRANSNUCLEAR, INC.	
(Three Applications for High-Enriched Uranium Exports to the Federal Republic of Germany), Dockets 70-2421, 70-2600, and 70-2694	
Memorandum and Order, CLI-77-32, December 22, 1977	854
TRANSNUCLEAR, INC. (Würgassen)	
(On Application to Export Special Nuclear Material), Docket 70-2561 (License XSNM-1116)	
Memorandum and Order, CLI-77-29, November 10, 1977	719

TRANSNUCLEAR, INC.

EXXON NUCLEAR COMPANY, INC.

(Ten Applications for Low-Enriched Uranium Exports to EURATOM Member Nations), Dockets 70-2561, 70-2566, 70-2568, 70-2608, 70-2614, 70-2647, 70-2657, 70-2667, 70-2674, and 70-2675

Memorandum and Order, CLI-77-24, October 4, 1977 525

(Low-Enriched Uranium Exports to EURATOM Member Nations), Dockets 70-2566, 70-2568, 70-2608, 70-2614, 70-2647, 70-2657, 70-2667, 70-2674, and 70-2675

Memorandum and Order, CLI-77-31, December 22, 1977 849

Issuances of the Atomic Safety and Licensing Appeal Boards

CLEVELAND ELECTRIC ILLUMINATING COMPANY, et al.

(Perry Nuclear Power Plant, Units 1 and 2), Dockets 50-440 and 50-441

Decision, ALAB-443, November 8, 1977 741

Decision, ALAB-449, December 14, 1977 884

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

POWER AUTHORITY OF THE STATE OF NEW YORK

(Indian Point, Units 1, 2, and 3), Dockets 50-3, 50-247, and 50-286

Decision, ALAB-436, October 12, 1977 547

CONSUMERS POWER COMPANY

(Midland Plant, Units 1 and 2), Dockets 50-329 and 50-330

Memorandum and Order, ALAB-438, October 19, 1977 638

Memorandum, ALAB-450, December 14, 1977 887

(Midland Plant, Units 1 and 2), Dockets 50-329A and 50-330A

Decision, ALAB-452, December 30, 1977 892

DUKE POWER COMPANY

(Cherokee Nuclear Station, Units 1, 2, and 3), Dockets STN 50-491, STN 50-492, and STN 50-493

Decision, ALAB-440, October 26, 1977 642

EXXON NUCLEAR COMPANY, INC.

(Nuclear Fuel Recovery and Recycling Center), Docket 50-564

Decision, ALAB-447, December 13, 1977 873

FLORIDA POWER AND LIGHT COMPANY

(St. Lucie Nuclear Power Plant, Unit 2), Docket 50-389

Decision, ALAB-435, October 7, 1977 541

GULF STATES UTILITIES COMPANY	
(River Bend Station, Units 1 and 2), Dockets 50-458 and 50-459	
Decision, ALAB-444, November 23, 1977	760
PHILADELPHIA ELECTRIC COMPANY, et al.	
(Peach Bottom Atomic Power Station, Units 2 and 3), Dockets 50-277 and 50-278	
Decision, ALAB-448, December 13, 1977	882
PITTSBURGH-DES MOINES STEEL COMPANY	
Byproduct Material License 37-02607-02	
Memorandum and Order, ALAB-441, November 1, 1977	725
PORTLAND GENERAL ELECTRIC COMPANY, et al.	
(Trojan Nuclear Plant), Docket 50-344	
Memorandum and Order, ALAB-451, December 20, 1977	889
POWER AUTHORITY OF THE STATE OF NEW YORK	
(Greene County Nuclear Power Plant), Docket 50-549	
Memorandum and Order, ALAB-439, October 21, 1977	640
POWER AUTHORITY OF THE STATE OF NEW YORK, et al.	
(Indian Point, Units 1, 2, and 3), Dockets 50-3, 50-247, and 50-286	
Decision, ALAB-436, October 12, 1977	547
PUBLIC SERVICE COMPANY OF INDIANA, INC.	
(Marble Hill Nuclear Generating Station, Units 1 and 2), Dockets STN 50-546 and STN 50-547	
Memorandum and Order, ALAB-437, October 14, 1977	630
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE, et al.	
(Seabrook Station, Units 1 and 2), Dockets 50-443 and 50-444	
Memorandum and Order, ALAB-442, November 2, 1977	728
PUGET SOUND POWER AND LIGHT COMPANY, et al.	
(Skagit Nuclear Power Project, Units 1 and 2), Dockets STN 50-522 and STN 50-523	
Decision, ALAB-446, December 9, 1977	870
TENNESSEE VALLEY AUTHORITY	
(Yellow Creek Nuclear Plant, Units 1 and 2), Dockets STN 50-566 and STN 50-567	
Memorandum and Order, ALAB-445, December 8, 1977	865

Issuances of the Atomic Safety and Licensing Boards

ATLANTIC CITY ELECTRIC COMPANY, et al.	
(Hope Creek Generating Station, Units 1 and 2), Dockets 50-354 and 50-355	
Order, LBP-77-73, December 23, 1977	1310

BOSTON EDISON COMPANY	
(Pilgrim Nuclear Power Station, Units 2 and 3), Dockets 50-471 and 50-472	
Partial Initial Decision Regarding Request for Limited Work Authorization, LBP-77-66, November 30, 1977	839
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.	
(Indian Point Station, Unit 2), Docket 50-247	
Order Granting Motion for Determination That All Governmental Approvals Have Been Received, LBP-77-63, November 23, 1977	799
DUKE POWER COMPANY	
(Cherokee Nuclear Station, Units 1, 2, and 3), Dockets STN 50-491, STN 50-492, and STN 50-493	
Partial Initial Decision (Construction Permits), LBP-77-74, December 30, 1977	1314
METROPOLITAN EDISON COMPANY	
JERSEY CENTRAL POWER AND LIGHT COMPANY	
PENNSYLVANIA ELECTRIC COMPANY	
(Three Mile Island Nuclear Station, Unit 2), Docket 50-320	
Initial Decision, LBP-77-70, December 19, 1977	1185
NORTHERN STATES POWER COMPANY (MINNESOTA)	
NORTHERN STATES POWER COMPANY (WISCONSIN), et al.	
(Tyrone Energy Park, Unit 1), Docket STN 50-484	
Initial Decision (Construction Permit), LBP-77-71, December 23, 1977	1232
PENNSYLVANIA ELECTRIC COMPANY, et al.	
(Three Mile Island Nuclear Station, Unit 2), Docket 50-320	
Initial Decision, LBP-77-70, December 19, 1977	1185
PHILADELPHIA ELECTRIC COMPANY, et al.	
(Peach Bottom Atomic Power Station, Units 2 and 3), Dockets 50-277 and 50-278	
Initial Decision (Remanded Cost-Benefit Analysis Issues), LBP-77-62, October 28, 1977	680
PORTLAND GENERAL ELECTRIC COMPANY, et al.	
(Trojan Nuclear Plant), Docket 50-344	
Memorandum and Order, LBP-77-69, December 14, 1977	1179
PUBLIC SERVICE AND GAS COMPANY	
ATLANTIC CITY ELECTRIC COMPANY	
(Hope Creek Generating Station, Units 1 and 2), Dockets 50-354 and 50-355	
Order, LBP-77-73, December 23, 1977	1310

PUBLIC SERVICE COMPANY OF INDIANA, INC.	
(Marble Hill Nuclear Generating Station, Units 1 and 2), Dockets STN 50-546 and STN 50-547	
Partial Initial Decision, Limited Work Authorization-2, LBP-77-67, December 9, 1977	1101
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE, et al.	
(Seabrook Station, Units 1 and 2), Dockets 50-443 and 50-444	
Supplemental Initial Decision (Construction Permit), LBP-77-65, November 30, 1977	816
PUGET SOUND POWER AND LIGHT COMPANY, et al.	
(Skagit Nuclear Power Project, Units 1 and 2), Dockets STN 50-522 and STN 50-523	
Order Granting Request for Substitution of Language, and Denying Motion for Reconsideration of Order Denying Pre-LWA Authority to Construct Proposed Sewer Line, LBP-77-61, October 28, 1977	674
Order Following Remand, LBP-77-72, December 23, 1977	1308
TENNESSEE VALLEY AUTHORITY	
(Phipps Bend Nuclear Plant, Units 1 and 2), Dockets 50-553 and 50-554	
Partial Initial Decision, LBP-77-60, October 14, 1977	647
VIRGINIA ELECTRIC AND POWER COMPANY	
(North Anna Power Station, Units 1 and 2), Dockets 50-338 and 50-339	
Initial Decision on Applicant's Motion for Temporary License to Load Fuel, LBP-77-64, November 26, 1977	808
Initial Decision, LBP-77-68, December 13, 1977	1127

Issuances of the Administrative Law Judge

ATLANTIC RESEARCH CORPORATION	
Byproduct Material License 45-02808-04	
Order Affirming Imposition of Civil Penalties, ALJ-77-2, October 28, 1977	702
PITTSBURGH-DES MOINES STEEL COMPANY	
Byproduct Material License 37-02607-02	
Order Affirming Imposition of Civil Penalties, ALJ-77-1, October 13, 1977	693

INDEXES

Case Name Index	I-1
Legal Citation Index	I-7
Cases	I-7
Regulations	I-31
Statutes	I-39
Subject Index	I-43
Facility Index	I-73

UNITED STATES
NUCLEAR REGULATORY COMMISSION

COMMISSIONERS:

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Victor Gilinsky
Richard T. Kennedy
Peter A. Bradford

In the Matter of

**Ten Applications for
Low-Enriched Uranium Exports to
EURATOM Member Nations**

TRANSNUCLEAR, INC.	Docket No. 70-2561 License No. XSNM-1116
TRANSNUCLEAR, INC.	Docket No. 70-2566 License No. XSNM-1117
TRANSNUCLEAR, INC.	Docket No. 70-2568 License No. XSNM-1119
TRANSNUCLEAR, INC.	Docket No. 70-2608 License No. XSNM-1142
EXXON NUCLEAR CO., INC.	Docket No. 70-2614 License No. XSNM-1145
TRANSNUCLEAR, INC.	Docket No. 70-2647 License No. XSNM-1162
TRANSNUCLEAR, INC.	Docket No. 70-2657 License No. XSNM-1167
TRANSNUCLEAR, INC.	Docket No. 70-2667 License No. XSNM-1176
TRANSNUCLEAR, INC.	Docket No. 70-2674 License No. XSNM-1180
TRANSNUCLEAR, INC.	Docket No. 70-2675 License No. XSNM-1181

October 4, 1977

Upon consideration of petitions by the Natural Resources Defense Council, Inc., for leave to intervene and a hearing on ten pending applications to export low-enriched uranium to nations in the European Atomic Energy Community (EURATOM), the Commission determines that petitioner lacks the requisite legal interest to intervene as a matter of right under §189 of the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2239. Since imminent passage by Congress of nuclear non-proliferation legislation could resolve all of petitioner's substantive claims, the Commission defers decision on whether a discretionary public hearing should be held.

RULES OF PRACTICE: STANDING TO INTERVENE

A petitioner is not entitled to intervene as a matter of right where its petition raises abstract issues relating to the conduct of U.S. foreign policy and protection of the national security. Petition must establish that it will be injured and that the injury is not a generalized grievance shared in substantially equal measure by all or a large class of citizens.

MEMORANDUM AND ORDER

I. BACKGROUND AND SUMMARY OF DECISION

Between May 20, 1977, and September 16, 1977, the Natural Resources Defense Council, Inc. ("NRDC"), filed with this Commission five petitions seeking leave to intervene and a hearing on ten pending export license applications¹ each raising issues with respect to the export of low-enriched uranium to nations in the European Atomic Energy Community ("EURATOM").² The applications subject to NRDC intervention petitions are:

- (1) XSNM-1116 for (519.182 kg U-235 contained in 18,981.415 kg of U, enriched to a maximum of 3.00 percent to be used as fuel in the Würgassen Nuclear Power Station—Federal Republic of Germany (FRG)).

¹NRDC also sought leave to intervene and a hearing on XSNM-1160 (Docket No. 70-2645), an application to export low-enriched uranium for use at the Trino Vercellese Atomic Power Station, Italy. By letter dated August 4, 1977, the Westinghouse Electric Company withdrew this application and therefore it will not be treated further in this memorandum and order.

²The EURATOM member countries include: Belgium, Denmark, Federal Republic of Germany, France, Ireland, Italy, Luxembourg, Netherlands, and the United Kingdom.

- (2) XSNM-1117 (304.823 kg U-235 contained in 11,234 kg of U, enriched to a maximum of 3.00 percent for use as fuel at the Phillipsburg 1 reactor—FRG).
- (3) XSNM-1119 (502.234 kg U-235 contained in 15,528.25 kg of U, enriched to a maximum of 2.8 percent for use as fuel at the Borselle Nuclear Power Station—The Netherlands).
- (4) XSNM-1142 (45.823 kg of U-235 contained in 1,367.8 kg of U, enriched to a maximum of 3.35 percent for use as working stock for the manufacture of fuel assemblies by RBU—FRG).
- (5) XSNM-1145 (265.1 kg U-235 contained in 11,088 kg of U, enriched to a maximum of 2.8 percent for use as fuel at the Gundremmingen Atomic Power Station—FRG).
- (6) XSNM-1162 (812.1612 kg of U-235 contained in 24,243.615 kg of U, enriched to a maximum of 3.35 percent for use as fuel at the Tihange Nuclear Power Plant—Belgium).
- (7) XSNM-1167 (489.915 kg of U-235 contained in 11,057 kg of U, enriched to a maximum of 5.73 percent for use as fuel at the SENA nuclear power reactor—France).
- (8) XSNM-1176 (6,526.8743 kg of U-235 contained in 217,363.4 kg of U, enriched to a maximum of 3.3 percent for use as fuel at the following nuclear reactors in France: Bugey 4, Bugey 5, Tricastin 1, Gravelines 3, Bugey 1 and Saint Laurent B1).
- (9) XSNM-1180 (390.988 kg of U-235 contained in 10,712 kg of U, enriched to a maximum of 3.65 percent for use as fuel at the Doel 1 nuclear power reactor—Belgium).
- (10) XSNM-1181 (1,000.136 kg of U-235 contained in 36,338 kg of U, enriched to a maximum of 3.40 percent for use as fuel at the Isar nuclear power reactor—FRG).

In accordance with procedures in Executive Order 11902, these applications were transmitted to the Department of State to obtain the coordinated views of the Executive Branch on issuance of the respective export licenses. The State Department has provided the Commission with the Executive Branch analysis of four applications: XSNM-1116, XSNM-1117, XSNM-1119, and XSNM-1145. The Executive Branch has concluded that the proposed exports would take place pursuant to the Additional Agreement for Cooperation between the United States and EURATOM signed at Washington, D.C., and New York on June 11, 1960 (T.I.A.S. 4650),³ and

³This agreement has been subsequently amended several times. The most recent revision occurred on September 20, 1972. See T.I.A.S. 5103; T.I.A.S. 5104; T.I.A.S. 5444; and T.I.A.S. 7566.

that the exports would not be inimical to the common defense and security of the United States. The State Department has not yet provided the Commission with the Executive Branch views on XSNM-1142, XSNM-1162, XSNM-1167, XSNM-1176, XSNM-1180 or XSNM-1181.

On September 19, 1977, in accordance with the Commission's internal procedures, the NRC staff forwarded its recommendation that license applications XSNM-1116, XSNM-1117, XSNM-1119, and XSNM-1145 be approved. Because several of the challenged applications are now in a procedural posture where NRC licensing action would ordinarily be appropriate, the Commission believes that Petitioner's intervention and hearing claims should now be addressed.

The Commission has carefully reviewed the submissions filed by all participants in this matter. In a public meeting on September 20, the Commission discussed the threshold procedural issues posed by the NRDC intervention petition and reached the following conclusion. First, Petitioner lacks the requisite legal interest in these proceedings under Section 189 of the Atomic Energy Act of 1954, as amended, to entitle it to intervene as a matter of right. Second, because imminent enactment of nuclear non-proliferation legislation by the Congress could resolve all Petitioner's substantive claims regarding the pending license applications, the Commission will defer consideration on whether further proceedings for receiving public views and information might benefit this licensing proceeding.

II. PETITIONER'S CONTENTIONS

Petitioner NRDC is a national, nonprofit membership organization which seeks to intervene in these export licensing proceedings on behalf of its members. NRDC states itself to be an environmental organization committed to the protection of the human environment, public health and safety.

Petitioner contends that these exports of low-enriched uranium to EURATOM countries would be inimical to the common defense and security of the United States because EURATOM countries may retransfer United States-supplied nuclear material or reprocess such material within the European Community without prior United States approval. Reprocessing is the separation of unburned uranium and plutonium from the spent fuel generated by a nuclear reactor. After separation, the plutonium may be used for fabrication into fresh fuel. Plutonium, however, can also be used directly to fabricate nuclear explosive devices. Therefore, reprocessing facilities must be safeguarded to ensure that extracted plutonium is not diverted for illicit purposes. NRDC notes that reprocessing facilities have been or are being constructed in France and

the United Kingdom and that these facilities are currently accepting orders for and shipments of spent nuclear reactor fuel for reprocessing. NRDC contends that commercial reprocessing of nuclear fuel anywhere may lead to nuclear weapons proliferation and is therefore a threat to United States national security. Petitioner asserts that before the Commission can make the determination required for issuance of an export license under the Atomic Energy Act (namely, that exports of low-enriched uranium to EURATOM countries are not inimical to the common defense and security of the United States), the Commission must condition each license to require a prior United States approval right for any retransfer or reprocessing of the exported fuel.

Petitioner filed motions on August 17 requesting that the Commission consolidate consideration of the applications subject to intervention petitions and to make a single decision with respect to these exports. Petitioner also requested financial assistance, so that it may fully present its members' views on the issues it raises.

III. STANDING

Petitioner NRDC is an organization with a membership in excess of 24,000 persons in the United States and foreign countries, including members in EURATOM nations. NRDC asserts that the interests of its members will be directly affected by the grant or denial of the specific licenses and it is therefore entitled to a hearing as a matter of right pursuant to Section 189 of the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2239. That section provides a right to a hearing to those who can establish that they have an interest which "may be affected by the proceeding." The interests which the NRDC seeks to protect are set forth in its petitions as follows:

NRDC members who travel to or reside in the EURATOM nations may be exposed to the risks associated with the reprocessing of this nuclear fuel. Moreover, because of the potential worldwide harm associated with the risk of diversion or theft of reprocessed special nuclear material and the use thereof for destructive purposes, the interests of all NRDC members in the maintenance of a safe, healthful and productive environment are directly threatened.

The NRC Staff, Exxon (the Applicant for license number XSNM-1145), and the Department of State have filed submissions with the Commission stating that these interests are not sufficient to confer standing upon the NRDC.

NRDC further requests that the Commission await the outcome of its

appeal to the United States Court of Appeals for the District of Columbia Circuit of the Commission's order in *Edlow International Company*, CLI-76-6, 3 NRC 563 (1976), which addressed the standing of NRDC in export licensing matters. The NRDC appeal, captioned *NRDC, et al. v. NRC* (D.C. Cir. No. 76-1525) was argued on December 8, 1976. The Commission believes that it would be inappropriate to await the results of the NRDC appeal.⁴ First, it cannot be predicted when the Court's decision will issue. To delay action indefinitely on all these licenses could have a significant and adverse impact upon United States relations with its European allies, particularly so since EURATOM has already requested prompt issuance of at least one of these licenses. In a letter dated September 8, 1977, Fernand Spaak, the Head of the Delegation of the Commission of the European Communities, informed the Commission that failure to ship material covered by License No. XSNM-1116 by mid-November would result in shutdown of the Würgassen nuclear power reactor in the Federal Republic of Germany in June 1978. Second, an analysis of the interests asserted by NRDC and recent judicial decisions on standing have led the Commission to reaffirm the earlier holding in *Edlow International, supra*, that this Petitioner lacks standing to compel its participation in Commission proceedings for the export of nuclear reactor fuel to foreign nations.

In *Edlow International, supra*, the rationale for using judicial precedents as guidance for NRC standing determinations was fully explained. In the same decision it was observed that expansive rules of standing would be "undesirable in the export licensing context, which involves sensitive questions of . . . foreign policy." 3 NRC at 570. In reaffirming those positions here, we see no need to repeat the extensive analysis contained in the *Edlow International* opinion.

Any right the Petitioner may have to demand a hearing in the present proceeding must be based upon Section 189 of the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2239. That section provides that a hearing must be granted, on the request of persons who can demonstrate an "interest [which] may be affected by the proceeding." Under the most recent Supreme Court decisions on standing, a party seeking relief must "allege some threatened or actual injury resulting from the putatively illegal action before a federal court may assume jurisdiction." *Linda R.S. v.*

⁴Unlike its petition to intervene in *Edlow International Company*, CLI-76-6, 3 NRC 563 (1976), NRDC does not assert broad institutional interests, but stated it wished to reserve the right to brief other issues with regard to standing after the D.C. Circuit issues its opinion. The standing of the NRDC as an institution is fully addressed in the *Edlow* opinion, 3 NRC at 572-74. We adhere to the view expressed in *Edlow*: that any institutional interests of the NRDC are insufficient to confer standing upon it in a nuclear export licensing proceeding for the shipment of reactor fuel to foreign nations.

Richard D., 410 U.S. 614, 617 (1973), *Warth v. Seldin*, 422 U.S. 490, 499 (1975); see *Simon v. Eastern Kentucky Welfare Rights Organization*, 426 U.S. 26 (1976). One focus of the “injury in fact” test is the concept that a claim will not normally be entertained if the “asserted harm is a ‘generalized grievance’ shared in substantially equal measure by all or a large class of citizens” *Warth v. Seldin*, 422 U.S. at 499. Thus, even if there is a generalized asserted harm, the Petitioners must still show a distinct and palpable harm to them. *Id.* at 501. See *United States v. Students Challenging Regulatory Agency Procedures (SCRAP)*, 412 U.S. 669 (1973).

Petitioner’s claims of interest here rest upon two assertions: (1) that its members who travel to or reside in the EURATOM nations may be exposed to alleged risks associated with the reprocessing of United States-supplied fuel and (2) that “the potential worldwide harm associated with the risks of diversion” of United States-supplied fuel will cause its members direct injury.

The Commission and the Courts have recognized a “functional need for well defined and specific interests, which will lend concrete adversity to the decision-making process.” *Edlow International, supra*, at 570. The Commission finds that the issues raised by the Petitioner embody abstract concerns pertaining to the conduct of U.S. foreign policy and protection of the national security rather than an actual injury which would entitle them to intervene in these proceedings.

The grant or denial of export licenses is so far removed from the generalized harm mentioned by the Petitioner that intervention in these proceedings as a matter of right would not directly benefit the petitioners in a tangible fashion. Rather than assert any direct palpable injury, Petitioner is only able to assert a remote potential for harm. The risks upon which Petitioner’s claim is based apply not only to each NRDC member residing in or traveling through a EURATOM nation, but also to all citizens of the United States. Thus, the asserted injury here is completely unparticularized and is “shared in substantially equal measure by all or a large class of citizens.” Under this test, announced in the *Warth* case, Petitioner’s standing claim fails. As the Court of Appeals for the District of Columbia Circuit stated in its recent decision in *Machinery Dealers National Association v. Lockheed Aircraft Corporation, et al.* (D.C. Cir. No. 74-535, August 25, 1977), “[a] plaintiff may not rely on ‘the remote possibility, unsubstantiated by allegations of fact, that [his] situation might have been better had respondents acted otherwise, and might improve were the court to afford relief.’ ” Slip Opinion, at 11, citing *Warth v. Seldin, supra*, at 507 and *Simon v. Eastern Kentucky Welfare Rights Organization, supra*, at 42-46.

Even if the Petitioner were to show an actual injury in fact, it must also establish that a causal link exists between the actions of the agency and the

alleged injury. *Linda R.S. v. Richard D.*, *supra*, at 617. The alleged harm to NRDC members would not flow from the approval of export licenses for low-enriched uranium to EURATOM. Rather, the potential risks NRDC is concerned with are dependent on the intervening acts of third parties. In this regard, diversion of nuclear material by terrorists or saboteurs would constitute an unlawful act in any of the EURATOM nations. Similarly, diversion of material by any of the recipient governments for weapons purposes would violate international undertakings with the United States and in multilateral agreements. As stated in *Edlow International*, *supra*:

. . . [T]he Commission's responsibility for considering the possibility of diversion as one aspect of protecting the common defense and security of the United States does not establish that diversion would cause any concrete personal or direct harm to petitioners which would entitle them to a voice in its proceeding. 3 NRC at 577.

IV. FURTHER DISCRETIONARY PROCEEDINGS

The Petitioner has not established a right under Section 189 to intervene or to demand a public hearing. Nonetheless, the Commission may in its discretion direct further public proceedings if it determines that such proceedings would be in the public interest. *Edlow International*, *supra*, at 580; *Babcock and Wilcox*, CLI-77-18, 5 NRC 1332, 1348-49 (1977).

For the reasons detailed below the Commission has decided that it would be inappropriate to consider the desirability of further proceedings at this time and will defer such consideration until a later date. Congress is presently addressing issues raised by Petitioner and legislation appears imminent. At such time as pending nuclear non-proliferation legislation is enacted or in the event that Congress recesses without adopting such legislation, the Commission will examine the need for and desirability of further proceedings.

For the past two and a half years, the Congress has actively considered legislation to provide a comprehensive framework for nuclear non-proliferation policy. In April of this year, President Carter also forwarded a specific proposal for non-proliferation legislation to the Congress. Presently, there is reason to believe that legislation bearing directly on these issues will be enacted prior to the Congressional recess this autumn.¹

¹H.R. 8638, the "Nuclear Anti-Proliferation Act of 1977," was approved by the House of Representatives on September 28, 1977. The counterpart Senate bill, S. 897, was reported by the Government Affairs Committee on August 5, 1977; and by the Foreign Relations Committee on October 3, 1977. If Senate floor action takes place before the recess, statutory guidance would be available to the Commission in the very near future.

The issues raised by Petitioner concerning United States reprocessing and retransfer rights for material exported to EURATOM have been actively discussed in the context of these legislative initiatives. The record of legislative consideration of these issues is voluminous. More than fifty witnesses representing concerned Federal agencies, the nuclear industry, and the public (including spokesmen for Petitioner, NRDC) have contributed to the development of the record on the precise issues raised with respect to the EURATOM licenses. For example, during the past eighteen months hearings have been held by at least ten Congressional full committees and subcommittees, including the following:

- Joint Committee on Atomic Energy [recently abolished as a result of Senate reorganization].⁶
- Senate Government Affairs Committee [formerly Government Operations].
- Subcommittee on Energy, Nuclear Proliferation and Federal Services.
- Senate Foreign Relations Committee.
 - Subcommittee on Arms Control, Oceans and International Environment.⁷
- Senate Energy and Natural Resources Committee.
 - Subcommittee on Energy Research and Development.⁸
- House International Relations Committee.
 - Subcommittee on International Security and Scientific Affairs.
 - Subcommittee on International Economic Policy and Trade.¹⁰

The most significant aspect of this detailed Congressional and Executive Branch record is that terms of the pending legislation could substantially resolve issues raised by Petitioners. Versions of non-proliferation legislation in both the House and Senate would impose specific new criteria to guide the Commission in its nuclear export licensing determinations. The issues Petitioner seeks to raise in this proceeding, namely whether the United States should insist upon a right of prior approval for retransfer and

⁶Hearings before the Joint Committee on Atomic Energy, 94th Cong., 2nd Sess., Volume I (June 22, 1976), 468 pages; Volume II (July 28 and August 31, 1976), 252 pages.

⁷Hearings before the Committee on Government Operations, 94th Cong., 2nd Sess. (January 19, 20, 29, 30 and March 9, 1976), 2,048 pages.

⁸Hearings held April 25, May 6 and 23, 1977.

⁹Hearings held September 13 and 14, 1977.

¹⁰Hearings and Markup before the Subcommittees in International Security and Scientific Affairs and on Economic Policy and Trade, 95th Cong., 1st Sess. (April 4; May 18, 26; July 27, 29; August 1 and 2, 1977), 418 pages.

reprocessing of United States-supplied nuclear material within EURATOM, are specifically addressed in the proposed criteria.¹¹ The legislation in both houses of Congress currently provides an exemption from these licensing criteria for United States exports to EURATOM for a specific time period during which the United States will seek to negotiate reprocessing and retransfer controls in a new agreement for cooperation with EURATOM.¹²

Even though we have not resolved the issue of whether a discretionary hearing should be held at some later date, the Commission will continue to process license applications for exports to EURATOM nations. While awaiting the outcome of Congressional deliberations, the Commission will consider expressions of need by the applicants for the fuel, as well as present statutory licensing requirements under the Atomic Energy Act.

The deferral of the decision whether to hold discretionary hearings makes it unnecessary for the Commission to rule on Petitioner's motion to consolidate these proceedings and for financial assistance at this time.

For the Commission

Samuel J. Chilk
Secretary of the Commission

Dated at Washington, D.C.,
this 4th day of October 1977.

SEPARATE VIEWS OF COMMISSIONER BRADFORD:

Given the Commission's disposition of the standing to intervene issue in the *Edlow* opinion and in this case, I concur in the result of Section IV of this opinion. However, I express no opinion at this time on Petitioner's standing to intervene in this or similar proceedings.

¹¹In the Senate, Section 305 of S. 897 would create a new Section 127 of the Atomic Energy Act entitled "Criteria Governing United States Nuclear Exports." Subsections (a)(4) and (a)(5) of new Section 127 would specifically require a prior U.S. approval right for reprocessing of U.S.-supplied nuclear material except for retransfers within the European community. In the House of Representatives, Section 505 of H.R. 8638 would adopt similar licensing criteria. Another section of the proposed legislation (Section 401 in both S. 897 and H.R. 8638) sets forth negotiating objectives to be included in new and revised United States agreements for civil nuclear cooperation. Reprocessing and retransfer rights are also specifically addressed in this new provision. The intent of Congress with respect to the EURATOM exemption is further clarified in the Report of the Committee on International Relations of the House of Representatives accompanying H.R. 8638 (Rpt. No. 95-587, 95th Cong., 1st Sess. (August 5, 1977)).

¹²This exemption is set forth in S. 897 at Section 304(a) creating a new Section 126 of the Atomic Energy Act. In H.R. 8638, the exemption is contained in Section 504(a).

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

COMMISSIONERS:

Victor Gilinsky
Richard Kennedy
Peter Bradford

In the Matter of

**Docket Nos. 50-443
50-444**

**PUBLIC SERVICE COMPANY OF
NEW HAMPSHIRE, et al.**

(Seabrook Station, Units 1 and 2)

October 14, 1977

Upon motion by the Commonwealth of Massachusetts, the Commission concludes that, despite noncompliance with Commission certiorari rules due to its failure actively to seek or oppose review earlier, Massachusetts should be named a party to the review of ALAB's 422 and 423 because (1) it has now shown its desire to participate in such review; (2) this is one of the first cases arising under the certiorari rules (a circumstance which does not excuse but rather helps to explain the Commonwealth's errors); and (3) participation by an interested sovereign state is always desirable and is particularly appropriate here, where the review includes an issue involving state utility ratesetting laws and practices.

RULES OF PRACTICE: PARTIES TO COMMISSION REVIEW

Under 10 CFR §2.786(b)(6), the selection of parties to a Commission review proceeding is clearly a matter of Commission discretion.

RULES OF PRACTICE: PARTIES TO COMMISSION REVIEW

A major factor in a Commission decision whether a party below should be made a party to a Commission review is whether that party has actively sought or opposed such Commission review. This factor helps reveal which parties are interested in the Commission's review and whether their participation would aid that review.

RULES OF PRACTICE: CERTIORARI

The Commission's certiorari rules do not provide that, if one party seeks review of an issue, other parties supporting review of that issue may or should remain silent. A party desiring to be heard in a Commission review proceeding should somehow participate in the process by which the Commission determines whether to conduct such a review.

RULES OF PRACTICE: CERTIORARI

When it seeks Commission review of an Appeal Board decision, an interested state “. . . is subject to all of the requirements which must be observed by other parties. . . .” *Gulf States Utilities Company* (River Bend Station, Units 1 and 2), ALAB-317, 3 NRC 175, 180 n. 7 (1976).

ORDER

Special counsel for the Commonwealth of Massachusetts has filed a motion to reconsider that part of our September 15, 1977, order naming the parties to our review of ALAB's 422 and 423 (CLI-77-22, 6 NRC 451). The motion falls within the prohibition in 10 CFR §2.786(b)(7) against petitions for reconsideration of Commission decisions granting or denying review and the Secretary would be normally authorized to reject it as improper without our taking any action on it. See 10 CFR §2.772(c). However, special circumstances lead us to address ourselves to the merits of this motion.

Massachusetts asks us to modify our September 15 order by adding it to the list of parties for the review proceeding. In that order we stated (6 NRC at 453, n. 1) that the parties there admitted “adequately reflect the spectrum of conflicting opinion . . .” and that no other parties had filed papers with the Commission on the issues as to which review was granted. 10 CFR §2.786(b)(6) clearly provides that the selection of parties to a Commission review proceeding lies within the Commission's discretion.

A major factor in our decision whether any particular party to the proceeding below should be made a party to our review is whether that party has actively sought or opposed such review before us. This factor is important since it permits us to see which of the parties below are interested in the review and an opportunity to judge whether their participation would aid our review. Here this factor weighed heavily in our initial selection of parties since Massachusetts had completely failed to participate.

The Commonwealth's apparent theory—that if one party seeks review of an issue, other parties supporting review of that issue may or should re-

main silent—must be rejected since it is flatly inconsistent with what we said when we adopted the certiorari rule. At that time we said,

. . . all of those who support review should petition under § 2.786(b)(1) within 15 days after service of the Appeal Board decision. This does not mean that duplicative petitions must be filed. Parties can communicate informally prior to filing, and one petition can incorporate by reference the substance of another.

42 *Fed. Reg.* 22128 (May 2, 1977) (emphasis added). We take this occasion to reiterate what is implicit in that statement: If a party desires to be heard in a Commission review proceeding, it should participate in some fashion in the process by which the Commission determines whether to conduct such a review.¹

Nonetheless, there are unusual and perhaps unique circumstances here present that persuade us to modify our previous order and to admit the Commonwealth as a party. First, Massachusetts has now shown its desire to participate in our review of ALAB's 422 and 423. Second, this is one of the very first cases arising under our certiorari rules which does not excuse the Commonwealth's errors but helps explain them. Lastly, the participation of an interested sovereign state in our licensing process, as a full party or otherwise, is always desirable and is particularly appropriate in this review proceeding which presents an issue about state utility ratesetting laws and practices. Together, these factors are sufficient here. But, all participants in our licensing process should be on notice that in the future we shall require compliance with the terms of our certiorari rule.

For the reasons stated above, the Commonwealth motion is granted.
It is so ORDERED.

By the Commission

Samuel J. Chilk
Secretary of the Commission

Dated at Washington, D.C.,
this 14th day of October 1977.

¹When it seeks Commission review of an Appeal Board decision, a state ". . . is subject to all of the requirements which must be observed by other parties. . . ." *Gulf States Utilities Company* (River Bend Station, Units 1 and 2), ALAB-317, 3 NRC 175, 180, n. 7 (1976).

may have [if any] with respect to any utilization of special nuclear material or atomic energy which appears to violate or to tend toward the violation” of any of the antitrust laws. 42 U.S.C. 2135(b).

It is so ORDERED.

By the Commission

Samuel J. Chilk
Secretary of the Commission

Dated at Washington, D. C.,
this 25th day of October 1977.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Michael C. Farrar, Chairman
Richard S. Salzman
Dr. W. Reed Johnson

In the Matter of

Docket No. 50-389

FLORIDA POWER & LIGHT COMPANY

(St. Lucie Nuclear Power Plant,
Unit No. 2)

October 7, 1977

Upon appeal by intervenors from the Licensing Board's initial decision (LBP-77-27, 5 NRC 1038 (1977)), the Appeal Board upholds the determination below that the staff's NEPA review of alternative sites was adequate, taking into account the procedures followed both before and after its methodology was questioned. Upon *sua sponte* review of other aspects of the initial decision, the Appeal Board directs the applicant to provide a memorandum setting forth information relevant to steam generator tube integrity.

Initial decision affirmed, subject to outcome of further examination into issue of steam generator tube integrity, over which jurisdiction is retained.

NEPA: CONSIDERATION OF ALTERNATIVES

An applicant's selection of a site may be rejected on the ground that a preferable alternative exists only if the alternative is "obviously superior."

RULES OF PRACTICE: PROPRIETARY DATA

If a licensing board (or an intervenor with a pertinent contention) wishes to review data claimed by an applicant to be proprietary, it has a right to do so (albeit under a protective order if necessary). 10 CFR §2.790(b)(6); *Commonwealth Edison Co.* (Zion, Units 1 and 2), ALAB-196, 7 AEC 457, 469 (1974).

Messrs. Harold F. Reis, Washington, D.C., and Norman A. Coll, Miami, Florida, for the applicant, Florida Power & Light Company.

Mr. Martin Harold Hodder, Miami, Florida, *pro se* and as counsel for intervenors Rowena E. Roberts, *et al.*

Messrs. William J. Olmstead and William D. Paton for the Nuclear Regulatory Commission staff.

DECISION

We have before us the Licensing Board's initial decision authorizing the construction by the applicant of a second nuclear unit at the St. Lucie site on Florida's east coast.¹ That decision resolves all the issues the Board had left open in an earlier partial initial decision.² It also contains the Board's conclusions on the intervenors' alternative site contention, which had been summarily dismissed early in the proceeding but was reinstated by us on the basis of information which came to light when the case reached us the first time.³

The intervenors have taken an appeal. Although their exceptions cover a number of topics, they abandoned many by failing to brief them.⁴ Of those that they have pursued, the alternative site matter has received their primary attention. We discuss it in Part A below.⁵ We then turn in Part B to a topic not raised by the intervenors but which our own customary review of the entire record has revealed to warrant discussion, *viz.*, steam generator tube integrity.

A. Alternative Sites. The Commission has held that an applicant's selection of a site may be rejected on the ground that a preferable alternative ex-

¹LBP-77-27, 5 NRC 1038 (April 19, 1977).

²LBP-75-5, 1 NRC 101 (1975), as supplemented by LBP-75-25, 1 NRC 463 (1975).

³ALAB-335, 3 NRC 830 (1976).

⁴See, e.g., *Union Electric Co.* (Callaway, Units 1 and 2), ALAB-347, 4 NRC 216 (1976). In order to assure that the failure to include a discussion of certain exceptions in their brief was not due solely to time constraints, we afforded the intervenors an opportunity to take additional time to supplement their brief (see June 8, 1977, App. Bd. Tr. 125-29). Certain exceptions remained unbrieffed even in the supplement that was filed.

⁵The other arguments which the intervenors have presented to us are essentially the same ones presented to the Licensing Board and fully considered and rejected by it. We concur in its disposition of the issues addressed in those arguments.

ists only if the alternative is “obviously superior.”⁶ In this connection, although the intervenors do argue that a preferable site exists, their principal contention is that the procedures which the staff followed in conducting its alternative site review fell far short of what the National Environmental Policy Act requires.

Since hearing oral argument on the intervenors’ motion for a stay of construction pending appeal,⁷ we have reviewed the entire record with some care. We are convinced that the Licensing Board dealt with the alternative site question in thorough and comprehensive fashion. With respect to the intervenors’ primary assertion, that Board ultimately found the staff’s alternative site review to have been adequate, taking into account what was done in the periods both before and after the staff’s methodology was first called into serious question.⁸ But the Board reached that conclusion only after it had conducted a searching and critical analysis of the staff’s procedures; indeed, it held that the staff’s early efforts, standing alone, were inadequate. We adopt as our own the essence of the Board’s well reasoned opinion and add but two brief comments.

1. The National Environmental Policy Act requires the staff to examine a wide range of possible impacts of a nuclear facility and, in that regard, to inquire into whether there exist alternatives of one kind or another that would mitigate those impacts. In that connection, we said earlier in this case that perhaps the most important environmentally related task the staff has is to determine whether an application should be turned down because there is some other site at which the plant ought to be located.⁹ No other environmental question is both so significant in terms of the ultimate outcome and so dependent upon facts particular to the application under scrutiny.

⁶*Public Service Co. of New Hampshire* (Seabrook, Units 1 and 2), CLI-77-8, 5 NRC 503, 526-36 (1977). As the Commission there explained, when a remand follows an earlier approval of construction activity, the comparison between alternatives is to be made as of the time the new decision is made—thereby giving the site selected by the applicant the benefit of any time and money previously expended—unless there has been a lack of integrity in the NEPA process. 5 NRC at 532-33. Here it does not matter at what point subsequent to the institution of the Unit 2 proceeding the comparison is drawn. For as it turns out, the work which tipped the balance in favor of the *St. Lucie* site occurred during the construction of the first unit on the site. Any time and money arguably misspent (see 5 NRC at 533) in the period between the Licensing Board’s first decision on Unit 2 and the Court of Appeals’ stay of that decision was essentially inconsequential.

⁷We denied the requested stay for the reasons assigned in ALAB-415, 5 NRC 1435 (June 28, 1977). Much of the oral argument on the stay focused on whether the intervenors were likely to prevail on the merits. After receipt of the parties’ full briefs on the appeals, we decided that additional oral argument on the merits would not be necessary.

⁸See fn. 3, *supra*.

⁹See ALAB-335, *supra*, 3 NRC at 840.

Consequently, we would expect the staff to take unusual care in performing its analysis and in disclosing the results of its work to the public.

We regret the necessity of having to state that the record of this case does not instill confidence in us that the staff always acts with that degree of care which would demonstrate its commitment to the vigorous enforcement of NEPA's commands regarding alternate site inquiries.¹⁰ At different times in this proceeding, the staff appeared to treat compliance with NEPA as a hurdle in the path of, rather than a prerequisite to, the issuance of a nuclear power plant license. Manifestly, the staff's attitude toward environmental questions should be parallel to its generally commendable stance in the safety area. There, the staff quite properly treats an applicant's statements as those of a decidedly interested party. Accordingly, the staff reviews them with a trained, dispassionate and skeptical eye. Where the environment is concerned, the same sort of review should be the norm.

Lest we be misunderstood, we harbor no bias for or against any particular outcome of the staff's review of environmental matters. But a staff conclusion that an applicant's proposal passes muster is valuable only to the extent it represents the results of vigorous probing for possible shortcomings. Where that has been done, there is much more reason to trust the validity of the conclusion.¹¹

2. Our second comment is related to the first. There was need here for careful probing of the staff's efforts, and the intervenors helped initiate and conduct that probe. Thus, although they did not achieve the ultimate result they desired, the intervenors clearly assisted in the search for truth. The contribution they made should not pass unnoticed.

B. Steam Generator Tube Integrity. Our review *sua sponte* of the other aspects of the initial decision and the record has disclosed one matter which requires further attention.¹² In another proceeding, we recently completed a

¹⁰As appears to be customary, in this case much of the work was done not by regular staff employees but by consultants it retained. The staff, of course, bears full responsibility whether it chooses to do the work itself or through outside consultants.

¹¹There is nothing startling about this message. That it ought to have been unnecessary to convey it is confirmed by the fact that a similar thought appears in the applicant's brief. In their urging us to affirm the Licensing Board's decision, that applicant placed emphasis on the fact that the Board below had come to its decision only after conducting a most searching and skeptical inquiry: "Here the Board was manifestly critical of the Staff and clearly had no predisposition to a particular conclusion. [Citations omitted.] With this attitude, the Licensing Board's ultimate acceptance of the testimony and conclusions of the Staff provides additional assurance of their validity." Applicant's Brief, p. 44.

¹²In addition, an observation is in order with respect to the procedure followed in looking into the applicant's financial qualifications. When the staff completed the last-minute reexamina-

(continued next page)

prolonged, in-depth consideration of questions relating to the integrity, or soundness, of the steam generator tubes in pressurized water reactors. See *Northern States Power Co. (Prairie Island, Units 1 and 2)*, ALAB-343, 4 NRC 169 (1976), and ALAB-427, 6 NRC 212 (August 15, 1977). This subject was not put in issue below, nor did the Licensing Board have occasion to discuss it. It may have believed this course to be justified because the applicant has proposed to utilize "all volatile" secondary water treatment (AVT) at St. Lucie 2, rather than the "phosphate" method which had earlier been in vogue.¹³ The AVT method had been found to offer reasonable assurance that there will be no tube corrosion.¹⁴ Moreover, it was expected to protect against the recently encountered "tube denting" phenomenon¹⁵ which has been particularly prevalent at plants, like St. Lucie, that are designed to use salt water for condenser cooling. For tube denting had been considered to be a consequence of the use of the phosphate method of secondary water treatment, which, as noted above, St. Lucie 2 will not employ.

It is no longer possible to be so sanguine about the matter. For, subsequent to the decision of the Board below, new information was brought to our attention in *Prairie Island*. The existence of steam generator tube denting now has been reported at two seawater-cooled nuclear plants which have used only the AVT method of secondary water treatment from the beginning of their operation (*i.e.*, they did not switch over after a prior use of phosphates). See ALAB-427, *supra*, 6 NRC at 216-218, fn. 7 and accompanying text.¹⁶ Both of the affected plants, like St. Lucie, are of the Combustion Engineering Company design.

(continued from preceding page)

tion prompted by the dramatic increase in the projected cost of the facility (see Tr. 6617-18, 6630), it submitted to the Board an expurgated version of the applicant's "source of funds" sheet. See the February 7, 1977, affidavit and accompanying documents later admitted into evidence as Staff Exhibit S-11 (5 NRC at 1076, fn. 2 and accompanying text.) Its stated reason for doing so was that the applicant claimed that the deleted figures were proprietary. Of course, had the Board or the intervenors wished to review the figures, they would have had the right to do so (albeit under a protective order if necessary), regardless of the proprietary claims. See 10 CFR §2.790(b)(6); see also *Commonwealth Edison Co. (Zion, Units 1 and 2)*, ALAB-196, 7 AEC 457, 469 (1974).

¹³See Amendment #39 to the Preliminary Safety Analysis Report (September 26, 1975), p. 10.3-6a.

¹⁴ALAB-343, *supra*, 4 NRC at 199.

¹⁵"Tube denting" refers to the pinching of tubes caused by the growth of corrosion products in the crevices between the tubes and their support plates.

¹⁶Additionally, the formation of porous magnetite, the precursor of denting, has been demonstrated in the laboratory under conditions simulating a steam generator operating under AVT with some chloride present. L.J. Martel, *et al.*, "EPRI Steam Generator Programs," American Power Conference, Chicago, Illinois, April 18-20, 1977.

Nothing presently in this record would allow us to disregard this experience, which portends the likelihood of steam generator tube denting at St. Lucie. Because of the potential safety problems associated with that phenomenon, we must explore it further. Accordingly, with respect to St. Lucie, Unit 2, we direct the applicant to provide us and the other parties by November 4, 1977, with a memorandum containing a full, current description of (1) the steam generators; (2) the components of the condensate and feedwater systems; and (3) the method by which the secondary cooling water is to be treated. In each instance, the submission should emphasize those aspects of the plant's design and operating procedures which will be directed toward avoidance of steam generator sludge formation, tube corrosion and denting; and the provisions, if any, which are being made to cope with denting should it nevertheless occur.¹⁷ Any other party may file a responsive memorandum by November 30, 1977.

For the foregoing reasons, the Licensing Board's authorization of the issuance of a construction permit for St. Lucie 2 is *affirmed*, subject to the outcome of our further examination into the issue of steam generator tube integrity, over which we are retaining jurisdiction.¹⁸

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD

Eleanor E. Hagins
Secretary to the Appeal Board

¹⁷In this connection, see also our unpublished order of August 19, 1977, calling for additional information in *Public Service Co. of New Hampshire* (Seabrook, Units 1 and 2), Docket Nos. 50-443 and 50-444. (A copy of that order is being sent to the parties along with this opinion.) As we there recognized, this type of information normally need not be supplied by (and may not even be available to) an applicant at the construction permit stage. However, here, as there, it will be useful to us to have all the information currently available.

¹⁸For reasons previously elaborated elsewhere, construction may proceed in the interim. See *Public Service Co. of New Hampshire* (Seabrook, Units 1 and 2), ALAB-422, 6 NRC 33, 105 (July 26, 1977) (Commission review pending on other grounds, CLI-77-22, 6 NRC 451, September 15, 1977).

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Michael C. Farrar, Chairman
Dr. John H. Buck
Dr. Lawrence R. Quarles

In the Matter of

Docket Nos. 50-3

**CONSOLIDATED EDISON COMPANY
OF NEW YORK, INC.**

50-247
50-286

**POWER AUTHORITY OF THE
STATE OF NEW YORK**

(Indian Point, Units 1, 2 and 3)

October 12, 1977

Following evidentiary hearings conducted pursuant to the Commission's Order in CLI-75-8, 2 NRC 173 (1975) (as well as the Appeal Board's Order in ALAB-357, 4 NRC 542 (1977)), the Appeal Board rules on various geologic and seismic issues.

TECHNICAL ISSUES DISCUSSED: Tectonic provinces; ground acceleration value resulting from safe shutdown earthquake; capable fault; significance of microearthquakes.

Messrs. Harry H. Voigt, Leonard M. Trosten, Patrick O'Hare and Eugene Fidell, Washington, D. C., and Mr. G.S. Peter Bergen, New York, New York, for the licensees, Consolidated Edison Company of New York and Power Authority of the State of New York.

Ms. Joyce P. Davis, New York, New York, for the licensee, Consolidated Edison Company of New York.

Mr. James L. Woods, New York, New York, for the licensee, Power Authority of the State of New York.

Mr. David S. Fleischaker, Washington, D. C., for the intervenor, Citizens' Committee for Protection of the Environment.

Messrs. John Clemente, Michael Curley and John Rosenberg, and Ms. Sandra Mitchell Caron, Albany, New York, for the New York State Atomic Energy Council.

Messrs. Joseph Gallo, Frederick Gray, Myron Karman, Thomas Bruen, Michael W. Grainey, and Richard C. Browne, and Ms. Coleen Nissl for the Nuclear Regulatory Commission staff.

DECISION

Opinion of the Board by Dr. Buck and Dr. Quarles:

This special proceeding on the seismic and geological aspects of the Indian Point nuclear reactor site near Peekskill, New York, was initiated by the Commission in its memorandum and order of August 4, 1975. CLI-75-8, 2 NRC 173. That memorandum and order was prompted by seismic and geologic questions raised during the operating license proceedings for the Indian Point 2 and Indian Point 3 nuclear reactors. The complete history of the proceeding to the date of the memorandum and order is outlined therein and need not be repeated here. See also ALAB-319, 3 NRC 188 (1976).

This Board¹ on August 5, 1975, issued a "Notice of Public Hearing on Seismic Issues, and Order in Connection Therewith"² and convened a prehearing conference on September 25, 1975, to discuss with the parties the formulation of the issues and other matters. As the result of this conference and later suggestions from the parties, we issued a prehearing conference order on October 17, 1975, setting forth the issues to be covered and outlining a schedule for discovery and submission of testimony.

The issues there stated were:

1. Does the Cape Ann earthquake of 1755, or any other historic event, require the assumption, in accordance with 10 CFR Part 100, Appendix A, of a safe shutdown earthquake for the Indian Point site greater than a Modified Mercalli intensity VII?

¹The initial Board Chairman, John B. Farmakides, left the Commission in November 1975 and was then replaced by the present chairman (see Reconstitution of Atomic Safety and Licensing Appeal Board, November 28, 1975).

²40 Fed. Reg. 33498 (August 8, 1975).

2. Should the ground acceleration value used for the design of Indian Point, Unit 1, 2 or 3, be increased?
3. Is the Ramapo fault a capable fault within the meaning of Appendix A, 10 CFR Part 100?

The 35 days of hearings on these issues commenced on April 21, 1976, and ended on July 25, 1976.

On August 27, 1976, the licensees forwarded to us "Licensees' Motion to Modify License Condition." The condition involved was contained in Amendment 2 to the Unit 3 operating license, which had been issued on April 5, 1976, just two weeks before the commencement of the hearings on the three issues. This amendment, *inter alia*, permitted the licensees to operate the Indian Point 3 reactor to 91% of rated power. However, Section 2(C)(4) of the amendment required the licensees to "conduct a program of geological and seismological investigations" of the Indian Point site and the Ramapo fault system. Included in this program was the requirement that the licensees expand the then existing microseismic monitoring network "southward to include the Pompton Lakes, New Jersey, epicenter area and northward to include the Fahnstock region." Amendment 2, §(C)(4)(c).

Although the amendment was relevant to the issues in these hearings, the NRC staff neglected to inform this Board about it. We first became aware of the license condition on the last day of the hearings on the three issues when licensees counsel brought the matter to our attention in his cross-examination of the staff on the purpose behind the requirement for an enlarged micromonitoring system.

The condition imposing the micromonitoring extension required the licensees to obtain two years of data on the expanded system by April 5, 1979. In its motion the licensees in essence requested this Board to examine the need for an enlarged monitoring system and extend the completion of the two-year investigation with such an expanded monitoring system until three years after the final Commission and judicial action on our decision.

On September 14, 1976, we stayed the installation of the new system pending our review of the problem. This allowed time for us to give the motion full consideration without requiring the licensees to take irrevocable action before we rendered a decision. On November 10, 1976, we issued a decision (Chairman Farrar dissenting) further postponing the time limits for compliance with the license conditions and calling for submission of evidence from all the parties, with the expectation that a hearing on the issue would be held early in 1977. ALAB-357, 4 NRC 542.³

³This decision was affirmed by the Commission in its memorandum of January 14, 1977 (CLI-77-2, 5 NRC 13).

Six days of hearings on the expanded monitoring system were held in Bethesda, Maryland, between March 15 and March 23, 1977. Testimony was submitted by the licensees, the NRC staff and the State of New York while CCPE participated only in the cross-examination. The questions involved in this phase of the hearing are discussed in this decision as Issue 4.

For the reasons given below we find that:

1. In accordance with Appendix A, 10 CFR Part 100, neither the Cape Ann earthquake nor any other historic event requires the assumption of a safe shutdown earthquake for the Indian Point site of greater than a Modified Mercalli intensity VII.
2. The ground acceleration value used for the design of Indian Point, Units 2 and 3, should remain at 0.15g. Indian Point, Unit 1, was designed for a lesser value, but the reactor is currently shut down and the fuel removed. If it should be reactivated it must be back-fitted to sustain an acceleration of 0.15g.
3. The Ramapo fault is not a capable fault under Appendix A, 10 CFR Part 100.
4. The extended micromonitoring system required by §2(C)(4)(c) of Amendment 2 to the operating license of Unit 3 is unnecessary and will not add to the assurance of public health and safety. The NRC staff is therefore instructed to delete that section of the license amendment requiring the enlarged monitoring system.

Additionally, in Section III of Issue 1. (pp. 574-577, *infra*) we have specifically agreed with certain findings of fact proposed by New York State and given our view of the need for the NRC staff to supply more definitive guidelines for the use of Appendix A to 10 CFR Part 100.

It will be noted that, other than for the above noted findings of fact, we have not attempted to deal specifically with any of the proposed findings submitted by the parties; but we believe we have covered the substantive subject matter of all of them in our decision.

ISSUE 1

Does the Cape Ann earthquake of 1755, or any other historic event, require the assumption, in accordance with 10 CFR Part 100, Appendix A, of a safe shutdown earthquake for the Indian Point site greater than a Modified Mercalli intensity VII?⁴

⁴Appeal Board Prehearing Order, October 17, 1975. We note that in its Proposed Findings of Fact and Conclusions of Law dated October 15, 1976, New York State at p. vi misquotes this order by using Modified Mercalli intensity VIII in place of VII—no doubt a true Freudian slip.

As we have noted in our preliminary statement, questions about the adequacies of the licensees and staff review of the Indian Point site seismic issues were brought up in hearings in both the Indian Point 2 and Indian Point 3 reactors. In the present proceeding, New York State (State)⁵ continues to claim that the Indian Point facilities should be built to withstand an intensity VIII earthquake.⁶ Evidence on this issue was received during a total of 18 days of hearings from April 29 through June 11, 1976. The licensees, State and the Nuclear Regulatory Commission staff (staff) participated fully but the Citizens Committee for the Protection of the Environment (CCPE) was excused by the Board from participation on this issue.

This issue centers upon the concepts of "tectonic provinces" and "tectonic structures," as used in Appendix A to 10 CFR Part 100 to determine the safe shutdown earthquake for a site.⁷ Among other things, Appendix A states that all "historically reported earthquakes which have affected or which could reasonably be expected to have affected the site" must be listed. *Id.*, §IV(a)(5). "The epicenters or locations of highest intensity" of those earthquakes are, where possible, to be correlated "with tectonic structures any part of which is located within 200 miles of the site"; where correlation with tectonic structures is not reasonably possible, "the epicenters shall be identified with tectonic provinces any part of which is located within 200 miles of the site." *Id.*, §IV(a)(6). Using that information, the vibratory ground motion at the site of each earthquake is determined by assuming (1) that the epicenters of earthquakes related to a tectonic structure are situated at the point on the structure closest to the site; (2) that the epicenters of earthquakes identified with the tectonic province in which the site is located (albeit not with structures) are located at the site; and (3) that the epicenters of earthquakes identified with other tectonic provinces are situated at the closest point to the site on the boundary of the respective tectonic provinces. *Id.*, §V(a).

All parties agreed that some seismic events resulting in earthshocks of in-

⁵The New York State intervention was made by the New York State Atomic Energy Council with principal witnesses from the New York State Geological Survey.

⁶See Charles F. Richter "Elementary Seismology" (W. F. Freeman and Company, Inc., 1958) at pp. 136-138 for a full description of the Modified Mercalli (MM) intensity scale. That scale uses a subjective description of an earthquake's effects on people, buildings and the surroundings to assign a ranking of between I and XII to the impact experienced at any particular location.

⁷For Appendix A purposes, "tectonic province" refers to "a region of the North American continent characterized by a relative consistency of the geologic structural features contained therein." A "tectonic structure" is "a large scale dislocation or distortion within the earth's crust." Appendix A, §§III(h) and (i).

tensity VIII or greater had occurred in the eastern United States. State maintained that at least some of these historic earthquakes were in what it considered to be the same tectonic province as Indian Point. On the other hand the licensees and the staff, for somewhat different reasons, delineated tectonic provinces such that none of the earthquakes above intensity VII was in the province in which Indian Point is located or near enough to affect the site significantly.

I. Testimony of the Parties

We will first discuss the theories of the parties on the proper method of designating tectonic provinces, then we will examine the historic earthquakes which must be considered in making the decision of the proper value for the safe shutdown earthquake (SSE) for the Indian Point facilities.

A. The Tectonic Provinces

1. Testimony of the State of New York

a. The State of New York maintained that tectonic provinces should be delineated on the basis of consistency of the style of deformation of the rocks. On this basis according to the State's witness, Dr. Hall,⁸ if rocks of "two distinctly different ages that have been subjected to the same deformation, and responded to that deformation in a similar fashion . . . those two ages of rocks would be part of one consistent regime of deformation and part of one province, the ages notwithstanding." Tr. 3309. Further explaining this understanding of tectonic provinces, Dr. Davis, New York State Geologist, emphasized that the State would consider only "first" order characteristics in describing a tectonic province.⁹ He agreed, however, that such provinces could be subdivided into subprovinces on the basis of the similarity of smaller structural features. Tr. 2138-40.

Using only first order characteristics, the State would divide the eastern United States and Canada into four tectonic provinces which closely match

⁸Dr. Leo M. Hall, Associate Professor, Department of Geology, University of Massachusetts, Amherst, Massachusetts.

⁹In using first, second and third order characteristics the State was following the terminology of Hadley and Devine (Hadley and Devine 1974 Seismotectonic Map of North America) to distinguish structural characteristics in terms of size. Dr. Davis agreed that this usage is informal and not universally accepted. Tr. 2139. The Jarvis P. Hadley and James P. Devine "Seismotectonic Map" was marked as State Exhibit 14 at Tr. 3444 and entered into evidence at Tr. 3688.

the physiographic provinces of the area. The State's four tectonic provinces are shown in the proffered testimony¹⁰ of Davis, Fakundiny and Pomeroy as Exhibit 1 (following page C-25 of Appendix C), a reproduction of which is included in this decision as Figure 1 (p. 578, *infra*).

As can be seen from the map, the Atlantic Coastal Plain province runs northward along the coast from Florida to New York and includes those sections of Georgia, North and South Carolina, Virginia, and New Jersey east of the Appalachians. Also included are Long Island and the eastern sections of Cape Cod. The boundary north of Cape Cod is undefined but is assumed by these witnesses to be far enough off shore for the Cape Ann earthquake to be included in the Folded Appalachian province. Tr. 2220-22. The Folded Appalachian province includes the Appalachian Mountains from northwestern Georgia north to the Canadian maritime provinces as well as the Gaspé Peninsula east of Quebec City. Starting in northern Alabama, the province includes the Blue Ridge Mountains, then narrows in the region of Harrisburg, Pennsylvania. The western border then turns northeast to the Hudson River Palisades, then north to include the Green Mountains. Thus essentially all of New England is included in this province. The line of separation between the Atlantic Coastal Plain and the Folded Appalachian provinces is not delineated north of Cape Cod. The third province identified by the State, the Appalachian Plateau, adjoins the western boundary of the Folded Appalachian province and extends from the Gulf Coastal Plain province in northern Alabama to approximately Albany, then in a northwesterly direction to the eastern tip of Lake Ontario, thence westerly to Lake Huron and south-southeast to the Gulf Coastal Plain in northern Alabama. The final tectonic province identified by the State, the Grenville province, adjoins the northern boundary of the Folded Appalachian province from Albany north. The province covers southern Ontario, most of Quebec Province and a small triangle in the U. S. between Albany, Lake Champlain and the east end of Lake Ontario.

According to the State, each of these tectonic provinces "has a distinctive set of consistent geological structural features" (N.Y. PFC,¹¹ p. A-5; also see State Exh. 9 at 3) and with regard to seismicity in the Folded Appalachian province "on a gross pattern there appears to be a general [seismic] density that is greater than in the contrasting areas outside of the fold belt." Tr. 2196. Later Dr. Davis did say some people divide this fold belt or province into four subprovinces (Tr. 2198), but he believes that the

¹⁰State Exh. 9. "Testimony of Dr. James F. Davis, Dr. Paul W. Pomeroy, and Dr. Robert F. Fakundiny (Panel) on Behalf of the New York State Atomic Energy Council on Issue I."

¹¹Abbreviation for New York State Proposed Findings and Conclusions.

State's use of the overall province is "the most defensible application of the siting appendix." Tr. 2196.

b. In addition to the general testimony on its proposed tectonic provinces, the State presented four other witnesses¹² on specific phases of New England geology and seismology. Dr. Lynn R. Sykes of the Lamont-Doherty Geophysical Laboratory of Columbia University and Dr. William H. Diment of the United States Geological Survey, Menlo Park, California, presented testimony on the so-called Boston-Ottawa seismic trend and its possible interpretations under Appendix A. Dr. Hall discussed this seismic trend in connection with a review of seismic frequency contours in the eastern United States. Dr. Charles L. Drake, a professor of geology at Dartmouth College, discussed the difficulty of applying Appendix A, given the present incomplete knowledge of tectonics.

Dr. Sykes¹³ stated that he accepts as a "working scientific hypothesis" that there is "a zone of activity in New England and adjacent parts of Canada [which] appears to be associated spatially with rocks whose age is younger than that of opening of the present Atlantic Ocean." State Exh. 7, p. 1. Both Dr. Sykes and Dr. Diment¹⁴ said that hypothesis has not been sufficiently proven to be used in making decisions on nuclear siting. They do agree that there is a spatial correlation between earthquake activity and a line of plutons¹⁵ running north through New Hampshire from the Boston area, or perhaps even from the Kelvin seamounts in the Atlantic Ocean.

Dr. Hall¹⁶ approached the New England seismicity on the basis of the frequency of earthquakes in various areas. By drawing iso-frequency lines about areas of seismicity,¹⁷ Dr. Hall finds that there are three isoseismic areas: (1) one running east-northeast from New York City to eastern Connecticut, (2) a second of much higher frequency running north from Boston through New Hampshire to the White Mountains, and (3) a third running approximately east-west along the St. Lawrence River near Montreal. The latter two regions are separated by an area of very low seismicity running north-northeast through central Vermont. The witness agreed that the New

¹²All four appeared as witnesses representing themselves and not their respective employers.

¹³State Exhibit 7, "Testimony of Dr. Lynn R. Sykes on behalf of the New York State Atomic Energy Council."

¹⁴State Exhibit 5, "Testimony of Dr. William H. Diment on Behalf of the New York State Atomic Energy Council on Issue I."

¹⁵A pluton is defined as a body of igneous rock that has been formed beneath the surface of the earth by consolidation from magma. See "Glossary of Geology," American Geological Institute, second printing, 1973, at p. 550.

¹⁶State Exh. 13, "Testimony of Dr. Leo M. Hall on Behalf of the New York State Atomic Energy Council on Issue I."

¹⁷Seismicity as used here is frequency of earthquake occurrence regardless of size.

Hampshire seismicity spatially correlates with the ring dike or pluton series running south from the White Mountains but does not correlate with the Monteregion Hills of Canada. State Exh. 13, pp. 6, 7. Finally, Dr. Hall concluded that while "there are many tectonic subdivisions in New England that can be made through detailed study . . . the intensely deformed and metamorphosed rocks throughout the region characterize it as a tectonic province." *Id.* at p. 15.

Dr. Drake's direct testimony¹⁸ was largely limited to criticisms of Appendix A, particularly the difficulty of applying such a regulation with the incomplete knowledge of tectonics that we have today. However, under cross-examination he stated that the licensees had proposed "structural provinces," *i.e.* "provinces in which a kind of deformation can be recognized, and that there is a continuity of this throughout this province, these are reasonable things." Tr. 2873-74.

Dr. Drake further agreed that these provinces meet the requirements of the regulatory criteria as stated by Appendix A (Tr. 2874) and that the licensees had properly outlined the present interpretation of the tectonic history of the East Coast. Tr. 2869-70. Following the trend of his direct testimony, he stated:

where I get into problems is when you start to divide the area up into specific tectonic provinces and then to associate the earthquake activity that is occurring today with these specific tectonic provinces. [Tr. 2870.]

2. Testimony of the Licensees

a. The licensees developed their primary tectonic provinces by using current plate tectonic theory together with their geologic petrographic studies. A panel of witnesses¹⁹ from the firm of Dames and Moore (D & M), consultants to the licensees, presented the testimony on the plate tectonics theory and its relationship to the tectonic provinces.²⁰

Plate tectonics as described by these witnesses traces the motion of the African and American plates from Precambrian time (600 million years (600 m.y.)),²¹ when they were joined together as one continent, to their present positions. The initial continental divergence took place during the Ap-

¹⁸State Exhibit 11, "Testimony of Dr. Charles L. Drake on Behalf of the New York Atomic Energy Council on Issue I."

¹⁹The panel consisted of Joseph A. Fischer, Matthew L. Werner, III, and Jerzy S. Szymanski.

²⁰Lic. Exh. 15, "Testimony of Dames & Moore (Panel) on Behalf of Licensees on Issue No. 1."

²¹This terminology denotes 600 million years ago.

palachian orogeny in late Precambrian-early Paleozoic time²² and formed an ancient eastern boundary of the American plate.

This separation of the North American and African plates eventually formed a proto-Atlantic Ocean with a long depositional trough being formed which developed an ocean crust. In mid-Ordovician time (450 m.y.), the continental motion reversed with the development of a subduction zone system—eventually leading to a continent-continent collision. Witnesses described this collision as occurring first with the closing of the proto-Atlantic Ocean along the southern portion of the Appalachians in what is known as the Allegheny orogeny. This was followed by a translation motion or possibly localized convergence of the continents and gradual closing of the proto-Atlantic along the entire ancient coastline of the American plate.

In the late middle Triassic time (200 m.y.), the continents again separated, but well east of the original line of separation, eventually producing the North American coastline as we now know it. This divergence formed the present Atlantic Ocean, which is still widening.

It is from a detailed study of these continental motions and of the geologic formations produced that the licensees derive the basis for their tectonic provinces which are shown in Licensees Exhibit 15, Figure 3-1.²³ (This plate is reproduced as Fig. 2 of this decision at p. 579.) As we develop below, although Fig. 2 shows nine provinces we need make a decision on only four of them.

b. We have already noted that the original divergence of the American and African continents formed an ancient coastline along the North American continent. The later convergence and finally the continental collision (300 m.y.) resulted in an eastern belt of great anticlinoria²⁴ on the American continent. The eastern portion of this belt, termed the Highlands province by the licensees, is characterized by Grenvillian rocks. Lic. Exh. 15, pp. 3-3, 3-4. To the immediate west of the Highlands province is a series of tightly folded Paleozoic sediments with an absence of basement involvement. *Ibid.* This is classified as the Fold and Thrust Belt whose western boundary is the limit of the Paleozoic thrusting and marks the eastern boundary of the Stable Interior province. In the Stable Interior province, the intense deformation of the provinces to the east is absent. *Ibid.*

²²For geologic time charts see, *Geology*, Richard M. Pearl, Barnes & Noble, 3rd ed., p. 191.

²³It will be noted that the licensees' tectonic province map goes southward only to 200 miles from the Indian Point site. The reasons for this are discussed at p. 560, *infra*.

²⁴Anticlinorium is defined as a composite upward folded structure of regional extent composed of lesser folds, the core of which contains stratigraphically older rocks. See the definitions of anticline and anticlinorium in the "Glossary of Geology," second printing 1973 (American Geological Institute), at p. 30.

Going now to the present coastline, the licensees agree with the State on the line of demarcation between the Coastal Plain province and the adjoining provinces to the west, as far north as Long Island Sound. But there agreement ceases. The licensees divide the northern part of the State's Folded Appalachian province (shown in State Exh. 9, Exhibit 1, p. C-25) into primarily four provinces (two additional subprovinces are described in northern Vermont). See Fig. 2 at p. 579, *infra*.

The easternmost of these provinces, the Avalon Platform, was described by the witnesses as "crystalline continental crust which is younger than the Grenvillian orogeny." Lic. Exh. 15, pp. 3-11, 3-12. Witness Szymanski indicated that the term Avalonian referred to a specific age of the late Precambrian (approximately 600 m.y.). Tr. 2810. The western boundary of the Avalon Platform in eastern Massachusetts and northern Rhode Island is, according to the licensees witnesses, marked by a change in magnetic signature²¹ which roughly outlines the area of the Avalonian age basement. Tr. 2812-13. On this basis the Avalon Platform boundary runs southwest from the region of Ipswich Bay, Massachusetts, to Worcester, then south near the Connecticut-Rhode Island border to Long Island Sound. It would then appear that the southern border extends eastward beyond Cape Cod and then turns northeasterly, so the Cape is within this province. The record is unclear as to the exact boundaries to the east and north of Massachusetts Bay, but witness Fischer cited the paper of Ballard and Uchupi to describe the boundaries in the Bay of Fundy area. Those boundaries are such that the Bay of Fundy earthquake (see item 6 in Table 1, p. 563, *infra*) location is almost midway between them. Tr. 2998-3003.

Licensees witnesses emphasized their belief that the Avalon Platform is actually a segment of the African plate left attached to the American plate following the closing of the subduction zone, and the final divergence of the two plates. They reached this conclusion not only on the basis of geologic similarity between the Avalon Platform rocks and african rocks, but also on the evidence they found in ocean floor deposits to the west of the platform. (See Lic. Exh. 15, Sections 2.2 through 2.5 and Tr. 2847-48.) We consider this evidence in our discussion of the licensees' provinces which lie between the Avalon Platform and the Highlands provinces.

North of Long Island and east of the New York-Connecticut border licensees proposed two tectonic provinces between the Avalon Platform and the Highlands. They call the western one the Inner Piedmont and the eastern one the Central New England. The dividing line between the two provinces runs from Long Island, northeast across Long Island Sound, and

²¹Magnetic signature is a record of the magnetism and magnetic gradients of the terrain in a given area.

then turns north, passing just to the east of Hartford, Connecticut. It continues north and generally traces the Vermont-New Hampshire line north-eastward into Canada. (See Fig. 2, p. 579, *infra*.) The southern boundary of the Central New England province runs east through Long Island Sound from just east of New Haven to the southwest corner of the Avalon Province and is part of the northern boundary of the Coastal Plain. *Ibid*.

The licensees panel depicted the two provinces as part of a mobile belt formed in the final convergence and translational movement of the North American and African plates. The Inner Piedmont and the Central New England provinces are considered to be sedimentary areas covering part of the original North American plate and the remains of the ocean floor which was present following the initial divergence of the American and African plates. Lic. Exh. 15, Sections 3.3.1 and 3.3.2.

In differentiating these provinces, licensees witnesses pointed out that (a) the Central New England province has a thick dense mafic crust and eugeosynclinal sedimentary rocks²⁶ while (b) the Inner Piedmont province has a Grenvillian²⁷ basement with miogeosynclinal sediments.²⁸ As a result of the change in basement rock across the boundary between the two provinces there is, according to the licensees, a distinct gravity gradient in this area. Tr. 2937. The boundary line is thought to correspond to the ancient eastern margin of the American plate. Tr. 2807.

The final province near the Indian Point site proposed by the licensees panel is the Conestoga Valley province which basically lies between the Inner Piedmont and the Highlands provinces southward from a point in mid-eastern Connecticut. The reason given for separating it from the Inner Piedmont province is, to say the least, less than clear in the licensees' written testimony. Lic. Exh. 15, pp. 3-10, 3-11. On cross-examination the licensees witnesses emphasized the extreme complexity of the structures along the line between the Inner Piedmont and Conestoga Valley provinces and stated:

Originally we had a large province which was composed of two provinces, one was the Inner Piedmont and the other one was the Conestoga Valley and we had them together. But after we had recognized that

²⁶Mafic rocks are dense, dark-colored rocks usually containing large amounts of iron. Tr. 2456. The eugeosynclinal sediments contain remnants of ocean crust. See fn. 28, below.

²⁷The Grenvillian basement rocks are primarily silica and alumina. Tr. 2528.

²⁸Simplistically, miogeosynclinal sediments are relatively thin sediments deposited in shallow water while eugeosynclinal sediments are thicker and deposited in deeper water. However licensees' witness Szymanski emphasized that the panel was using the term miogeosynclinal to cover sediments older than the subduction zone which existed between the continents. The miogeosynclinal deposits of the Inner Piedmont contain the great carbonate bank along the eastern edge of the province. Tr. 2447. There is no known Grenvillian crust east of the eastern boundary of the Inner Piedmont province. Lic. Exh. 15, p. 3-8.

these provinces are not characterized by uniformities in geological structures, we thought that for the purpose of this report and this proceeding it would be fair to put this line, since it divides in our judgment the two different structural domains. [Tr. 2960.]

Three remaining provinces to the north were proposed by the licensees panel. The first is the Ottawa Basin which appears to be identical to the State's Grenville province. The remaining two are merely northeasterly extensions of the Fold and Thrust Belt and the Inner Piedmont provinces and are of no particular importance in this proceeding.

c. Another licensee's witness Dr. H. James Dorman²⁹ covered part of the same ground as State's witnesses Sykes, Diment and Hall, *i.e.*, the geologic structures and seismic activity in the southern segment (New Hampshire) of the "Boston-Ottawa trend."³⁰ While the State and NRC staff referred to this area as a seismic trend, Dr. Dorman proposed that, within the context of Appendix A, it be classified as the Cape Ann-New Hampshire tectonic province.

Under Board questioning (Tr. 2663-2672), Dr. Dorman outlined the approximate boundaries of this province. He did not define the boundary on the Atlantic Ocean side. The southern border passed north of Cape Cod, thence westerly beyond the 71st meridian, northwesterly to the Massachusetts-New Hampshire border, north along a line slightly east of the 72nd meridian to cover the granitic intrusive in Quebec at a latitude of about 45.5° north. The province line would then loop eastward to approximately the 71st meridian and south to the Maine-New Hampshire border, thence southeast out into the Atlantic. Tr. 2668-72; also see Fig. 2, p. 579, *infra*.

In his testimony (Lic. Exh. 17 at p. 4) Dr. Dorman testified that such a province would include:

(1) A series of granitic intrusive complexes of the White Mountains and extending offshore to the southeast.

(2) Active faults indicated by earthquakes occurring in an area partially coextensive with the igneous complexes.

It was Dr. Dorman's contention that the province includes "the largest historic earthquakes of the northeastern U. S., including the Cape Ann earthquake of 1755 . . ." *Id.* at p. 5. Dr. Dorman also pointed out that this system appears to be colinear with the Kelvin Seamounts (*id.* at pp. 14,

²⁹Dr. H. James Dorman, Professor of Geophysics, University of Texas, Marine Science Institute, Galveston, Texas.

³⁰Lic. Exh. 17, "Testimony of Dr. H. James Dorman on Behalf of Licensees on Issue No. 1."

15) and the Atlantic fracture zone which are probably related to a "rearrangement of the relative movement of the plates about 80 million years ago." *Id.* at p. 17.

d. As we have previously noted at p. 556, *supra*, the licensees did not develop specific provinces south of the Pennsylvania-Maryland border. It is their thesis that the northern and southern Appalachians developed differently with different alignments and stresses (Lic. Exh. 15, p. 1-5, para. 5; Tr. 3015-21) and the major earthquakes south of the Pennsylvania-Maryland border were below the transverse break line between the north and south Appalachians.

3. Testimony of the Staff

In its very brief direct testimony,³¹ the NRC staff stated:

In our review we determined that six tectonic provinces lie partially within 200 miles of the Indian Point site. These are: (1) Piedmont-New England, (2) Northern Valley and Ridge, (3) Appalachian Plateau, (4) Central Stable Region, (5) Southeastern Platform, and (6) Atlantic Coastal Plain. [*Id.* at p. 2.]

Since no map was presented, and the province names did not match the province names used by either the State or licensees, it was necessary to develop approximate locations of the provincial boundaries used by the staff through cross-examination. By this means a map showing the staff provinces was developed on a seismotectonic map by Jarvis B. Hadley and James P. Devine (1974), identified as State Exhibit 14. See Tr. 3338-40 and 3443-45 and p. 552, *supra*. This map is reproduced in this decision as Figure 3 (see p. 580, *infra*).

In a general way the staff map matches that of the State with regard to the Grenville, Appalachian Plateau, and the Atlantic Coastal Plain provinces. However where the State used one large province called the Folded Appalachian Province, the staff divided the area into three parts. The two westernmost regions next to the Appalachian Plateau are the Northern and Southern Valley and Ridge provinces. These are split in western Virginia and the northern province appears to coincide roughly with the licensees' Fold and Thrust Belt. Staff witness Robbins explained that the Appalachians have "a significant structural break" along a zone lying between Roanoke and the James River. Tr. 3522. The witness noted also that the

³¹Staff Exh. 5, "NRC Staff Testimony on Issue No. 1 and Issue No. 2"; J. C. Stepp, D. R. Budge, S. M. Coplan, R. B. McMullen, G. A. Robbins.

region south of this break has major seismicity with thrust faulting as the dominant style of deformation, while the province north of it is virtually aseismic with folding being the dominant structural style. Tr. 3448-49.

Staff's Piedmont-New England province runs between the Atlantic Coastal Plain and the two Valley and Ridge provinces. In the north this seems to coincide with that area which licensees have split into the Highlands, Conestoga, Inner Piedmont and Central New England provinces. Finally the staff identified its Southeastern Platform province in Massachusetts and Rhode Island.

For this final province the staff explained that the United States Geological Survey (USGS) had advised it by correspondence in late 1975 that USGS considered that "the New England part of the Avalonian belt forms a tectonic province in the larger New England-Maritime Province and is called the Southeastern Platform in Massachusetts." Tr. 3472-73. As we shall see later, this area is essentially the same as the licensees' Avalon Platform province.

In addition to its determination of provinces the staff, in accordance with Appendix A, Section V, designated two areas as "tectonic structures" with which seismicity is related. In its testimony the staff stated:

(1) within the Piedmont-New England and southeastern Platform Provinces we conclude that the 1727 southeastern New Hampshire earthquake of maximum intensity VIII, the 1755 Cape Ann, Massachusetts, earthquake of maximum intensity VIII and the 1817 Woburn, Massachusetts, earthquake of maximum intensity VII-VIII can be reasonably correlated with the White Mountain Intrusive Complex; and (2) within the Central Stable Region, we conclude that the 1929 Attica, New York, earthquake of maximum intensity VIII can be reasonably correlated with the Clarendon-Linden structure. [Staff Exh. 5, p. 3.]

B. The Seismic Events to be Considered

In its direct testimony, the State of New York presented a list of intense earthquakes the effects of which, under its view of the tectonic provinces, should be considered at the Indian Point site.³² Since this list encompassed all of the earthquakes suggested for consideration by the other parties we include it in this opinion.³³

Both the licensees and the staff objected to consideration of most of these earthquakes for one or both of two reasons: (a) the earthquake oc-

³²State Exh. 9, pp. B-1, B-2.

³³See Table 1, p. 563, *infra*.

curred in a province so far removed from Indian Point that the resultant intensity would not have been greater than MM VII at the site and (b) the intensity used by the State is too high.

All of the events listed by the State and other parties will be analyzed on the basis of our decision on the applicable tectonic provinces (see Section II.B, *infra*).

II. Discussion of the Testimony

A. Tectonic Provinces

As is obvious from the testimony, the interpretations of 10 CFR Part 100, Appendix A, vary widely between the parties. The variations are attributable to Section III(h) in which a "tectonic province" is defined as "a region of the North American Continent characterized by a relative consistency of the geologic structural features contained therein."

On the basis of our review of the entire record covering this issue, we must conclude that the approach taken by the licensees in formulating their provinces is the correct one. Our reasons for this conclusion will be outlined in the following discussion of the provinces proposed by the State, the NRC staff and the licensees.

1. The State takes the definition of "tectonic province" to mean that consideration will be given only to "first order characteristics."⁴ As a result it claims that the entire United States between the western edge of the Appalachians and the western edge of the Coastal Plain and from Alabama to the St. Lawrence River is one big province (see Fig. 1, p. 578, *infra*). It is inconceivable to us that the formulators of Appendix A to the siting criteria intended that only first order characteristics be considered in delineating tectonic provinces. If this had been the type of province that was being considered for siting, it is reasonable to suppose that Appendix A would have said so explicitly. It is our conclusion that the licensees and NRC staff have made a proper showing that some smaller provinces are justified within the requirements of Appendix A. (See also the testimony of State's witnesses Sykes, Hall and Drake, pp. 554-555, *supra*.)

2. It is our opinion that the licensees, in their determination of tectonic provinces, have made the only consistent attempt to utilize a range of scientific data in their interpretation of the requirements of 10 CFR Part 100, Appendix A. A major basis for their approach is the present tectonic plate theory model of past movements of the American and African continents which their witnesses in this proceeding considered to represent the current

⁴See p. 552, *supra*.

TABLE 1^a

	Date	Location	MM Intensity	Coordinates
The Atlantic Coastal Plain				
1.	1886, Aug. 31	Charleston, S.C.	X	32.9°N 80.0°W
The Folded Appalachians				
1.	1638, Jun. 11	Off Cape Ann, Mass.	VIII	42.5°N 69.0°W
2.	1727, Nov. 9	Newbury, Mass.	VIII-IX	42.8°N 70.8°W
3.	1755, Nov. 18	East of Cape Ann, Mass.	VIII	42.5°N 70.0°W
4.	1791, May 18	Connecticut	VIII	41.5°N 72.5°W
5.	1817, Oct. 5	Woburn, Mass.	VII-VIII	42.5°N 71.2°W
6.	1869, Oct. 22	Bay of Fundy	VIII	45.0°N 66.2°W
7.	1897, May 31	Giles Co., Virginia	VIII	37.3°N 80.7°W
The Appalachian Plateau				
1.	1929, Aug. 12	Attica, N.Y.	VIII	42.9°N 78.3°W
Grenville				
1.	1663, Feb. 5	St. Lawrence River	X	
2.	1732, Sep. 16	St. Lawrence Valley	IX	45.5°N 73.6°W
3.	1860, Oct. 17	Northeast of Quebec City-St. Lawrence Valley	VIII- IX	47.5°N 70.0°W
4.	1870, Oct. 20	St. Lawrence Valley	IX	47.4°N 70.5°W
5.	1944, Sep. 5	Massena, N.Y.	VIII	44.9°N 74.8°W

^aState Exh. 9, pp. B-1, B-2; column entitled *Intensity Source* omitted.

“state of the art.”” We have summarized in Section I.A.2 the currently accepted history of the two continents and the provinces that have been proposed by the licensees. While the model which led the licensees to their selection of tectonic provinces may not be completely correct, we find the geologic evidence that they present for the differentiation between many of their provinces to be convincing. We will now discuss our reasons for accepting or rejecting the various provinces proposed by the licensees and the staff.³⁶

a. The Grenville or Ottawa basin and the Stable Interior or Appalachian Plateau Provinces

Since all parties agree on these provinces we will not discuss them further.

b. The Fold and Thrust or Valley and Ridge Provinces

The NRC staff divided its Valley and Ridge province into northern and southern sections: The boundaries the staff proposed for the Valley and Ridge province follows a 1970 map developed by Rodgers and no geologic reasons for the eastern and western boundaries were presented. Tr. 3447 and 3749. However, with respect to the boundary which separates the northern and southern sections of the province, the staff showed convincingly that in the Southern Valley and Ridge thrust faulting is the “dominant style of deformation” (Tr. 3448-49) and the province has high seismicity (Tr. 3526-27). On the other hand the Northern Valley and Ridge is primarily folded and is “virtually aseismic.” Tr. 3449; 3522-23.

The licensees for their part identified the Northern Valley and Ridge (their Thrust and Fold Belt) as a series of tightly folded Paleozoic sediments with an absence of basement involvement. We have noted in Section I.A.2.b, (p. 556, *supra*) that the western boundary of this province is the limit of the Paleozoic thrusting and marks the eastern boundary of the Stable Interior province. To the east of the Thrust and Fold Belt, however, is an area characterized by Grenvillian rocks (licensees’ Highland province).

The licensees did not consider the Southern Valley and Ridge province specifically since it is their view that the geologic movement and develop-

³⁶Staff witnesses also accept the hypothesis of plate tectonics (Tr. 3638) as do some of the State’s witnesses (e.g., Sykes and Drake, State Exh. 7, p. 1 and Tr. 2870). On the other hand State witness Davis branded the use of the tectonic plate theory to explain the deformation of the Appalachians as “supposition and speculation.” N.Y. PFC, pp. A-12 and A-13; Tr. 1810-11.

³⁷The provinces discussed are shown on the attached maps: Fig. 1—N. Y. State; Fig. 2—Licensees; Fig. 3—Staff, pp. 578, 579 and 580, respectively.

ment south of a line roughly between the 39th and 40th parallels have been entirely different from the development to the north. This view would of course split the Valley and Ridge as well as the lower Piedmont and Highland provinces at this line. Lic. Exh. 15, p. 1-5 and Tr. 3014-17. State witness Drake tended to agree with this interpretation of the break between the North and South Appalachians which he considers to run from the New Jersey coast southwesterly to the western part of West Virginia. Tr. 2884-88.

We accept the Southern Valley and Ridge and Northern Valley and Ridge (or Thrust and Fold Belt) as two tectonic provinces.

c. The Highlands Province

The licensees have described this province as the eastern belt of the anticlinoria on the American continent. This zone of Grenvillian rocks is bounded on the west by the Fold and Thrust Belt and to the east by sedimentary rocks over a Grenvillian basement (as we have noted at pp. 556, 558, *supra*). Licensees witness Szymanski described the rock formation as being structurally different from the surrounding areas. He stated

. . . this is an uplifted block of the basement, a block which broke through the Paleozoic cover. And since it did so, it has a very specific structural assemblage which we call up-thrusts, that is to say there are faults which bound this great anticlinoria on either side. [Tr. 3049.]

This type of consistent style of deformation of the rocks is a feature we have already discussed in connection with the separation of the Valley and Ridge area into two distinct provinces, one being primarily folded and the other characterized by thrust movements. We note also that State witness Hall, when asked what characteristics—such as age of rocks, basement rock types and the like—could be used to define the boundaries of a tectonic province, answered:

The age of the rocks involved would not, in my opinion, be an overriding concern in defining the tectonic province. I would say the overriding concern would be the consistency of the style of deformation of the rocks. [Tr. 3309.]

We conclude that the Highlands province as outlined by the licensees is a valid tectonic province.

d. Inner Piedmont, Central New England and Avalon Platform Provinces

As we have seen in Section I.A.2.b. (p. 558, *supra*), the licensees described the Inner Piedmont province as Grenvillian basement surmounted

by miogeosynclinal sediments (including the great carbonate bank). The Central New England province however was described as mafic rocks covered by eugeosynclinal sediments.

The licensees emphasized that the boundary line between the Central New England and the Inner Piedmont provinces indicates the location at which an area containing Grenvillian age rocks changes to an area which holds the "remnants of a defunct ocean." Tr. 2807. The division line or zone is indicated by a change in rock chemistry, a gravity gradient and seismic velocity changes. Tr. 2807-09.

We have noted (p. 557, *supra*) that crossing the line from the Central New England into the Avalon Platform province the crust changes to a "crystalline continental crust" which is younger than the Grenvillian orogeny. The boundary line chosen by the licensees is located along the change in magnetic characteristics between the crust of the Avalon Platform and that of the Central New England province.

The staff's proposed province called the Southeast Platform agrees very closely with the Avalon Platform province, the difference being that the staff chose a series of faults running closely parallel to the magnetic changes for its province boundary.

The State of New York, in its Proposed Findings of Fact and Conclusions of Law, objected strongly to the division of New England into the Inner Piedmont, Central New England and Avalon Platform provinces (N.Y. PFC, pp. A-13, A-14), referring primarily to Dr. Hall's testimony under cross-examination. Tr. 3201-07, 3308-11. In this testimony Dr. Hall objected to the use of rock age, type and stratigraphic succession to outline provincial boundaries. The State also pointed to its primary objection that the proposed provinces are based on second and third order geological characteristics. Tr. 1713-14.

We note however that the State omitted reference to much of Dr. Hall's cross-examination by the licensees' counsel, and his redirect examination by State's counsel. When asked for his criteria for establishing a tectonic province, Dr. Hall replied that all of New England is characterized by rocks that have undergone intense deformation and metamorphism and that any subdivision should be based on folds and fault bounded areas. Tr. 3205-06. Furthermore, he admitted that folds and faults are not the only type of geological structure (Tr. 3213) and that there are different degrees of metamorphism, different episodes of folding and different periods of sedimentation in New England. Tr. 3210-13.

Dr. Hall also agreed that based on radiometric dating there are no Grenvillian basement rocks east of the boundary between licensees' Inner Piedmont and Central New England provinces. Tr. 3230. He agreed that this boundary line correlates with a line of Avalonian rocks similar to the rocks

of the proposed Avalon Platform. Tr. 3237-38. He further stated that, under the plate tectonic theory:

. . . the bedrock geology of the Central New England province is in large part defined as the Merrimac synclinorium and the rocks that occupy that consist of a eugeosynclinal assemblage of rocks that are Ordovician through at least part of the Devonian in age and these rocks have all been subjected to intense deformation and metamorphism that presumably would have occurred at the time of closing or collision of plates. [Tr. 3238.]

Dr. Hall stated that generally these rock formations are correctly outlined in Licensees Exhibit 20 (Tr. 3244-45) and that one interpretation of these formations is

. . . that they may represent a portion of Africa that has been somehow sutured onto the present continental extent of North America, and the boundary that is drawn on this map that I keep erroneously referring to is the boundary that is commonly suggested as being the boundary between Avalonian type rocks and those west of the Avalonian type rocks. [Tr. 3237.]

This theory, according to Dr. Hall, is enhanced by the fact that the sedimentary rocks over the Avalonian rocks contain a fossil assemblage that is different from the assemblage of fossils that is present in the rocks of the same age in the western part of the New England area. Tr. 3314. Dr. Hall noted that:

. . . the fossil assemblage in the overlying rocks in the vicinity of Hopkin Hill in Massachusetts and other local fossil localities in eastern Massachusetts near Boston is the assemblage that is known fairly commonly as the assemblage representative of the Atlantic fauna and the Atlantic fauna is the faunal assemblage that is found in eastern Newfoundland and in parts of Great Britain as opposed to the fauna representative of the early Paleozoic in the western part of New England which is known as the Pacific fauna. [Tr. 3314-15.]

NRC staff witnesses Budge and Robbins agreed that the USGS had defined the proposed Avalon Platform as the Southeast Platform province and had stated that "plate tectonic theory suggests that this had been a part of the African continent." Tr. 3633-34. These two witnesses however, while agreeing with the plate tectonic theory, were uncertain in their own minds that there was sufficient evidence specifically to link the Avalon Platform with the African plate. Tr. 3633-37.

Based on the weight of evidence received, we accept the geological differentiations between the three areas (Inner Piedmont, Central New England and Avalon Platform) to be adequate to classify them as three distinct tectonic provinces within the meaning of Appendix A.

e. Conestoga Valley Province and Southern Section of the Inner Piedmont Province

The Inner Piedmont province continues southwest from Long Island Sound but in this region is bordered by the Coastal Plain on the southeast and the proposed Conestoga Valley province on the northwest. In this area, the geology and the licensees' description of the reasons for two provinces become equally complex and confusing. Upon consideration of the licensees testimony (Lic. Exh. 15, pp. 3-9, 3-10) and the cross-examination by the State (Tr. 2950-67), we are inclined to agree with Dr. Werner's statement [s]o we have three things going on there at once, and there's no straightforward answer to anything. We have a facies transition, a zone of structural telescoping, and an area in which there has been complex overfaulting. [Tr. 2955.]

We are not convinced that the Conestoga Valley can be classified as a separate province.

While the site is within the licensees' Conestoga Valley province, we do not need to decide whether this is a separate province. The licensees witnesses first had it included as a province with the Inner Piedmont. Pp. 558-559, *supra*. If we were to conclude it should have remained undivided, there would still be no earthquakes larger than the design SSE within the enlarged province. Similarly, if the Conestoga Valley province were to be a part of the Highlands province to the west, there would be no earthquake larger than the SSE within this composite province.

f. The St. Albans Thrust Belt and Vermont-Quebec Piedmont Provinces

For the purposes of this decision we need not discuss these two proposed provinces, since neither contains an earthquake larger than the SSE we have assumed for the Indian Point facilities.

g. The Cape Ann-New Hampshire Tectonic Province

The area between the White Mountains of New Hampshire and Cape Ann, Massachusetts, and its continuation seaward was extensively discussed by State, staff and licensees witnesses. While this area has been considered

as part of the Boston-Ottawa seismic trend, the testimony of State's witnesses Hall and Diment, the staff panel and licensees witness Dorman¹⁷ tended to separate this seismic trend into two distinct areas; the southern section trending north-northwest from Cape Ann and the northern section including the Montereion Hills running approximately east-west from Montreal.

All witnesses agreed that there is a series of igneous intrusives known as the White Mountain magma series which can be spatially correlated with the region of seismic activity in New Hampshire. Dr. Hall stated that these intrusives are somewhat older than those of the Montereion Hills but considerably younger than the intrusions of northeastern Massachusetts. State Exh. 13, pp. 3-5. Dr. Diment called the White Mountain intrusives postorogenic (Tr. 1303) and stated that their alignment corresponds roughly with the New England Seamounts. Tr. 1287-88.

Dr. Dorman called this zone of intrusives with the spacially associated seismicity a tectonic province since he believes this combination meets the definition of tectonic province in 10 CFR Part 100, Appendix A, Section III(h). Lic. Exh. 17, p. 14. The staff on the other hand believes that the series of intrusions can be called a "tectonic structure" (Appendix A, Section III(i)) to which the seismicity is related. Tr. 3410-11.

The State disagreed with both of these views. It claimed that Dr. Dorman's proposed province is inconsistent with some of those delineated by other licensees witnesses and furthermore that the Cape Ann-New Hampshire region is *not* characterized by "a consistency of geological structural features, as required by the siting appendix, but merely represents areas of high epicenter density." N.Y. PFC, p. A-15; State Exh. 9, pp. C-19, C-21. In the case of the staff proposal, the State insisted that even if ". . . the White Mountain intrusives satisfy the siting appendix definition of a tectonic structure, they have no relevance to the evaluation of seismic risk because no evidence has been found relating them to a causal mechanism for generating earthquakes." N.Y. PFC, p. A-17. (But see discussion by staff witness Coplan at Tr. 3620-22.)

We also note the State's general observation (which it applies to *inter alia* this province) that neither the use of "neotectonics" nor of plate tectonic theory "for the purpose of establishing tectonic provinces" is provided for in Appendix A. N.Y. PFC, p. A-12. (However, see the discussion on this point by licensees witnesses at Tr. 3054-56.) It further asserted that the use of plate tectonic history, "especially the concepts of initial divergence, convergence, translation and final divergence" by Dames and

¹⁷Hall, Tr. 3262, *et seq.*; Diment, Tr. 1287-94; Dorman, Lic. Exh. 17, pp. 10, 11; Staff, Tr. 3410-13.

Moore is pure speculation. N.Y. PFC, pp. A-12, A-13. (See also State witnesses' comments at Tr. 1810-11.)

Considering first the State's general objections to "neotectonics" and "the plate tectonic theory" we find that we must reject both of its claims. Neotectonics is defined as "the study of the last structures and structural history of the Earth's crust, after the Miocene and during the late Tertiary and the Quaternary"³⁸—*i.e.*, the most recent 25 million years of the earth's history. The State has given no reason for ignoring this period of the earth's history and we know of none.

With regard to plate tectonics we acknowledge that every facet of this theory is not scientifically proven but it is recognized by the large majority of the witnesses in this case (including three of the State's witnesses) as the "state of the art." We find nothing in Appendix A that prohibits us from utilizing the latest accepted geologic developments in making determinations of tectonic provinces.

With regard to whether the Cape Ann-New Hampshire area may be considered as containing either a tectonic province or a tectonic structure, in our opinion the answer is yes. The evidence is clear that the intrusives stretching south from Mt. Megantic through New Hampshire and out into Massachusetts Bay are all of similar age, shape and magnetic signature. It must be assumed therefore that they were produced by the same type of mechanism.³⁹ We need not here decide what that mechanism was—*e.g.*, a transform fault or a crustal weakness. What is evident is that we have in the region "a large scale dislocation or distortion within the earth's crust"—hence a "tectonic structure" as defined in Appendix A. Similarly we have "a region—characterized by a relative consistency of geologic structural features" or a "tectonic province." While the choice between the two makes no difference in the final result, we favor the designation of the area as the New Hampshire-Cape Ann province⁴⁰ which would then for our purposes cut through the older Central New England and Avalon Platform provinces as a separate entity.

B. Seismic Events to be Considered

We must now decide whether any of the list of intense earthquakes

³⁸*Glossary of Geology*, American Geological Institute; second printing, 1973, at p. 477.

³⁹We note that we do not include in this series of intrusives the older intrusives of eastern Massachusetts which were formed about 275 million years before the New Hampshire intrusives. (See Hall testimony, State Exh. 13, pp. 3, 4.)

⁴⁰We have outlined the boundary of this province, as described by Dr. Dorman, by a dashed line on Fig. 2 (p. 579, *infra*).

presented by the State of New York could, under 10 CFR Part 100, Appendix A, be considered as affecting the Indian Point site at a greater than intensity VII level. We will consider each of the earthquakes listed in Table 1 (on page 563, *supra*) in terms of their relationship to the tectonic provinces and structures that we have accepted in II.A.

1. Charleston, S. C., August 31, 1886

Both the State and the licensees⁴¹ agree that this intensity X earthquake is related to a specific structure. State Exh. 9 at C-3; Lic. Exh. 15 at 4-6, 4-7. We agree and, since this structure is more than 200 miles from the site, it need not be considered. 10 CFR Part 100, Appendix A, Section IV(a)(6).

2. Off Cape Ann Massachusetts, June 11, 1638

Neither the State nor the licensees⁴² believe that this earthquake need be seriously considered because of both doubtful location⁴³ and uncertain intensity. We agree with assessment. Furthermore, it is located in a province separated from Indian Point by two intervening provinces.

3. Newbury, Massachusetts, November 9, 1727

While there is some disagreement among the parties as to the actual intensity of this earthquake,⁴⁴ there is agreement as to its location. The epicenter is within the boundaries of the Cape Ann-New Hampshire province which we have accepted. Since the nearest boundary of this province is nearly 200 miles from the Indian Point facilities a similar event will not cause an intensity higher than MM VII at that site.

⁴¹We have found no comment by the staff on this earthquake.

⁴²We have found no comment from the staff on this event.

⁴³Location was more probably in the St. Lawrence River Valley. This location change has been proposed by the Dominion Observatory of Canada as a result of recent new studies of this earthquake. Tr. 3530-31.

⁴⁴The earthquake is listed as VIII-IX by the State but witnesses for all parties agreed that it should be no higher than an VIII and perhaps only a VII (State, Tr. 1870-75; Staff, Tr. 3350; Licensee, Lic. Exh. 15, p. 4-4). We agree with the State that a single analysis by the Weston Geophysical (accurate though it may be) lowering this intensity to VII should not be accepted without thorough review. It is evident however that the intensities of many of the older earthquakes are probably overstated and are perhaps more hysterical than historical. It would seem that in this case a review of the Weston analyses by the State geologic group might have sufficed to settle the argument insofar as this proceeding was concerned. We will, for the purposes of this proceeding, consider it an intensity VIII event.

4. East of Cape Ann, Massachusetts, November 18, 1755

All parties agree that this was probably an intensity VIII event. Since there is some uncertainty as to its exact location, although somewhere in Massachusetts Bay offshore of Cape Ann, the earthquake may have occurred in either the Cape Ann-New Hampshire or the Avalon Platform province. In either case, since the closest point of the boundary of the nearest of these two provinces is over 100 miles from the Indian Point facility, an intensity VIII event would be attenuated to no more than an intensity VII at the site.⁴⁵

5. East Haddam, Connecticut, May 18, 1791

The State originally rated this earthquake as an intensity VIII event on the basis of its rating in the publication "Earthquake History of the United States." However, on the basis of a Weston Geophysical report of 1964 the publication is now revising the intensity rating to a VII. Tr. 1877, 3341-42. Since all parties now agree to the intensity VII rating, the design of the Indian Point facilities will be unaffected by consideration of this earthquake.

6. Woburn, Massachusetts, October 5, 1817

Here again we have some dispute over the intensity of this event but all parties agree that intensity VIII is probably too high. Tr. 1931, 2995-96, 3350-51. While this earthquake appears to have occurred within either the Avalon or Cape Ann-New Hampshire Provinces the location data are not precise enough to say this with certainty. To be conservative we therefore consider the event as having been within the Central New England province. In this case Appendix A requires that the event be considered at the nearest point of the Central New England province to the site or a distance of approximately seventy five miles from Indian Point. It would therefore present no more than an intensity VII at the site location.⁴⁶

7. Bay of Fundy, October 22, 1869

This earthquake was originally assigned an intensity VIII by Smith

⁴⁵See, for example, TID 7024, "Nuclear Reactors and Earthquakes," T. H. Thomas, *et al.*, August 1963, pp. 15-17.

⁴⁶New York State has agreed that since it assumes this earthquake to be intensity VII-VIII it does not consider it to be a controlling event for the Indian Point site. Tr. 1931.

“Earthquakes of Eastern Canada and Adjacent Areas 1534-1927.”⁴⁷ Both the staff and the licensees have been informed by the Dominion Observatory that it has reviewed this event and now rates it as intensity VI and considers it to have been located in New Brunswick rather than the Bay of Fundy. Tr. 3345-46.

While the State insists that this has not been reviewed by the “scientific community” we are of the opinion that a revision by a responsible government agency of its own work must be viewed in a different light than a revision proposed by a private company. We accept the revision of intensity value and location and drop the event from further consideration.

8. Giles County, Virginia, May 31, 1897

All parties agreed that this was an intensity VIII event. The State considered both the earthquake and the Indian Point site to be in its proposed Folded Appalachian province and therefore argued that the nuclear facilities should be designed for an MM VIII intensity level.

The staff, however, presented convincing detailed evidence that the earthquake occurred in its proposed Southern Valley and Ridge province. Tr. 3347, 3447-48, 3520. This evidence supported the general picture of a distinct separation between the North and South Appalachians presented by the licensee (Lic. Exh. 15, p. 1-5 and Tr. 3-15-17) and State witness Drake (Tr. 2884-88).

We have accepted the Southern Valley and Ridge province (or Southern Fold and Thrust province). Thus under Appendix A an earthquake equivalent to the Giles County event need be considered as being no closer than about 350 miles from the Indian Point site.

9. Attica, N. Y., August 12, 1929

All parties have agreed that this earthquake was near the western end of Lake Ontario, more than 200 miles from the site, and in a different tectonic province than that in which the Indian Point site is located. Furthermore all agree that the event can be reasonably linked with the Clarendon-Linden structure. Staff Exh. 5, p. 3; State Exh. 9, p. C-3; Lic. Exh. 15, pp. 4-5, 4-6. We find no reason to consider it further.

⁴⁷Publications of the Dominion Observatory, V. 32, No. 3, Ottawa (1962). (See State Exh. 9, pp. B-1, B-2.)

10. Grenville Province Earthquakes, February 5, 1663, September 16, 1732, October 17, 1860, October 20, 1870, and September 5, 1944

All parties agree that these earthquakes were located in the Grenville province. All parties are in agreement on this province (see Figs. 1, 2, 3) and the fact that its nearest point of approach to the Indian Point site is approximately 200 miles.

Under these conditions any of the listed earthquakes in the Grenville province will be attenuated to a level of VII or less at the Indian Point facilities.

Conclusion

For all of the above reasons we must conclude that none of the earthquakes listed by the State requires an assumption of more than an MM VII intensity at the Indian Point site.

III. Additional Remarks

Included in the Findings of Fact of New York State were the following three items:

10. Determination of seismic risk in the eastern United States through the analysis of regional geologic structures and the delineation of tectonic provinces is difficult, because of lack of knowledge about causal mechanisms of earthquakes and because the analysis of modern seismicity in relation to geologic structure does not generate a tectonic province map, but rather a seismotectonic map.

11. The NRC has not promulgated an official tectonic province map of the eastern United States.

12. The NRC Staff has accepted differing sets of tectonic provinces for New England in licensing proceedings for other power plant sites.

State PFC at p. A-3 (references omitted).

These statements are correct and focus on some of the major difficulties that this Board faced in reaching its decision on the selection of tectonic provinces. We believe that further discussion is therefore warranted.

During the course of the hearing on this issue this Board questioned witnesses for all parties on their theories, methodology and criteria for making their decisions on the location and size of tectonic provinces. The State and licensees both presented detailed maps and discussion of their approaches. Only the NRC staff failed to develop its own map of the pro-

vines it was proposing, even though it was requested to do so by the Board. Tr. 3337-40. During cross-examination, staff witnesses were able to draw, in rough outline, their proposed provinces on a copy of a Hadley and Devine map supplied by the State.⁴⁸

In answer to a question by New York State counsel as to why such a map had not been promulgated by the NRC staff, witness Stepp replied:

I will repeat my answer of earlier today and say that we have given this matter of tectonic provinces endless thought and consideration during the past two and a half to three years and we have discussed it with virtually everyone who has any contact with nuclear power plant siting including our advisors in the USGS who have worked with us on site-to-site bases and our advisory committee that is formed of the USGS people.

Now we have been advised that it is not now timely on the basis of the data that we have available to us to establish an official tectonic province map that would be used for making—that would be used in a nondiscretionary way in making decisions about seismic design. We have instead undertaken a very extensive program of obtaining—to obtain the data that are needed by all of those people who are involved in this program in order to be able to make a decision about such a map.

Tr. 3475-76.

Later Dr. Stepp stated that presently the staff is “simply generally defining the tectonic provinces as defined by King, Rodgers and Hadley and Devine . . . this is the general concept that we would follow, as an illustration.” Tr. 3746. However, when being questioned by the Board about the purpose of the Rodgers, *et al.* maps, the following series of questions and answers took place:

- Q. And my concern is that Rodgers or Hadley-Devine and King, were those maps really drawn with the knowledge of the distribution of epicenters in mind?
- A. Obviously the Rodgers and King maps were not, and were drawn for a completely different reason with no thought whatever of the occurrence of earthquakes.
- Q. That becomes a problem, Dr. Stepp, in that okay, here you’re saying in the guidelines for applications and so on for seismic that you’re basically relying on these two maps, and yet those two maps were not drawn with the purpose in mind that the NRC requires for provinces.

⁴⁸This map was entered into evidence as State Exh. 14 (Tr. 3444, 3688). It is presented here as Fig. 3 on p. 580, *infra*.

A. That's right. They were not.

Q. So, you know, where does that leave us? Confused or otherwise?

A. Well, I can tell you where it leaves the Staff in trying to make our decisions. It leaves us generally recognizing that the province—the generalized province concepts that we use are not consistent with what I would interpret to be the intent of Appendix A in defining tectonic provinces.

It leaves us without a set of provinces that I believe might be considered to be consistent with the meaning and intent of Part 100.

Tr. 3749.

We contrast this uncertainty on the part of the staff with the requirement which the same staff places on applicants with regard to what must be shown in the application for a construction permit. The Standard Review Plan⁴⁹ states, in Section 2.5.2 (entitled Vibratory Ground Motion), subsection 2.5.2.2 (Geologic and Tectonic Characteristics of Site and Region), that:

The applicant's presentation is accepted when all regional geologic structures and tectonic activity which are significant in determining the earthquake potential of the region are identified. Information presented in Section 2.5.1 of the applicant's safety analysis report (SAR) and information from other literature sources (e.g., Refs. 8, 9, 10, 11, 12) dealing with regional tectonics should be developed into a coherent, well-documented discussion to be used as the basis for determining tectonic provinces and the earthquake-generating potential of the identified geologic structures. . . . In addition, in those areas where there are capable faults, the results of the additional investigative requirements described in 10 CFR Part 100, Appendix A, Section IV(a)(8), must be presented. The discussion should be augmented by a regional-scale map showing the tectonic provinces, earthquake epicenters, locations of geologic structures and other features which characterize the provinces, and the locations of any capable faults.

In view of the staff's uncertainty concerning the definition of tectonic provinces, expressed in the testimony quoted above, *we find it difficult to determine the basis on which the staff can evaluate the applicants' response*

It was obvious from the staff panel's comments during this proceeding that the members of this panel could draw their own set of guideline pro-

⁴⁹NUREG-75/087, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," September 1975.

vinces but the NRC advisory committee on geology (composed of USGS employees) has advised against doing so. Dr. Stepp stated that insofar as he knows "the advice that the USGS has given this agency has never been modified. I don't think that there is any policy that says the USGS is running the show, but in reality their advice has always been followed." Tr. 3752. We are thus faced with the situation where the USGS which had a major role in developing Appendix A (Tr. 3778) nevertheless has expressed the belief "that the Appendix would be extremely difficult to apply and would lead to a lot of confusion in the assigning of tectonic provinces." Tr. 3778-79.

In this situation, we believe that having accepted the USGS concept of tectonic province the NRC staff must now do its "own thing," *i.e.*, decide, on its own, the criteria to be applied and how the regulation is to be enforced. In this proceeding we received little assistance from the staff witnesses in deciding whether the State or the licensees had the correct concept of the tectonic province requirement of Appendix A because they are apparently required to implement USGS recommendations without question. Thus, while the staff witnesses have the necessary expertise, it seems that management support for utilization of this expertise is lacking. In our opinion it is essential for the *NRC* to decide whether the tectonic province concept is viable and, if so, it should issue the requisite guidelines for the acceptability of such provinces at the earliest possible moment.

This Board appreciates the effort of New York State in helping to bring this problem to light.

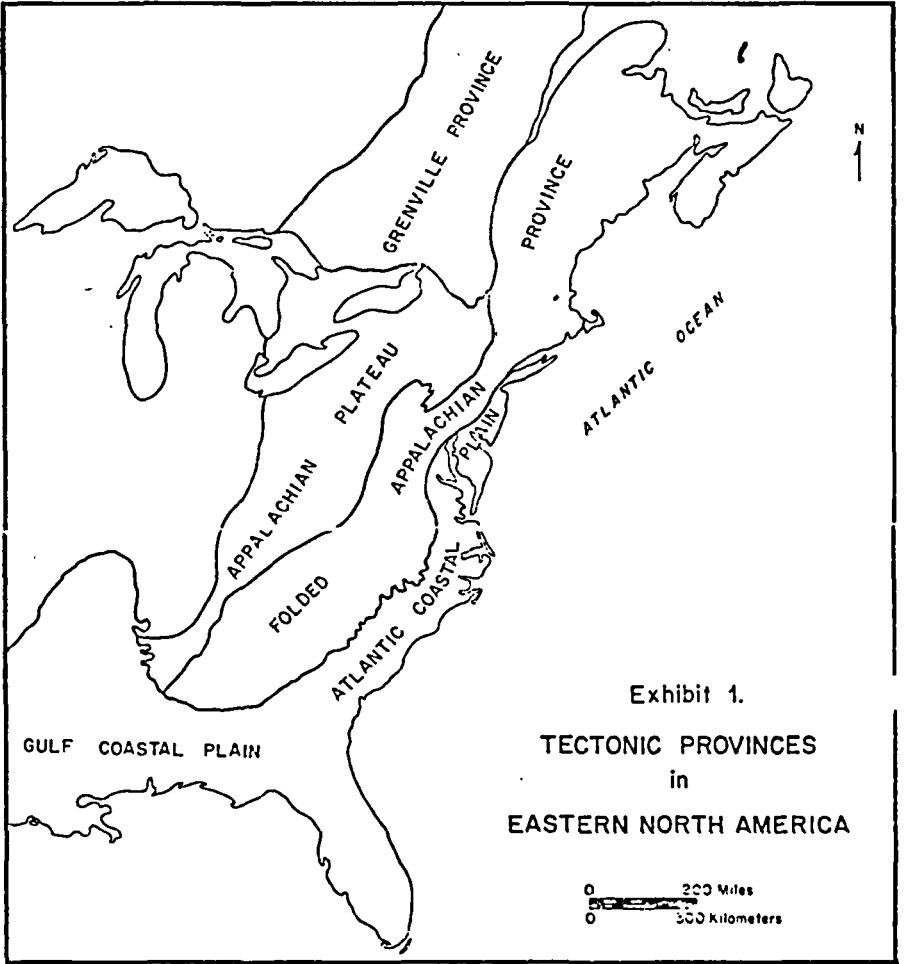
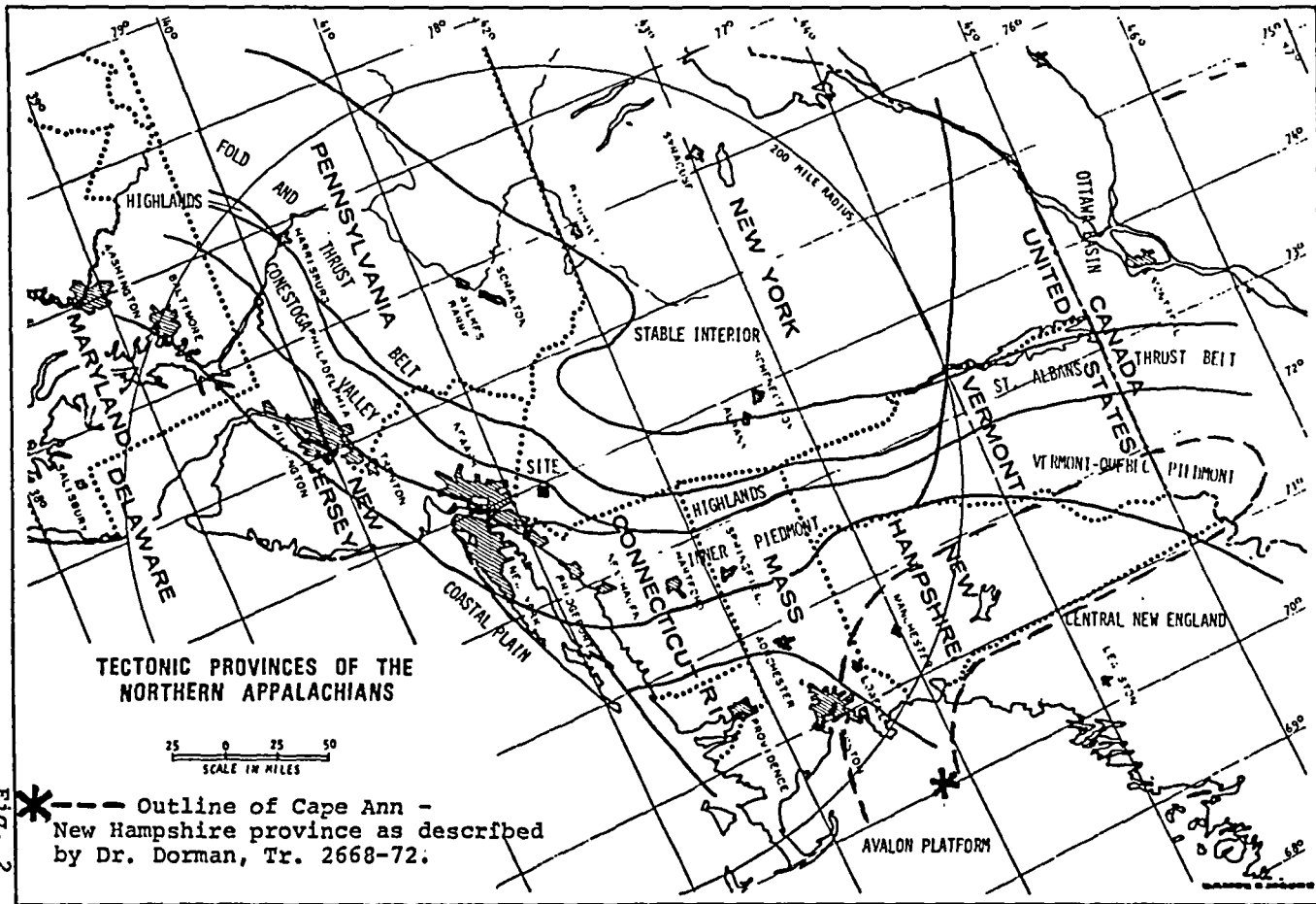
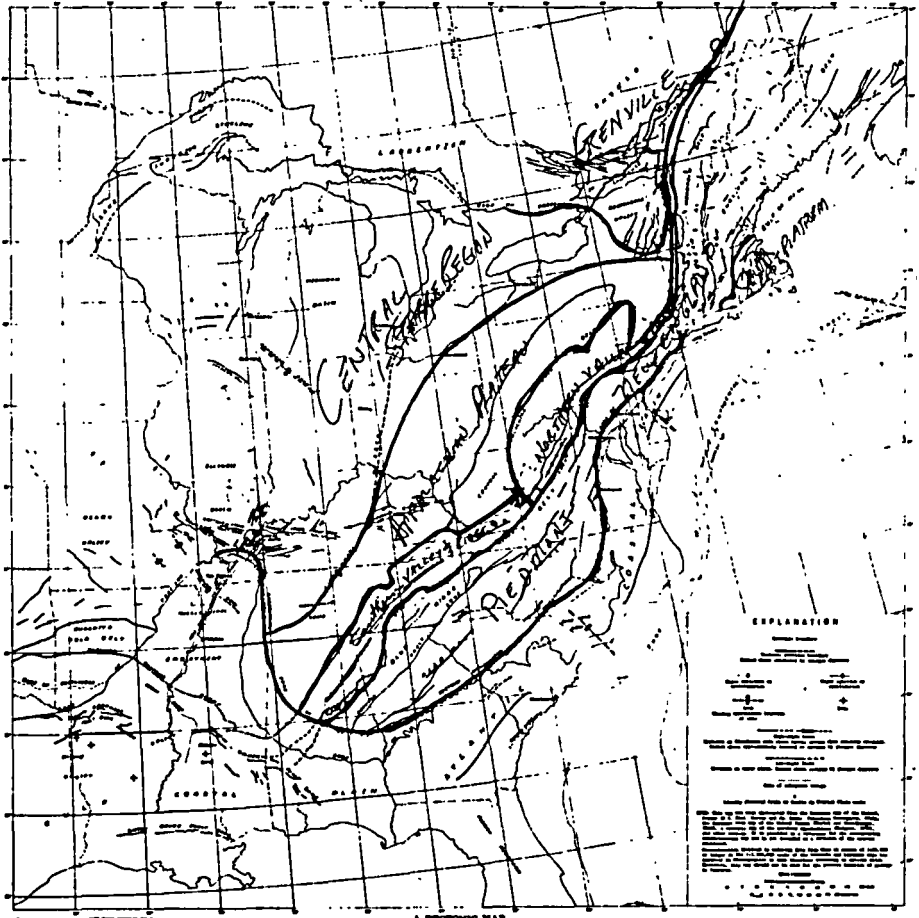


Exhibit 1.
TECTONIC PROVINCES
 in
EASTERN NORTH AMERICA

Fig. 1





A TECTONIC MAP
SEISMOTECTONIC MAP OF THE EASTERN UNITED STATES

Fig. 3

By
Jarvis R. Hadley and James F. Devlin
1954

ISSUE 2

Should the ground acceleration value used for the design of Indian Point, Unit 1, 2, or 3, be increased?

In the Safety Evaluation Report for Indian Point Nuclear Generating Station, Unit 3, the staff concluded (at pp. 3-5, 3-6) that the licensees' decision to use a horizontal ground acceleration of 0.15g for the safe shutdown earthquake was acceptable. This conclusion was based on a maximum probable earthquake intensity of MM VII at the site. Intervenor CCPE objects to this determination and insists that a horizontal acceleration value of 0.20g be used for intensity VII and 0.40g for intensity VIII. Six full days of hearings (April 21-23 and 26-28, 1976) were used to cover this issue. Since we have found in Issue 1 that an intensity VII is the maximum intensity to be considered for the Indian Point site we will limit our discussion to that level.

It is recognized that the ground acceleration at a given site as the result of an earthquake depends, *inter alia*, upon the intensity of the shock at that particular location. However, as the State of New York noted in its testimony:¹⁰

Intensity of ground motion as reported at a given distance from the earthquake source, is a highly subjective quantity and any relationship between intensity and acceleration must be considered to have significant uncertainty associated with it. Furthermore, intensities of historic earthquakes (such as the Cape Ann earthquake of 1755) have been assigned relatively recently based on historical accounts. Thus a second order of subjectivity is present in the intensity values for most historic earthquakes.

Only well documented relationships between intensity and acceleration should be used to determine the asymptotic acceleration value for a design response spectrum.

State Exh. 1, p. 1.

In their testimony¹¹ the licensees utilized the intensity-acceleration rela-

¹⁰State Exh. 1, "Testimony of Dr. James F. Davis, Dr. Paul W. Pomeroy, and Dr. Robert H. Fakundiny (Panel) on Behalf of the New York State Atomic Energy Council on Issue II."

¹¹Lic. Exh. 2., Dames and Moore Report: "Evaluation of Ground Acceleration for the Indian Point Site," March 15, 1976.

tionship developed by Coulter, Waldron and Devine of the United States Geological Survey.³² The other parties (the State, CCPE, the NRC staff) all used the relationship developed by Trifunac and Brady.³³ While there was considerable discussion during the hearings about the value of each of these sets of relationships, their ultimate conclusions are very similar.

We will first briefly outline the differences in the correlation between intensity and acceleration as developed by Coulter, Waldron and Devine and that of Trifunac and Brady. We will then discuss the application of such relationships to the Indian Point, Units 2 and 3, followed by a brief review of the requirements for Unit 1.

1. The principal difference between the Coulter, Waldron, Devine (Coulter) and the Trifunac and Brady (Trifunac) correlations is that the raw data for much of the Coulter material is not publicly available and thus has not been subjected to the normal peer review process, while the Trifunac material has been published. The Coulter correlation data were presented at the Fifth World Conference on Earthquake Engineering, but the backup material was not nor has it been made generally available. Witness Pomeroy for the State had been unable to obtain the information from the authors (Tr. 651) but licensee's witness Fischer had seen enough of the data in private meetings to convince him of the reliability of the conclusions. Tr. 773.

If there were, in fact, large differences in the conclusions to be drawn from the two sets of data we might be constrained to investigate the matter further. However, all parties agree that the two correlations are the most up-to-date and are better than any other available information. With this in mind, since the Trifunac and Brady data appear to be the most fully documented, we will for our purposes consider only their relationship between intensity and acceleration.³⁴

2. The major difference between CCPE and the other parties is on the conservatism that should be used in the application of Trifunac and Brady data to the Indian Point reactors. If these data are used, the licensee, NRC staff and the State all agree that the acceleration at the site for an intensity VII earthquake should be the mean of all the acceleration peaks measured

³²H. W. Coulter, H. H. Waldron and J. F. Devine, "Seismic and Geologic Siting Considerations for Nuclear Facilities," Fifth World Conference on Earthquake Engineering; Rome, Italy, 1973. (Lic. Exh. 2, pp. 4-6.)

³³Presented in a series of papers included in testimony of CCPE witness Dr. Mihailo Trifunac, Assistant Professor of Applied Science, California Institute of Technology. (See CCPE Exh. 1 and 2, "Testimony of Dr. Mihailo D. Trifunac—Estimating Peak Accelerations in Terms of the Modified Mercalli Intensity Scale" and Staff Exh. 5, "NRC Staff Testimony on Issue No. 1 and No. 2.")

³⁴This of course does not imply that the Trifunac-Brady correlation is technically superior to that of Coulter, Waldron and Devine.

by Trifunac and Brady for such intensity earthquakes.⁵⁵ All three of these parties consider this to be suitably conservative because the peaks utilized include the high frequencies representative of near field conditions. As witness Fischer explained, these peaks have little significance in establishing the level of response spectra, yet they produce a much higher mean amplitude. He pointed out that even a building as poorly constructed as an adobe hut would not be affected by the high frequency, because “[t]he high frequency spike carries so little energy and is over so fast. . . .” Tr. 800. As an example, Mr. Fischer noted

. . . there’s a barn out in California that housed a seismograph where the acceleration peak reached—I think it was roughly 60 percent g and the barn is still there and the instrument is still there and the barn could in no way be considered an earthquake resistant design structure. [Tr. 800.]

However, Dr. Mihailo D. Trifunac, a witness for CCPE, contended that use of the mean of the peak accelerations may not be conservative enough. He pointed out that his correlation is based primarily on West Coast data and there is evidence to show that “the attenuation of high frequency waves in the East [of the United States] is considerably smaller than that in the West.”⁵⁶ CCPE Exh. 1, p. 7. On this basis, he recommended that the correlation between intensity and acceleration be made on the basis of the average of the peak accelerations “plus one standard deviation of all the peak amplitudes.” *Id.* at pp. 4-5. For an intensity VII earthquake this would result in designing the facilities at Indian Point to withstand a 0.20g acceleration instead of the 0.13g calculated on the basis of the mean of the acceleration peaks only.

In his testimony, Dr. Trifunac asserted that soil condition may be a factor in the degree of damage to be expected (Tr. 321) and that:

Contrary to the frequently stated opinion that alluvium layers amplify strong-motion acceleration at certain “predominant” frequencies, the data studied in this paper show that on the average peaks recorded on hard rock may be higher, but not significantly, than the peaks recorded on alluvium. This is in accord with our previous study (17) where we demonstrated that for a given Modified Mercalli intensity level peak accelerations reached on a hard rock site are on the average higher than the same recorded on alluvium. [CCPE Exh. 2, App. C, p. 51.]

⁵⁵Staff Exh. 5, p. 5; State Exh. 1, p. 1; Lic. Exh. 2, pp. 8-9.

⁵⁶It would appear that such a lower attenuation of the high frequencies would result only in a slightly larger distance at which the near field high frequencies would be important.

But he appeared to agree with Mr. Fischer on the significance of high frequency peaks when he stated:

Finally, it should be pointed out here that, from the practical earthquake engineering point of view, high acceleration amplitudes should not necessarily be associated with a proportionally higher destructive potential. An extended duration (19) of strong ground motion and high acceleration amplitudes characterize destructive earthquake shaking, while one or several high-frequency high-acceleration peaks may, in fact, constitute only minor excitation because of the short duration involved and may lead to only moderate or small impulses when applied to a structural system. [*Ibid.*]

Dr. Trifunac admitted that he had no personal knowledge of the Indian Point site or the design of the Indian Point reactors and that his testimony was concerned with a generic estimate of peak accelerations in terms of the Modified Mercalli scale without reference to Indian Point. Tr. 332.

On the basis of all of the testimony discussed above, we must conclude that the approach taken by Dr. Trifunac is unnecessarily conservative for the Indian Point site. It is our opinion that, given the current state-of-the-art in this area, use of the correlation of the mean of the peak accelerations with the Modified Mercalli intensity scale as suggested by the licensees, the staff and the State is a reasonable method of applying the data. This requires that the Indian Point reactors be designed to withstand a horizontal acceleration of 0.13g. In actuality the Indian Point, Units 2 and 3, are designed to withstand a 0.15g so that there is more than adequate assurance that the health and safety of the public will be protected insofar as the Indian Point nuclear reactors are concerned.

However, we do not mean to imply that further study of this question is not desirable. The opinion we have expressed is based upon our understanding of the seismic design procedure used by the staff in this connection. This procedure includes conservatism at various stages of the process as pointed out by staff witnesses Stepp and Coplan (Tr. 1159-61) and licensees witness Fischer. Tr. 1011-14. One part of this process is the selection of the appropriate value of acceleration to be used as the "anchor" point (zero period limit) for the design response spectrum. For this purpose the staff obtains the average peak value for a given intensity by using the maximum peak acceleration from each of the individual accelerograms resulting from events of that intensity. Tr. 1166-68. Dr. Trifunac appeared to indicate during cross-examination that the procedure he used in his studies was the same as that used by the staff. Tr. 290. However, questions were raised regarding what is believed to be unnecessary conservatism in this approach.

Licensees witness Fischer suggested that use of other parameters might produce better correlations of intensity with earthquake damage. Tr. 1008-17. Specifically, Mr. Fischer stated:

[w]hat I have tried to indicate is that there are other, and I believe better ways of attempting to correlate damage than merely peak accelerations. Peak accelerations have little to no significance in building design.

What would be better correlation is perhaps velocity or something that would be considered a sustained level of acceleration.

Tr. 1008-09.

Mr. Fischer had earlier suggested that a more appropriate parameter for correlation with intensities might be the "sustained" or "effective" acceleration of a given record as suggested, e.g., by Ploessel and Slossen in a note entitled "Repeatable High Ground Accelerations." Tr. 828-29; see also Tr. 584-94. Such a correlation (based on "sustained" acceleration) would appear, on its face, to be less conservative than the procedure currently used by the staff and licensees. It would, nonetheless, be desirable for the staff to provide a more quantitative assessment of its current methods. This perhaps should include an evaluation of the frequency spectrum associated with the individual peak acceleration associated with each record using, for example, a Fourier type analysis. (This should indicate the level of the damaging accelerations involved.) However, a complete quantitative assessment can be properly carried out only through parallel consideration of all of the factors involved in selecting and applying acceleration values. These factors would include safety margins related to the structural engineering evaluations. Dr. Trifunac agreed that, in choosing the design acceleration value selected for a nuclear plant one must "consider numerous factors." Tr. 600-02.

3. We face a different situation with respect to Indian Point, Unit 1. This plant was built prior to any specific requirement for earthquake protection and is not designed to withstand a 0.15g acceleration. At present the plant is inoperative. If it is to be operated again, changes will have to be made so that it can withstand an intensity VII earthquake.

Indian Point, Unit 1, however, does have a fuel storage pool containing fuel and intervenor CCPE questioned whether the pool and stored fuel support structure would withstand such an earthquake. Licensees presented William Cahill, a vice president of Consolidated Edison, as a witness on this matter. Under cross-examination by CCPE counsel, the witness demonstrated convincingly that the pool and accessories as designed and built have adequate engineering safety factors to withstand an acceleration of 0.15g. (See Tr. 697, *et seq.*)

Under these circumstances we find that there is reasonable assurance that the fuel storage pool of Indian Point, Unit 1, is adequately designed and built to protect the public health and safety if subjected to an Intensity VII earthquake.

ISSUE 3

Is the Ramapo fault a capable fault within the meaning of Appendix A, 10 CFR Part 100?

Appendix A to Part 100, "Seismic and Geologic Siting Criteria for Nuclear Power Plants," in Section III, "Definitions," defines a capable fault as follows:

- (g) A "capable fault" is a fault which has exhibited one or more of the following characteristics:
- (1) Movement at or near the ground surface at least once within the past 35,000 years or movement of a recurring nature within the past 500,000 years.
 - (2) Macroseismicity instrumentally determined with records of sufficient precision to demonstrate a direct relationship with the fault.
 - (3) A structural relationship to a capable fault according to characteristics (1) or (2) of this paragraph such that movement on one could be reasonably expected to be accompanied by movement on the other.

In some cases, the geologic evidence of past activity at or near the ground surface along a particular fault may be obscured at a particular site. This might occur, for example, at a site having a deep overburden. For these cases, evidence may exist elsewhere along the fault from which an evaluation of its characteristics in the vicinity of the site can be reasonably based. Such evidence shall be used in determining whether the fault is a capable fault within this definition.

Notwithstanding the foregoing paragraphs III(g)(1), (2) and (3), structural association of a fault with geologic structural features which are geologically old (at least pre-Quaternary) such as any of those found in the Eastern region of the United States shall, in the absence of conflicting evidence, demonstrate that the fault is not a capable fault within this definition.

A. Age of the Most Recent Movement on the Ramapo System

1. The licensees have sponsored extensive studies of the site and surrounding region by Dr. Nicholas M. Ratcliffe, Department of Earth and Planetary Sciences, City College of C.U.N.Y., and by the consulting firm of Dames and Moore. While Dr. Ratcliffe's report was not presented for the record by any of the parties, it was used as a basis for cross-examination of both D & M and staff witnesses.

On the basis of its study of the entire Ramapo fault system, D & M includes in the system the primary Ramapo fault extending from northern New Jersey to northeast of Ladentown.⁵⁷ At that point the fault branches into a wide zone of less well defined faults. These include, in addition to the Ramapo, the Thiells fault, the Letchworth fault, the Cedar Flats fault, the Mott Farm Road fault and the Timp Pass fault. Lic. Exh. 26 at 2-1, Plate A1-1. The Mott Farm Road fault trends towards Indian Point but neither Ratcliffe nor D & M show it crossing the Hudson River.

The licensees presented a panel of D & M scientists and engineers as witnesses⁵⁸ to sponsor testimony concerning the Ramapo fault system. They testified, under cross-examination, that while they had not shown a connection between certain faults on the east side of the river and those of the Ramapo system on the west side, they were suspicious that some of them might be part of the Ramapo fault system.

The State of New York witness panel⁵⁹ generally agreed with the D & M geographical description on the west side of the river, but contended the northeast trending faults on the east side should be included. N. Y. Exh. 18 at D-1, D-2.

The staff panel⁶⁰ was also in general agreement with the D & M definition of the system. However, staff witnesses stated that there were some

⁵⁷See Lic. Exh. 26, "Testimony of Dames & Moore (Panel) on Behalf of Licensees on Issue No. 3," p. 2-1 and plate A1-1. Ladentown appears to be some 8 miles southwest of Indian Point.

⁵⁸Lic. Exh. 26, "Testimony of Dames and Moore (Panel) on Behalf of Licensees on Issue No. 3," Joseph A. Fischer, Samir G. Khoury, Bernard Archer, Jerzy Szymanski, Todd M. Gates, Umesh Chandra. Tr. 4364-66.

⁵⁹Drs. James F. Davis, Robert H. Fakundiny, Leo M. Hall and Klaus H. Jacob, who replaced Dr. Paul W. Pomeroy of the earlier panel. Tr. 4302. This panel sponsored State Exh. 18, "Testimony of Dr. James F. Davis, Dr. Paul W. Pomeroy, and Dr. Robert H. Fakundiny, and Dr. Leo M. Hall (Panel) on Behalf of the New York State Atomic Energy Council on Issue III." Tr. 4301-08.

⁶⁰Staff Exh. 17, "Direct Testimony on Issue III by J. Carl Stepp, Seth M. Coplan, David R. Budge, Richard B. McMullen." Tr. 5115.

conflicts between D & M and Ratcliffe and, until the staff completes its evaluation, all the faults shown by both Ratcliffe and D & M have to be considered as part of the Ramapo system. The staff panel expressed the view that the question of the faults on the east side is "still a little up in the air." Tr. 5304.

The evidence on a possible relationship of the east and west side faults is enough for us to consider it likely that they are connected. However, as developed in our further findings on the capability of the Ramapo fault, *infra*, we do not need to decide this question.

2. There was no significant conflict between the staff and licensees witnesses on the dating of the latest movement on the fault system. While intervenors State and CCPE disagreed, they presented no evidence of their own on this point.

The D & M testimony traced the geological history of the region and concluded that the most recent movement was 73 ± 5 m.y. ago. Based on this analysis, the D & M witnesses believe tectonic displacement along the Ramapo has not occurred since the opening of the northern North Atlantic Ocean (late Mesozoic). Lic. Exh. 26 at 2-6. Undeformed zeolite crystals growing on top of undeformed calcite crystals have been K-Ar dated and give a minimum age since last movement of 73 ± 5 m.y. *Id.* at 2-5. This compares well with opening of the northern North Atlantic Ocean about 80 m.y. ago. *Ibid.* The faults on the east side of the river show no movement more recent than 73 ± 5 m.y. Tr. 4975-76.

The staff testified that the determination of the minimum age of unbrecciated calcite crystals from faults in the vicinity of the site give an upper limit for the age of the last movement of several hundred thousand years. Furthermore, it believes the relative uniformity of homogenization temperatures of all fluid inclusions in calcite crystals reviewed to date suggests a regional hydrothermal event for which conditions have probably not existed in the area of the site since Mesozoic or early Tertiary time (37 to 65 million years ago). Staff Exh. 17 at 17. This opinion is supported by the conclusions of a special review panel set up to assess the results of the D & M investigation.⁶¹ This panel's report, signed by Drs. Price and Coates, states that ". . . the last movements on the faults occurred many millions of years ago. . . ." *Ibid.*

⁶¹This panel was assembled by the licensees, at the staff's suggestion, and consisted of Dr. R. Price of Queens University, Kingston, Ontario, Dr. D. Coates from State University of New York at Binghamton and Dr. N. M. Ratcliffe, City College, the City University of New York. *Id.* at 18.

The New York State witnesses stated that they do not believe "the minimum age of fault movement has been conclusively determined by fluid intrusion studies of calcite crystals found within the fault planes." State Exh. 18 at B-3. They do not agree with the D & M thesis that movement after formation of the crystal will deform the crystal. *Ibid.* However, they did not present any evidence in support of their views on this point. On cross-examination by the licensees, the State witnesses said they had found no information that Ramapo fault has exhibited evidence of physical offset at or near the surface within the past 500,000 years. Tr. 4309.

3. Two other points on the age question brought forth different opinions among the parties. In his investigation of the region, Dr. Ratcliffe had found an exposed polished surface with a small offset at Call Hollow. He said this could be a glacially polished surface. Ratcliffe, June 1976, pp. 76 and 133.⁶² (See also Tr. 4462 and 5322.) Since the most recent glaciation in this region was more recent than 35,000 years, if the surface is glacially polished the offset is more recent than 35,000 years. The D & M panel, in response to questions by the State, expressed its belief that the surface was not glacial, and that the small offset was due to quarry and construction activities nearby. Tr. 4463-64. The staff panel was also questioned on this point and witness Stepp stated it is geologically unreasonable to expect such a localized offset on a major feature and no evidence of it otherwise. Tr. 5322-23. We find this offset surface is not evidence of recent tectonic activity.

The second point is related to the indication of river bottom anomalies found by a D & M bathymetric survey in 1975. Tr. 4470, *et seq.* One of these anomalies was later identified as a pipeline crossing. Tr. 4476. In an effort to identify the others a diver was sent down to explore the river bottom but he was unable to find any special feature. Tr. 4499. Another bathymetric survey of the area was run in 1976, but no indications of the suspected anomalies were found. Tr. 4473. Furthermore, there was no corresponding feature on shore. Tr. 4484-85, 5037-39. These facts led D & M to conclude that the anomalies had no tectonic significance. Lic. Exh. 26 at 2-8.

The staff panel testified and were cross-examined on this matter, stating that the features appear to be irregularities at the water-sediment interface attributable to erosion and debris. When questioned, Dr. Stepp said an offset of the magnitude indicated (3-4 feet) would, if tectonically generated, require an earthquake of magnitude six or seven. Thus it would be geological-

⁶²This refers to a report by Dr. Ratcliffe, a consultant to the licensees, which was utilized in the hearing by New York State for cross-examination of licensees witnesses. See Tr. 4462, *et seq.* Also see Tr. 5322. This report was not entered into evidence.

ly unreasonable to expect such an offset not to be identified onshore. Tr. 5327; Staff Exh. 17 at 16.

We find that the evidence shows the latest movement at or near the surface on the Ramapo system occurred at least 73 ± 5 m.y. ago. Hence the fault is not capable in terms of 10 CFR Part 100, Appendix A, Section III(g)(1).

B. Magnitude and Location of Earthquakes

1. Before determining the capability of the Ramapo fault under the criterion of Appendix A, Section III(g)(2) (p. 586, *supra*), it is necessary to arrive at a definition of "macroseismicity." This term is not defined in Appendix A, nor is it much in use among seismologists. Tr. 4648, 4981, 5268. Each party in this proceeding had its own definition.

In *North Anna Environmental Coalition v. U. S. Nuclear Regulatory Commission*, 533 F.2d 655 (D.C. Cir. 1976), the court gave a definition of macroseismicity, which it based on a book authored by Dr. Charles F. Richter.⁶³ However, in his testimony⁶⁴ Dr. Richter stated that the definition relied upon by the court related to macroseismic effects, not macroseismicity. He also said that Dr. Sykes misapplied the same quotation from the book in using it to characterize the December 1962 and March 1976 earthquakes as macroearthquakes. Lic. Exh. 29 at 2-3.

Dr. Richter gave his definition as follows:

. . . I understand "macro-seismicity" to refer to large and significant seismic activity like that observed in California, such as is generally associated with fault movement at the surface. [Lic. Exh. 29 at 4.]

During cross-examination he added that one earthquake of magnitude 6 would not constitute macroseismicity, but "[i]f you had a region in which earthquakes of that magnitude were frequent, then I would consider that as possibly categorized as macro-seismicity." Tr. 4659.

The members of the D & M panel gave their own definitions, which were probably best summed up by Dr. Chandra:

A micro-earthquake is observable merely by the aid of instruments. A macro-earthquake produces geological effects such as ground rupture, sand boils, landslides, etc. Its effect is observable without the aid of instruments or the presence of nearby population centers. [Tr. 4982.]

⁶³Dr. Charles F. Richter, Professor Emeritus, California Institute of Technology; member Lindvall, Richter & Associates, Consultants in Earthquake Sciences.

⁶⁴Lic. Exh. 29, "Testimony of Charles F. Richter." Tr. 4625.

Dr. Davis, a New York witness, defined a macroseismic event as one “which has an Intensity greater than III . . . and a magnitude . . . somewhere between 2 and 2.5.” Tr. 4322. Later he said there should be more than one such event to constitute macroseismicity. Tr. 4336.

Dr. Sykes, a witness for CCPE, believes the intensity for qualifying as a macroearthquake will vary with locality, but for southeastern New York he thinks intensity III is the lower limit for a macroearthquake. Tr. 4060. He stated that the most significant consideration is to determine whether there exists a tectonic pattern identified with a constant driving mechanism and a potential for damaging earthquakes. Tr. 4059. Again he said “macroseismicity would be earthquakes of a sufficient size, sufficient intensity, that they will be tectonically significant in terms of ascertaining the potential for damage from an earthquake.” Tr. 4255.

Staff witness Coplan stated:

My understanding of the term macroearthquake is that it is the complement of that [micro] . . . in other words, earthquakes of magnitude greater than 3. [Tr. 5381.]

He also agreed with others that there can be a macroearthquake without macroseismicity. Tr. 5382.

The staff panel introduced a “working definition” as Staff Exhibit 18:⁶⁶ The staff considers the term, macro-seismicity, as used in Section III(g) (2) of Appendix A to 10 CFR Part 100, to mean seismicity of a level that implies significant, coherent, sustained tectonic activity. With respect to individual faults or fault zones, we interpret macroseismicity to be seismicity of a level that implies a significant and constant tectonic driving mechanism.

We consider the term to refer to the seismicity of larger earthquakes. In our view such seismicity might have different aspects in different areas. Therefore, decisions as to what seismicity is “macroseismicity” must be made after consideration of the seismicity of a region.

Thus, while there are differences in these definitions, the parties are generally agreed that earthquakes below Modified Mercalli intensity III or magnitude 2 are not macroearthquakes. Hence, we need examine only those earthquakes above intensity III or magnitude 2. Furthermore, the weight of the evidence is that macroseismicity involves more than one macroearthquake.

2. Before proceeding to a consideration of the earthquakes which may

⁶⁶Staff Exh. 18 “Staff Panel’s Working Definition of Macroseismicity,” Tr. 5122, 28.

be of interest in connection with a determination under Section III(g)(2) of Appendix A, a brief summary of how earthquakes are located will be useful in understanding further discussion of the issue.

When an earthquake occurs several types of elastic waves emanate from the source, traveling outward in all azimuths at velocities characteristic of each particular wave type. Distant seismographs respond to these passing waves by recording the ground motions at their respective locations as functions of time on plots called seismograms. The waves of particular interest for use in determining the location of the earthquake are a shear wave, S, and a compressional wave, P. The P wave travels faster than the S wave, so in computing the location from the seismogram the seismologist may utilize any of the three phase (wave) arrival times—P arrival, S arrival or S-P arrival time interval. An error is introduced in such a calculation using the P or S arrival if the clock of the seismograph station is in error, so clock accuracy must be verified by checking against time signals from the National Bureau of Standards. As expressed by the staff, “[t]he basic problem then is simply one of determining a location and origin time that is consistent with the phase arrival times, given the velocities with which the different types of waves travel through the earth.” Staff Ex. 17 at 26.

The waves travel through different parts of the earth at somewhat different velocities so a specification of the spatial distribution of velocities within the earth, called a velocity model, is used in calculating the location of the source. Models can best be determined by observing the travel times of waves from known sources such as quarry blasts or test explosions. The usual velocity models assume lateral homogeneity of the earth, yet in real life this may not be true and hence significant errors in the calculated location of the earthquake may result.

By using phase arrival times from seismograms of several recording stations and assuming velocity models, the seismologist obtains several “locations” which can be statistically combined to determine a “best” hypocenter.⁶⁶

It may be noted that numerous solutions for the location of a given earthquake were obtained by different witnesses, or even by the same witness, using differing velocity models. Factors which affect the accuracy of the final determination of a hypocenter include: accuracy of the velocity model, coordinates of the seismograph station, clock corrections, readings of arrival times from the seismograms and weight given the result of any one station in the statistical combining of results. Dr. Sykes testified that in

⁶⁶The hypocenter is the location, including depth, of the initiating rupture causing the earthquake.

parts of California, where there are many stations offering good azimuthal distribution and where there are good velocity models, a precision of something better than a kilometer may be obtained. He further stated that the accuracy in the New York-New Jersey region has improved considerably over the last few years with a better distribution of stations until now "it's possible to talk about a precision at the few-kilometer level or better." Tr. 4085.

3. Earthquakes which the various parties have claimed should be considered in resolving the question of the capability of the Ramapo fault are presented in Table 2 (pp. 594-595, *infra*).

New York claims that events 5, 7 and 10 of Table 2 (and possibly 9, 11, 12, 14, 16 and 18) may indicate that the Ramapo system experiences a "significant and constant tectonic driving mechanism" (N.Y. PFC at I-4) which would qualify it as an area of macroseismicity under the staff's "working definition" (p. 591, *supra*). However, the State believes that the uncertainty of location and lack of sufficient focal plane solutions⁴⁷ do not permit a conclusion that the Ramapo system is capable or that it is not. N.Y. PFC at I-4; State Exh. 18 at E-1.

From Table 2 and the listed references to each seismic event it is evident that items 1, 2, 3, 4, 5, 7, 8, 9, 11, 12, 14, 18, 19 were not instrumentally located or, in some cases, not felt. We must therefore eliminate these from consideration. Similarly items 6, 13, 15, 17 and 21 are eliminated as being too far from the Ramapo fault to be of concern.

We are therefore left with the earthquakes of December 20, 1962, and March 11, 1976, (Numbers 10 and 16 in Table 2) for further consideration.

C. The December 20, 1962, and March 11, 1976, Earthquakes

1. There were widely different views on the December 20, 1962, event depending on the witness' definition of macroearthquake. Dr. Chandra said

⁴⁷To obtain a focal plane solution, an arbitrary unit sphere is drawn with its center at the focus (hypocenter) of the earthquake and first motion observations from each station are plotted on this sphere. The motion for a given station is plotted by determining where the vector from the source to the particular seismograph penetrates the unit sphere. The first motions (compressions or rarefactions) are obtained by reading the seismogram and are indicated on the plot by appropriate symbols. The resultant drawing is a circle with compression and rarefaction points grouped. Two orthogonal nodal planes can be drawn through the center of the arbitrary sphere separating these two groupings so compression points are in two quadrants and rarefaction points in the other two. One of these planes is the fault plane, the other is called the auxiliary plane. By comparing these planes with known fault planes of the region any correlation of the fault planes with the results of the focal plane solution aids in determining the association of the earthquake with the known fault. Lic. Exh. 26 at C-10, 11; Tr. 3945-49.

TABLE 2

Date	Intensity (MM)	Remarks	Reference
1. 11/30/1783	VI	Not instrumentally located.	CCPE Exh. 4, Table 1; Lic. Exh. 26, Table Cl.
2. 9/1/1895	VI	" "	Tr. 3897
3. 1943	V	Doubtful. Not listed in usual tables. Recollection of one individual 30 years later. Felt location.	Tr. 3864-70.
4. 4/1/1947	III		Tr. 3876; CCPE Exh. 4 at 9.
5. 1948		Perhaps a typo. Not listed in tables in this record.	N.Y. PFC at I-4.
6. 9/3/1951	V	Located too far from Ramapo (10-15 km)	Tr. 3813, 3951, 3975-9; 3806-7; 4982. Lic Exh. 26, Tables C-1, C-2, C-3.
7. 9/15/1951 ^a	V	Apparently a typo.	N.Y. PFC at G10.
8. 3/23/1957	VI	Not instrumentally located.	Tr. 3891.
9. 10/13/62	(M:1)	No felt reports	State Exh. 18, Table C-1; CCPE Exh. 4 at 9.
10. 12/20/62	IV		Tr. 4982; State Exh. 18 at C-1.

^aApparently a typo in the State's proposed findings and conclusions of law. Perhaps it should be event No. 6 above. (See State Exh. 18 at C-5.)

TABLE 2 (continued)

Date	Intensity (MM)	Remarks	Reference
11. 11/30/64	M:1	Not felt	State Exh. 18 at C-1; Tr. 4329.
12. 5/21/66	M:1-1.5	Not felt	State Exh. 18 at C-1; Tr. 4329.
13. 1969	M<1.5	Too far away (~20 km NW of Ramapo).	CCPE Exh. 4 at 13; NRC Exh. 17 at 20.
14. 5/11/72	—		N.Y. PFC at I-4.
15. 7/19/75	M:2.3	Located E. of river, near Fahnstock State Park.	State Exh. 18 at C-3; Lic. Exh. 26 at Table C-1; Tr. 4330.
16. 3/11/76	IV	Pompton Lakes	CCPE Exh. 4 at 10; Tr. 4982, 4330.
17. 4/13/76	M:3.0	Too far away, 30 km Sykes, 20 km staff.	CCPE Exh. 4 at Fig. 2; NRC Exh. 17 at 22.
18. 9/22/76	—	Not in evidentiary record.	N.Y. PFC at I-4.

Note: In Table III-C-2 of State Exh. 18 the State listed eleven earthquakes located in 1975-76 by the Con Ed network. Only three of these were felt (Tr. 4330) as follows:

a. 6/15/75	—	Quarry action, not macro.	State Exh. 18 at C-3.
b. 3/11/76	IV	Pompton Lakes	State Exh. 18 at C-3; Tr. 4330.
c. 4/13/76	IV	Sykes places 20 km SE of Ramapo.	CCPE Exh. 4, Table 1, Fig 2; NRC Exh. 17 at 22.

Note: Table III-C-3 of State Exh. 18 lists nine probable earthquakes but a State witness said none were evidence of macroseismicity. Tr. 4330.

that although it had an intensity of IV it produced no observable geological effects and hence was not a macroearthquake. Tr. 4982-83. On the other hand, Dr. Sykes stated in his testimony that it was a macroearthquake, and cited Richter's definition of macro-effects to support his view.⁶⁴ He apparently confused the definition of macro-effect with that for macroearthquake. Lic. Exh. 29 at 3. He considers the 1962 earthquake to be macroseismicity under his definition of the term—" . . . earthquakes of sufficient size, sufficient intensity, that they will be tectonically significant" Tr. 4255, 4264. The New York panel's written testimony stated that the event (with the March 11, 1976, one) fits "at least one definition of 'macro' seismicity." State Exh. 18 at C-5. On cross-examination Dr. Davis of the New York panel said this "one definition" referred to Dr. Sykes' definition. Tr. 4320.

According to Dr. Sykes, some investigators (Isacks and Oliver, 1964) used records from seven stations to locate the December 20, 1962, event a few kilometers from the main trace of the Ramapo fault. Tr. 3850, 3856. Dr. Sykes himself assumed the December and the October 31, 1962, earthquakes had a common focus, and, using S-P data for the two events combined, he obtained a location "along the Ramapo fault." CCPE Exh. 4 at 9. Later he obtained new clock corrections for the stations and used these with the data from the December event alone to calculate a new location, still along the Ramapo fault and within a kilometer of his previous one. Tr. 3844-45. A third solution using corrected coordinates for one of the recording stations (Ogdenburg) changed the result about 300 meters in a direction parallel to the fault. Tr. 4251-52.

Dr. Chandra also used the combined data for the October and December earthquakes to calculate a location of the events. He conceded that there is no evidence that this assumption of a common focus is valid, but, due to the poor quality of the data, it was necessary. Tr. 4374; Lic. Exh. 26 at C-6 and C-7. Later, however, clock correction data for the three stations used were found in Lamont-Doherty files so the location of the December earthquake was recomputed using the P and S data for it alone. Tr. 4374-75; Lic. Exh. 26 at C-24. This solution is about one kilometer from the surface trace of the Ramapo fault. Lic. Exh. 26 at plate C-3; Tr. 4546.

The final solutions by both parties are very close to one another, and, as Dr. Chandra said, the epicenter location could be coincident with the Ramapo fault. Tr. 4546. However, both the staff and the State panel testified that the location of one event, without additional evidence, does

⁶⁴CCPE Exh. 4, "Testimony of Dr. Lynn Sykes—The Capability of the Ramapo Fault," p. 10. See also p. 590, *supra*.

not establish the “direct relationship” required by Sections III(g)(2) and (3) of Appendix A. Tr. 4334, 5225-27.

Staff panel member Coplan amplified this by saying that, rather than how close a single earthquake is to a fault, the important consideration is “. . . what the other earthquakes in the area are doing.” Tr. 5227. Dr. Davis, of the New York panel, said they “. . . would want to see several events well located of that kind . . . exceeding our conception of the threshold of macroseismicity.” Tr. 4336. Dr. Richter stated, “[t]he occurrence of a small number of earthquake events which are suspected of being related to a given fault is also not very conclusive evidence” of a direct relationship with a given fault. Tr. 4814.

The parties generally agreed that an obvious lineation of earthquakes would be cause to consider a possible relationship with a fault. However, no one presented evidence of such a lineation here. The State panel claimed to show an alignment of epicenters with the Ramapo fault, but when presented with an epicenter map of the region without faults or geographical boundaries⁶⁹ shown they were unable to detect a lineation marking the Ramapo fault. Lic. Exh. 22; Tr. 4312-16. The staff panel’s testimony states that the map entitled “Exhibit 2” of the State’s testimony (State Exh. 18, p. E-4) shows no “. . . concentration that aligns with the Ramapo fault.” Staff Exh. 17 at 19. Dr. Richter was cross-examined on the question of lineation and he stated that the 1951, 1962 and 1976 locations do not comport with his testimony concerning the significance of earthquakes found to line up and repeat along a known fault. Tr. 4774-77. Furthermore, when presented with a copy of plate C-2 (from Lic. Exh. 26) with the 1974, 1976 (2 events) and 1975 earthquake epicenters marked in yellow, Dr. Richter said such alignment as there might be does not agree with the trend of the surface trace of any of the faults shown on the map. Tr. 4784, 4787-88; Lic. Exh. 26, plate C-2.

Fault plane solutions of the 1962 earthquake were not introduced since there are insufficient data to find a solution for that event by itself. Dr. Sykes prepared a composite solution of the 1951, 1962 and 1976 earthquakes. CCPE Exh. 4 at 14a; Tr. 3940-44. We do not find such a composite solution persuasive as it involves assumptions of a common source at different times. Such widely separated occurrences do not necessarily have consistent causal mechanisms. Lic. Exh. 26 at C-14, C-15.

We find that the mere location of the earthquake near the Ramapo fault cannot establish a direct relationship, and there is no other valid evidence in the record to support such a direct relationship.

⁶⁹Lic. Exh. 22, a map bearing the legend “Seismicity of Northeastern United States.” Tr. 4313.

2. The solutions obtained by the parties for the March 11, 1976, earthquake differ more widely. Dr. Sykes gives the location as about 0.75 km from the main trace of the Ramapo fault. This value was obtained using his preferred velocity model which is supported by data from quarry blasts: CCPE Exh. 4 at pp. 6-7, and Figure 1.

The licensees witnesses did a more elaborate calculation, using 12 velocity models with two different data sets for each, thereby producing a total of 24 solutions. Lic. Exh. 26, Table C-7. They agreed that Dr. Sykes' preferred velocity model (his model 6) was the preferable one, and using it (their solutions 23 and 24) they got locations of 4 and 6 km, respectively, from the surface trace of the fault. Tr. 4561, 4615, 4618, 4874; Lic. Exh. 26 at C-10, Plate C-3.

The difference between the solutions of the two parties is significant and we are faced with the need to find which is preferable. For the reasons set forth below we find the location of the epicenter of the March 11, 1976, earthquake to be some 4-6 km from the main trace of the Ramapo fault.

Both parties used the S wave arrival time at OGD,⁷⁰ but their readings differed appreciably. Dr. Sykes read this as 27.6 and characterized Dr. Chandra's reading of 27.02 as a gross error. Tr. 4104. The actual OGD seismogram was presented to the Board and Dr. Chandra demonstrated to the Board how he determined the arrival point for the S wave. Tr. 4550, *et seq.* Also, Dr. Willis, another witness⁷¹ for the licensees, made an independent determination on each of three records and read 26.9 and 27.0 seconds. Tr. 5073. Mr. Coplan of the staff panel looked at all three components and gave 27.1 as his selection. Tr. 5410. We find the D & M value to be the preferable one.

Station PNJ, used by both parties, is an amateur station. While the operator of the station furnished clock corrections, there was no way to verify their accuracy. Tr. 4233-34. Because of this, licensees witness Dr. Chandra chose to use the S-P time, so the absolute arrival time (and hence clock correction) were not involved. (See our discussion at pp. 591-592, *supra.*) Dr. Sykes used the P wave arrival. Tr. 4378, 3880-81.

Dr. Sykes also used a velocity correction for station PNJ because, he said, the wave path traverses a low velocity material of the Triassic Basin. Tr. 4035-36. However, he did not make a velocity correction for station

⁷⁰The seismograph stations are identified by letters for the name of the location, e.g. OGD is Ogdenburg.

⁷¹Dr. Willis is Professor of Geophysics and Chairman of the Department of Geological Sciences at the University of Wisconsin. He was serving as a consultant on the location of the 1951 and 1962 events but was asked by the licensees to read the OGD record here.

PAL which also is across the Triassic Basin from the hypocenter. The staff panel agreed that a correction would be proper if the Triassic velocities were definitely known. Tr. 5444. The D & M panel said that station corrections are determined from (1) the average of the residuals at that particular station from a large number of earthquakes, or (2) accurate geological information like the thickness of the Triassic Basin. Tr. 4894-95. Dr. Sykes presented no evidence that he determined his PNJ correction from either, so his correction appears to us to be somewhat arbitrary.

The licensees presented, as Exhibits 32 and 33, the residuals²² provided by D & M for each station used in its solutions for models 23 and 24. It is worthy of note that the D & M residual for station PNJ S-P model 24 solution is -0.02, one of the lowest found, thus indicating high degrees of correctness in the phase reading and the velocity model. Tr. 5003. The residual for OGD, the station for which the phase reading by licensees witnesses was questioned by Dr. Sykes (p. 598, *supra*), is -0.01, the lowest of all residuals for model 24. *Ibid*. The record is silent on the matter of the residuals for Dr. Sykes' solutions for stations OGD and PNJ, but his residual for PAL is 0.14 for the P wave. Tr. 4235. The D & M residual for the P wave for station PAL is -0.12. Lic. Exh. 33. These low residuals give confidence in the models used for PAL and raise a question concerning the correctness of applying a different model for PNJ as was done by Dr. Sykes.

All parties agreed that fault plane solutions are significant and relevant to the question of a "direct relationship." Dr. Sykes and the D & M panel submitted such solutions for the March 11, 1976, event.

Dr. Sykes prepared his focal plane analysis by using a composite of the data for the 1951, 1962 and 1976 earthquakes. He testified that the fact that a composite solution fits the data from three events suggests a similar mechanism for all three and is also suggestive of a regional pattern of stress. CCPE Exh. 4 at 14a; Fig. 4. Under cross-examination he said his Fig. 4 was actually constructed using the data from the March 11, 1976, earthquake

²²The residual for a given station and wave type is equal to the observed arrival time minus the calculated arrival time, where the calculated time is that computed as the time of travel to the station from the epicenter after this location has been determined using a particular velocity model. The significance of this is that a small residual gives one confidence about the reading of phases. Conversely, a large residual indicates (1) the phase arrival reading is incorrect or (2) the velocity model used to obtain the location is incorrect. Tr. 5001.

Lic. Exh. 32 and Lic. Exh. 33 are copies of Table C-5 from p. C-25 of Lic. Exh. 26 upon which residuals for each of the stations have been inserted by its witnesses. Lic. Exh. 32 was marked with a "23" in the upper right hand corner indicating it applied to solution number 23, and Lic. Exh. 33 was marked with a number "24" indicating it applied to solution number 24. Tr. 5066-67.

and its aftershock, and the information from the 1951 and 1962 events were then added. Tr. 3940-44.

We do not find such a composite solution persuasive. Events widely separated in time do not necessarily have the same causal mechanism. Even the main event and its aftershocks may have different mechanisms. Licensees witnesses testified that McKenzie (1972) said "A curious feature of several of the large shocks [in the Mediterranean region] for which fault plane solutions could be obtained for the main shock and one major aftershock was that the two often had different mechanisms." They also quoted Strelitz (1975), "the September 5, 1970, Sea of Okhotsk earthquake consisted of two possibly causally related but dissimilar events." Additionally, "the fault planes and principal stress axes of the two events are significantly different; furthermore, the second event does not lie on either of the nodal planes of the first event." Lic. Exh. 26 at C-14, C-15.

Examination of the resultant Sykes solution (CCPE Exh. 4, Fig. 4) indicates the result is not clean-cut.

Dr. Sykes characterizes his composite solution for the 1976 event as unique.⁷³ CCPE Exh. 4 at 15. We cannot agree with this characterization. The D & M panel obtained two fault plane solutions for the same event based on their solution 24. Lic. Exh. 26 at C-11, C-12, plate C-4. CCPE questioned the D & M solutions, claiming the polarity of the instruments at stations GSC and DBM were reversed and hence D & M plotted the points for these stations incorrectly. The record reflects only that CCPE's own witness said these polarities were in question. CCPE Exh. 4 at 15; Tr. 4950-54. The licensees introduced two exhibits, 30-A and 30-B,⁷⁴ showing the identification of the stations for their focal plane solutions given in figures a and b on Plate C-4 of Lic. Exh. 26. An examination of these two exhibits shows the points for the two stations in question to be in the center of a cluster of points of similar polarity. Hence, if these two are changed, the result would not appear to change the location of the planes but merely to give two anomalous points. In cross-examining the D & M panel, CCPE attempted to show that stations near the nodal plane could be determined from the shape of the first P wave arrival. The panel did not agree with this hypothesis or that it is a "common method of picking up nodal arrivals or [determining] the nodal planes." Tr. 4948. CCPE also criticized the D & M solutions because they did not allow for refraction of the wave. Tr. 4963-66.

⁷³"Unique" means only one set of normal planes can correctly separate the data points.

⁷⁴Lic. Exh. 30-A and 30-B are copies of figures a and b, respectively, on Plate C-4 in Lic. Exh. 26. These figures show the focal plane solutions for the March 11, 1976, earthquake. Tr. 4960.

However, the record does not show that refraction of a wave in the region in question actually occurs.

The solutions of Dr. Sykes and that given in Lic. Exh. 30-A are quite similar and one plane, striking N52°E, has approximately the strike of the Ramapo fault (N40°E-N45°E). Lic. Exh. 26 at C-11; Tr. 4946. The other plane would indicate the strike as N74°W and, while there is no known fault in this area with this strike, there is a possibility of such a fault subsurface. Lic. Exh. 26 at C-12.

The second D & M solution (Lic. Exh. 30-B) shows E-W striking planes. There is no surface rupture to aid in determining which solution is correct. The staff said “. . . there’s not really any reason in the data to choose one over the other,” since neither exhibits consistency with other relatively nearby focal mechanism solutions. Tr. 5446.

On the basis of the above findings we conclude that the March 11, 1976, event does not “demonstrate a direct relationship with the fault.” We prefer the D & M location and accept the staff’s statement that the Ramapo fault dips approximately 70° to southeast (away from the D & M location). Tr. 5464. Thus the hypocenter is even more than 4-6 km from the fault. The two D & M fault plane solutions, while we find them equally valid, do not offer the necessary demonstration of a “direct relationship” of this event with the Ramapo fault.

D. Structural Relationship Between the Ramapo Fault and Any Known Capable Faults

The record does not contain any evidence to indicate a structural relationship between the Ramapo fault and other faults known to be capable. The New York panel testified that it had found no evidence indicating such a relationship. Hence we conclude the Ramapo fault does not meet the condition for a capable fault set forth in Section III(g)(3) of Appendix A. See p. 586, *supra*.

For the above reasons we find that, in accordance with the definitions in 10 CFR Part 100, Appendix A, Section III(g), the Ramapo fault is not a capable fault.

ISSUE 4

Is the operating license condition for Indian Point 3, requiring an expanded microseismic monitoring network along the Ramapo fault warranted?

This issue arose following the evidentiary hearings on the previous three issues as the result of the licensees' motion to us requesting that we "issue an order modifying the time limits within which [they] must comply" with a particular condition of the Indian Point 3 reactor operating license. Licensees' Motion to Modify License Condition, dated August 27, 1976, p. 6.

The condition in question was part of Amendment 2(C) issued by the NRC staff on April 5, 1976. Amendment 2(C)(4) ordered the licensee to "conduct a program of geological and seismological investigations."⁷⁵ As part of the seismological investigations the licensees state that they "were directed to expand the existing microseismic monitoring network southwestward to include Pompton Lakes, New Jersey, and northeastward to include Fahnstock, New York." *Id.* at p. 2.

Following our review of the record concerning this matter we issued a memorandum and order⁷⁶ deferring our decision pending an evidentiary hearing by us on the matter. This hearing was conducted for six days between March 8 and March 16, 1977. Written testimony was supplied by the licensees, the State of New York and by the NRC staff. CCPE submitted no testimony but participated in cross-examination.

For the reasons given below we have decided that the enlarged monitoring network would not contribute to the assurance of health and safety of the public and is therefore unnecessary.

We were first made aware of the imposition of the license condition on July 26, 1976—the last day of our evidentiary hearing on Issue 3. The matter arose during cross-examination of staff witnesses by the licensees and was followed up by Board questions to the staff. In the course of the questioning by the Board on the reasons for requiring the expanded monitoring system, staff witness Stepp responded to a question:

Question: Let me ask this: Are you suggesting this program of microseismicity stations to prove or disprove activity on the Ramapo fault, or are you looking at it as a pure research project?

Answer: There are elements of both here. So far as my understanding of the problem goes, the principal benefit that we might expect from the microearthquake monitoring is one of attempting to define the tectonic environment, I will characterize it, the way the stresses are behaving, the kinds of focal mechanisms that are occurring in the area, and so on.

It is in part a research project. While a number of important people,

⁷⁵See p. 549, *supra*, for summary statement of Amendment 2(C)(4).

⁷⁶ALAB-357, 4 NRC 542 (1976). Our reasons for calling an evidentiary hearing are fully explained in that order and are not repeated in this decision.

very prominent people, Page, Isacks, and Oliver, among them, Dr. Sykes, who have considerable knowledge in the Eastern United States have postulated that microearthquakes or small earthquakes are occurring along the Ramapo, it is not clear so far as I know in anyone's mind what these small earthquakes may mean so far as the potential for larger earthquakes in this region:

That is really the problem we are trying to address here. I would extend this in the context of this being in some aspects of a research project to the general statement that we do not know what the significance of microearthquakes may be so far as being able to estimate what they mean—to determine what they mean for the potential for defining where future larger earthquakes may occur in the eastern United States.

Tr. 5530-31.

As the result of further Board questioning witness Coplan added:

There may be, as Dr. Sykes has claimed on the basis of his data, a stress condition, in that region that is conducive to some movement on the Ramapo Fault. But we don't know how much or how often.

We know that it is very much less than what we would see on faults in California that would normally be considered to be active.

While we think that given in fact we are quite confident that, given the data that we have available to us, the situation is not one that causes a hazard for the Indian Point site, or creates any great degree of risk, there are just some things that we are a little bit uncertain about and we would like to know more about.

And that is what we have directed this program toward.

Tr. 5537-38.

At that time the Board questioned (1) the usefulness of the monitoring network on only one section of the tectonic province, (2) whether such a limited network would present a biased picture of the seismicity along the fault, and (3) whether it would supply any useful information with regard to the safety of the Indian Point site.

When the decision to call for an evidentiary hearing was made⁷⁷ we requested that all parties presenting written evidence address the following questions:

1. Is an enlarged microseismic monitoring network warranted for

⁷⁷Mr. Farrar dissented from this decision. See 4 NRC at 552-57.

reasonable assurance of the public health and safety in connection with the Indian Point nuclear facility?

2. If not:
 - a. On what other basis can the licensees be made responsible for the cost of the expanded network?
 - b. Is the problem concerning the significance of microearthquakes on the east coast of the United States of sufficient importance to be of concern to state and Federal governments because of general danger to east coast residents?
3. In answering the following questions, consideration should be given to the Dames & Moore testimony on the possible location of shallow tensional stress fields surrounding the northern end of the Ramapo Fault:
 - a. If an expanded seismic monitoring network is found to be warranted, is the presently suggested expansion the best one?
 - b. If such a stress field exists, should the expanded network be concentrated around it rather than the Ramapo Fault?
 - c. If the stress field is a more likely source of microseismicity in the area, should not the research work on the stress field be completed before consideration of an expanded seismic network?

ALAB-357, *supra*, 4 NRC at 551.

We will first outline the testimony of the licensees, NRC staff and New York State relevant to these questions, and then discuss the entire record.

I. Testimony of the Parties

A. Licensees Testimony

Licensees testimony was presented in three sections: (1) a discussion of the questions asked by this Board (Witnesses Fischer, Werner and McWhorter), (2) a detailed discussion of the relationship between microseismicity and the occurrence of larger earthquakes (Witness Willis), and (3) the projected cost of installing and operating the expanded microseismic monitoring network (Witness Gonnella).

We shall discuss these *seriatim*.

1. Fischer, Werner and McWhorter Testimony

a. This section of the licensees testimony^{7*} is basically summarized in their response to question 1, as follows:

First, it is our opinion that the contribution to the *reasonable* assurance of public health and safety, that would be provided by the enlarged microseismic monitoring network would be next to nil. To date we are aware of no reasoned and logical analysis by which the risk of an earthquake in excess of the SSE can be determined from only microseismicity. Second, the assurance of the public health and safety in connection with the Indian Point facility is provided in performing a series of geologic and seismologic investigations done in accord with Appendix A to 10 CFR Part 100. The enlarged network would not make a meaningful contribution to the level of assurance provided by the above investigations. As consulting earth scientists we are obliged to point out aspects in investigative programs that would not reasonably be expected to indicate whether or not the Ramapo Fault System is capable within the meaning of Appendix A to 10 CFR Part 100.

Lic. Exh. 35, p. 5.

The witnesses further noted that the staff (at pp. 2-6 of Supplement No. 3 to the Indian Point, Unit No. 3, SER) had stated:

We consider the lack of evidence of geologically young movement and the absence of any obvious clustering of historic earthquake activity along the Ramapo Fault System to support the conclusion that the fault is not capable within the meaning of Appendix A to 10 CFR Part 100. We therefore, consider our original position, that the design of the units for the largest historic earthquake to have occurred randomly within the site's tectonic province, provides reasonable assurance that the plant will not be subjected to ground motion greater than that for which it was designed.

Nevertheless, because of the recent location of the two earthquakes near the fault, we consider a confirmatory program directed toward more definitive determination of the age of most recent movement and a determination of the potential for earthquake activity on the fault system to be necessary.

^{7*}Lic. Exh. 35. "Testimony of Dames and Moore (Panel) on Behalf of Licensees on the Expansion of the Microseismic Monitoring Network," James G. McWhorter, Matthew L. Werner, III and Joseph A. Fischer. Tr. 5631-47. As we have noted in Section 1, *supra*, all those witnesses are employees of Dames and Moore (D & M), consultants to the licensees.

In other words the additional monitoring network was to be required for confirmatory information over and above the stated requirements of Appendix A.

In their testimony the licensees witnesses pointed out that the State's initial rationale for recommending the expanded microseismic monitoring network included the demand for an "[a]nalysis of microseismic patterns to ascertain whether such patterns might be used to forecast larger earthquakes." Lic. Exh. 35, p. 7. The State had gone on, however, to admit that these ". . . tests are new to the science of seismology and are in and of themselves inconclusive . . ." *Ibid.*

The licensees witnesses discussed the question of a relationship between the occurrence of small earthquakes and the potential for larger earthquakes. They stated that: "in order to describe this relationship: (1) one must be aware of all of the variables in the system; and (2) at least the most important variables must be observed." Lic. Exh. 35, p. 10. They pointed out that, in establishing simply a monitoring network, most of the other variables in the system are ignored. *Id.* at p. 11. Reducing the system to only the comparison between small and larger earthquakes immediately increases the amount of data and time required to identify the relationship, if any, that may be involved. *Id.* at pp. 11-12.

The witnesses noted that only two intensity IV and two intensity V earthquakes⁹ have occurred within the area of the proposed network in the last 278 years, therefore the chances of obtaining sufficient data in the next two years on both micro and macroearthquakes to determine a relationship between the two is extremely remote. *Id.* at p. 12.

Licensees therefore concluded that the addition of the monitoring network would not add to the assurance of public health and safety insofar as the operation of the nuclear reactors at Indian Point is concerned.

b. Question 2

The licensees witnesses did not attempt to answer Board question 2.a. on the basis that it called for a strictly legal conclusion. As far as question 2.b. is concerned, a yes or no answer was not given but the witnesses discussed the difference between the overall geologic approach of Appendix A and the use of microearthquake measurements to obtain a determination of

⁹Indian Point 2 and 3 reactors are designed to withstand ground motions resulting from an intensity VII earthquake at the site (see pp. 550, 584, *supra*).

reasonable assurance of public health and safety. They pointed out that prediction of earthquakes by any means is in its infancy and, where predictions over a limited range have been somewhat successful, they have been made by the use of several variables (*e.g.*, magnetic field, tilting of surface, strain measurements) and not on microseismicity alone. Even in these cases, the estimates of earthquake intensities by the Appendix A method have always been the most conservative. *Id.* at pp. 18-19.

The witnesses further noted that, while low intensity earthquakes may be of major concern to the public in general (Tr. 5734), the design of the Indian Point nuclear plants is such as to give reasonable assurance of public health and safety up to and including intensity VII. Thus, according to them, for microseismic measurements to add to the assurance of public health and safety a relationship must be found between microseismicity and earthquakes of intensity VIII or greater. *Id.* at pp. 19-20.

The witnesses did agree that a long range research program to study microseismicity in areas of high seismicity should be established for general public interest but they emphasized that “[w]e cannot accept that two years of microseismic monitoring in a very small area is going to even marginally increase our understanding.” *Id.* at p. 22. See also pp. 27-28.

c. Question 3

Licensees witnesses answered Board Question 3 in two ways—depending on the purpose for which the monitoring network is established. Licensees see two such possible purposes: (1) in their view the staff considers the monitoring network to be largely for research and development directed at determination of the relationship between microearthquakes and larger earthquakes; (2) they believe this Board by its question 1 had raised the possibility that the monitoring network has a “purpose in connection with the assurance of public health and safety.” Lic. Exh. 35 at p. 27. (See also Tr. 5713-14.)

The witnesses expressed the belief that such an R&D program will not be capable of achieving the sought objective until much larger data bases (*i.e.*, recorded events) are obtained in areas of high seismicity. Lic. Exh. 35 at pp. 27-28. In addition, they noted that their own shallow stress measurements had been completed but were inconclusive as to the location of any uniform shallow stress field. *Id.* at 29.

With regard to the assurance of public health and safety it is the licensees’ view that this has been reasonably assured by the other geological and seismological investigations required by the license conditions and Appendix A to 10 CFR Part 100. They indicated that the installation of the monitoring network might add a false sense of security. *Id.* at 30.

2. Willis Testimony

Dr. Willis' testimony⁸⁰ concerning the relationship between microseismicity and larger earthquakes was primarily a discussion of the empirical equation $\log N = A + bM$ developed by Richter.⁸¹ Lic. Exh. 35 at p. 5. As Dr. Willis pointed out, if b is constant the equation "implies that within a range of magnitudes governed by the linear log N versus M law seismic activity is simply described by the constant A ." *Id.* at p. 6.

Recent work has shown, however, that b , which is considered to be related to the physical characteristics and distribution of stress in a region, varies between values of 0.5 and 1.5. *Id.* at pp. 5-16. The value of b may vary between geographical regions, with depth or, in some cases, with time and between fore shocks and after shocks. *Id.* at pp. 15-16, 24.

On the basis of his data Mr. Willis stated that even in areas of high seismicity with a broad data base, b values obtained "are shown not to be valid to project the occurrence of earthquakes with magnitudes above 3.5." *Id.* at p. 23. Because of this Dr. Willis concluded that "it is uncertain whether data from a microseismic monitoring network can be utilized in the above equation to accurately predict large earthquakes." *Id.* at p. 24.

3. Gonnella Testimony

The licensees presented Victor C. Gonnella as a witness to provide data⁸² on the projected cost of installing and operating the expanded microseismic monitoring network. These data were based on the bid prices received from the successful bidder, and were presented here in four sections. Phase I dealt with relocating the present recording station and operation of the present network during the transition period. The cost of Phase I was estimated as \$104,500. Phase II covered the detailed design and site selection for the expanded network and was estimated to cost \$47,000. Phase III was the cost of equipment and installation of the network. The cost for this latter phase was \$358,500. The final phase concerned operation of the expanded net-

⁸⁰Lic. Exh. 37, "Testimony of Dr. David E. Willis on Behalf of Licensees on the Expansion of the Microseismic Monitoring Network." Tr. 5918-21. See also fn. 71, p. 598, *supra*.

⁸¹ M = magnitude

N = number of earthquakes of magnitude M or larger per unit of time.

A and b are empirical constants.

⁸²Lic. Exh. 39, "Testimony of Victor C. Gonnella on Behalf of Licensees on the Costs Associated with Expansion of the Consolidated Edison Microseismic Monitoring Network." Tr. 6038-45.

work for 24 months, at a cost of \$561,000, thus making a total of \$1,071,000. Lic. Exh. 39, pp. 3-5.

This Board believes that cost is not a factor if a proposed action is important for the public health and safety. However, cost is a factor if health and safety are not involved, and is also a factor in selecting among options where more than one is available.

B. Staff Testimony

1. The NRC staff testimony³³ was presented by a panel of four witnesses, J. Carl Stepp, Richard B. McMullen, John Kelleher, and David Budge. This testimony, while answering generally the three questions posed by the Board, was basically aimed at explaining the staff rationale for imposing the monitoring condition. The thrust of the staff testimony was that, while geologic evidence permitted the conclusion that the Ramapo fault is not capable, “. . . [w]e were not able to conclude conservatively that this structure does not play a possible role in localizing earthquake activity.” Staff Exh. 25, p. 1. Because of this, the staff stated it would “. . . continue to press for expansion of the microearthquake network, so that a more accurate determination of what the relationships are between earthquakes and geologic structures in the region.” *Id.* at 2.

According to the staff, this relationship “is an important means of assessing the likelihood of future movement of faults and, when this relationship is known, an accurate assessment of the seismic hazard at the site can usually be made.” *Ibid.*

2. Prior to the amendment³⁴ of the license by condition 2(C), the NRC staff had licensed Indian Point, Unit 2, for operation and Indian Point, Unit 3, for fuel loading and subcritical testing on the basis that the Ramapo fault was not capable and that the maximum historic earthquake occurring in the tectonic province had resulted in a Modified Mercalli intensity VII.³⁵ The authorization for Indian Point 3 to engage in subcritical testing was issued on December 12, 1975.

By that time the licensees, following discussions with the State of New York, had agreed to set up a network of 12 microseismic stations (later ex-

³³Staff Exh. 25, “Testimony of J. Carl Stepp, Richard B. McMullen and John Kelleher.” Tr. 6186-90.

³⁴Amendment 2 was dated April 5, 1976. (See p. 602, *supra.*)

³⁵See “Supplement No. 1 to the Safety Evaluation Report (SER)—of the Indian Point Nuclear Generating Station, Unit No. 3,” (January 16, 1977) at pp. 1-5. This decision was confirmed in Supplement No. 2 to the SER (December 12, 1975) at pp. 2-1 through 2-3 and p. 22-1.

panded to 13) in the vicinity of the Indian Point Station but aimed at the northern end of the Ramapo fault. Tr. 6317. This network began partial operation June 1, 1975, and full operation in September 1975.

The staff witnesses testified that they had taken and still do take the position that the Ramapo fault is *not capable within the meaning of Appendix A to 10 CFR Part 100*. Staff Exh. 25, p. 12. However, they have not been able to conclude that the Ramapo fault “plays no role in localizing earthquake activity.” *Ibid*. The witnesses indicated that the staff’s concern about the “localization” of earthquakes began with the occurrence of a magnitude 2.5 earthquake near Pompton Lakes, New Jersey,⁸⁶ on March 11, 1976, which followed a 1951 earthquake in Rockland County, New Jersey. *Id.* at 1-2.⁸⁷

Initially, condition 2(C)(4) called only for a southwestern expansion of the monitoring system but, following discussions with New York State, the system was later expanded to include stations to the northeast.⁸⁸ The entire condition 2(C) was then issued at the time of the issuance of the SER Supplement 3 for the Indian Point 3 station *without prior discussion with the applicants*.⁸⁹

3. Throughout the hearing the staff insisted that the data collected by the expanded microseismic network neither would nor could be used to predict the advent of large earthquakes either in the short term or long term.⁹⁰ It did insist that the expanded network would enable it to detect and obtain accurate focal plane solutions for any microseismic events that might occur along the entire length of the Ramapo fault. It pointed out that the expanded network including the segment north of Indian Point would cover 4 to 5 times the area of the present network.

According to witness Stepp, the data would supply the following:

The data themselves would not necessarily—the microearthquake data themselves would not necessarily lead you to a determination of the potential of movement on the fault. That alone would not. But considerations—this would be a two-step process.

⁸⁶The earthquake epicenter was located about 50 km from Indian Point but close to the surface trace of the Ramapo fault.

⁸⁷The March 11, 1976, earthquake (which was a magnitude 2.5 event) was at that time thought to have occurred adjacent to the Ramapo fault about 20 km from the Indian Point site. A later review of the data placed the epicenter about 9 km from the Ramapo (approximately 30 km from Indian Point). Tr. 6193, 6493; also Lic. Exh. 26 plates C2 and C3.

⁸⁸Tr. 6317-18.

⁸⁹Tr. 6318. The supplement was issued on April 5, 1976, shortly prior to the time that the licensees expected to receive their full operating license.

⁹⁰Statement by Staff Counsel. Tr. 5591. Statement by staff witnesses Stepp and Kelleher. Tr. 6226-27.

We're considering the first step in it now, whether or not there is any reason to be unduly concerned about localization of earthquakes along this structure, and the microearthquake can lead us directly to that—can directly lead to a conclusion about that.

Now if in fact it should be determined that earthquakes of small magnitude are localized along this fault zone then the question arises of what the maximum earthquake along that fault zone should be and that determination would involve other considerations than simply the microearthquakes, and considerations of the extent of the fault, the fault geometry, possibly the sense of movement, possibly the levels of stress in the area, stress conditions in the area, and the depth extent of the fault.

In short, it would consider—it would be based upon considerations of the, I guess the fault dynamics, if we could use a very generalized term, and its geometry and dimensions.

Tr. 6231.

Later, when pressed for a course of action if the data showed the worst possibility, Dr. Stepp stated:

Well, let's suppose that the data—for a moment suppose the data caused us to conclude that earthquakes are being localized along—preferentially along the Ramapo Fault system; that is, that it has a greater risk of having—a greater probability of having earthquakes, if they should occur in the region, localized along it than would be the case assuming scattered activity throughout the region.

Then the course of action we would take is to assess what the maximum earthquake activity would be on it.

There are several outcomes from that, it seems to me.

(Q. All right, Now on what basis do you do that?)

The assessment would be made, based upon the nature of the activity along the fault zone. Maybe it clusters only at Pompton Lakes and there's not another earthquake along the fault zone anywhere. Maybe those focal mechanisms are eventually shown to be incompatible with the geometry of the Ramapo Fault system. Maybe they are compatible but it clusters only there. Then that would pose one situation.

Maybe the earthquake activity is rather uniform along the extent of the fault. That would pose another situation.

One outcome could be that—and it would seem to me the most likely one, in the event we concluded that earthquake activity was being localized along this fault zone at all, one outcome could be that we would

accept the maximum earthquake as being represented by the maximum regional earthquake just as we've done now, and we would say something like an Intensity VII might be produced by this fault zone, or a magnitude 5-plus.

But the difference would be that if we concluded that this fault is in fact localizing earthquakes is that—we would have to consider that that particular earthquake has a greater likelihood of being localized near the plant than we now have considered.

And our recommendation most likely would be that the design response spectrum be reevaluated to determine whether or not it embraces an earthquake of that magnitude that close to the plant site.

Tr. 6350-52.

The staff admitted that “[w]hile many [microseismic] studies have been reported in the literature, a general relationship between microearthquake activity and the occurrence of larger earthquakes significant to engineering design has not yet been established.” Staff Exh. 25, p. 5. It nevertheless claimed that “because microearthquakes reflect current tectonic activity more directly than any other measurable geophysical data, they are powerful data for evaluating the geologic causes of earthquakes.” *Ibid.*

The staff provided no data as to the probability of finding that microearthquakes were focusing on the Ramapo, apparently basing their concern in this matter entirely on the March 11, 1976, earthquake.

4. In summary, the staff stated (*id.* at p. 7) three reasons for requiring the expanded network:

1. If the tectonism is uniform in the area a larger network will get more data in less time.
2. A greater potential will be provided for gathering data for more focal mechanism solutions and from there to assess whether there is the potential for movement along a particular fault.
3. The network should show whether or not earthquakes are concentrated along the Ramapo fault.

C. State Testimony

The testimony⁹¹ for the State of New York was presented by its witness,

⁹¹State Exh. 19, “Testimony of Dr. Yash Pal Aggarwal on Behalf of the State of New York.” Tr. 6379-91. Certain parts of this testimony were stricken following a motion by the licensees (March 8, 1977). See also Tr. 5969-92, 5995-6017, 6161-73, 6177-81, 6303-05, 6379-95.

State Exh. 20, “Supplementary Testimony of Dr. Yash Pal Aggarwal on Behalf of the State of New York.” Tr. 6396-6403.

Dr. Aggarwal, and it discussed Board questions 1 and 3.

1. The major portion of the written testimony concerned question 1 and the State's position on the need for an expanded microseismic network. The State maintained that "[i]n order to evaluate risk to public health and safety from the Indian Point nuclear facility, it is necessary to evaluate the seismic potential of the Ramapo Fault System." State Exh. 19, p. 6. To do this the State urged that one must (a) understand the "earthquake problem" in the eastern United States, (b) critically evaluate the historical record of earthquakes in the area of interest, and (c) consider the seismotectonics of southeastern New York and northern New Jersey in light of the most recent instrumental data. *Ibid.* On the basis of such requirements, the State concluded that an enlarged microseismic network is necessary.

To support its conclusion, the State's testimony discussed the relatively brief historic record of seismicity in eastern United States compared to the longer record in China. Since historical events of intensity VI and VII have occurred in southeastern New York and northern New Jersey, the State observed that ". . . [i]ntensity VII or greater events may occur in this region in the future." *Id.* at 8.

Finally, the State maintained that, since it is futile to attempt to associate historic events "faults in this area" (*Id.* at 9),

the alternative is to examine the more recent instrumental data for seismic events in the area and to ascertain whether these more accurately located events show any relationship to local faults. If such is the case, then we can conclude with reasonable certainty that the historical events were also associated with faults in the area.

Ibid.

The State asserted that the necessary instrumental data can only be supplied by an expanded microseismic network because this will be able to detect microearthquakes along the Ramapo fault with enough precision to allow calculations of focal mechanism solutions. In the State's opinion only such precise information can link a particular fault with a given earthquake. *Id.* at 18-19.

The State asserted that the present microseismic network is inadequate since, of eighteen earthquakes reported in the general area in the last three years, focal mechanism solutions were obtainable on only eight.²² It claimed that, had the expanded network been in operation, more focal plane solu-

²²State Exh. 20, p. 1.

tions might have been obtained and uncertainties in one of the present solutions eliminated. State Exh. 19 at p. 19. The State thus implies that a decision could be reached as to whether the Ramapo fault is localizing current seismicity.

2. The State's answer to our question 3 asserted in essence that the focal plane solutions are the only way to determine stress orientation at the depth of the hypocenter and that shallow direct stress measurements may or may not indicate the same stress orientation. The placement of an expanded network therefore does not depend on completion of shallow stress measurements. State Exh. 20, p. 3.

II. Discussion of the Testimony

A. Question 1

As above noted the first question posed by the Board was:
Is an enlarged microseismic monitoring network warranted for reasonable assurance of public health and safety in connection with the Indian Point nuclear facility?

ALAB-357, *supra*, 4 NRC at 551.

We will discuss the testimony received in response to this question in the light of 10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants." If we find the answer to this question to be negative the remaining questions need not be considered.

In Appendix A which was adopted in November 1973³ (just 1-1/2 years before the staff condition was imposed) the Commission set forth:

. . . the principal seismic and geologic considerations which guide the Commission in its evaluation of the suitability of proposed sites for nuclear power plants and the suitability of plant design bases established in consideration of the seismic and geologic characteristics of the proposed sites.

10 CFR Part 100, Appendix A, Section I.

These criteria are primarily based on the geology and seismicity of the geographic region around the site with particular regard to the geologic and seismic history of the area. Particular emphasis is placed on faulting near the site and determinations of whether such faults are "capable."

³See 38 Fed. Reg. 31281 (November 13, 1973), as amended at 38 Fed. Reg. 32575 (November 27, 1973).

The definition of a "capable" fault given in Appendix A, Section III(g), is of particular importance but since this definition has already been quoted in full under issue 3 (see p. 586, *supra*), we will not repeat it here. Further, in imposing condition 2C the staff placed reliance on paragraph IV(a)(7) which reads:

For faults, any part of which is within 200 miles of the site and which may be of significance in establishing the Safe Shutdown Earthquake, determination of whether these faults are to be considered as capable faults. This determination is required in order to permit appropriate consideration of the geologic history of such faults in establishing the Safe Shutdown Earthquake. For guidance in determining which faults may be of significance in determining the Safe Shutdown Earthquake, Table 1 of this appendix presents the minimum length of fault to be considered versus distance from site. Capable faults of lesser length than those indicated in Table 1 and faults which are not capable faults need not be considered in determining the Safe Shutdown Earthquake, except where unusual circumstances indicate such consideration is appropriate.

Since we have determined in Issue 3 that the Ramapo fault is not capable, we must now decide (1) whether, in accordance with Section IV(a)(7), there are unusual circumstances here that require special investigations; and (2) whether the installation and operation of an expanded microseismic network is a required part of these investigations.

When asked for a statement of what was considered to be the special circumstances which required further investigation of the Ramapo fault, staff witness Stepp replied:

The unusual circumstance here is founded both in the geologic history of this particular fault zone and in the seismicity of the area, in my view. The geologic history of the fault is such that it has been a locus of movement dating from pre-Cambrian time, at least into the Mesozoic time, a period of several hundred million years, and spanning many different orogenic phases, several different orogenic phases, I should say.

Tr. 6336.

In further questioning, Dr. Stepp asserted that there is "a higher level of seismicity in this general region." Tr. 6337. He later admitted that seismicity around Indian Point, while higher than seismicity to the west, is not higher than the activity to east of the site or for that matter not more than the rest of New England in its entirety. *Ibid.*

Despite this lack of unusual seismicity compared to the rest of New

England, we agree with Dr. Stepp that the historical circumstances of the Ramapo fault structure are somewhat unique in that it is a fault system which, though not capable now, has had a history of movement through the geologic ages and does have splays which are close to the site of a nuclear facility. It is therefore appropriate to be sure of the most recent age of movement and of the location of the fault.

In Supplement No. 3 of the SER for the Indian Point Nuclear Generating Station, the staff briefly stated the special program of investigations required by license amendment 2C as follows:

(1) Geological mapping in sufficient scope and detail to accomplish the following:

(a) Definition of the main trace of the Ramapo fault and associated faults of the Ramapo fault system.

(b) Structural and tectonic relationships of the Ramapo fault system with faults at the Indian Point site.

(c) Identification of crosscutting features and faults which might be used to determine the age of most recent movement on faults of the Ramapo system.

(d) Age dates of the fault along those sectors near the epicenters of the 1951 Rockland County, New York, earthquake and the 1976 Pompton Lakes, New Jersey, earthquake.

(2) Determination of the age of most recent movement on the Ramapo fault and the Ramapo fault system by appropriate age dating techniques and relationship to crosscutting features.

(3) Determination of the relationship of current and historic earthquake activity to the Ramapo fault system. The existing earthquake monitoring network is to be extended southward to include the Pompton Lakes, New Jersey, epicenter area and northward to include the Fahnstock region. The density of the network should be sufficient to obtain precise locations and focal mechanism solutions. Velocity studies needed to obtain reliable earthquake locations and mechanism solutions should be conducted. This network is to be operated at least two full years following complete installation of all stations. These studies should be supplemented by stress measurements to define the current tectonic environment of the area.

(4) Additional geochronological age dates of most recent movements shall be obtained on those faults observed in the immediate vicinity of the plant, including each of the different fault sets. Fluid inclusion dates are to be confirmed by dating other mineral assemblages and/or by using other dating techniques.

Only the part of item 3 of this list covering the proposed installation and operation of an additional microseismic monitoring network is being questioned in this proceeding. In other words, because of the special circumstances that we have discussed (see p. 615, *supra*) on the relationship of the Ramapo fault to the Indian Point nuclear facility, major projects of mapping, age dating and stress measurements are being accomplished in a large area surrounding the Indian Point site. What we must now decide is whether, in addition to the programs already completed or underway, data from an enlarged microseismic network would be of any real significance in assuring the health and safety of the public insofar as the nuclear facilities at Indian Point are concerned.

As we have seen, the State of New York and the NRC staff insist that the condition is necessary to make the decision for reasonable assurance of health and safety. The licensees insist it is worthless in this respect.

1. We will first consider the license condition for the microseismic network in the general terms of whether the condition is a proper one under Appendix A. After consideration of the record before us, it is our opinion for the reasons given below that it is not.

a. We note first of all that mention of instrumentally determined earthquakes in the definition of a capable fault concerns only those earthquakes which produce macroseismicity. On cross-examination the staff was asked to explain, if microearthquakes are one of the better (if not the best) source of information, why microseismic evaluations were not specifically included in Appendix A. Staff witness Stepp gave the following answer:

The answer is that I don't really know. I could speculate and I think it would be somewhat informed speculation because it's a question that I've asked a number of times myself.

If I understand the reasoning that went into it, it could be specified as that related to the state of the art of the use of microearthquake data and a cost-benefit you might say reason with regard to the state of the art when Appendix A was being formed. Microearthquake studies was even in more infancy than it now is in. And the people who were forming Appendix A, some of them at least, held the strong view that such information would create more confusion than not and eventually the use of microearthquake data was not included in the appendix.

Part of the reason, I believe, for it not being included in there is that we do not have these data available to us. The appendix was written around data that are available to us in ordinary circumstances. Microearthquake information, microearthquake data are generally not avail-

able to us because the level of the network capability that we have is simply not sufficient to provide those data.

Moreover, and this, as I understand it, was a very large factor in the consideration to include or not include the data, one could not place great reliance on the locations for as you go down in magnitude fewer stations record the events. The scatter in the data become greater and reliance on the epicenters becomes weakened.

So for all of those reasons a requirement to consider microearthquake data was not included in Appendix A.

Tr. 6277-79.

Dr. Stepp agreed that Appendix A is a recent regulation having become effective in December 1973 and he gave no indication that any great advance in microseismic techniques had taken place in the 18-month interval between December 1973 and April 1975 when the condition was imposed.

b. Witnesses for all of the parties agreed that the focal plane mechanism can provide data concerning the direction of the stress field at the hypocenter but can give no indication of the magnitude of the stress. Licensees, Tr. 5934; State, State Exh. 19, p. 13 and Tr. 6507; Staff, Tr. 6270. However, it was noted by staff witnesses (Tr. 6269-72) and agreed to by Dr. Aggarwal (Tr. 6511-12) that, if the earthquake occurs near a pre-existing fault, the uncertainty of the direction of the principal stress is at least $\pm 20^\circ$ and may therefore present an erroneous picture of the stress orientation near the fault.

c. In various discussions during the hearing several ways in which microseismic monitoring systems had been used were mentioned. Primarily such systems have been used in areas of high activity for monitoring the seismicity of faults known to be active. In these cases the number of micro-occurrences was large—perhaps several per day. In one or two instances a *decrease* in the frequency of microseismic events has been shown to have preceded by some hours or days the occurrence of a larger quake. Tr. 5826-27.⁹⁴

In low seismicity areas, however, microseismic networks had previously been required by NRC to meet special situations in two instances, *e.g.*, in one case to monitor the change in microseismicity during and following the filling of a large reservoir. No usage has previously been made of

⁹⁴Several references were cited here by licensees witness Dr. Werner to papers by Dr. Sykes, State witness on Issue 1, and Dr. Kelleher, now a member of the NRC staff and a witness in this proceeding.

microseismicity by itself in either low or high seismic areas to establish a relationship between microseismic events and the potential of a fault for larger movement. Tr. 6360. This is demonstrated by the following staff testimony:

Q. Gentlemen of the panel, let me ask if you will direct your attention to page 2 of your testimony, the first full paragraph which starts there in the middle of the page and there it's your testimony, is it not, that an expansion of the network is required:

. . . so that a more accurate determination of what the relationships are between earthquakes and geologic structures in the region. . . .

That correctly states your testimony, is that correct?

A. (Witness Stepp) Yes, that's correct.

Q. Do you expect to be able through the use of this microearthquake data to define any type of relationship between these earthquakes and structure that would allow you to assess the potential of an event in excess of the SSE?

A. I would like to answer no and then explain why.

We do not expect these microearthquake—any microearthquakes that may be located by this network to lead directly to an assessment of a larger than SSE earthquake. In fact we had not even considered that at this point and we think that such an earthquake would be extremely remote based upon regional considerations and that's why we accept the level of SSE that we have accepted. We think that's consistent with the level of conservatism that is embodied in Appendix A.

The measure to which that might be drawn upon for such a determination is really not clear to me at this time. I would not wish to state one way or the other whether one could extrapolate from a set of small earthquakes to predict larger earthquakes.

Tr. 6226-27.

Given these considerations we do not believe that a research project with such tenuous usefulness is one which should be required of an applicant or licensee under Appendix A.

d. Finally, we observe that the staff has apparently ignored the third paragraph of Appendix A, Section III(g)(3) (see p. 586, *supra*) which appears to fit the situation at the Indian Point site. This paragraph states:

Notwithstanding the foregoing paragraphs III(g)(1), (2) and (3), structural association of a fault with geologic structural features which are

geologically old (at least pre-Quaternary) such as many of those found in the Eastern region of the United States shall, in the absence of conflicting evidence, demonstrate that the fault is not a capable fault within this definition.

As we have seen in Section 2 of this decision (pp. 588-589, *supra*), the licensees and staff agree that the latest movement along either the Ramapo fault system or the faults on the east side of the Hudson appears to have occurred at least several million years ago. The State claims that the faults sampled have not been proven to be the youngest but they admit that there is no physical evidence at or near the surface of movement in at least the last 500,000 years. See p. 589, *supra*.

We find that the weight of the evidence strongly indicates that there has been no movement in the faults around Indian Point since the end of the Mesozoic period. On this basis there is no need for the "additional investigations" suggested by Section II of Appendix A⁹⁵ beyond mapping and age dating.

2. We will now assume *arguendo* that we have erred in our decision in subsection 1 above and examine the actual seismic situation that we find around Indian Point. A microseismic network of 13 stations around Indian Point has been in use for over 18 months.⁹⁶ The system began operating in June 1975 and became fully operational in September of 1975. Since that time licensees' quarterly reports to the NRC indicate that some 839 tremors have been recorded.⁹⁷ Of these only 18 appear to be natural events, the remainder being disturbances caused by quarry and construction blasting.

The State's testimony indicates that since April 8, 1974, the Indian Point network together with the Lamont-Doherty and Connecticut seismic networks have recorded a total of 18 events of possible interest to the Indian Point facility.⁹⁸ Of these the four events at Wappinger Falls, which may have been quarry blasts, are agreed by all parties to have no relationship to the Ramapo Fault. Similarly, the earthquakes at Schooley Mountain were over 75 km from Indian Point and apparently not connected with the main Ramapo fault.⁹⁹ We are thus reduced to a consideration of 12 events during

⁹⁵Appendix A, Section II, "Scope," third paragraph.

⁹⁶The network stations are located over an area of approximately 300 km² (25 km northeast-southwest, 12 km east-west). One station is 20 km west of the main group. State Exh. 19, p. 2 and Fig. 2. Within the area surrounded by the stations the network is capable of detecting an earthquake down to magnitude zero or a little less. Tr. 5667.

⁹⁷See Quarterly Reports for the Seismic Monitoring Program for Indian Point dated October 22, 1975, January 5, 1976, April 12, 1976, August 10, 1976, November 8, 1976 and February 14, 1977.

⁹⁸State Exh. 19, Table 1, appended thereto.

⁹⁹State Exh. 19, Table 1, and State Exh. 20, Fig. 1.

the last two years. These 12 events taken in chronological order and numbered as in the State's Table 1 (see fn. 98, *supra*) are shown in the following table:

TABLE 3			
No.	Magnitude	Location ^a	Date
5	2.1	7 km SSW of I.P. close to splay of Ramapo ^b	4/8/74 (prior to operation of I.P. network)
9	2.3	20 km NE of I.P.	7/19/75
10	2.3	15 km S of I.P. ~ 12 km SW of Ramapo	8/22/75
12	1.5	40 km SW of I.P. 5 km from Ramapo	11/10/75
13	1.0	17 km SE of I.P. 17 km from Ramapo and east of Hudson River	3/6/76
14	2.5)	50 km SE of I.P.	3/11/76
15	1.8)	Close to Ramapo	3/12/76
16	3	50 km S of I.P.	4/13/76
17	2.5	27 km SE of I.P. 25 km from Ramapo; east of Hudson River	8/20/76
18	1.8	About 2 km N of I.P. in the Hudson River	9/22/76
19	1.0	60 km SE of I.P. may be near extension of Ramapo	10/28/76
20	1.9	30 km S of I.P. 20 km from Ramapo east side of Hudson River.	11/22/76

^aAll distances given in table are scaled from Fig. 1 of State's Supplemental testimony. State Exh. 20.

^bDistance from fault is stated along a line perpendicular to fault trace to epicenter.

From this table we see that only two events (5 and 18) occurred within the Indian Point network, *i.e.*, within 13 km of the site. Of the rest, only 12, 14, 15 and 19 can conceivably be directly connected with the Ramapo fault.

We believe that it is important to note that the two earthquakes (5, 18) nearest to the Indian Point facility appear to be near splays of the Ramapo. Staff witness Kelleher emphasized the importance of this with the following remarks:

If there's a complicated fault system and if there's—in general, the more heterogeneous it is, the more splays, the more broken up, the more transfer structures, in general the smaller will be the earthquakes associated with that.

So if you have a very complex, complicated fault system with a lot of splays on it, and you're getting a number of different events on these, small events, microearthquakes on various parts of the system, I would not necessarily feel that there was potential for a much larger earthquake.

Tr. 6286.

In the case of earthquake 18 (the September 22, 1976, event) which occurred just to the north of Indian Point, State witness Aggarwal was of the opinion that this earthquake was most probably associated with the Timp Pass fault, a member of the Ramapo fault system. Tr. 6479. Dr. Aggarwal pointed out that his focal plane solution of earthquake 18 showed a fault dip of approximately 62° and hypocenter depth of 8 km. He stated that this dip extending from the hypocenter to the surface would come close to the surface trace of the Timp Pass fault. Tr. 6479-85.

In rebuttal testimony, however, the licensee witnesses Werner and McWhorter presented a strong argument that the actual measured dip of the Timp Pass fault is 81° . Tr. 6562, *et seq.* Since this fault is a strike-slip fault, Dr. Werner explained that the dip measured near the surface will be maintained at depth:

Q. (Mr. Curley) . . . What we're talking about is a dip at the surface. Must that angle continue to depth?

A. (Dr. Werner) I would say yes it is a law established on several levels, the one being the rock mechanics level where observations are that, you know, in response to a given stress system you're going to have a planar break develop, a flat planar break and that's what the fault represents.

Additionally there are field observation studies—I can't give you exact citations right now because I don't have the material with me, but I would reference the work of Handon relative to rock mechanics.

There are field studies which indicate that strike-slip faults as a class are planar. They maintain their dip at depth and in that I would cite the works of Moody and John Wilcox.

Tr. 6571-72.

Under these circumstances the Timp Pass fault could not extend eastward to the hypocenter of earthquake 18.

It should be noted that events 12, 14, 15 and 19, at least three of which were detected by the Indian Point network and a focal plane solution obtained on one, are at the extreme southern end of the proposed expanded network. In addition, Figure 1 of State Exh. 20 indicates that five (10, 13, 16, 17, 20) of the earthquakes in their Table 1 are located east of the Ramapo fault, three of them east of the Hudson River. In answer to a Board question (Tr. 5536) as to the significance of a hypothetical scatter of earthquakes either close to or at some distance from a fault, staff witness Stepp gave the following comment:

So that to answer your question, Mr. Farrar, directly, the fact that microearthquakes may be scattered rather randomly throughout a broad region here, occurring on many faults, even though the overall stress system may be consistent with movement on the Ramapo, the distribution of the earthquakes in a more random fashion would suggest that at the very worst, if we speak of worst in terms of hazard of movement of faults, all of the faults in the area of some kind of equal participation in the deformation that is going on, so that if one then distributes the level of seismicity among all of these faults, it gets pretty much diluted so far as the significance that it has for movement on any one of the faults.

Tr. 5540.

In summary, it is apparent to us that the picture presented by the data from the existing Indian Point, Lamont-Doherty and Connecticut monitoring networks is of a very few microearthquakes in a large region about the Indian Point facility. Only three of these earthquakes were within 12 km of the Indian Point site and at worst these may have been connected with splays of the Ramapo fault. Five of the earthquakes were 40 km or more southeast of the site near the southern extension of the Ramapo fault. The remainder of the events were well east of this fault. This picture would be in accordance with the historic data shown by applicants plate C2.¹⁰⁰ This

¹⁰⁰Attached to licensees testimony (Lic. Exh. 26) on Issue 3 of this proceeding.

plate shows a trend line of historic earthquakes in the area running north-south some 30 km east of Indian Point. The activity appears to increase as one goes east from the area of the Ramapo and decreases to the west of the fault.

The preponderance of the evidence indicates that an expanded network will not produce data to enhance assurance of public health and safety. The data already at hand from the existing networks do not provide any basis for requiring an additional network. Thus we find no justification for requiring the installation by the licensees of the expanded monitoring network.

Findings

For the reasons given in this opinion, we have made the following findings:

1. No historic event requires the assumption, in accordance with 10 CFR Part 100, Appendix A, of a safe shutdown earthquake greater than Modified Mercalli intensity VII for the Indian Point facilities.

2. The horizontal ground acceleration design value should remain at 0.15g for the Indian Point site based on a maximum probable earthquake of intensity MM VII.

3. The Ramapo fault is not a capable fault.

4. That section of Amendment 2 to the Indian Point, Unit 3, operating license numbered 2(C)(4)(c), which contains the requirement for an enlarged microseismic monitoring network will not add to the assurance of public health and safety and is unnecessary.

5. Determination of the seismic risk in the eastern United States through delineation of tectonic provinces is difficult. Because of advice from its geologic advisory committee the staff has not promulgated an official tectonic map of eastern United States, nor has it issued guidelines to the industry to aid it in developing such provinces. It now appears that the U. S. Geological Service which had a major role in developing Appendix A has expressed the opinion "that the Appendix would be extremely difficult to apply and would lead to a lot of confusion in the assigning of tectonic provinces." Tr. 3778-79.

6. In this proceeding the licensees presented the most reasoned scientific approach to the selection of tectonic provinces and the staff offered no opposition to those provinces. We have accepted most but not all of them.

7. If the tectonic province approach is to remain viable, guidelines must be issued so that the industry and public alike can be aware of the ground

rules. In other words the staff must know, and tell others, what rules it is trying to enforce.

As the result of these findings, we conclude that the operating licenses for Indian Point, Units 2 and 3, should not be modified *except* with respect to amendment 2 to the Indian Point, Unit 3, license. That amendment is to be modified by the deletion of that portion of Section 2(C)(4)(c) which relates to installation of an expanded microseismic monitoring network.

The licensees should be allowed to continue operation of the Unit 1 fuel storage pool, but before operation of that reactor may be resumed necessary modifications must be made to ensure the public health and safety in the event of an intensity VII earthquake.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD

Margaret E. Du Flo
Secretary to the Appeal Board

Opinion of Mr. Farrar, dissenting in part:

I disagree with my colleagues on a number of counts, and thus cannot join in the opinion which they have prepared. It will be some time, however, before I can complete the writing of a full response to what they have said, and they are anxious to issue their opinion.¹ Considering all the circumstances, we have agreed that the best course to follow in this case is to release their opinion now, accompanied by only an outline of the main points on which my views differ from theirs. I will supply a complete opinion as soon as possible, and in it set forth a detailed analysis supporting my conclusions.

1. A number of earthquakes greater than intensity VII (the level taken into account in designing the second and third units of this plant) have oc-

¹Although the majority decision does not call for any change in the *status quo* of the facility, its authors believe that some of their holdings will be important in other cases, and that licensing boards should therefore have the guidance of their opinion now. Particularly important, in their judgment, is the need for senior NRC staff management to focus on the ambiguities concerning the meaning and application of the tectonic province concept embodied in the present regulations (see pp. 574-577, *supra*).

curred in and around the Eastern seaboard in the past 200 years. Under the Commission's regulations, we must assume that earthquakes of this size will recur; the question is—where? In that connection, we are told by the regulations to assume that, unless a prior earthquake can be associated with a particular structure, it can happen again anywhere in the same "tectonic province." Such a province is defined as "a region of the North American continent" having "a relative consistency of . . . geologic structural features"²

In deciding which of the widely varying versions of proposed tectonic provinces to accept, we must be conscious of the context of our inquiry. In searching for "relative consistency," we should be paying particular attention to those features which are similar or dissimilar in terms of what they signify in terms of earthquake potential. In other words, structural differences which have no discernible bearing on the present likelihood of earthquakes should not, as I read the regulations, form the basis for drawing province boundaries.³

I am not convinced that in all instances the majority opinion adheres to this principle. Yet my colleagues should not necessarily be faulted on this score, for the lengthy hearing revealed a paucity of knowledge about earthquake mechanism. In the face of this inexactitude, our task is difficult but our course is plainly marked. As I have stressed before, "in recognition of the gaps in our understanding of earthquake occurrence and mechanism, the Commission's regulations insist that in this area, more so than in others, conservatism be the watchword."⁴

Without going into detail at this time, I can say that my conservative application of what I believe to be the controlling principle leaves me at odds with my colleagues on some of the province boundaries they adopt. But, in light of the imprecise state of the art, I would be exceptionally careful to avoid deciding matters not absolutely necessary to the disposition of this case. In this connection, it can be seen from the majority's opinion that the

²10 CFR Part 100, Appendix A, §III(h).

³In light of this principle, and the fact that the definition of a province is couched in terms of a "region" of the "continent," I find perplexing the majority's unbuttressed statement (p. 562, *supra*) that it is "inconceivable" that the drafters of the regulation could have intended that only so-called "first-order" characteristics be employed, resulting in provinces of the size proposed by the State. The suggestion that any such intent would have been stated "explicitly" ignores the imprecise wording of the regulation, which was deliberately drawn with vague contours. Indeed, one of the reasons the dispute on this issue was so sharp, and the evidence so voluminous, was precisely because the deceptively simple definition of tectonic province leaves so much room for differing interpretations.

⁴*Public Service Co. of New Hampshire* (Seabrook, Units 1 and 2), ALAB-422, 6 NRC 33, 111 (July 26, 1977)(dissenting opinion).

disputes which are crucial to a decision involve relatively few earthquakes and province boundaries. Thus, my opinion will deal with this issue on as narrow a basis as possible. I cannot now, before my own analysis is complete, say with certainty whether I will be able to endorse the majority's ultimate conclusion on the first issue, *i.e.*, that it was acceptable to use only an intensity VII earthquake as the starting point for plant design.

2. The Commission's regulations go on to require that, once a forecast is made of the highest intensity earthquake likely to be felt at the site of a nuclear power plant, the plant be designed to take account of the "maximum" acceleration which might result from such an earthquake.⁵ 10 CFR Part 100, Appendix A, §VI(a). We have indicated elsewhere that this requirement was not intended to be applied literally; it is to be understood as referring only to a lesser quantity, *i.e.*, maximum *effective* acceleration.⁶ But even at that, the majority's decision on how to determine the effective acceleration level to be associated with a particular intensity suffers from the same deficiencies which I outlined when the identical question came up in *Seabrook*.⁷ In both instances, the board majorities settled upon a figure which has not in my judgment been shown to correspond in any significant way to the maximum effective acceleration for the intensity in question.

In a nutshell, the problem is this. The basic data relied upon, about which there is no dispute, have been taken from a large number of earthquake records. Tracings—called seismograms—recording the acceleration measured by an instrument at a particular location during a particular earthquake have been grouped according to the intensity believed to have been felt near the location of the seismograph during that same earthquake. The seismograms in each intensity group were then analyzed to ascertain the highest amplitude, or peak, acceleration recorded on each of them. The dispute before us involves the validity of conclusions drawn from an analysis of the several peak acceleration figures found in each intensity group.

All parties agree that it is not necessary to use the highest peak associated with a particular intensity level to represent the maximum acceleration expected for that intensity. This is because the highest peaks generally have a large component of high frequency waves which will have

⁵In effect, then, the regulations require that the somewhat subjective intensity ranking (see p. 551, fn. 6, *supra*) be converted into a specific, objective measurement of the force which the earthquake in question might bring to bear on the nuclear power plant.

⁶*Seabrook*, ALAB-422, *supra*, 6 NRC at 63 (majority opinion), 113 (dissenting opinion); see also pp. 627-628, *infra*.

⁷ALAB-422, *supra*, 6 NRC at 113 (dissenting opinion).

no discernible impact upon the facility. In other words, the maximum effective acceleration lies at some level below the highest peak.

While it is thus permissible not to insist on the use of the highest peak, there is not, in my judgment, an adequate explanation in the record or in my colleagues' opinion for countenancing use of the mean, or average, of the peaks to represent the maximum effective acceleration. This approach might have obvious merit if the several peak acceleration figures, taken from the seismograms for all earthquakes of a particular intensity, fell within a narrow range. But their scatter is large—the record reveals that the highest and lowest peaks associated with each of the relevant intensity differ from each other by an order of magnitude, *i.e.*, by a factor of ten.⁸

Consequently, the mean of the peaks taken from all seismograms associated with a particular intensity might fall considerably below the level of effective or sustained acceleration found, for example, on one of the seismograms reflecting generally high levels of acceleration. And it is that quantity—the *maximum effective* acceleration—which the regulation requires be employed to represent an earthquake of the intensity under scrutiny. I cannot perceive any justification in this record for stating that the mean of the widely scattered peaks found in a number of records is inherently representative of the maximum effective acceleration latent in one. And I fail to see in the majority's decision to accept the use of the mean of the peaks any other legitimate support for doing so. I believe that an effort should be made to ascertain the maximum effective acceleration in some other, rational, manner.⁹

3. I do not take issue with my colleagues' resolution of the third issue, *i.e.*, the capability of the Ramapo fault. Although I would not express the reasons for my own conclusion in quite the same way they do, we all agree that the evidence thus far accumulated and presented to us does not demonstrate that any of the criteria which determine capability have been met.

Nonetheless, the staff has made what to me is a convincing presentation supporting its claim that the fault might "play a possible role in localizing earthquake activity" and that the expanded microseismic monitoring network is warranted. Thus, on the fourth issue, I must agree with the staff, the State, and the Citizens' Committee that the monitoring condition which the staff attached to the Unit 3 operating license should be upheld. I dissent,

⁸Trifunac testimony (CCPE Exh. 1), pp. 3-4; Tr. 312-15 (the reference at Tr. 314 to the figures found in Appendix "C" of the written testimony should be to Appendix "E").

⁹The views I have been espousing may at last be gaining some degree of acceptance. See the majority's additional remarks, pp. 584-585, *supra*.

then, from the majority's opinion on that score. As previously indicated, I will explain the reasons for this conclusion, and the other views I have expressed, in a subsequent opinion.¹⁰

¹⁰In *Seabrook* (ALAB-422, *supra*), I made a similar commitment in connection with my dissent on the seismic questions presented in that case. The Commission has extended its time to decide whether to review those questions until it receives and analyzes my opinion. (See its *Seabrook* order of September 15, 1977, CLI-77-22, 6 NRC 451, 453.) As noted above (p. 627, *supra*), one of the questions here is the same as one of those in *Seabrook*. Moreover, the so-called "Boston-Ottawa seismic trend" or "Cape Ann-New Hampshire tectonic province" plays a significant role in both proceedings. Consequently, I intend to release my supplemental opinion in both cases at the same time.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Richard S. Salzman, Chairman
Dr. John H. Buck
Michael C. Farrar

In the Matter of

Docket Nos. STN 50-546
STN 50-547

**PUBLIC SERVICE COMPANY OF
INDIANA, INC.**

**(Marble Hill Nuclear Generating
Station, Units 1 and 2)**

October 14, 1977

Upon consideration of motions for a stay of construction pending appeal, the Appeal Board determines that the movants did not show irreparable injury, that equitable considerations do not aid them, and that the movants have not made the requisite strong showing that they were likely to prevail on the merits.

Motions denied.

RULES OF PRACTICE: STAY PENDING APPEAL

The determination whether to grant a stay pending appeal is governed by the four criteria of *Virginia Petroleum Jobbers Ass'n v. Federal Power Commission*, 259 F.2d 921, 925 (D.C. Cir. 1958), which are embodied in 10 CFR §2.788(e). The practice of the Appeal Board in applying these criteria has not been to require that movants prevail on each one, but to balance all of the factors.

Mr. Harry H. Voigt, Washington, D.C., (with whom **Messrs. F. David Doane** and **Michael F. McBride** were on the brief) for the applicant Public Service Company of Indiana.

Mr. Thomas M. Dattilo, Madison, Indiana, for the intervenors Save the Valley/Save Marble Hill.

Assistant Attorney General of Kentucky **David K. Martin**, Frankfort, Kentucky, (with whom Attorney General **Robert Stephens** and Assistant Attorney General **David C. Short** were on the brief) for the Commonwealth of Kentucky.

Assistant City Law Director **Donald L. Cox**, Louisville, Kentucky, (with whom Assistant County Attorney **Walker Cunningham** and **Mr. Charles D. Kaplan** were on the brief) for the City of Louisville and Jefferson County.

Mr. Lawrence Brenner (with whom **Mr. Harry Glasspiegel** was on the brief) for the Nuclear Regulatory Commission staff.

MEMORANDUM AND ORDER

By a partial initial decision issued on August 22, 1977 (LBP-77-52, 6 NRC 294), the Licensing Board authorized the applicant to begin "limited work" on the proposed Marble Hill facility in advance of the receipt of full construction permits.¹ That facility would be located in southern Indiana, across from Kentucky on a bluff overlooking the Ohio River.

The facility has the approval of the Indiana authorities. Its construction is opposed, however, by Kentucky and two of its subdivisions, the City of Louisville and Jefferson County. They each filed requests with us for a stay of the limited work authorization pending the outcome of their appeals from the decision below. One of the Indiana-based citizens organizations which participated in the proceedings below—Save the Valley/Save Marble Hill—has supported those stay requests.² The NRC staff opposes them, as, of course, does the applicant.

The criteria which control our decision are the familiar four set out in *Virginia Petroleum Jobbers Ass'n v. Federal Power Commission*, 259 F.2d

¹Upon the making of environmental and certain safety-related findings by the Licensing Board, the Commission's regulations allow an applicant to engage in site preparation and related activities. 10 CFR §50.10(e). Before a decision is made on whether to issue construction permits, the Licensing Board must address a number of additional matters.

²The private intervenors sought no stay themselves, although they too have taken an appeal. The applicant has also taken exception to limited portions of the decision. The time for filing briefs in opposition to each of the appeals has not yet expired. Consequently, our decision on the merits of the appeals will be some time in the offing. In that connection, our reference to the "applicant" in the singular should not, of course, be taken as reflecting any view on the merits of the "co-applicant" issue pending before us.

921, 925 (D.C. Cir. 1958), and now formally embodied in the Commission's rules. 10 CFR §2.788(e), 42 Fed. Reg. 22128, 22130.³ Our past practice in applying those criteria has not been to require that the movants prevail on each one. Rather, we have balanced them all: "the strength or weakness of the showing by the movant on a particular factor influences . . . how strong his showing on the other factors must be" *Public Service Co. of New Hampshire* (Seabrook, Units 1 and 2), ALAB-338, 4 NRC 10, 14 (1976). The correctness of this approach has recently been confirmed by the decision in *Washington Metropolitan Area Transit Commission v. Holiday Tours*, ___ F.2d ___ (D.C. Cir. July 5, 1977, No. 77-1379). Specifically, the court there held that the "'level' or 'degree' of possibility of success" on the merits necessary to justify a stay "will vary according to the court's assessment of the other factors." ___ F.2d at ___ (slip opinion, p. 5).

In the matter before us, this test requires denial of the relief sought. As we explain in the next portion of this opinion, the movants have been unable to point to any irreparable injury that will be done to their interests if the initial decision is allowed to stand pending our full review of it. Nor does analysis of the other equitable factors (*i.e.*, the impact of a stay upon the other parties or the public interest) afford the movants any support. That being so, they would need an especially strong showing of likelihood of success on the merits of their appeals in order to prevail on their stay motions.⁴ In the final portion of this opinion, we discuss their failure to make that requisite showing.

A. 1. The factor which has proven most crucial in our deliberations (as it often does in judicial ones) is the question of irreparable injury to the movants. It is the "established rule that a party is not ordinarily granted a stay of an administrative order without an appropriate showing of irreparable injury." *Permian Basin Area Rate Cases*, 390 U.S. 747, 773 (1968).

³That section tells us to consider: "(1) Whether the moving party has made a strong showing that it is likely to prevail on the merits; (2) Whether the party will be irreparably injured unless a stay is granted; (3) Whether the granting of a stay would harm other parties; and (4) Where the public interest lies."

⁴In *Holiday Tours*, *supra*, the court was concerned with whether a *strong* showing on the other three factors could overcome a weak showing on the merits. The question remains whether in the absence of substantial equity in the movant's favor on the other three factors, a stay can be granted solely on the basis of a strong showing on the merits. The applicant argues that in the absence of irreparable injury a stay can never be granted. In that connection, it asserts that the appropriate remedy where there is an overwhelming probability of success on the merits is not a stay pending appeal but summary reversal. In light of the disposition we make of the stay applications, we need not pass on the validity of this proposition.

The Kentucky governmental units are scarcely in a position to complain about any environmental impacts of the early stages of construction. These will take place entirely within, and have an effect only upon, Indiana. No suggestion was made to us that that construction would have any discernible impact upon the interests of the Kentucky citizens for whom these governments speak.

For their part, the intervening Indiana citizens groups did not even ask for a stay in the first instance and, in supporting the stay requests that were filed, have not documented any claims that early construction activity has been causing, or will cause, any untoward environmental impact in their state. We made clear at oral argument the importance of this factor to our determination of the case (*e.g.*, App. Bd. Tr. 7, 35-37). Thus, we may safely assume that the intervenors' failure to come forward with any serious claim is not due to oversight but instead indicates that no irreparable environmental damage is occurring.

The movants attempt to satisfy the irreparable injury requirement by relying upon less tangible forms of damage. First they argue that the alleged failure of the Licensing Board to follow NEPA's dictates is itself irreparable injury.⁵ So too, they say, is the continuing commitment of resources to the project authorized by the limited work authorization, for it will prejudice the outcome of the NEPA review.

Claims of this nature, while not within the traditional categories of irreparable injury, cannot be dismissed lightly. Their first argument finds support in the one decision cited to us in the moving papers, which holds that the "harm with which courts must be concerned in NEPA cases is . . . the failure of decision-makers to take environmental factors into account in the way that NEPA mandates." *Jones v. D.C. Redevelopment Land Agency*, 499 F.2d 502, 512 (D.C. Cir. 1974).⁶ But that decision involved whether a district court should enjoin agency action taken without the preparation of any environmental impact statement whatsoever. Other decisions in that line involve similar blatant NEPA violations. In contrast, here a final environmental statement was prepared and there is outstanding a Licensing Board decision approving the NEPA review thus far conducted. Thus, the movants can point neither to an outright refusal to comply with NEPA nor to an obdurate disregard of its dictates. Rather, the questions they raise are ones of degree, *e.g.*, whether subsequent changes in the pro-

⁵As the Commonwealth puts it, "violation of laws in and of itself should constitute irreparable injury." (Stay Application, p. 5.)

⁶Other decisions, cited at oral argument, stand for a similar principle: *Scherr v. Volpe*, 466 F.2d 1027, 1034 (7th Cir. 1972); and *Environmental Defense Fund v. Tennessee Valley Authority*, 468 F.2d 1164, 1184 (6th Cir. 1972).

posed project are of sufficient significance to require that the environmental statement be redrafted and recirculated.⁷ Consequently, whether in this sense any "irreparable injury" is being done is intertwined with the merits of their appeal.

Movants' central claim in this respect is that a proper cost-benefit analysis could not have been conducted because the ownership of the plant is still in flux, and that the changes in ownership called for recirculation of the environmental statement. But the applicant has a ready answer. Specifically, it says that regardless of who owns the plant, the power it will produce is needed and will be utilized by the same customers originally contemplated, and that neither the benefit nor the cost side of the equation will be affected by any shift in ownership.⁸ To be sure, this answer may prove inadequate upon further examination of the merits of the case. But it is substantial enough to preclude us from saying now with any certainty that irreparable injury is being done to the policies served by NEPA.

The remaining claim of irreparable injury—*i.e.*, that allowing work to continue will prejudice the ultimate outcome—must likewise be taken seriously.⁹ This factor is most crucial when there is a serious alternative site contention being pressed and there is substantial doubt about its resolution. That situation does not obtain here. And we have been furnished no particulars which suggest that our resolution of other contentions will be prejudiced by the continuity commitment of resources.

2. We need not pause long to consider the other two equitable factors. If we were to grant the requested stay, the applicant would suffer delay and the attendant financial costs and deferral of the completion date of the facility. As we have said in similar circumstances, "although these burdens may not be enormous in the short term, they do exist and militate against granting the stay." *Florida Power and Light Co.* (St. Lucie, Unit 2), ALAB-404, 5 NRC 1185, 1188 (1977).¹⁰

⁷*Cf. Allied-General Nuclear Services* (Barnwell Facility), ALAB-296, 2 NRC 671, 680 (1975).

⁸In this regard, we are told, for example, that the siting of the transmission line connecting the proposed plant to the region's electrical grid will be the same irrespective of how the ownership shares of the plant are distributed. (App. Bd. Tr. 90.)

⁹See *Public Service Co. of New Hampshire* (Seabrook, Units 1 and 2), CLI-77-8, 5 NRC 503, 532 (1977); *Florida Power & Light Co.* (St. Lucie, Unit 2), ALAB-404, 5 NRC 1185, 1188 (1977).

¹⁰In that same decision, we rejected the argument, pressed by those seeking a stay, that a stay might prove beneficial to the applicant. The same reasons given there call for rejection of the similar argument made here. See 5 NRC at 1188, citing *Virginia Petroleum Jobbers, supra*, 259 F.2d at 926-27, to the effect that the movants will not be heard to assert that a stay will benefit, rather than injure, their opponents.

Public interest considerations do not aid the movants. They have not pointed to any public interest factors (other than those this opinion has already touched on) which independently indicate that the public interest would be best served by refusing to allow construction to proceed.

In short, the best that can be said from the movants' point of view is that neither of these factors aids their cause. With this in mind, we turn to a consideration of their likelihood of success on the merits.

B. In light of the movants' failure to establish either that significant irreparable injury will occur in its absence or that the other equitable factors favor its grant, they must make out an overwhelming case of probability of success on the merits in order to obtain a stay. The movants have not carried that burden.¹¹

We have already discussed the ownership issue. The other principal issue at this stage, and the one we thought the most likely to justify a stay, stems from the longstanding boundary dispute between Kentucky and Indiana over whether, as Kentucky claims, it owns the entire Ohio River up to the *present* low-water mark on the Indiana shore. This time that dispute takes the form of a claim by Kentucky that the applicant did not satisfy Section 401 of the Federal Water Pollution Control Act (FWPCA)¹² by obtaining the certificate required by that section from the State of Indiana. As Kentucky sees it, the applicant's discharge structure is in its waters; thus only a Kentucky certificate will do and none has been obtained. A prerequisite to start of construction would be lacking were Kentucky correct.

We are in no position to decide the merits of this question now. What we can say is that Kentucky's arguments are in the face of a Supreme Court decision, resolving an earlier boundary dispute with Indiana, that appears to place the boundary between the two states at the low-water mark of the Ohio River as it existed *in 1792* when Kentucky came into the Union. *Indiana v. Kentucky*, 136 U.S. 479, 508 (1890).¹³ It is common knowledge that the level of the Ohio has risen since because of dams built downstream. The applicant asserts that a portion of the river—*i.e.*, that above and to the west

¹¹There is much to be said for not analyzing the merits too definitively at this juncture, before all briefs are in. See *Holiday Tours, supra*, ___ F.2d at ___ (slip opinion, pp. 6-7), warning against "an exaggeratedly refined analysis of the merits at an early stage in the litigation" while recognizing that such an "endeavor may be necessary in some circumstances." As we have pointed out, the balance of equities does not present us with such circumstances here.

¹²33 U.S.C. 1341.

¹³There the Court said that Kentucky's rights "could not be affected by any subsequent change of the Ohio River," and concluded that Kentucky's "dominion and jurisdiction continue as they existed at the time she was admitted into the Union, unaffected by the action of the forces of nature upon the course of the river." *Ibid.*

of the contour line denoting an elevation of 405 feet above mean sea level (the alleged 1792 low-water mark)—now lies in Indiana. In keeping with its position, the applicant designed the proposed discharge structure so that it is on the Indiana side of the 405-foot contour.

The Licensing Board declined to take evidence on the location of the boundary, instead holding, at Kentucky's urging, that it lacked jurisdiction to become involved in the boundary dispute. See Tr. 5276, 5279-80, 5288-94;¹⁴ see also LBP-77-52, 6 NRC at 337.¹⁵ Our present thinking, subject to change when we do consider the merits, is that that holding was erroneous—the Board did have jurisdiction to consider the evidence tendered by the applicant.

Because the Board below excluded that evidence, the record is now devoid of any proof of the location of the 1792 boundary. Where a request for equitable relief is concerned, however, we are disinclined to let the movant profit from an error which it induced, regardless of how well intentioned it might have been. Solely for purposes of ruling on the stay request, then, we will assume that, had it been permitted to do so, the applicant could have established that the 1792 boundary was in fact the 405-foot contour. Because there is no dispute that the applicant's discharge structure will be on the Indiana side of that mark, all that we need decide now is whether Kentucky is likely to prevail in its claim that the present low-water mark (rather than the 1792 low-water mark) is the boundary. In the face of *Indiana v. Kentucky* (*supra*, fn. 13 and accompanying text) we cannot say that Kentucky clearly has the best of the argument on the border dispute.¹⁶

None of the movants' other arguments on the merits is so likely to succeed as to warrant granting a stay in the circumstances present here. To be

¹⁴Kentucky had a less sweeping and less vigorously pursued objection to the evidence, namely that the particular witnesses through whom it was to be presented were not competent to testify on the subject. Tr. 5291. The Board did not appear to base its ruling on this ground.

¹⁵At the same page of its decision, the Board indicated that the parties were in agreement that the boundary is the 1792 low-water mark. No such agreement obtains.

¹⁶Because of the disposition we make of this point, we do not now need to consider the applicant's further argument that the equities are against Kentucky in that it has never indicated that, were the applicant to seek a 401 certificate from it, it would be likely to refuse to grant the certificate on the ground the quality of its waters would be adversely affected. Nor do we need to consider the argument, pressed primarily by the staff, that even if the discharge structure is in Kentucky's waters, sound policy embodied in Environmental Protection Agency practice calls for interpreting the FWPCA in a manner that would let it fall to Indiana—where the balance of the plant is located—to issue (or decline to issue) a Section 401 certificate. The Board below is, of course, free to explore either or both of these arguments further and, if asked to do so, to take evidence on the location of the 1792 low-water mark (which evidence might ultimately prove necessary to a final decision).

sure, they have raised substantial questions about a number of the rulings of the Board below, *e.g.*, its failure to invoke the sanction of denying the requested limited work authorization when it found the applicant to have violated NEPA in connection with the unauthorized road-building effort; its allegedly inadequate treatment of the need-for-power issue; and the alleged procedural unfairness surrounding the filing of testimony on the issue of the differing health effects associated with nuclear and coal-fired plants. Since hearing argument, we have taken a preliminary look at each such issue and in no instance is the action of the Licensing Board without some rational foundation. All we can say is that at best (from the movants' point of view) it is possible their appeal will be successful on one or more grounds. But in no instance have the movants established the degree of probability of success that would be necessary to justify a stay in the absence of irreparable injury or other equitable factors in their favor. Consequently, it would serve no useful purpose to discuss those issues now. If the movants' claims prove to have merit, the remedies available in the ordinary course of the appellate process will be adequate.

For the foregoing reasons, the motions for a stay pending appeal are *denied*.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD

Margaret E. Du Flo
Secretary to the Appeal Board

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Michael C. Farrar, Chairman
Richard S. Salzman
Dr. W. Reed Johnson

In the Matter of

Docket Nos. 50-329
50-330

CONSUMERS POWER COMPANY

(Midland Plant, Units 1 and 2)

October 19, 1977

The Appeal Board declines a Licensing Board's referral of a discovery order as inappropriate in the absence of a strong showing that the impact of the order upon the aggrieved party or the public interest was "unusual."

MEMORANDUM AND ORDER

On October 7, 1977, the Licensing Board (1) rejected the licensee's request that discovery of certain documents in its possession be allowed only under protective order; (2) referred its ruling to us on its own initiative; and (3) stayed the effectiveness of the discovery order pending our action on the referral.

For all that appears, this discovery ruling is not one where our "prompt decision is necessary to prevent detriment to the public interest or unusual delay or expense." 10 CFR §2.730(f). In this connection, the Board below did not explain why it believed our involvement to be necessary. And the losing party had not indicated it could not live with the Board's ruling. Moreover, that ruling is not novel; it plows no new ground but merely applies settled principles to the facts before it. See *Commonwealth Edison Co.* (Zion, Units 1 and 2), ALAB-116, 6 AEC 258 (1973).

In short, there was no apparent reason for the Board below to refer its ruling to us on its own motion. And we are not inclined to become embroiled in discovery disputes in the absence of a strong showing by an aggrieved party that the impact of the order upon that party or upon the public interest is indeed "unusual." See *Kansas Gas and Electric Co.* (Wolf

Creek, Unit 1), ALAB-327, 3 NRC 408, 413 (1976). The requisite showing not having been made, we *decline* the referral as inappropriate.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD

Margaret E. Du Flo
Secretary to the Appeal Board

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Alan S. Rosenthal, Chairman
Dr. John H. Buck
Michael C. Farrar

In the Matter of

Docket No. 50-549

POWER AUTHORITY OF THE STATE
OF NEW YORK

(Greene County Nuclear Power
Plant)

October 21, 1977

The Appeal Board summarily denies the applicant's petition for directed certification of an evidentiary ruling of the Licensing Board.

Mr. Leonard M. Trosten, Washington, D. C., for the applicant, Power Authority of the State of New York.

MEMORANDUM AND ORDER

The applicant in this construction permit proceeding has filed a petition for directed certification under 10 CFR §2.718(i) of a licensing board ruling requiring it "to prepare and submit evidence of the health and safety impacts of the coal fuel cycle and the nuclear fuel cycle on a comparative basis." Without pausing for an instant to consider the merits of the applicant's attack upon the ruling, we reject the petition summarily on the authority of *Long Island Lighting Co.* (Jamesport Nuclear Power Station, Units 1 and 2), ALAB-353, 4 NRC 381 (1976), and cases there cited. See also, *Public Service Co. of Indiana* (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-393, 5 NRC 767 (1977). Indeed, it is difficult to imagine any ruling less worthy of our interlocutory scrutiny than one which

does no more than to call upon a party to adduce evidence which the Licensing Board has expressly indicated it "is interested in considering."

Petition for directed certification denied.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD

Margaret E. Du Flo
Secretary to the Appeal Board

'The Licensing Board is conducting joint hearings with the New York State Board on Electric Generation Siting and the Environment (Siting Board), from which under New York law the applicant must obtain a Certificate of Environmental Compatibility and Public Need. The applicant insists in its papers to us that, in all events, the Licensing Board lacks the authority to order the submission of the evidence in question to the Siting Board. Although this may be so, we construe the Licensing Board's order as calling for the submission of the evidence to itself. The extent to which the Siting Board might then make use of it would, we presume, be determined on the basis of the Joint Hearing Protocol governing the jointly held proceedings.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

**Alan S. Rosenthal, Chairman
Dr. John H. Buck
Richard S. Salzman**

In the Matter of

**Docket Nos. STN 50-491
50-492
50-493**

DUKE POWER COMPANY

**(Cherokee Nuclear Station,
Units 1, 2 and 3)**

October 26, 1977

Absent a convincing showing that petitioners could make a significant contribution on a crucial issue, the Appeal Board affirms the Licensing Board's orders denying petitions to intervene which were inexcusably three years late.

RULES OF PRACTICE: NONTIMELY INTERVENTION PETITIONS

A petitioner who has relied on a state participating pursuant to 10 CFR §2.715(c) to represent her interests in a proceeding cannot rely on her dissatisfaction with the state's performance as a valid excuse for a late-filed intervention petition, at least where no claim is made that the state undertook to represent her interests specifically.

**Messrs. J. Michael McGarry III, Washington, D.C., and
William L. Porter, Charlotte, North Carolina, for the ap-
plicant, Duke Power Company.**

**Ms. Evelyn H. Smith, Gaffney, South Carolina, *pro se* and
for Ms. Evelyn F. Howe, petitioners.**

**Mr. Charles A. Barth for the Nuclear Regulatory Commis-
sion staff.**

DECISION

This construction permit proceeding involving the three units of the proposed Cherokee Nuclear Station was noticed for hearing more than three years ago. 39 Fed. Reg. 26470 (July 19, 1974). The deadline specified in the notice for the filing of petitions for leave to intervene under 10 CFR §2.714 was August 19, 1974. No such petitions were timely filed. The State of South Carolina sought and obtained, however, permission to participate in the proceeding under the "interested state" provisions of 10 CFR §2.715(c).

The proceeding went through the pretrial stage and then moved into the evidentiary hearing phase. To date, the Licensing Board has rendered three published decisions which, in their totality, appear to dispose of all of the presented issues other than those concerned with radiological health and safety matters not related to site suitability. See LBP-76-18, 3 NRC 627 (1976); LBP-77-19, 5 NRC 676 (1977); LBP-77-47, 6 NRC 191 (1977).¹ The hearing on the remaining questions has now been concluded and all that is left is the rendition of the Licensing Board's ultimate decision on whether the issuance of construction permits should be authorized.²

It is against this background that we must consider the consolidated appeal taken by Evelyn H. Smith and Evelyn F. Howe under 10 CFR §2.714a from the September 6 and 8, 1977, orders of the Licensing Board (unpublished) denying their petitions for leave to intervene.³ These petitions had been filed on July 11 and August 7, 1977, respectively—almost three years late. With respect to each petitioner, the Board determined that there was an absence of "a substantial showing of good cause for failure to file on time." 10 CFR §2.714(a), as interpreted in *Nuclear Fuel Services, Inc.* (West Valley Reprocessing Plant), CLI-75-4, 1 NRC 273 (1975). See also, e.g., *Metropolitan Edison Co.* (Three Mile Island Nuclear Station), ALAB-384, 5 NRC 612, 615 (1977); *Duke Power Co.* (Perkins Nuclear Station, Units 1, 2 and 3), ALAB-431, 6 NRC 460, 462 (September 8, 1977). More

¹The applicant and the NRC filed exceptions to the first of these decisions but recently withdrew them in the light of the subsequent decisions. Our review *sua sponte* has been deferred to abide the event of the completion by the Licensing Board of the radiological health and safety phase of the proceeding. See order of September 27, 1977 (unpublished).

²As a result of the licensing board decisions to date, limited work authorizations have been issued pursuant to the provisions of 10 CFR §50.10(e).

³For appellate purposes, these individuals refer to themselves collectively as the Cherokee Intervenors. Although the brief in support of the appeal was signed by Ms. Smith alone, and is addressed almost exclusively to her own petition, we will treat it as submitted on behalf of Ms. Howe as well. In doing so, we waive the seeming requirement of 10 CFR §2.713(a) that an individual not appearing on his or her own behalf must be represented by a lawyer.

specifically, the Board concluded that neither petitioner had advanced a sufficient justification for filing belatedly⁴ and, further, that application of the four factors specifically enumerated in Section 2.714(a)⁵ did not, in combination, warrant overlooking the extreme tardiness.

We agree with the Licensing Board on both scores, and, accordingly, affirm the two orders under appeal. To begin with, Ms. Smith is not aided by the averment in her petition that it was not until "approximately one year ago" that she first became concerned about radioactive emissions during the course of normal facility operation (the principal issue which the petition seeks to raise). As is conceded in her appellate brief, she was aware in 1974 of the proposal to construct the Cherokee facility (on a site located "approximately eight to ten miles" from her residence). Although we are told that at that time domestic and other responsibilities occupied her full attention, and thus precluded her pursuit of then available information pertaining to the facility,⁶ that scarcely can be taken to constitute an adequate reason for permitting her to enter the proceeding as it approaches the terminal point of licensing board consideration. Most persons in our society are confronted with many and varied demands upon their time. The practical effect of acceptance of petitioner's explanation therefore would be free license to make the timing of an intervention petition a matter wholly dictated by personal convenience. The contemplation of the Commission's Rules of Practice is clearly otherwise. Nor could any adjudicatory process function effectively, if at all, in such circumstances.

For her part, Ms. Howe points to the fact that, shortly before the deadline for the filing of an intervention petition, her father died following an illness of several weeks duration. That consideration undoubtedly would have prompted the Licensing Board to excuse her failure to have strictly adhered to the deadline. A three-year delay in filing is, however, quite a different matter. All that Ms. Howe offers in justification for that protracted

⁴In the case of Ms. Smith, the conclusion is not explicitly stated but may fairly be implied.

⁵Those factors are:

- (1) The availability of other means whereby the petitioner's interest will be protected.
- (2) The extent to which the petitioner's participation may reasonably be expected to assist in developing a sound record.
- (3) The extent to which petitioner's interest will be represented by existing parties.
- (4) The extent to which the petitioner's participation will broaden the issues or delay the proceeding.

⁶The applicant's Environmental Report and the staff's Final Environmental Statement were on file, and subject to public inspection, in July 1974 and October 1975, respectively. The applicant's Preliminary Safety Analysis Report became available even earlier (in May 1974). Copies of all of these documents were placed upon issuance in the Cherokee County Library, located in Gaffney, South Carolina, where Ms. Smith resides.

period of inaction is that, after attending some of the evidentiary hearings and examining many documents pertaining to the facility, she reached the conclusion that her interests were not being adequately protected by any of the participants—more particularly, the State of South Carolina. That explanation similarly will not carry the day. It is not claimed that the state undertook to represent the interests of the petitioner specifically, as opposed to the public interest generally. This being so, Ms. Howe assumed the risk that the state's degree of involvement in the proceeding would not fulfill her expectations. And a foreseeable consequence of the materialization of that risk was that it would then no longer be possible to undertake herself the vindication of her interests.

That is the necessary consequence here insofar as both petitioners are concerned. Given the present posture of the proceeding, the Licensing Board would have been warranted in allowing their intervention only upon the most convincing showing that their participation at this late date would make a significant contribution on an issue of crucial importance. Such a showing has not been made. To the contrary, although their sincerity is beyond question, there is nothing before us to indicate that either petitioner possesses (or has at her disposal) any expert knowledge which might be brought to bear upon one or more of the concerns which their petitions set forth.⁷

The September 6 and 8, 1977, orders of the Licensing Board are *affirmed*.⁸

⁷As previously noted, Ms. Smith is principally concerned with radioactive releases during normal plant operation. She also raised, however, the question of the applicant's competence to operate the proposed facility. Ms. Howe has identified a number of specific concerns, including radioactive waste disposal and the seismology of the site.

⁸In their brief, the petitioners ask that, should their appeal prove unsuccessful, they be granted "permission to intervene in proceedings when the Duke Power Company applies for an" operating license. The request is premature. Under now prevailing procedures, the Commission will issue and publish in the Federal Register a notice of opportunity for hearing on any operating license application which may eventually be filed in connection with this facility. The petitioners can then seek to intervene by the filing, in response to the notice, of timely petitions which conform to the requirements of Section 2.714(a) of the Rules of Practice. In this connection, as the Licensing Board found, neither of the petitions now before us satisfies the requirement of that section that the petitioner set forth with particularity "the basis for [her] contentions with regard to each aspect on which [she] desires to intervene." We have not, however, taken that consideration into account for present purposes in view of the Board below's indication that, but for the lateness of the petitions, it would have provided an opportunity to amend.

It is so ORDERED.

**FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD**

**Margaret E. Du Flo
Secretary to the Appeal Board**

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Edward Luton, Chairman
Ernest E. Hill
David R. Schink

In the Matter of

Docket Nos. 50-553
50-554

TENNESSEE VALLEY AUTHORITY

(Phipps Bend Nuclear Plant,
Units 1 and 2)

October 14, 1977

The Licensing Board in an uncontested proceeding renders a partial initial decision, making findings of fact and conclusions of law necessary to permit issuance of a limited work authorization pursuant to 10 CFR §50.10(e), subject to seven conditions to protect the environment.

NEPA: CONSIDERATION OF ALTERNATIVES

Neither the NRC staff nor a licensing board is limited to reviewing only those alternative sites unilaterally selected by the applicant.

**PARTIAL
INITIAL DECISION**

I. INTRODUCTION

This is a proceeding on the application of the Tennessee Valley Authority ("Applicant") for construction permits which would authorize the construction of the proposed Phipps Bend Nuclear Plant, Units 1 and 2. The proposed facilities are to be located in Hawkins County, in eastern Tennessee, approximately 2.5 miles east of Surgoinsville, and approximately 15 miles west-southwest of Kingsport, Tennessee.

In addition to the Applicant, the parties to this proceeding are the Commission's Regulatory Staff ("Staff") and the State of Tennessee.¹ This is an uncontested proceeding within the meaning of 10 CFR §2.4(n).

On the present aspect of the case, the Applicant seeks authorization to perform those limited work activities, pursuant to 10 CFR §50.10(e), set out in Attachment A of the document entitled "Activities for Which the Tennessee Valley Authority has Requested a Limited Work Authorization" (Tr. 155). These activities may be authorized only after this Board has (1) made all of the findings required by 10 CFR §51.52(b) and (c); (2) determined that there is reasonable assurance that the proposed site is a suitable location for a nuclear power reactor of the general size and type proposed from the standpoint of radiological health and safety considerations; and (3) determined that there are no unresolved safety issues that would constitute good cause for withholding authorization. Thus, this partial initial decision addresses only these matters; a subsequent partial initial decision addressing the remaining radiological health and safety aspects of the construction permit application will be issued by this Board after the conclusion of the public hearing on those issues.

An evidentiary hearing on the matters addressed herein was held on July 13-14, 1977, in Kingsport, Tennessee. A number of limited appearance statements were made at the hearing. Some of the persons making limited appearance statements raised questions concerning the environmental and site suitability aspects of the facility. Both the Applicant and the Staff expressed their intention to respond in writing to such questions at a later date (Tr. 115, 118).

The record in this proceeding to date consists of the transcript of a prehearing conference held on September 10, 1976, the transcripts of the evidentiary hearing held on July 13-14, 1977, containing, *inter alia*, the testimony of witnesses appearing on behalf of the Applicant and Staff, and all the exhibits admitted into evidence.

II. ENVIRONMENTAL MATTERS

A. Compliance With the Federal Water Pollution Control Act Amendments of 1972

As required by §402 of the Federal Water Pollution Control Act Amendments of 1972 ("FWPCA"), 33 U.S.C. §1251, *et. seq.*, the Applicant has received a final National Pollutant Discharge Elimination System

¹The State of Tennessee's participation is pursuant to 10 CFR §2.715(c).

("NPDES") permit from the U.S. Environmental Protection Agency ("EPA") for the Phipps Bend project. The permit was issued on July 6, 1977.² This final NPDES permit establishes, *inter alia*, limitations on effluents authorized to be discharged from the Phipps Bend Nuclear Plant point sources.

B. Compliance with 10 CFR Part 51 and the National Environmental Policy Act

In accordance with 10 CFR Part 51, the Applicant submitted with its application an Environmental Report ("ER"), which has been received into evidence as Applicant's Exhibit 3 (Tr. 233). The Regulatory Staff prepared and circulated for comment a draft environmental statement in August 1976. As required, copies of the draft statement were provided to appropriate Federal, state, and local agencies for comment. In February 1977, the Staff published its Final Environmental Statement ("FES"). The FES was made available to various governmental agencies and to members of the public, and was received in evidence as Staff's Exhibit 3 (Tr. 464).³ The FES describes the proposed site, the major plant systems, the environmental impacts of site preparation, and plant construction and operation. It also contains the Staff's cost-benefit analysis, which considers the environmental effects of the proposed facility and alternatives for reducing or avoiding adverse effects. On the basis of its review, the Staff concluded that the action called for under the National Environmental Policy Act ("NEPA") and 10 CFR Part 51 is the issuance of construction permits, subject to certain conditions for the protection of the environment (Staff Exhibit 3, pp. (ii), (iii)).

1. Impacts of Construction and Operation

Approximately 406 acres of the 1,270-acre site will be used for construction activities (Staff Exhibit 3, p. (i), Section 4.1.1). About 240 acres will be only temporarily disturbed since, upon completion of construction, this land will again be landscaped. An estimated 1.02 million cubic yards of

²Applicant's Exhibit 6 (Tr. 410); attachment to NRC Final Environmental Statement replacing Appendix D thereof (Staff Exhibit 3) (Tr. 464). The permit will become effective on August 22, 1977, provided that there is no request filed with EPA for an adjudicatory hearing on challenged provisions of the permit.

³The FES was amended by a document entitled "Revised Evaluation Regarding Health Effects Attributable to Coal and Nuclear Fuel Cycles," and by inclusion of Applicant's final NPDES permit.

earth will be excavated during the cut and fill operations at the site. In order that the impact of these activities be minimized, the Applicant has agreed to implement an erosion and sedimentation control program. The program will include the use of berms, diversion dikes, check dams, storm-water collection ponds, fiber mats, netting, gravel, mulches, grasses and drains where necessary. In addition, usable topsoil and excavated material will be removed, stored, rolled and seeded as necessary to minimize erosion. Buffer zones will be left along streams and drainage ways to retard runoff (Staff Exhibit 3, §§4.1.2, 4.3.2.1, 4.5.1.3, 4.5.1.6).

A total of about 139 circuit miles of transmission lines will be constructed for the Phipps Bend plant (Staff Exhibit 3, p. (i), paragraph 3(g); §4.1.2; Applicant's Exhibit 4; §§3.9, Tr. 292). The transmission lines will require about 1,464 acres of land (Staff Exhibit 3; §§3.7, 3.7.1.1, 3.7.1.2; Applicant's Exhibit 4, §§3.9, 4.3, Supp. 1). After the transmission corridors have been cleared and construction of the transmission facilities completed, the Applicant will grade, fertilize, and revegetate disturbed areas. It is the Board's view that, if properly implemented and timed, the Applicant's program for revegetation of these disturbed areas will significantly reduce the environmental impact.

The major impact of construction activities on surface water resources will result from the temporary pumping station which will provide water for fire protection, cooling, flushing, clearing, and other needs during construction. Since the minimum Holston River flow is about 350,000 gpm, the expected maximum monthly use of 2 million gallons for these purposes is negligible (Staff Exhibit 3, §4.2.1). Potable water will be obtained from the Surgoinsville Utility District and, if necessary, from the First Utility District of Hawkins County (Staff Exhibit 3, §4.2.1; Applicant's Exhibit 4, §4.2.1). Construction waste water will be routed to a holding pond and treated to conform with applicable Federal and state standards before the waters are discharged (Staff Exhibit 3, §4.2.1). Final NPDES permit provisions govern the construction of sanitary waste treatment facilities and operation of sanitary discharges (Attachment to Staff Exhibit 3 replacing Appendix D thereto). Waste from the preoperational cleaning of the system will be directed to a pit for storage and treatment (Staff Exhibit 3, §4.2.1).

No ground water will be used during construction or operation, though ground water movement may occur in the immediate vicinity of necessary excavations. However, since all the ground water flows are toward the river and away from any other users, no impact should be experienced by other water users in the vicinity of the plant (Staff Exhibit 3, §4.2.2; Applicant's Exhibit 4, §4.1.2.1).

Construction activities will result in increased turbidity and siltation in the Holston River as a result of dredging and erosion. This could cause loss

of habitat, benthic-community disruption, reduction in primary productivity by restriction of light penetration, smothering of periphyton and macrophytes, an increase in biological oxygen demand resulting in lowered dissolved oxygen concentrations, and disruption of fish migration and spawning patterns. Additionally, the release of toxic substances associated with resuspension of sediments during instream excavation for the intake and discharge structures could result in adverse impacts on water quality and aquatic biota (Staff Exhibit 3, §4.3.2.1). But because of the comparatively small amount of instream excavation that will be necessary for installation of the intake and discharge systems, no long-term irreparable damage to downstream aquatic systems is anticipated. Depending on sediment contamination, however, short-term impacts may result. Since information on the possible existence of toxic substances in riverbed deposits at Phipps Bend is not presently available, no assessment of the potential impact of such substances has been made. The Staff and EPA (see Staff Exhibit 3, Appendix A, p. A-33' and the final NPDES permit attached thereto as revised Appendix D) have decided to require the Applicant to perform sediment and elutriate tests on riverbed deposits from the Phipps Bend site and to prepare an assessment of the anticipated environmental consequences of the release of toxic substances due to instream excavation. The report must be submitted to the Staff for evaluation prior to the commencement of instream excavation. Depending upon the results of the assessment, special restrictions for control of disturbed sediments may be necessary.

A certain amount of siltation and sedimentation are unavoidable consequences of construction activity of this magnitude. Thus, some temporary, but reversible, adverse impacts are expected (Staff Exhibit 3, §4.3.2.1). We find that, with the implementation of appropriate impact limiting construction practices agreed to by the Applicant (Staff Exhibit 3, §4.5.1.4; Applicant's Exhibit 4, §4.1.2) all portions of the aquatic ecosystem should recover satisfactorily following cessation of construction activities (Staff Exhibit 3, §4.3.2.1).

The Applicant estimates that almost 30% of the work force required during the period of peak construction will move into the affected area and that 70% (525) of these will bring their families with them. The maximum in-migrating population at any given time is expected to number about 1,800 people. This population increase will affect housing patterns and the availability of housing, and place an additional demand on social organizations and municipal services (Staff Exhibit 3, §4.4; Applicant's Exhibit 4, §4.2.2).

In those instances where the project will create adverse impacts on the local communities, the Applicant has proposed a program, summarized in Staff Exhibit 3, §4.5.1.5 and Applicant's Exhibit 4, §4.2.3, designed to

mitigate these effects. The Board finds that the adverse impacts on the site area from construction of the Phipps Bend Nuclear Plant, Units 1 and 2, have been adequately described and evaluated. It is our view that the proposed construction activities and resultant environmental effects will be at the minimum practicable level during construction of the facility.

Operation of the proposed station will preclude use of the site for pasture and crop production for the life of the plant. The change in land use will also preclude harvesting of forest products on the site (currently about 10% forested) (Staff Exhibit 3, §2.2 and 2.7). Plant operation will give rise to noise from the natural-draft cooling towers. The Staff estimates that the noise level from this source will not cause undue annoyance to those in the site vicinity.

Operation of the proposed station can, under the most adverse meteorological conditions, cause the withdrawal of as much as about 132 cfs of water from the Holston River. The maximum consumptive use is expected to be about 66 cfs. As the lowest projected river flow is 800 cfs, the station will consume no more than 9% of the minimum river flow. The year-round average consumption is expected to be 58 cfs which, for an average river flow of 3,600 cfs, corresponds to a 1.6% consumptive use (Staff Exhibit 3, §5.2.1, Applicant's Exhibit 4, §5.1.7.3).

At present, a 9% short-term decrease in river flow in the stretch of river between Phipps Bend and Cherokee Reservoir (20 miles downstream) would not affect operation of the John Sevier Steam Plant, the only water user in this part of the river. Additionally, the water level and water quality in the Cherokee Reservoir pool will not change significantly as a result of station operation, as these properties would be affected by average flows rather than by changes in short-term flow (Staff Exhibit 3, §5.2.1).

Operation of the cooling towers will cause the formation of a visible cloudlike plume, which will contain whatever soluble chemicals that are present in the circulating water. Because large amounts of heat and water vapor are added to the atmosphere over a small area from tower operation, local atmospheric changes can occur.

A potential impact of the vapor plume would be a decrease in the intensity of the sunlight reaching the ground. However, because of the shifting shadow, the small area affected, and natural cloudiness, the decrease in sunlight intensity is not expected to be important (Staff Exhibit 3, §5.3.1.2).

Due to the elevation at which the moist air leaves the cooling towers, ground level fogging and icing are not expected to be a significant problem on level terrain. Ground level fogging and icing could occur at the 700-foot River Mountain Ridge, one mile southeast of the plant, though plume rise is likely to make this an infrequent occurrence. Downward dispersion of water vapor from the elevated plume might increase fogs in the area, but the

elevation of release makes this unlikely. Thus, other than infrequent visible plume touchdown on River Mountain Ridge, the operation of the cooling towers is not likely to result in significant fogging or icing conditions (Staff Exhibit 3, §5.3.1.3; Applicant's Exhibit 4, §5.1.6).

Cooling tower plumes do create clouds and create and enhance precipitation. Occasional small additions to natural snow and slight restrictions on visibility may be anticipated (Staff Exhibit 3, §4.5.1.4).

A small fraction of the cooling tower water is carried into the plume and discharged into the atmosphere as drift. These droplets will cause impacts such as wetting, icing, and deposition of salts onto soil, plants and structures. Under conditions of relatively high humidity, some of the droplets will not evaporate before reaching the ground and will be deposited at various distances from the cooling tower. Most of the drift that does reach the ground will do so within the station boundary (Staff Exhibit 3, §5.3.1.5; Applicant's Exhibit 4, §5.1.7). Drift from the Phipps Bend cooling towers may deposit about 25 times more salt than does average rainfall. The concentration of salts in the drift can be on the order of 500 mg/liter, while salts in natural rainfall are on the order of 1-4 mg/liter. The much higher concentration of salt in drift droplets may cause leaf necrosis if the salts are not washed off by rain. There is some possibility that these salts enter leaf stomata and affect osmotic balance within the plant (Applicant's Exhibit 4, §5.1.7.1).

The blowdown from the cooling towers will be discharged to the Hoston River by means of a submerged multiport diffuser, consisting of two or three diffuser pipe sections with a combined length of 275 feet (Staff Exhibit 3, §3.4.4; Applicant's Exhibit 4, §5.1.1). This type of discharge promotes the mixing of the blowdown with the ambient river water, and maximizes the dilution of the heated effluent. Similarly, dilution of dissolved solids and other chemicals will be maximized by this type of discharge structure (Staff Exhibit 3, §5.3.2.1).

The principal environmental impacts to be expected from operation of the intake system are the impingement of juvenile and adult fish on the intake screens, and the entrainment and loss of small planktonic or weakly swimming aquatic biota in the condenser cooling system. The proposed intake system for the Phipps Bend plant consists of an inland pump station with a 750-foot intake channel running from the Holston River, and two separate sets of screens (shown in Staff Exhibit 3, Figure 3.5). A screening device, employing fine mesh screens, will be located in the channel at the shoreline and conventional vertical traveling screens will be located at the blind end of the channel. The shoreline screens will feature a system for removal and return of live fish from the screens to the river. Maximum

water velocity through the screens has been estimated by the Applicant to be approximately 0.5 fps. A bypass channel around the shoreline screens will be constructed (Staff Exhibit 3, §5.5.2.1; Applicant's Exhibit 4, Rev. 3, §§3.4.2.1, 3.4.2.2, 10.9). In order to mitigate the potential larval fish entrainment problem, the Applicant has instituted a research and development program to evaluate the feasibility of use of fine-mesh screens on the shoreline intake and to develop the necessary engineering technology for their use (Applicant's Exhibit 4, §10.9). Results of the program suggest that screening of larval fish is feasible and that this approach could minimize entrainment losses (Applicant's Exhibit 4, §9.3.2). Since the design of the shoreline device which is intended to mitigate these effects has not been finalized, the Board will impose an appropriate condition (Condition No. 6) upon the license.

During the larval fish season (March to August), adverse effects on some larval fish are possible if ambient temperatures are near the upper tolerance limits. However, due to the short period of exposure to elevated temperatures in the mixing zone (1 to 2 minutes), high mortality is believed to be unlikely. The Staff believes, however, that mixing zone mortality would exist in addition to entrainment losses and that this added mortality could be substantial at low river flows (*i.e.*, 800-2,000 cfs). At higher river flows, (*i.e.*, about 2,000 cfs) there should be no detectable impact (Staff Exhibit 3, §5.5.2.2).

Biocidal treatment of various plant systems to prevent fouling will result in the release of chlorine residues to the Holston River. The effluent limitation set in the final NPDES Permit (Attachment to Staff Exhibit 3) of 0.1 milligrams per liter total residual chlorine makes it unlikely that there will be any adverse environmental impact on this account (Staff Exhibit 3, §5.5.2.4).

The increases in chemical concentrations in the Holston River due to discharges from the facility were calculated by the Staff (Staff Exhibit 3, Table 3.7). The Staff concluded that, with the possible exception of copper, the discharge of chemicals into the Holston River would not result in a measurable change in the aquatic ecosystem (Staff Exhibit 3, §5.5.2.3).

A decrease in oxygen levels may result from the increase in river temperature as a result of plant operation. The Staff has calculated the approximate additional oxygen depletion caused by a raised temperature and lowered water volume under the most unfavorable operating conditions expected. It found that there is a slight decrease in oxygen in the river due to plant temperature and volume changes amounting to a net increase in oxygen deficit of 0.23 or 0.32 mg/liter, depending upon the reaction constant used. Since the oxygen in the water returned to the river as blowdown is at a level of 7 to 9 mg/l, compared to the river's assumed 3 mg/l, the oxygen

level in the water after mixing is raised by about 0.3 mg/1, thus compensating for the loss resulting from the increased thermal load and lower volume effects (Staff Exhibit 3, §5.5.2.6).

The radiological impact of the plant was evaluated by the Staff and presented in terms of individual doses in Tables 5.6, 5.9 and 5.11 of Staff Exhibit 3, and in terms of population dose commitments in Table 5.7 of Staff Exhibit 3. The calculated doses from liquid effluents from the proposed facility are 0.11 mrem/year to the total body, and 1.5 mrem/year to any organ. The calculated doses from noble gas effluents are estimated to be 1 mrem/year to the total body and 2.1 mrem/year to the skin. The dose to any organ from radioiodines and particulates is estimated to be 9.1 mrem/year. These annual individual doses are a small fraction of the dose limits specified in 10 CFR Part 20. The population doses also are small fractions of the doses received from natural environmental radioactivity. The Board concludes that there will be no measurable radiological impact upon man from routine operation of the Phipps Bend plant (Staff Exhibit 3, §§3.5.1.5, 3.5.2.8, 5.4.1.6, Table 5.6, 5.7, 5.9, 5.11).

The Staff estimates of radiation doses to biota within the exposure pathways anticipated at the Phipps Bend Nuclear Power Plant are presented in Table 5.12 of Staff Exhibit 3. We conclude that no measurable radiological impact on biota is to be expected from radiation released to the biosphere as a result of the routine operation of the plant.

On March 14, 1977, the Commission published in the *Federal Register* (42 FR 13803) an interim rule regarding the environmental effects of the uranium fuel cycle. The rule revises Table S-3 of 10 CFR §51.20(e). The Staff entered written testimony on this matter which concludes that those values do not adversely tip the cost-benefit balance. Table S-3 Testimony at 4-5, following Tr. 467.

2. Need for Power

Applicant's service area has a total population of about 6.7 million people. The Applicant is primarily a wholesaler of electric power to three major groups of customers, namely, municipal electric systems and rural electric cooperatives, directly served industries, and directly served Federal agencies. The Applicant's statistics indicate that the historic power consumption growth rate for the 11 years prior to 1976 was about 4.3% (see Table 8.1, Staff Exhibit 3). Excluding that load used by Federal activities, the average growth rate was about 5.2% per year for the same period. *Id.* The system capacity, the diversity interchange, the TVA peak load, peak load responsibility, the reserve, the reserve margin for 1976, and TVA's projections for 1977 to 1986 are presented in Table 8.7 of Staff Exhibit 3. The Applicant

projected reserve margins of 22.2% and 20.0% in 1985 and 1986, respectively, based on planned generating capacity between 1977 and 1985 (Applicant's Exhibit 4, Revision 5; see 8.7 of Staff Exhibit 3).

The Federal Power Commission ("FPC") has suggested that, based on industry practice, a reserve margin between 15% and 25% of peak load should provide reliable electric service (FPC comments to NRC DES, dated January 21, 1977, Staff Exhibit 3, Appendix A, A-38). In the opinion of the Federal Power Commission (Staff Exhibit 3, §8.3.4), a delay of one year in the start of operations at Phipps Bend would cause system reliability to fall below a level generally considered adequate. The Board finds that additional baseload generating units of the capacity proposed should be constructed in the time frame proposed (April 1984 and April 1985) to provide the Applicant the generating capacity that it will need to meet the power demands of its service area.

III. ALTERNATIVES TO THE PLANT

The Applicant and Staff have analyzed alternative methods for supplying the needed power, including the use of solar, geothermal, hydro, nuclear, and fossil-fueled power sources. Both also considered conservation and rate restructuring (ER §1.1, 9.1, 9.2.0; Staff Exhibit 3, §9.1, 8.2.4). These analyses indicate that the only viable alternatives for the needed baseload capacity addition are fossil fuel (in particular, coal) and nuclear power. On the basis of its analysis, the Staff concludes that the overall economic costs of the nuclear alternative are less than those of the coal-fired alternative, and the environmental costs are no greater than those for the coal-fired alternative, and probably are less (Staff Exhibit 3, §9.1.2.2). The Board agrees with this assessment.

In their consideration of alternate plant systems which might be employed to reduce environmental impacts, the Applicant and Staff examined several methods of dissipating the waste heat to be generated: once-through cooling, cooling lakes, natural-draft evaporative cooling towers, mechanical-draft evaporative cooling towers, spray canals, and dry cooling towers (Staff Exhibit 3, §9.3.1; Applicant's Exhibit 4, §10.1). Their conclusion, with which we agree, is that the use of natural-draft cooling towers at Phipps Bend is the most advantageous method from an economic and environmental standpoint.

Various other alternate plant systems have also been analyzed by the parties to assess their reasonable potential for reducing impact (e.g. biocide treatment system, ER §10.5; Staff Exhibit 3, §9.3.4.3; plant water intake system, ER §10.9; Staff Exhibit 3, 3.9.3.2). These analyses appear to have adequately evaluated the potential system alternatives. None of those alter-

natives evaluated reflect economic or environmental advantages which would warrant their selection instead of the systems proposed to be utilized.

Alternate Sites

The Regulatory Staff's assessment of alternate plant sites is contained in §9.2 of Staff's Exhibit 3. Additional Staff evidence concerning this matter was presented by the joint testimony of Staff's witnesses Boyle and Ness. The evidence indicates that the Staff's review was limited to an examination of the proposed Phipps Bend site, and to three additional sites designated as Bellefonte, Murphy Hill, and Watts Bar. The characteristics of these latter three sites (the "candidate sites") are summarized by the Applicant in Table 9.3-1 of Applicant's Exhibit 4, and by the Staff in Table 9.6 of Staff's Exhibit 3. The site characteristics evaluated by the Staff included economics (site preparation costs and transmission requirements), hydrology and aquatic impacts, population, ecology, land use compatibility, historical and archaeological significance, and certain "social impacts." The Staff stresses its findings that "the relative cost estimate for site preparation and transmission requirements indicate a marked advantage in developing the Phipps Bend site"; and, "none of the other site characteristics evaluated favored development of any alternative site over the proposed Phipps Bend site."

In the Staff's judgment, the candidate sites selected for comparison with the Phipps Bend site constituted "viable alternatives" to that site (Testimony of Boyle and Ness, p. 3). We understand the quoted phrase to mean that these alternative sites were, *prima facie*, acceptable and *not obviously unacceptable*. Our review of the evidence persuades us to the view that each of the alternate sites selected for examination by the Staff was, at least initially, a plausible possibility for the location of the proposed facility. We are also of the view that, upon the evidence available, none of the alternate sites evaluated is "obviously superior" to the proposed Phipps Bend site. *Public Service Company of New Hampshire, et al.* (Seabrook) Station, Units 1 and 2), CLI-77-8, 5 NRC 503 (March 31, 1977). Our difficulty, however, is with the breadth of the alternate site possibilities actually explored by the Regulatory Staff.

The Applicant's power system projections for the early 1980's indicated the need for additional generating capacity in the eastern part of the system, or in an area in close proximity to that portion of the system (ER §9.2.1; Cross, Att. at 9). In its Environmental Report, the Applicant identified the Bellefonte, Murphy Hill and Watts Bar sites as "viable alternatives." Thus, these were the only alternate sites evaluated by the Regulatory Staff. Neither the Bellefonte nor the Murphy Hill sites is located in the preferred

eastern area. The Watts Bar site is located near, but not in, the preferred area. The Phipps Bend site is, of course, within the preferred eastern area. Our concern is with the Staff's failure to investigate, or even to *inquire* about, the existence of any other alternate sites, at least in that area in which the Staff *knew* the Applicant desired to locate its facility. Instead, it elected to evaluate two sites located well away from the preferred area, undoubtedly aware of the likelihood that one very important factor that caused the eastern area to be preferred (lower transmission costs) would weigh heavily against any possibility that either of those two sites could be found to be a superior choice to the Phipps Bend site. While it is true that Watts Bar is located out of, but near, the preferred area, that fact alone can hardly inspire confidence in what appears to have been a totally uncritical Staff reliance on only those alternate site possibilities suggested to it through the medium of the Applicant's Environmental Report.

Apparently in reaction to inquiry by the Board at the hearing into the site selection process, the Applicant served with its proposed findings a brief addressing the "criteria which [the Applicant] believe[s] should guide the Board in its consideration of alternative sites." The argument touches upon both the question of the breadth of the site review properly to be performed by the Regulatory Staff, and upon the Board's authority and responsibility respecting its review of the Staff effort. We are first told that the Commission's decision in *Seabrook, supra*, requires us to confine our review to "the proposal" submitted by the Applicant; on this aspect of the case, that "proposal" is said to be the "process," described by the Applicant in its environmental report and in the testimony of its witness Jimmy Cross, which resulted in the Applicant's selection of the Phipps Bend site; and that "process" is said to constitute "TVA's alternate site 'proposal' for this project." Finally, it is argued that, in accordance with *Seabrook*, this Board can only determine "whether any of those alternatives *proposed by the Applicant*" is obviously superior to the proposed site. (Emphasis added.)

The argument is not wholly comprehensible. We confess our inability to understand how the "process" resulting in the Applicant's selection of the Phipps Bend site is reasonably to be viewed as its "proposal" before this agency. As we view the matter, the Applicant's "proposal" here is quite direct: it is to locate a two-unit nuclear plant at the Phipps Bend site. Manifestly, the Applicant is not proposing, on its current application to the Nuclear Regulatory Commission, to locate that plant at any of the other sites described in its environmental report, or at any other location. In these circumstances, we are simply unable to discover that asserted "alternative sites proposal" which the Applicant insists it has made.

As best we are able to discern, the Applicant argues that this Board (and, presumably, the Regulatory Staff) is limited to a consideration of only

those alternate sites described by the Applicant in its environmental report. We find no authority whatever for such a proposition. The *Seabrook* case, upon which the Applicant relies, is certainly no such authority. In that case, the Commission expressly stated that its holding should not be “misunderstood as suggesting that the obligations of the NEPA *analysis* are any less than have previously been required by our Staff with respect to alternate sites NEPA requires that the performance of the analysis which has been done, and the thoroughness and good faith of that analysis to remain an issue to be resolved before a license may issue.” It is the *adequacy* of the alternate site analysis performed by the Staff that remains a proper subject of inquiry by the Licensing Board, notwithstanding the fact that none of the alternatives selected by the Applicant proves to be “obviously superior” to the proposed site. The view pressed by the Applicant seems to be that this Board, and the Regulatory Staff, is limited to concerning itself with *only* those alternate site possibilities unilaterally selected for examination by the Applicant in its environmental report. We reject that view, one which, if adopted, would permit decisions to be based upon “sham” alternatives elected to be identified by a given applicant, and a view which oftentimes would result in consideration of something less than that full range of reasonable alternatives that the National Environmental Policy Act appears to contemplate.

In short, we do not believe our concern about the breadth of the Staff’s alternate site analysis in this case to be misplaced. It is our opinion that the Staff’s performance would have been of a higher quality had it exhibited some independence and made inquiry, at least, about the existence of alternate site possibilities beyond those suggested to it by the Applicant.

The evidence is, however, that the alternate sites examined were not plainly frivolous selections. In view of the inherent uncertainties in the NEPA concept of “reasonableness” (*NRDC v. Morton*, 458 F.2d 827), and the lack of clear guidance in the decided cases on the point at issue, we are compelled to find the Staff’s analysis minimally acceptable in the circumstances of this case.

IV. SITE SUITABILITY

The Staff issued a Report on Site Suitability (hereafter, “SSR”) in connection with the proposed plant in May 1977 (Staff Exhibit 1, Tr. 204; summarized at Tr. 212-13). The Staff concluded that the proposed site is a suitable location for the two proposed nuclear reactors from the standpoint of radiological health and safety considerations under the Atomic Energy Act and the Commission’s rules and regulations (Staff Exhibit 1 at 23).

A. Population, Exclusion Area, and Low Population Zone

The site consists of approximately 1,270 land acres which lies inside a bend in the Holston River at river mile 121. The site is bounded on the northeastern through western quadrants by the river. The site topography is characterized by flood plains along its eastern side which rise into a series of ridges on the western side. The exclusion area consists of the site property plus the Holston River where it borders the site property (Staff Exhibit 1 at 2).

The exclusion area property is owned by the United States Government and is in the custody of the Tennessee Valley Authority. No public highways or railroads traverse the exclusion area. Control of the movement of fishermen and boaters on the portion of the Holston River which is within the exclusion area will be initiated by the plant security force in the event of a plant emergency. The Applicant plans to arrange with the appropriate state agencies for the implementation of additional control procedures on the river as part of the radiological emergency plan (Staff Exhibit 1 and 2; Applicant's Exhibit 1, §2.1, TVA Site Suitability Testimony at 2-3). The Board concludes that there is reasonable assurance that the Applicant has the authority to determine all activities within the exclusion area, as required by 10 CFR Part 100 (Staff Exhibit 1 at 2).

The region surrounding the Phipps Bend site is not heavily populated. Approximately 18,000 persons resided within 10 miles of the site in 1970.

The community closest to the site is Surgoinsville which is located approximately 1.5 miles to the northwest and which had a population of 1,285 in 1970. Two other communities, Mount Carmel and Church Hill, with a combined 1970 population of 5,634, are located between 6 and 12 miles northeast of the site. The largest urban center within 50 miles of the site is Kingsport, Tennessee, which is located approximately 15 miles northeast. Kingsport City and the unincorporated suburb of Kingsport North had a combined population of 45,056 in 1970 (Staff Exhibit 1 at 2).

The 1970 population density within 10 miles of the site was 56 persons per square mile and within 30 miles of the site was 108 persons (*see Id.* at 5, Table 1). By the year 2020, the population density is projected to be 193 persons per square mile within 10 miles of the site and 280 persons per square mile within 30 miles of the site. *Id.*

The Applicant has specified a low population zone with an outer boundary distance of 4,830 meters (three miles). The population of this area was 2,090 in 1970 and the Applicant projects that it will increase to 2,395 by 1980. There are no large transient populations within or immediately beyond the low population zone which could significantly alter the population distribution (Applicant's Exhibit 1, §2.1.3). Based on the available

evidence, the Board concludes that there is reasonable assurance that adequate protective measures can be developed to protect members of the public in the low population zone (Staff Exhibit 1 at 5).

The nearest population center of 25,000 persons or more, is Kingsport, Tennessee which, in combination with the suburb of Kingsport North, had a 1970 population of 45,056. Although population growth is projected for the area, a population center containing more than 25,000 residents is not expected to develop between Kingsport and the site. Kingsport is located approximately 15 miles northeast of the site, a distance which is greater than the minimum population center distance of one and one-third times the distance from the center of the site to the outer boundary of the low population zone. We conclude that the exclusion area, low population zone, and population center distances specified for the Phipps Bend site meet the requirements of 10 CFR Part 100.

B. Nearby Industrial, Transportation and Military Facilities

No missile sites, military bases, or chemical plants are located within 5 miles of the proposed site, nor are any projected for development in the near future (PSAR §2.2). The nearest waterway which is navigable by commercial barge traffic is 121 river miles downstream from the site. A small natural gas pipeline (6.25" o.d.) is located approximately 7,500 feet from the proposed plant site. The Hawkins County Airport is located 4.2 miles west of the site (PSAR §2.2; TSST at 6).

The Aladdin Plastics Company of Tennessee operates a factory located about 5,000 feet from the site. It produces plastic houseware items by injection molding at temperatures in the range of 350 degrees to 400 degrees Fahrenheit. The plastics used in the injection molding process are thermoplastics—styrene and polyethylene. These two chemicals are stored in pellet form, which is not considered to be flammable except at high temperatures. No vinyl chloride is used at the plant, and no hazardous materials are stored at or shipped to and from the plant (PSAR §2.2; SSR at 7).

The Holston Army Ammunition Plant, which is located southwest of Kingsport, Tennessee, produces high explosives (primarily military class 7). The closest approach from the military reservation boundary to the reactor building is eight miles. The explosive potential of materials stored at the facility has been analyzed in accordance with Regulatory Guide 1.91, resulting in the conclusion that they will not affect the safety of the proposed Phipps Bend plant (PSAR §2.2). Quantity-distance relationships for potential hazards were examined and compared with the Regulatory Guide 1.91, resulting in a conclusion that no hazard to the plant would exist due to the transportation of explosives (PSAR §2.2; SSR at 8).

Holliston Mills, located approximately 4.3 miles northeast of the proposed Phipps Bend Nuclear Plant site, normally stores 250,000 pounds of nitrocellulose at its facility. Shipments of nitrocellulose are normally received by rail twice a month and usually do not pass by the site. However, the potential danger of such a shipment was evaluated. Quantity-distance relationships were examined and compared with the requirements of Regulatory Guide 1.91. It was determined that no hazard to the proposed Phipps Bend Nuclear Plant would exist due to the transportation and storage of the nitrocellulose (PSAR §2.2).

The East Tennessee Natural Gas Company owns and operates a gas pipeline which is approximately 7,500 feet northwest of the proposed plant. The pipeline, which carries gaseous natural gas at a nominal operating pressure of 404 psig, is 6.25-inch outside diameter and is buried to a depth of 30 inches. There are no immediate plans by East Tennessee Natural Gas Company to transport any other products except natural gas in the pipeline. The pipeline does not pose an unacceptable threat to the safety of the plant (PSAR §2.2; TVA Site Suitability Testimony at 8; SSR at 9).

The airport nearest the site is the Hawkins County Airport, 4.2 miles to the west. The airport has one asphalt runway 3,500 feet in length, and serves only general aviation aircraft operating under visual flight rules. The nearest airport served by commercial airline traffic is the Tri-Cities Airport, located approximately 20 miles east of the site. It is a category I airport with minimum operating conditions of a 200-foot ceiling and 2,400-foot visibility. The airport has two runways. One is 6,600 feet long and oriented NE-SW, and the other is 4,441 feet long and oriented E-W. Because of the large distance between the proposed Phipps Bend Nuclear Plant site and the Tri-Cities Airport, airport traffic will not pose a significant hazard to the plant (PSAR §2.2; SSR at 9). At the present time, the centerline of a military low-level training route passes approximately 1.2 miles west of the site. By agreement between the Nuclear Regulatory Commission and the Department of Defense, military low-level training routes will be changed when plant operations begin so that the training route will avoid the plant site.

Based upon a review of the aviation activities in the vicinity of the site, we conclude that the probability of an aircraft crashing into the Phipps Bend plant and causing offsite radiological doses in excess of the 10 CFR Part 100 guidelines is so low that no provision for this event need be made in the design of the facility (Staff Exhibit 1 at 8-9; TVA Site Suitability Testimony, at 8-9).

The principal highway through the area has in past years been U.S. Highway 11-W. Recently, however, Interstate 81, which runs roughly parallel to U.S. Highway 11-W, has been opened. Therefore, the traffic on U.S. Highway 11-W near the proposed Phipps Bend Nuclear Plant site is

decreasing and will continue to decrease. Interstate 81 is outside the immediate area, *i.e.*, greater than five miles from the plant site (PSAR §2.2; TVA Site Suitability Testimony at 9; SSR at 8).

On the basis of our analysis of nearby industrial, transportation, and military facilities in the vicinity of the Phipps Bend Nuclear Plant site, we conclude that these facilities will not pose an unacceptable hazard to the proposed plant.

C. Site Characteristics and Nearby Population

The site is in a physiographic region where the occurrence of severe storms is relatively infrequent. The area is east of the center of tornadic activity, south of most storms producing blizzard conditions, and too far inland to be directly affected by hurricanes. During a 59-year period (1916-1974), only three tornadoes were reported for Hawkins County, which includes the proposed Phipps Bend Nuclear Plant site. The estimated recurrence interval for a tornado at the site is 2,950 years (PSAR §2.3; TVA Site Suitability Testimony at 10; SSR at 10).

The annual average occurrence of lightning flashes to the ground was estimated to be 6.5 per square mile (2.5 per square kilometer). The estimated recurrence interval for glaze icing greater than 1.0 inch (2.5 cm) and 2.0 inches (5.0 cm) thick has been calculated to be 2,500 years and 8,300 years, respectively (PSAR §2.3; TVA Site Suitability Testimony at 10).

The average annual precipitation at nearby Rogersville is about 45 inches (114.3 cm) with the maximum which has been observed in 24 hours being 4.20 inches (10.7 cm). The maximum 24-hour snowfall observed at Bristol in 31 years of record was 16.2 inches (41.2 cm). The predicted 100-year return period snow pack added to the estimated 48-hour probable maximum snowfall gives a conservative combined snowload of about 40 pounds/ft² (195 kg/m²) (PSAR §2.3; TVA Site Suitability Testimony at 10-11).

On an annual basis, the most frequent wind directions at the 33-foot (10 m) tower level were from the north-northeast through northeast (about 10 to 11 percent of the time, respectively), southwest through west-southwest (about 10 percent of the time for each), and north-northwest (about 11 percent of the time). The terrain features common to the site region favor northeasterly-southeasterly type of low-level flow because of the general northeast-southwest orientation of the valley ridge configuration. The exception, north-northwest, occurred most frequently during stable conditions with northeasterly winds at the 150-foot (46 m) level. During these conditions, the 33-foot winds appear to be influenced by higher ground to the north and west of the plant site and the low ridge oriented north-

northwest to south-southeast on the west side of the proposed Phipps Bend Nuclear Plant site (PSAR §2.3; TVA Site Suitability Testimony at 11; SSR at 11).

Atmospheric stability, classified according to Pasquill and Regulatory Guide 1.23, and based on one year of onsite data, show that stable conditions were present about 60 percent of the time. The two most stable classes, F and G, occurred about 25 percent of the time; classes D and E occurred about 64 percent of the time; and the unstable classes A, B, and C, in combination, occurred about 11 percent of the time (TVA Site Suitability Testimony at 12). Dispersion estimates presented in the ER and PSAR are based on site specific meteorological information of wind speed, wind direction, and atmospheric stability. These measured meteorological conditions are the result of, and directly reflect, the meteorology and geography of the proposed site area (PSAR §2.3; TVA Site Suitability Testimony at 12; SSR at 11).

On the basis of the evidence, we conclude that the site is suitable for the proposed nuclear plant from a meteorological standpoint.

D. Hydrology

The Holston River will supply makeup water for the proposed Phipps Bend Nuclear plant. The average flow in the river is 3,600 cfs, while the expected minimum flow past the site is 800 cfs. This flow will provide a sufficient supply of raw water for operation. For safety, two essential service water (ESW) spray ponds will provide a 30-day supply of water for shutdown. These ponds, during shutdown, are independent of the water supply in the river (PSAR §2.4; TVA Site Suitability Testimony at 12-13).

The plant grade and safety-related structures are at or above elevation 1,184.0. Safety-related facilities, systems, and equipment are above maximum flood levels, including wind waves. The maximum flood level elevation 1,182.6 results from a probable maximum precipitation (PMP) storm over both South Holston and Watauga watersheds with the isohyetal pattern constrained to produce sufficient rain on Watauga watershed to overtop and fail Watauga Dam. It was determined that concurrent wind waves could raise water levels to elevation 1,183.7. The wave runup coincident with the worst potential flood from any other cause does not exceed elevation 1,183.6 in the vicinity of the plant site (PSAR §2.4; TVA Site Suitability Testimony at 13; see SSR at 15-16).

The site drainage system, including the roofs of safety-related buildings, will be designed such that the local PMP will not constitute a threat to safety-related facilities. Access to safety-related facilities will be sufficiently above the plant grade as to be unaffected by the PMP. For the rail access to

the fuel building, which is at plant grade, minor leakage around doors will not affect any safety-related equipment or functions (PSAR §2.4; TVA Site Suitability Testimony at 13).

The nearest major user of surface water for public use is the First Utility District of Hawkins County, Tennessee, located 8.2 miles northeast of the plant site. The nearest industrial user of surface water for human consumption is located 7.3 miles upstream of the proposed Phipps Bend Nuclear Plant site. The nearest downstream user is at Rogersville on Big Creek, 8.3 miles from the site. Thus, ground and surface water sources should not be affected from either normal or postulated accidental radioactive releases. Periodic samples will be taken of various private and municipal water supplies to ensure that they are not affected by the operation of the proposed plant (PSAR §2.4; TVA Site Suitability Testimony at 13-14; see SSR at 17).

We conclude that, from the hydrologic standpoint, the site is suitable for the proposed nuclear power plant.

E. Geology

Physiographically, the site is located in the Tennessee section of the Valley and Ridge Province of the Appalachian Highlands. This section is the southernmost of the three sections comprising the Valley and Ridge Province and extends from the Tennessee River-New River Divide, southwestward into central Alabama. It is bounded on the west by the Cumberland Plateaus Province and on the east by the Blue Ridge Province (ER §2.4; PSAR §2.5; TVA Site Suitability Testimony at 14; SSR at 18).

The site is located along side the Holston River, a northern tributary of the Tennessee River. The Holston meanders south-westward along a northeast-southwest trending valley which has developed adjacent to the northwestern limb of the Bays Mountain synclinorium, a broad syncline made up predominantly of Middle and Upper Ordovician shales and sandstones (ER §2.4; PSAR §2.5; TVA Site Suitability Testimony at 14; SSR at 18).

Alluvial terrace deposits form the surface of the proposed plant location. Beneath these deposits lies the Middle Ordovician Sevier Shale, an interbedded calcareous siltstone and shale. Weathering occurs mostly near the top of the rock layers. Irregularities in this weathered surface are usually related to the geologic structure, *i.e.*, weathering extends deeper into the troughs of minor synclines than beneath anticlines and extends down bedding planes of vertical strata. There are no broad, continuous zones of weathering beneath the top of rock surface. Faults present in the site area are associated with the Late Paleozoic era and as such are not capable faults within the meaning of 10 CFR Part 100, App. A (PSAR §2.5; TVA Site Suitability Testimony at 14-15; SSR at 18-19).

The evidence indicates that the Phipps Bend site is a geologically suitable location for the proposed plant.

F. Seismology

There are no indications either in the immediate site area or in the adjoining region of surficial effects of any recent earthquakes. Historically, the highest Modified Mercalli (MM) intensity shock to have been felt in the vicinity of the site was MM VI associated with three events:

- (1) the 1811-1812 New Madrid series of quakes;
- (2) the Charleston, South Carolina, quake of August 31, 1886; and
- (3) possibly the May 31, 1897, Giles County, Virginia, quake.

These intensities resulted in no determinable displacement of either the surficial geological materials or of strata underlying the site (PSAR §2.5; TVA Site Suitability Testimony at 15; SSR at 20).

For the proposed Phipps Bend Nuclear Plant site, the seismic analysis assumed that the largest earthquake known in the Southern Appalachian Tectonic Province occurred adjacent to the site. Therefore, maximum accelerations for the site were determined by using the May 31, 1897, quake in Giles County, Virginia, which had a reported epicentral intensity of MM VIII (PSAR §2.5; TVA Site Suitability Testimony at 15-16; SSR at 20).

Using this conservative approach lead to the conclusion by TVA and the Staff that there are no seismological conditions which would preclude the construction of a nuclear plant at the proposed Phipps Bend Nuclear Plant site. We agree.

G. Foundations

The foundation material beneath all category I features at the proposed Phipps Bend Nuclear Plant site will be either *in situ* soil, compacted engineered granular fill, or *in situ* rock. The ESW spray ponds are the only category I features supported by existing overburden material. The ESW ponds will be lined with a 5-foot-thick impervious clay blanket. The remaining soil-supported structures will be founded on compacted engineered backfill (PSAR §2.5; TVA Site Suitability Testimony at 16).

Beneath the overburden (depth from 13 to 64 feet in the plant area) lies the Middle Ordovician Sevier Shale upon which rock supported category I structures will be founded. All fresh and unweathered rocks are capable of supporting all category I rock-supported structures. No need for a general, consolidation grout treatment program is anticipated. However, dental work or spot grouting will be used wherever questionable areas occur. The

foundations will be geologically mapped by a qualified geologist (PSAR §2.5; TVA Site Suitability Testimony at 16; SSR at 21-22).

The design-basis ground water level (1,182.0) for all STRIDE and balance of plant (BOP) category I features except for those adjacent to the ESW spray ponds is assumed to be 2 feet below the plant grade which is 1,184.0. The average maximum ground water level in the *in situ* soil is approximately 2 to 2.5 feet below the original ground surface. It is expected that the ground water level that exists after the completion of the plant will be more than 2.5 feet below the final plant grade. The yard drainage system will provide better surface drainage than the existing contours afford, and topographic depressions will not be present (PSAR §2.5; TVA Site Suitability Testimony at 16-17).

It has been determined by both the Staff and the Applicant that the foundation conditions at the proposed Phipps Bend Nuclear Plant site are suitable for the construction of the proposed nuclear power plant. We concur in that conclusion.

V. UNRESOLVED ISSUE

Of the four standing issues identified in Section 1.9 of the SER which require resolution prior to a decision on the issuance of construction permits for the Phipps Bend project, only one, the water level (flood) design criteria, relates to the requested LWA-2 activities. "Supplemental Testimony of NRC Staff on LWA-2 Activities by Sydney Miner" (hereafter Miner Testimony), as amended (Tr. 207-209), following Tr. 210. At the time the SER issued, the Applicant had agreed to design and construct the Phipps Bend plant to withstand a maximum stillwater level of 1,182 to 1,183 feet sea level plus coincident wind wave and runup effects without loss of safety-related function. However, the Applicant had not provided information on how it expected to accomplish this. In amendment No. 14 to the PSAR, received by the Staff on June 20, 1977, the Applicant stated that plant grade will be raised to 1,184 feet mean sea level and that safety-related structures are at or above this elevation. It also provided a list of elevations of all penetrations to safety structures. The only penetration that is below the 1,184 feet is the rail access to the fuel building. *Id.* at 5.

Because amendment No. 14 to the PSAR was then only recently filed, the Staff had not completed its review of the supplied information at the time of the evidentiary hearing on July 13 and 14, 1977. However, the Staff agreed with the Applicant that safety equipment, safety systems and structures located at or above 1,184 feet may adequately be protected for the design basis flood. If, upon completion of its review, the Staff finds that some additional protection is required for safety systems located below

1,184 feet, the Applicant could readily provide this by waterproofing exterior walls and slabs and sealing penetrations. In the opinion of the Staff, amendment No. 14 adequately resolves any concerns on this matter which pertain to the foundation-related activities associated with the LWA-2 request. The outstanding concerns relate to details of the protection of safety equipment and systems which are not encompassed by the proposed LWA-2 activities but, rather, involve design details appropriately left for consideration at the construction permit phase of this proceeding and for which resolutions are technologically feasible. *Id.* at 5-6.

It appears, then, that there are no unresolved safety issues relating to the requested LWA-2 activities that would constitute good cause for withholding authorization for these activities. *Id.* at 6, 9.

VI. QUALITY ASSURANCE

Applicant's witnesses Barnett and Dibeler explained the quality assurance program that will be in effect for the drilling, grouting and placement of dental and fill concrete. The quality assurance procedures encompass design, procurement, document control, inspections, examination and testing. The program also includes the training and qualification of quality control personnel. Specific technical criteria relevant to the work will be developed as work progresses by a team of soil and rock specialists. This team will also evaluate reported data and resolve irregularities (Barnett and Dibeler Testimony, following Tr. 193).

The Board is of the opinion that the Applicant's program of quality assurance is adequate to assure that the proposed drilling, grouting, and placement of dental and fill concrete can be performed in conformance with Appendix B of 10 CFR Part 50.

VII. COST-BENEFIT ANALYSIS

The Board has independently considered the costs and benefits of the proposed plant. We conclude that the benefits to be derived from Phipps Behd outweigh its costs.

The principal benefit from construction and operation of the plant is an ample supply of electricity to meet the region's needs. The economic costs for constructing and operating the plant over a 35-year life include capital costs of land acquisition and improvement, capital costs of facility construction, capital costs of transmission and distribution facilities, fuel costs, operating and maintenance costs, plant decommissioning, license fees, and

payments in lieu of taxes.⁴ The environmental impacts resulting from the construction and operation of the facility can be summarized as follows:

Land

- a. About 166 acres of the 1,270-acre site will be occupied by station structures and will be unavailable for alternate uses.
- b. About 866 acres, of which approximately 51% is forested, will be withdrawn from production because of the establishment of new transmission rights-of-way.
- c. During construction, 406 acres of the site will be disturbed and noise and dust will be created. Additionally, the disturbed area will be subject to some soil erosion and unavoidable soil loss.
- d. Corn, tobacco, hay, and pasture production will cease on about 180 acres onsite.
- e. The station structures, transmission towers and lines, and the natural-draft cooling towers will contrast with the level to rolling landscape of the site and environs.

Water

- a. About 58 cfs of water from the Holston River will be evaporated during plant operation.
- b. A total of 4,392 pounds per day of excess dissolved solids will be discharged to the Holston River.

⁴Both the Applicant and the Staff have moved the Board to reopen the record for the receipt of additional evidence concerning plant costs. The Applicant is offering the "Affidavit of Jack E. Gilleland Regarding Revised Cost Estimates for the Proposed Phipps Bend Nuclear Plant," dated September 1, 1977; the Staff is offering the "Affidavit of Regis R. Boyle Regarding Capital Cost Estimates for the Phipps Bend Nuclear Plant, Units 1 and 2, Derived Using the CONCEPT Cost Model," dated September 29, 1977. The Gilleland affidavit reflects a \$200 million increase in the estimated capital costs for the Phipps Bend plant. It appears that revisions to the CONCEPT code model utilized by the Staff in calculating cost estimates has also resulted in an increase in the Staff's estimate of capital costs for a the plant. Neither of these offerings is objected to by any party, and each is hereby received in evidence as an exhibit in this proceeding. The Board has taken into account the revised cost estimates reflected in these most recent submissions, and is of the opinion that none of that information alters the cost-benefit balance for the proposed Phipps Bend plant.

Air

- a. During operation, approximately 58 cfs of water will be evaporated and lost to the atmosphere.
- b. Vapor plumes will be visible from the cooling towers. Additionally, possible cloud formation and precipitation may occur under very cold conditions.
- c. About 0.12 pounds per minute of solid particulates (as evaporated spray) will be introduced into the atmosphere.

Biotic Effects

- a. Terrestrial
 - (1) Wildlife will be displaced from the site by construction activities.
 - (2) Collision with cooling towers during construction and operation may result in bird mortality.
 - (3) Drift-salt depositon from the cooling towers may cause foliage damage within (and perhaps outside) the site boundary.
- b. Aquatic
 - (1) During intake and discharge, some fish will be destroyed and small benthic and fish habitat will be lost.
 - (2) The proposed intake system could result in the impingement of juvenile and adult fish and the entrainment of larval fish.
 - (3) Benthic organisms and fish will be eliminated from the mixing zone due to high temperatures and turbulence.
 - (4) A small increase in primary production will probably occur in portions of the thermal plume.

Radiological Effects

There will be releases of gaseous and liquid effluents containing small amounts of radioactive materials. The estimated annual population dose to the general public due to these releases is about 8 man-rem to the body and 85 man-rem to the thyroid.

The Board finds that the benefits of operation of the Phipps Bend Nuclear Power Plant, Units 1 and 2, outweigh the environmental, economic and other costs and, therefore, the balancing of these factors favors issuance of construction permits for the proposed facilities.

VIII. CONCLUSIONS OF LAW

Based upon a review of the entire record in this proceeding and upon the foregoing findings, and in accordance with 10 CFR §50.10(e) and 10 CFR Part 51 of the Commission's regulations, the Board concludes as follows:

- (a) The environmental review performed by the Staff pursuant to the National Environmental Policy Act of 1969 has been adequate.
- (b) The requirements of §§102(2)(A), (C) and (E) of the National Environmental Policy Act of 1969 and 10 CFR Part 51 have been complied with in this proceeding.
- (c) Having given independent consideration to the final balance among conflicting environmental factors set forth in the record of this proceeding with a view to determining the appropriate action to be taken, having weighed the environmental, economic, technical, and other benefits against environmental and other costs, and having considered available alternatives, the Board determines that the appropriate action to be taken, after making all of the radiological health and safety findings required by the Atomic Energy Act of 1954, as amended, is the issuance of construction permits for the Phipps Bend Nuclear Plant, Units 1 and 2, subject to (i) conditions which may hereafter be determined to be warranted with respect to radiological health and safety matters, and (ii) the following conditions for the protection of the environment:
 1. The Applicant shall take the necessary mitigating actions (including those summarized in Sections 4.5, 5, 6 and 11.3.3 of the FES, and those agreed to in its ER) during construction and operation of the station and associated transmission lines to avoid unnecessary adverse environmental impacts from construction and operation activities.
 2. In addition to the preoperational monitoring program described in Section 6.1 of the Environmental Report, with amendments, the Staff recommendations in Section 6 of the Final Environmental Statement shall be followed.
 3. The Applicant shall establish a control program which shall include written procedures and instructions to control all construction activities as prescribed in the NRC FES and shall provide for periodic management audits to determine the adequacy of implementation of environmental conditions. The Applicant shall maintain sufficient records to furnish evidence of compliance with all the environmental conditions herein.
 4. Before engaging in a construction activity not evaluated by the

Commission, the Applicant will prepare and record an environmental evaluation of such activity. When the evaluation indicates that such activity may result in a significant adverse environmental impact that was not evaluated, or that is significantly greater than that evaluated in the NRC Final Environmental Statement, the Applicant shall provide a written evaluation of such activities and obtain prior approval of the Director of Nuclear Reactor Regulation for the activities.

5. If unexpected harmful effects or evidence of irreversible damage are detected during facility construction, the Applicant shall provide to the Staff an acceptable analysis of the problem and a plan of action to eliminate or significantly reduce the harmful effects or damage.
 6. Prior to instituting construction of the shoreline screening structure device on the intake system, the conceptual design of such shoreline device shall be submitted for Staff and EPA evaluation and approval. The design of the shoreline device shall be based on the results of the ongoing intake structure research and development program (NRC FES §9.3.2). The shoreline device shall be constructed and operational prior to fuel loading.
 7. If TVA should anticipate periods of river flow at the Phipps Bend site which are less than a minimum daily average of 800 cfs (*e.g.*, river flows which would result if the contract between TVA and the Tennessee Eastman Company were terminated) when the plant is in operation, then TVA shall immediately notify the Staff of any anticipated change in the minimum sustained flow rate and submit to the Staff a description of the proposed flow regime, a description of the environmental impacts resulting from plant operation at the new flow regime, and any proposed changes for the protection of the environment at the Phipps Bend Nuclear Plant made necessary by the reduced flow rate (NRC FES, §5.2.1).
- (d) Based upon the available information and review to date, there is reasonable assurance that the proposed site is a suitable location for nuclear power reactors of the general size and type proposed from the standpoint of radiological health and safety considerations under the Atomic Energy Act of 1954, as amended, and rules and regulations promulgated by the Commission pursuant thereto.
- (e) The Applicant's proposed program of established quality assurance instructions and procedures are adequate to ensure that the pro-

posed drilling, grouting, placement of fill and dental concrete, and other foundation treatment work described in §2.4.4.12 of the PSAR can be performed as required by Appendix B to 10 CFR Part 50.

- (f) There are no unresolved safety issues relating to the LWA-2 activities that constitute good cause for withholding authorization to conduct such activities.

IX. ORDER

Based upon the foregoing findings and conclusions, and pursuant to the Atomic Energy Act of 1954, as amended, and the Commission's regulations, **IT IS ORDERED** that this Partial Initial Decision shall constitute a portion of the ultimate Initial Decision to be issued upon completion of the radiological health and safety phase of this proceeding.

It is further **ORDERED**, in accordance with §§2.760, 2.762 and 2.764 of the Commission's Rules of Practice, 10 CFR Part 2, that this Partial Initial Decision shall be effective immediately and shall constitute the final action of the Commission thirty (30) days after the date of issuance hereof, subject to any review pursuant to the Rules of Practice. Exceptions to this Partial Initial Decision may be filed by any party within seven (7) days after service of this Partial Initial Decision. A brief in support of the exceptions shall be filed within fifteen (15) days thereafter (twenty (20) days in the case of the Regulatory Staff). Within fifteen (15) days after the service of the brief of appellant (twenty (20) days in the case of the Regulatory Staff), any other party may file a brief in support of, or in opposition to, the exceptions.

THE ATOMIC SAFETY AND LICENSING BOARD

David R. Schink, Member

Ernest E. Hill, Member

Edward Luton, Chairman

Dated at Bethesda, Maryland,
this 14th day of October 1977.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Samuel W. Jensch, Chairman
Frank F. Hooper
Gustave A. Linenberger

In the Matter of

Docket Nos. STN 50-522
STN 50-523

PUGET SOUND POWER AND LIGHT
COMPANY, et al.

(Skagit Nuclear Power Project,
Units 1 and 2)

October 28, 1977

Upon motion by the applicants concerning proposed sewer line construction prior to receipt of a limited work authorization (LWA), the Licensing Board: (1) grants a request to modify and in some instances delete portions of the descriptions of the sewer line contained in a July 7, 1977, initial decision (LBP-77-44, 6 NRC 141) that denied pre-LWA authority for the projected sewer line; (2) denies applicants' motion to reconsider the findings in LBP-77-44 concerning tree damage impact of a proposed 4-inch sewer line; and (3) refuses to reconsider the conclusions of LBP-77-44 dealing with the proscriptions of the Wild and Scenic Rivers Act, 16 U.S.C. 1271.

NEPA: PRE-LWA CONSTRUCTION ACTIVITIES

Pre-limited work authorization authority for construction activities may not be granted unless those activities will have ". . . so trivial an [environmental] impact that it can be safely said that no conceivable harm would have been done to any of the interests sought to be protected by NEPA should the eventual outcome of [the] proceeding be a denial of the . . . application [for the facility]." *Kansas Gas and Electric Co.* (Wolf Creek, Unit 1), ALAB-331, 3 NRC 771, 777 (1976).

NEPA: PRE-LWA CONSTRUCTION ACTIVITIES.

Pre-limited work authorization construction activities that would cause

tree damage "which is irreversible within a reasonable span of time and is not redressible within the same time span" have an environmental impact that is more than trivial and results in more than "no conceivable harm."

PRE-LWA ACTIVITY: RELATIONSHIP TO WILD AND SCENIC RIVERS ACT

The proscriptions in the Wild and Scenic Rivers Act against any form of assistance by a Federal agency in the construction of a water resource project precludes the granting by a licensing board of pre-LWA authority for constructing a proposed sewer line.

ORDER GRANTING REQUEST FOR SUBSTITUTION OF LANGUAGE AND DENYING MOTION FOR RECONSIDERATION OF ORDER DENYING PRE-LWA AUTHORITY TO CONSTRUCT PROPOSED SEWER LINE

Puget Sound Power and Light Company, *et al.* (Applicants) filed a motion seeking reconsideration of the July 7, 1977, Initial Decision Granting Pre-LWA Authority for Road Construction Except for a Zone 150 Feet West of Weisman Creek, and Except for the Areas Requiring Tree Removal, and Denying Pre-LWA Authority for Projected Sewer Line (Pre-LWA Decision) (LBP-77-44, 6 NRC 141).

Additional hearings were held in July respecting the pre-LWA authority for the reduced scope of the proposed roadwork (as modified by an amendment to the original request) and the proposed sewer line construction. An Order denying reconsideration of the reduced roadwork proposal was issued September 15, 1977 (LBP-77-56, 6 NRC 478).

This instant Order is limited to the several requests made in reference to the proposed sewer line construction. One request is directed to certain language contained within the July Pre-LWA Decision. The expressions which are the subject of objection by Applicants relate principally to concerns of possible radioactive substances in the proposed sewer line. While the original design presentation for the sewer line portrayed a separation of facilities that presumably would avoid any intermixture of liquids, some of which might have radioactive substances, the Applicants' description of proposed operations included the measures that would be taken to determine if radioactive substances were in some of the liquids. The Licensing Board construed these measures to reflect the possibility of the presence of radioactive substances. At the July hearing, Applicants explained that the measures to be taken reflected an abundance of caution to assure the City of Sedro Woolley, whose sewage treatment facilities would be utilized, that ab-

solutely there would be no radioactive substances in the liquids passing through the City's sewage treatment facilities. At the conclusion of the July hearings, the Regulatory Staff requested an opportunity to further study the matter¹ and the Applicants supplied further affidavits to confirm the original sewage line design.

Upon the basis of the explanation provided by the Applicants, and the additional affidavits submitted by both Applicants and the Staff, and absent any opposition from SCANP or Forelaws on Board, the Licensing Board grants the request of the Applicants to modify and in some instances to delete portions of the descriptions given to the sewer line as reflected in the July 7 Pre-LWA Decision. As will be provided in the conclusion of this Order, the following changes are to be made to the Pre-LWA Decision:

- (a) Substitute the words "sanitary sewage" for the words "all liquid wastes" in the last line on page 4 and the first line on page 5 of the Pre-LWA Decision (LBP-77-44, 6 NRC at 143, line 33).
- (b) Substitute the words "an integral part of the overall project" for the words "a vital part of the nuclear power facility" in the second line of the first full paragraph on page 19 of the Pre-LWA Decision (LBP-77-44, 6 NRC at 150, lines 19 and 20).
- (c) Delete the word "ordinarily" from the next-to-last line on page 19 of the Pre-LWA Decision (LBP-77-44, 6 NRC at 150, line 23).
- (d) Delete lines 2 through 10 on page 20 of the Pre-LWA Decision (LBP-77-44, 6 NRC at 150, lines 24-30).

The Applicants have made additional requests in their motion for reconsideration of the July Pre-LWA Decision.

A second request seeks authority for the construction of a proposed 4-inch sewer line and raises the issue of the expected environmental impact. The route for the proposed sewer would extend for some 4.5 miles, from the proposed nuclear power plant site, south along Bacus Road, west along State Highway 20, north along Fruitdale Road and ultimately reach the Sedro Woolley municipal system. The sewer line would cross three creeks, eight drainage ditches and three existing roads. The sewer line would be buried at an average depth of five feet below grade, and would cross the streams by suspension arrangements from the bridges across the streams.

The July hearings included several presentations in reference to the environmental impact. The intervenors raised contentions in reference to

¹In a Staff submittal to the Appeal Board (letter of September 29, 1977), the Staff asserted that the September Order of the Licensing Board did not resolve the sewer line consideration. The lack of determination in that regard was due to the Staff's request for delay in order to give further consideration to the matter.

stream siltation, effects on levels of water tables and tree damage. The Licensing Board does not minimize the concerns respecting the streams or water tables but the Board finds the evidence of tree damage more specifically directed. Exhibit 113 enumerates the trees likely to be affected along the route of the proposed sewer line, either by removal or likely root damage from trench digging, of some 14 cedars ranging from 13", 14", 18" in diameter to even one of 24" diameter, one at 26", three at 28", and one of 39" diameter.² In addition, it appears that seven fir trees would be affected, the largest of which is 26" in diameter, one each of 25", 23", 22", 21", and the smallest is 16". Perhaps in the category of what some persons may classify as inconsequential are six alders, the largest of which is 30" in diameter, with four others within the range of 18" and 20". To these may be added three maples, two of which are 23" in diameter. Exhibit 113 also reflects an unmeasured group of birch and two groups of maples, the colors of which must be exquisite in the fall.

To refer to both the July Pre-LWA Decision and September Order dealing with the test to be applied to measure the environmental impact, the *Kansas Gas and Electric* case (3 NRC 771, affirmed 5 NRC at 12) stands as the guide. Pre-LWA authority is denied unless the environmental impact is ". . . so trivial an impact that it can be safely said that no conceivable harm would have been done to any of the interests sought to be protected by NEPA³ should the eventual outcome of this proceeding be a denial of the . . . application." The Licensing Board, in an analysis and consideration of the likely tree damage, either the removal or the killing of the tree from root damage, concludes that the damage, which is irreversible within a reasonable span of time and is not redressible within the same time span, thus constitutes more than a "trivial impact" and more than "no conceivable harm."⁴ The Pre-LWA Decision and the September Order are to the same effect and the Licensing Board does not alter its position respecting the tree damage impacts. Accordingly, the Licensing Board Order denies the motion for reconsideration⁵ in this respect.

²A standard reference for the value as timber for boards is the U.S. Department of Agriculture Forest Service Bulletin No. 72, entitled "Wood Handbook," describing the sizes of trees useful as lumber. The esthetic value of these trees exceeds their lumber values.

³National Environmental Policy Act.

⁴The poet Joyce Kilmer and his "Trees" may be more eloquent.

⁵The Applicants also request the Licensing Board to determine that pre-LWA procedures can be used for sewer line considerations. The Applicants refer to 10 CFR §50.10(e)(2). That section considers "*inter alia* . . . sanitary sewerage treatment facilities . . ." (underscoring added), which apparently are localized in one area, and must nevertheless be controlled by 10 CFR §51.52(b) and (c) with site suitability considerations as well. It is clear that site suitability is not determinable at this stage of the proceeding.

Finally, the Licensing Board observes a significant omission in both the Applicants' and the Staff's submittals in this motion for reconsideration respecting the sewer line, and that is in reference to the proscriptions of the Wild and Scenic Rivers Act. To refresh their respective memories, that Act is positive that:

. . . no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project . . .

16 USCA 1271, Section 7.

The legislative history is equally clear that "or otherwise" in Section 7 means that no Federal agency shall give any other form of assistance in the construction of a water resource project. The Staff, in one of its submittals in a footnote⁶ but in reference to the Applicants' proposed road construction refers to the Wild and Scenic Rivers Act as an "additional complication." This understatement might be expanded by the Staff.

The Staff's analysis respecting the importance of the sewer line is that while the line may not be a vital part of the proposed nuclear power facility, it is an *integral* part. The Licensing Board has accepted that distinction in granting the Applicants' and Staff's request in this respect. Further, the Staff emphasizes in its June memorandum (page 11) that Courts give great weight to an agency's interpretation of a statute which the agency must administer. It is not necessary to repeat here the conclusions set forth in the Licensing Board's Initial Decision of July 7, but it must be noted again that the Department of Agriculture's Acting General Counsel has interpreted the Wild and Scenic Rivers Act, which is under the Department's jurisdiction, to proscribe the construction of the proposed sewer line. The pertinent portions of the interpretation are as follows:

The relevant questions are twofold: First, whether the proposed pre-LWA activity would constitute commencement of construction for the entire project. Second, whether approval of such activity by the Licensing Board would be an assistance by "license, or otherwise."

In answer to the first question, it is our opinion that pre-LWA activities of the kind proposed would be commencement of construction of a water resources project involving Section 7(b) application *if*, in the opinion of the Licensing Board, *such construction is a necessary and integral part of the overall project*. With regard to the second question, if approval of the Board is a legal prerequisite to the Company's under-

⁶Fn. 9, page 5 of NRC Staff's Response to Applicants' Petition for Reconsideration of Licensing Board's Pre-LWA Decision, filed in August.

taking the proposed pre-LWA activities, then *such approval would constitute assistance by "license, or otherwise."* (Emphasis added.)

The pre-LWA authority sought by the Applicants here would, if granted, require the affirmative findings specified by the Commission's regulations (10 CFR §50.10) and thus would be the approval proscribed by the Wild and Scenic Rivers Act.

The Atomic Safety and Licensing Board finds that no adequate basis has been presented by either the Applicants or the Staff to support the motion for reconsideration of the Pre-LWA Decision issued in July 1977 in reference to the environmental impact of the proposed sewer line and the proscription of the Wild and Scenic Rivers Act, and the motion for reconsideration is denied in those two respects.

WHEREFORE, IT IS ORDERED, in accordance with the Atomic Energy Act, as amended, and the Rules of Practice of the Nuclear Regulatory Commission, that the descriptions made by the Atomic Safety and Licensing Board in its July 7, 1977, Pre-LWA Decision are modified and deleted as follows:

- (a) Substitute the words "sanitary sewage" for the words "all liquid wastes" in the last line on page 4 and the first line on page 5 of the Pre-LWA Decision (LBP-77-44, 6 NRC at 143, line 33).
- (b) Substitute the words "an integral part of the overall project" for the words "a vital part of the nuclear power facility" in the second line of the first full paragraph on page 19 of the Pre-LWA Decision (*Id.*, 6 NRC at 150, lines 19 and 20).
- (c) Delete the word "ordinarily" from the next-to-last line on page 19 of the Pre-LWA Decision (*Id.*, line 23).
- (d) Delete lines 2 through 10 on page 20 of the Pre-LWA Decision (*Id.*, lines 24-30).

But in all other respects the motion by Applicants for reconsideration of the July 7, 1977, Pre-LWA Decision is denied.

ATOMIC SAFETY AND
LICENSING BOARD

Frank F. Hooper
Gustave A. Linenberger
Samuel W. Jensch, Chairman

Issued:
October 28, 1977
Bethesda, Maryland

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Marshall E. Miller, Chairman
Kenneth A. McCollom
Ernest O. Salo

In the Matter of

Docket Nos. 50-277
50-278

PHILADELPHIA ELECTRIC
COMPANY, et al.

(Peach Bottom Atomic Power
Station, Units 2 and 3)

October 28, 1977

Upon remand from the Court of Appeals for the District of Columbia Circuit, and pursuant to Commission Order (CLI-76-3, 3 NRC 82 (1976)), the Licensing Board considers the cost justification of additional radioactive emission control equipment, as required by Appendix I to 10 CFR Part 50, and determines that technical improvements to the rad-waste system need not be added since the annualized cost of any additional item of equipment is greater than the annualized benefits (*i.e.*, the cost-benefit ratio is greater than one).

TECHNICAL ISSUES CONSIDERED: radioactive emissions (measurement; dispersion; control equipment).

**INITIAL DECISION
(REMANDED COST-BENEFIT ANALYSIS ISSUES)**

Appearances

Troy B. Conner, Jr., Esq., and Mark J. Wetterhahn, Esq., of Conner, Moore & Corber, Washington, D.C., and Eugene J. Bradley, Esq., and Edward J. Cullen, Jr., Esq., Philadelphia, Pennsylvania, for the Applicant, Philadelphia Electric Company.

Raymond L. Hovis, Esq., Stock and Leader, York, Pennsylvania, and **Mr. Mark Swann**, for Intervenors, York Committee for a Safe Environment, Save Solanco's Environment Committee, and Environmental Coalition on Nuclear Power.

John B. Griffith, Esq., Special Assistant Attorney General, Department of Natural Resources, Annapolis, Maryland, for Intervenor, the State of Maryland.

James M. Cutchin, IV, Esq., and **Richard C. Browne, Esq.**, Office of the Executive Legal Director, U.S. Nuclear Regulatory Commission, Washington, D.C., for the Staff, Nuclear Regulatory Commission.

I. REMANDED ISSUES

In *York Committee for a Safe Environment v. United States Nuclear Regulatory Commission*,¹ the Court of Appeals for the District of Columbia Circuit held that the applicable Commission regulations² as applied to the Peach Bottom Atomic Power Station required “. . . individualized consideration of the costs and benefits of reducing radioactive emissions from any particular reactor below the numerical guidelines.” The Court went on to state:

In this case it does not appear that such an individualized analysis was ever performed, and the Commission's decision did not rest on a finding that no further reduction in radioactive emissions would produce a favorable cost-benefit ratio. We therefore remand this case to the Commission in order to allow such an analysis to be performed. Following the analysis, the Commission can determine in an appropriate proceeding whether to modify the operating license for the Peach Bottom reactors to require additional emission control equipment. See 10 CFR §50.109 (1975). Since the current level of emissions is low, the public interest does not require the operating license to be suspended during the pendency of the remand proceedings. (Footnotes omitted.)³

On February 25, 1976, the Commission entered an order which set forth the pertinent portions of the Court's opinion and then stated:

¹527 F.2d 812 (D.C. Cir. 1975).

²10 CFR §§20.1, 50.34a, 50.36a (1975) and Appendix I to 10 CFR 50.

³527 F.2d at 815-816.

In order to effectuate the Court's mandate, we direct the regulatory staff to perform the cost-benefit analysis required by the Court's opinion, and hereby assign this matter for further supervision to an Atomic Safety and Licensing Board to be appointed by the Chairman of the Atomic Safety and Licensing Board Panel. After that cost-benefit analysis is completed, the Licensing Board shall assure that an opportunity for a hearing concerning the adequacy of the cost-benefit analysis and possible modifications to the operating license is afforded parties who participated in the prior administrative proceedings in this matter.⁴

By a designation dated March 2, 1976, an Atomic Safety and Licensing Board was established in accordance with the Commission's Order. By a Notice of Reconstitution of Board dated May 23, 1977, the present Chairman was appointed.

On April 14, 1977, the Staff transmitted its report entitled "Evaluation of the Radioactive Waste Treatment Systems Installed at Peach Bottom Atomic Power Station, Units 2 and 3, with Respect to the Requirements of Appendix I to 10 CFR Part 50" to the Board and parties. Errata pages were transmitted by letter dated August 11, 1977, and at the hearing an errata page with corrections to the list of references was furnished. These documents were received in evidence and included in the transcript of the hearing (Tr. 61 *et seq.*). They are collectively referred to herein as the Staff Report.

Pursuant to notice, the Board held a conference with counsel on June 21, 1977.⁵ Counsel for Intervenors had previously informed the Board by letter dated April 11, 1977, that it was his position that, under the Court's remand order, a hearing should be held concerning the adequacy of the Staff Report. However, at the conference, counsel stated that the request for hearing was withdrawn because Intervenors were in no position to put on any meaningful testimony in view of the results presented in the Staff Report, which showed that the most nearly cost-beneficial additional item of emission control equipment would have a cost-benefit ratio of 2 (Tr. 16). It was undisputed that to be cost-beneficial, the ratio must be less than 1.

Although no party requested a hearing and the Licensees contended that none was required, the Board decided that the public interest would best be served by holding a hearing and developing an evidentiary record on the

⁴*Philadelphia Electric Company* (Peach Bottom Atomic Power Station, Units 2 and 3), CL1-76-3, 3 NRC 82 (1976).

⁵The Licensees, the Staff and the Intervenors appeared through counsel. EPA had informed the Board by letter dated June 7, 1977, that it would not appear or take a position. The States of Maryland and Pennsylvania conveyed the same information through Staff counsel.

remanded issues. Accordingly, a notice of hearing was published in the *Federal Register* (42 Fed. Reg. 38441), and a hearing was held in Bethesda, Maryland, on August 16, 1977. The Board had previously indicated to the parties the questions which should be addressed at the hearing by its letter dated July 21, 1977, enclosing a memorandum of major issues of focus. This memorandum is attached hereto as Appendix B. The major areas of focus designated by the Board and developed in the record concerned:

- (1) The source terms that went into the assessment.
- (2) The meteorological models used to determine the X/Q values and, in particular, any experimental variations brought about as a result of the plume test.
- (3) Actual models used to calculate the cost.
- (4) Cost figures for equipment that went into balancing the other side of the cost-benefit analysis equation.

In particular, the Board searched for those parameters or procedures that might, if logically changed, alter the minimum cost-benefit ratio found by the Staff of 2 to a ratio less than 1 (Tr. 81-2).

The record in this proceeding consists of the transcripts of the conference held on June 21, 1977 (Tr. 1-50), and the evidentiary hearing held on August 16, 1977 (Tr. 51-204), together with the Staff Report and exhibits offered by the Licensees^{1A} and received into evidence (Tr. 61, 65-69). In addition, the record is hereby augmented to include:

- (1) Corrections to the transcript of the evidentiary hearing appended hereto as Appendix C.
- (2) Corrected figures for releases during the first quarter of 1977 and the first half of 1977, as reported by Licensees in their letter dated August 25, 1977, which is attached hereto as Appendix D.
- (3) The attachment to that letter entitled "Information requested by Atomic Safety and Licensing Board at August 16, 1977, hearing concerning releases of I-131 and Capacity Factors," attached hereto as Appendix E.

The remanded issues substantially involve the application of Section II.D of Appendix I to 10 CFR Part 50, which reads as follows:

D. In addition to the provisions of paragraphs A, B and C above, the applicant shall include in the rad-waste system all items of reasonably demonstrated technology that, when added to the system sequentially and in order of diminishing cost-benefit return, can for a favorable cost-

^{1A}See Appendix A attached hereto.

benefit ratio effect reductions in dose to the population reasonably expected to be within 50 miles of the reactor. As an interim measure and until establishment and adoption of better values (or other appropriate criteria), the values of \$1,000 per total body man-rem and \$1,000 per man-thyroid-rem (or such lesser values as may be demonstrated to be suitable in a particular case) shall be used in this cost-benefit analysis.⁶

The purpose of the remanded cost-benefit analysis is to establish whether the rad-waste systems for Peach Bottom, Units 2 and 3, include all items of reasonably demonstrated technology that, when added to the systems sequentially and in order of diminishing cost-benefit return, can for a favorable cost-benefit ratio (that is, a reduction of 1 man-rem or 1 man-thyroid-rem per year for an annualized expenditure of \$1,000), effect reductions in dose to the population reasonably expected to be within 50 miles of such reactors. This issue, accordingly, involves consideration of the adequacy of the Staff Report when measured against the mandated issues, and whether modifications of the operating licenses are necessary if additional emission control equipment should be added as a result of such analysis.

Any proposed findings of fact or conclusions of law submitted by the parties which are not incorporated directly or inferentially into this Initial Decision, are herewith rejected as being unsupported in law or in fact, or as being unnecessary to the rendering of this Initial Decision.

II. FINDINGS OF FACT

Pursuant to the Commission's Order of February 25, 1976, the Staff performed an independent evaluation of the Licensees' compliance with the requirements of Appendix I to 10 CFR Part 50 (Staff Report (SR) at 3). This evaluation consisted of:

- (1) A review of the information provided by the Licensees in the June 4, 1976, and subsequent submittals.
- (2) A review of the radioactive waste (rad-waste) treatment and effluent control systems described in the FSAR and amendments.
- (3) The calculation of expected releases of radioactive materials in liquid and gaseous effluents (source terms) from the facilities.

⁶A man-rem is the summation of the environmental dose of radioactive effluents to the population. It is used to relate the radiation dose delivered to the general public resulting from reactor operations. This measure is the product of the dose delivered per unit time to an individual at a particular location multiplied by the number of individuals that spend their time at that location. 527 F.2d at 815, fn. 10. See also 10 CFR §51.20(g), Summary Table S-4, fn. 3.

- (4) The calculation of relative concentration (X/Q) and desposition (D/Q) values for the site.
- (5) The calculation of individual doses at or beyond the site boundary and the population doses to the population reasonably expected to be within 50 miles of the site.
- (6) The calculation of the cost-benefit ratios for items of additional emission control equipment (SR 3-4).

The gaseous and liquid rad-waste systems installed at the Peach Bottom Atomic Power Station, Unit Nos. 2 and 3, were described in Chapter 8.0 of the Staff's Safety Evaluation Report (SER) dated August 11, 1972, and in Section III. D.2 of the Staff's Final Environmental Statement (FES) dated April 1973. Units 2 and 3 have separate but identical gaseous rad-waste treatment systems, and they share a common liquid rad-waste system. There have been no changes in the gaseous rad-waste treatment systems from those described in the SER and FES (SR 4). The liquid rad-waste treatment system has been modified from that described in the FES. The modification consists of a filter/demineralizer (Powdex) installed upstream of the mixed bed demineralizer in the clean waste (low-conductivity) subsystem and the installation of a filter/demineralizer (Powdex) in the dirty waste (high conductivity) subsystem. These modifications were considered in the Staff's evaluation (SR 5).

Based on more recent operating data at other operating nuclear power reactors, which are applicable to the Peach Bottom facilities, and on changes in and on updated Staff calculational models, new liquid and gaseous source terms were calculated (SR 5). The new source terms were calculated using the model and methodology described in NUREG-0016, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Boiling Water Reactors (BWR-GALE Code)," dated April 1976 and are presented in Tables 1 and 2 of the Staff Report (SR 5). These values are different from and replace those given in Tables III-5 and III-6 of the FES (SR 5). The principal parameters and plant conditions used in calculating the new liquid and gaseous source terms are presented in Table 3 of the Staff Report and replace those given in Table III-3 of the FES (SR 5). In its calculations of source terms, the Staff considered waste flow rates, concentrations of radioactive materials in the primary system and equipment decontamination factors consistent with those expected over the 30-year operating life of the plant for normal operation including anticipated operational occurrences (SR 5). The source terms calculated and used in the cost-benefit analysis characterize the radioactive materials released to date in liquid and gaseous effluents from the Peach Bottom Atomic Power Station, Units 2 and 3 (SR 8-9).

The 8 x 8 fuel which operates at lower power density than 7 x 7 fuel is now being loaded into the Peach Bottom Atomic Power Station, Units Nos. 2 and 3, and it has normally performed with less defects and lower releases of radioactivity than the 7 x 7 fuel which it is replacing (Tr. 86133). Materials for removal of radioactivity which could deteriorate with age (for example, demineralizer resins) can be replaced to maintain low releases (Tr. 87). Equipment which may develop leaks can be repaired (Tr. 87). The continued operation of the facility will be conditioned on compliance with Technical Specifications which will assure that releases are compatible with values used in the cost-benefit analysis (Tr. 88). Therefore, no significant increases in source terms over the life of the facility are to be expected (Tr. 86).

During the hearing, the Board asked Applicant for information concerning radioactive releases experienced at steady state operation for the most recent experience for Peach Bottom 2 and 3. The purpose of this request was to assure the Board that the facility with existing cleanup equipment and expected capacity factors could be expected to operate close to the calculated values in the Staff Report and within the limits of the Technical Specifications and the regulations of the Commission (Tr. 185-192, 201-203). During 1976 and the first six months of 1977, the Licensee made several changes to equipment and facility operation to reduce iodine releases. The Board requested that data not available at the time of the hearing concerning releases of Iodine-131 for the first six months of 1977 be forwarded to the Board as soon as available. The Applicant complied with a letter and attachment dated August 25, 1977 (Appendices D and E). The releases during operation of both Peach Bottom, Units 2 and 3, were lower than that during the first halves of 1976 and significantly lower than the applicable Technical Specifications and Commission regulations. Also, the operation at different capacity factors did not cause increases sufficient to arouse concerns about approaching such levels (Tr. 102-103; 144-146). In addition, the new fuel of the 8 x 8 fuel design will continue to be loaded into both units so that within three years or less all fuel in the reactors will be this type. These factors reassure the Board that the present system can and will readily meet the standards required of the facility and that the new source terms used by the Staff are reasonable.

The Staff made estimates of average atmospheric dispersion conditions for the Peach Bottom Atomic Power Station using a model based upon the "Variable Trajectory Model" described in Regulatory Guide 1.111, "Methods of Estimating Atmosphere Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors," dated March 1976 (SR 9). The model in Regulatory Guide 1.111 was altered in the plume rise part of the equation, and the building wake adjustment factor

was changed, as a result of plume tests conducted by the Licensees at the Peach Bottom site (Tr. 115). The computer model approximates a continuous point source release by dividing the plume into discrete segments released at frequent intervals (SR 9). The one-year period of meteorological data input to the computer was selected by comparing it with a four-year period of data at the Peach Bottom site. The four-year period of data for the site was compared with four and ten-year periods of data for Harrisburg, Pennsylvania, to confirm that the one-year period of data used was representative of long-term conditions to be expected at the site (Tr. 153-154).

The Staff's dose evaluations considered the following effluent pathways:

- (1) Pathways associated with radioactive materials released in liquid effluents to the Susquehanna River.
- (2) Pathways associated with noble gases released to the atmosphere.
- (3) Pathways associated with radioiodines, particulates, carbon-14, and tritium released to the atmosphere.

The mathematical models used by the Staff to perform the individual and population dose calculations are described in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," dated March 1976 (SR 10-11). Site-specific information was used as input to the models (Tr. 117-119). The Staff's calculation of the dose to the population within 50 miles of the site considered the fact that not all of the milk produced within a radius of 50 miles of the site is consumed as fluid milk, but that about 40 percent is used to make other dairy products (Tr. 120-121, 171-173).

The calculated doses to the population living within 50 miles of the Peach Bottom Atomic Power Station owing to radioactive materials released in liquid effluents were based on the following parameters:

- (1) By the year 2000, 1.2 million people will be receiving their drinking water from the Susquehanna River downstream of the Peach Bottom Atomic Power Station.
- (2) The year 2000 population within 50 miles of the Peach Bottom Atomic Power Station was estimated to consume 35,000 kilograms of edible fish harvested from the Susquehanna River and to spend 5 million man-hours along the shoreline for recreational purposes (SR 11-12).

The calculated doses to the population living within 50 miles of the Peach Bottom Atomic Power Station owing to the noble gases,

radioiodines, particulates, carbon-14, and tritium were based on the following parameters:

- (1) At the year 2000, the population within 50 miles of the Peach Bottom Atomic Power Station was estimated to be 5.3 million people.
- (2) One billion liters of milk, 54 million kilograms of meat and 53 million kilograms of vegetables will be produced within 50 miles of the Peach Bottom Atomic Power Station.
- (3) All of this produce, except 320 million liters of milk, will be consumed by the population within 50 miles of the site.
- (4) Milk animals would receive pasturage equivalent to four and one-half months per year of their total diet from grazing.
- (5) Thirty percent of the milk produced would be used for cheese production (Tr. 119-120, 170-173; SR 12-13).

The calculated doses to the population within a 50-mile radius of the Peach Bottom Atomic Power Station, Unit Nos. 2 and 3, are presented in Table 7 of the Staff Report. The calculated contributions of the individual release pathways to the total doses are presented in Table 9 of the Staff Report (SR 15).

The Staff's cost-benefit analysis was made by calculating annualized costs for all items of additional emission control equipment considered to be of reasonably demonstrated technology and computing the ratios of those costs to the annualized benefits those items of equipment would provide in terms of dose reductions valued at \$1,000 per man-rem⁷ (SR 16). The costs of items of emission control equipment were calculated using procedures and cost data presented in Regulatory Guide 1.110, "Cost-Benefit Analysis for Rad-Waste Systems for Light-Water-Cooled Nuclear Reactors," dated March 1976 and in Table 8 of, and Appendix A to, the Staff Report (SR 14). The principal factors influencing the costs of retrofitting additional items of emission control equipment (augments) into rad-waste systems already constructed and in operation that were considered in the Staff's analysis were building space requirements, downtime for installation, interfaces with existing systems, change orders, and special craft labor requirements (SR App. 2-3). Assumptions which would result in minimizing the costs of retrofitting were made as to certain of these factors (SR App. 3). To confirm the validity of important inputs used in developing the cost

⁷Section II.D. of Appendix I to 10 CFR Part 50 states in pertinent part:

As an interim measure and until establishment and adoption of better values (or other appropriate criteria), the values \$1,000 per total body man-rem and \$1,000 per man-thyroid-rem (or such lesser values as may be demonstrated to be suitable in a particular case) shall be used in this cost-benefit analysis.

estimates, the major areas of the costs were reviewed with representatives of utilities, equipment vendors and architect-engineering firms and were found to be in the range of costs actually being encountered (SR App. 5). All equipment costs were presented in 1975 dollars (SR App. 5). The Staff has reviewed evolving rad-waste technology and does not expect to see any major changes in rad-waste equipment technology in the next few years (Tr. 127).

For the liquid rad-waste systems, the augments evaluated by the Staff included a demineralizer, an evaporator, and additional tankage. For the gaseous rad-waste systems, the augments evaluated included charcoal and HEPA filtration of process systems and building ventilation systems, addition of charcoal adsorbers to the main condenser off-gas system, and use of clean steam on the turbine gland seals. The capital costs of these augments are provided in Tables A-1 and A-5 of Regulatory Guide 1.110 and in Table 2 of Appendix A to the Staff Report. Operation and maintenance costs given in Regulatory Guide 1.110 were used for these augments, since these costs are independent of whether the equipment was retrofitted or included in the original design. Operation and maintenance costs for charcoal filtration in the main condenser off-gas system were not included in Regulatory Guide 1.110 and were estimated to be \$2,600/year/reactor (SR 15-16).

The cost-benefit ratios for each augment considered are presented in Table 10 of the Staff Report.¹ An augment has a favorable cost-benefit ratio when the annualized costs of installing, operating and maintaining the augment are less than the annualized benefits the augment would provide in terms of dose reductions valued at \$1,000 per man-rem (when the cost-benefit ratio is less than 1.0) (SR 16).

The most nearly cost-beneficial gaseous rad-waste system augment would be a charcoal filter in the reactor building ventilation exhaust. The cost-benefit ratio for that augment was calculated by the Staff to be 2.2. The most nearly cost-beneficial liquid rad-waste system augment would be a 50 gpm (gallon per minute) demineralizer. The cost-benefit ratio for the augment was calculated by the Staff to be two. Therefore, the Staff concluded, based on its analysis, that there are no rad-waste system augments that for a favorable cost-benefit ratio can effect a reduction in the doses to the population reasonably expected to be within 50 miles of the Peach Bottom Atomic Power Station, Units 2 and 3 (Tr. 17).

The Board finds that the assumptions and parameters used by the Staff in its analysis using the calculational procedures described in NUREG-0016 for boiling water reactors and in the Regulatory Guides 1.109, 1.111 and 1.112 appear reasonable and thus the resulting cost-benefit ratios also ap-

¹Table 10 as corrected is attached hereto as Appendix F (Tr. 59-60).

pear reasonable. The Board did not ask for evidence in the modeling assumptions but rather concentrated on the use of models in calculating the cost-benefit ratio results.

III. CONCLUSIONS OF LAW

The Licensing Board has considered all of the documentary and oral evidence submitted by the parties. Based upon a review of the entire record as augmented in this proceeding and the foregoing findings of fact, the Board has concluded:

1. Pursuant to the mandate of the Court of Appeals and the order of the Commission, the Staff in conformance with the provisions of 10 CFR §§20.1, 50.34a, 50.36a and Appendix I to 10 CFR Part 50, has performed an individualized analysis of the costs and benefits of items of additional radioactive emission control equipment which could effect reductions in dose to the population reasonably expected to be within 50 miles of the Peach Bottom Atomic Power Station.
2. An opportunity for a hearing concerning the adequacy of the cost-benefit analysis and possible modifications to the operating licenses has been afforded to the parties who participated in the prior administrative proceedings.
3. Based upon its review of the Staff Report and the entire record in this proceeding, the Board has satisfied itself as to the adequacy of the Staff's independent cost-benefit evaluation.
4. The Staff's cost-benefit analysis is adequate to support the conclusion that no additional items of radioactive emission control equipment can for a favorable cost-benefit ratio be incorporated in the rad-waste systems for the Peach Bottom Atomic Power Plant, Unit Nos. 2 and 3, and no modifications to the operating licenses are required in this respect.

IV. ORDER

IT IS SO ORDERED that Facility Operating License Nos. DPR-44 and DPR-56 shall be continued in effect without modifications to require incorporation of additional radioactive emission control equipment to reduce doses to the population reasonably expected to be within 50 miles of the Peach Bottom Atomic Power Station. **IT IS FURTHER ORDERED**, in accordance with 10 CFR §§2.760, 2.762 and 2.764 that this Initial Decision shall be effective immediately and shall constitute the final action of the Commission forty-five (45) days after the date of issuance hereof, subject to

any review pursuant to the above referenced rules. Exceptions to this Initial Decision must be filed within seven (7) days after service of the Decision. A brief in support of the exceptions must be filed within fifteen (15) days thereafter (twenty (20) days in the case of the NRC Staff). Within fifteen (15) days of the filing and service of the brief by the appellant (twenty (20) days in the case of the Staff), any other party may file a brief in support of, or in opposition to, the exceptions.

IT IS SO ORDERED.

THE ATOMIC SAFETY AND
LICENSING BOARD

Dr. Kenneth A. McCollom, Member

Dr. Ernest O. Salo, Member

Marshall E. Miller, Chairman

Dated at Bethesda, Maryland,
this 28th day of October 1977.

[Appendices A-F have been omitted from this publication but are available in the NRC Public Document Room, 1717 H Street, N.W., Washington, D.C.]



UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ADMINISTRATIVE LAW JUDGE
Samuel W. Jensch

In the Matter of

BML 37-02607-02

PITTSBURGH-DES MOINES
STEEL COMPANY
Grand Avenue, Neville Island
Pittsburgh, Pennsylvania 15225

October 13, 1977

The Administrative Law Judge grants the staff's motion for summary judgment and affirms the order of the Director of the Office of Inspection and Enforcement imposing a civil penalty on a byproduct material licensee, where the parties stipulated that the violation occurred and the licensee's employee willfully violated licensee's safety procedures without licensee's knowledge. The Judge further grants the licensee's request for an opportunity for a hearing to present facts in support of mitigation of the amount of such penalty.

ATOMIC ENERGY ACT: CIVIL PENALTIES

The NRC's authority to impose civil penalties for license violations is founded upon Section 234 of the Atomic Energy Act, as amended (42 U.S.C. 2282), and the legislative history of that section. In enacting that section, Congress accepted the Nuclear Regulatory Commission's view that effective enforcement of the Act's safety requirements could be aided by the assessment and collection of civil penalties for license violations—such penalties to be measured in part by the gravity of the violation and the attitude toward compliance of a licensee's management—in situations where the Commission deems license revocation to be unwarranted.

ATOMIC ENERGY ACT: CIVIL PENALTIES

The management of a license must involve itself in all aspects of operations conducted under the license and must be responsible for instances of license violations, irrespective of its specific knowledge of a violation; this conclusion is directed by the legislative history of Section 234 of the Atomic Energy Act, as amended (42 U.S.C. 2282), and by the Commission's action

in *Virginia Electric and Power Company* (North Anna, Units 1 and 2), CLI-76-22, 4 NRC 480 (1976).

ORDER AFFIRMING IMPOSITION OF CIVIL PENALTIES

Pittsburgh-Des Moines Steel Company is a Licensee by virtue of the issuance by the Nuclear Regulatory Commission, or its predecessor, the Atomic Energy Commission, of Byproduct Material License No. 37-02607-02. That license authorizes, among other things (or, *inter alia*), the conduct of radiographic activity utilizing an atomic nuclear source form, but ordinarily shielded in, properly designed equipment. The radiographic activity is required to be conducted in accordance with Commission regulations and specific provisions of the license. These regulations and license provisions are complete and understandable and are designed in aid of the Commission's legislative mandate to provide for the health and safety of the public, and the operators of the radiographic equipment.

The Licensee has conducted radiographic operations for many years. Its operators are carefully selected and trained by special instruction and are supervised in their performance of radiographic work. Despite this selection, training and supervision, a radiographer working in a restricted area (using the nuclear source from the shielded equipment) received a dose of radioactivity evaluated as being as high as 3,500 rems to a portion of his right hand and a whole body dose of 5.38 rems as measured by his film badge. The Commission's regulation (10 CFR §20.10(a)) limits radioactivity dose to the extremity (hands, forearms, or feet) to 18.75 rems per calendar quarter and further limits whole body doses to 3 rems per calendar quarter under specified conditions. In addition, the radiographer failed to conduct a required (by 10 CFR §34.43(b)) physical radiation survey after each radiographic exposure during radiographic operations to determine that the sealed nuclear source had been returned to its shielded position.

The Director of the Office of Inspection and Enforcement issued¹ an Order imposing civil penalties of a total of \$2,000, with \$1,000 being assessed for each of the above violations,² as determined by the Director. In ac-

¹The Order imposing civil penalties was issued after the Commission-required preliminary procedures had been completed; *i.e.*, of the issuance of a Notice of Proposed Issuance, etc., and a response by the Licensee to that Notice.

²The Director also determined that an infraction had occurred of license condition 16, which requires that the radiographer immediately notify his supervisor of his off-scale dosimeter, and delayed the notification until midway through the following shift on the next day. The Director did not assess any civil penalty for this failure of performance, which was considered of less seriousness than the occurrences which were termed violations.

cordance with procedures, the Licensee requested a hearing and the Regulatory Staff of the Commission (Staff) filed a motion for summary judgment based upon the admissions made by the Licensee that the violations occurred. A prehearing conference was convened which considered the scope of the allegations of violations and the admissions in regard thereto, and the issue of the need to determine the extent of Licensee management involvement in the violations. Following the prehearing conference, the Licensee and the Staff developed a stipulation of facts which presented more detail for consideration of the matters raised at the prehearing conference. In view of the presentation of the stipulation, it is considered that the Staff does not press for the determination of the contentions herein solely upon the basis of the motion for summary judgment, but rests its position upon all of the pleadings regarding violations, the admissions, and the more expanded presentation of facts reflected by the stipulation.³ The entire record comprising those elements therefore is considered in this Order. Both the Licensee and the Staff were requested and submitted proposed forms of order.

The Staff states that the view of the Licensee is that it does not consider that it has violated the regulations and the license condition because it believes it was without fault as the incident was not foreseeable nor preventable by the Licensee by any reasonable action. The Licensee proceeds from that premise and it argues that the overexposure was caused by the failure of the radiographer to follow the Licensee's safety procedures, and not because the Licensee failed to provide necessary training, supervision, and equipment. The Licensee's statement in its proposed form of order is:

The Licensee appealed (the Director's Order imposing civil penalties) on the basis that it had performed every control function required by the license to prevent such an occurrence. (Parentheses added.)

The Licensee asserts that a disposition of the matter without a hearing is not permitted by Section 234 of the Atomic Energy Act and the Commission's regulations and Rules of Practice, especially in view of the Licensee's assertion of defense that it was without fault.

The issue is thusly stated: granted that the radiographer committed the violations as alleged, does the Licensee's management have a responsibility in the violations that can serve as the basis for the imposition of civil penalties.

Upon a consideration of the entire record, the allegations, the admissions, the stipulation, the briefs of the parties and the proposed forms of

³A copy of the stipulation is attached hereto and is accepted into the record for determination of this Order.

order, all considered in the light of the legislative history pertaining to Section 234 of the Act, and the Court decisions pertaining to civil penalties, it is concluded that the issue warrants an affirmative determination.

The imposition of the proposed civil penalties is fully supported, not only by the terms of Section 234, but importantly also, by its legislative history, and the Commission action in an unrelated case but dealing with the effect of violations of the Atomic Energy Act.

In a review of the legislative history, it is significant to observe the status of the Commission's enforcement authority prior to the enactment of Section 234 and the circumstances and purposes to be accomplished that were considered by the Congress. The objectives to be achieved by the legislation are factors which aid in its interpretation and application.

The policy, as well as the letter of the law, is a guide to decision.

Markham v. Cabell, 326 U.S. 404 (1945).

Prior to Section 234, the Commission's authority in reference to violations was largely directed to revocation or modification of licenses. After some years of experience under this practice, the Commission recommended that legislation be enacted which would permit something less than revocation or modification of licenses, for those offenses not warranting such a drastic change in licensee's operations, and yet provide an effective method for securing compliance with the safety requirements of the Atomic Energy Act, and the regulations issued thereunder. The Commission view was that in some situations not requiring revocation, the licensees could be permitted to continue operations after the assessment and collection of civil penalties, which would be measured, in part, by the gravity of the violation and the attitude of the management of the licensees toward compliance. The Congress accepted the recommendation as an aid to the effective enforcement of safety requirements of the Act.

Civil penalties are not unique to the proceedings conducted pursuant to the Atomic Energy Act. Many agencies of the Federal government, as well as some departments thereof, have been authorized to impose civil penalties, with the range of agencies extending from the Interstate Commerce Commission to one of the more recent units, which is the Occupational Safety and Health Review Commission. Respecting this latter agency, a recent Court decision held:

. . . we have now come too far down the road to hold that a civil penalty may not be assessed to enforce observance of legislative policy

Frank Irey, Jr., Inc. v. Occupational Safety and Health Review Commission, 519 Fed (2d) 1200 (1975).

Many Court decisions have upheld the authority of the Congress to pro-

vide for imposition of civil penalties by the Federal agencies, and the uniformity of decisions in this regard establishes the validity of Section 234.

The Nuclear Regulatory Commission has consistently followed the practice of dealing promptly with violations of the Atomic Energy Act and the regulations. The remedies for the violations have varied according to the seriousness of the incident involved. When revocation or modification of licenses has not been warranted in its view, the Commission has imposed civil penalties.

The attitude and *modus operandi* of the Commission in not tolerating violations have recently been demonstrated in the decision pertaining to *Virginia Electric Power Company* (VEPCO), which, while it is not related to radiography, does reflect the necessity for responsibility of licensee management in instances of violations. Despite entreaties by the VEPCO management that it had no knowledge of some of the matters considered in that proceeding, the Commission imposed penalties of a substantial nature. The Commission emphasized that the purposes sought to be accomplished by legislation are important elements for consideration in enforcement, and the determination was made that:

. . . licensees bear an unavoidable and heavy responsibility for helping insure that nuclear power is utilized safely. . . .

4 NRC 480 at p. 487.

The Commission quoted (at p. 490) with approval language from a Court decision dealing with the SEC Act (*SEC v. Capital Gains Research Bureau*, 375 U.S. 180 (1963)):

. . . based on the purposes of the statute that Congress intended "a broad remedial construction of the Act" . . .

and the Commission concluded:

. . . courts have construed statutory language to effectuate statutory purpose, an undertaking equally incumbent upon the agency charged with administering the statute in question.

Id., fn. 9, p. 490.

The legislative history of Section 234 and the Commission's determinations respecting violations direct the conclusion that the management of a licensee must involve itself in all aspects of its operations conducted under a license. If the technical specifications require certain procedures, then those must be specifically followed. The necessity of safety in operations overcomes the usual need for a showing of management involvement and knowledge of the details of all operations. The use of nuclear power carries with it a continuing and detailed responsibility for all operations. The civil

penalties here involved reflect the Commission program that performance under a license involves the entire management as well as the particular operators undertaking the activity. To paraphrase the Commission determination in the VEPCO decision for consideration in this proceeding, the statement can be as follows:

To assert that management "liability (can) attach only if" an incident is known and involving a licensee's management "is inconsistent with the Commission's obligation to protect the public health and safety. . . . The less the (licensee) knew, the less its vulnerability to civil proceedings," such as violations of technical specifications ". . . forgiving innocent mistakes puts a premium on innocence."

Id. at p. 486. (Parentheses added.)

Significantly, the Commission cited *United States v. Park*, 421 U.S. 658, 44 L.Ed. 2d 489 (1975), which considered the Federal Food, Drug and Cosmetic Act, but the determinations made by that case reflect the trend of the law. The Supreme Court held that even a criminal conviction under that statute (and thus it would seem *a fortiori*: for civil penalties) may stand even in the absence of the conventional requirement for awareness by management of some wrongdoing by subordinate employees. The majority of the Court stated:

. . . the liability of managerial officers did not depend on their knowledge of, or personal participation in, the act made criminal by the statute. . . . holding criminally accountable the persons whose failure to exercise the authority and supervisory responsibility reposed in them by the business organization resulted in the violations complained of, has been confirmed Respondent testified . . . that he had employed a system in which he relied upon his subordinates . . . found these subordinates to be "dependable" and had "great confidence" in them once violations were unearthed he did everything possible to correct them.

U.S. v. Park, infra.

The Commission applied this rule to the corporate responsibility and that determination is controlling here.

Additionally, Court decisions reflect the increasing use of the civil penalty procedure to achieve compliance with a variety of government enforcement programs. In the recent case of *U.S. v. Johnson*, 541 Fed (2d) 710 (1976), the Court recited the position of the complaining party:

His (the defendant's) position is that he attempted in good faith to assure compliance with the FTC order by informing TEC salesmen of the

order, that any subsequent violations of the order by TEC employes can only be attributed to the corporation

. . . This duty could not be discharged by Johnson if he simply did nothing. (He) argues by providing each salesman with a copy of the FTC order, he acted in good faith . . .

. . . the good faith effort . . . is generally not a defense to an action for civil penalties

. . . Act was designed to protect the public

Where such practices have occurred, liability for civil penalties arises without a need for any showing that the practices were intentional or malicious (Parentheses added.)

In the case of *U.S. v. Vitasafe Corporation*, 212 Fed. Sup. 397 (1962), the government moved to strike out the defenses asserted to the imposition of civil penalties. The Court's determination was as follows:

The first three (defenses) seek to avoid liability by the claim that the violations were not intentional, but were the result of clerical errors made in good faith in processing the voluminous correspondence . . .

. . . sixth, that applicability of these penalties . . . constitutes an unconstitutional delegation of legislative power

All the defenses should be stricken . . . its claimed good faith have no bearing on the question of whether it has violated the order Defendant may urge its lack of intent to violate the order in mitigation of the penalty. It cannot do so, however, as a defense to liability.

. . . defendant's argument as to the constitutionality of legislative power was long ago held to be valid. (Parentheses added.)

A further case upholding the imposition of civil penalties included the provision for a defendant to have an opportunity to present facts by way of mitigation of the amount of the penalties. The Court ruled in *U.S. v. H. M. Prince Textiles, Inc.*, 262 Fed. Sup. 383 (1966), as follows:

. . . lack of wilfulness or intention is not a valid defense to an action by the government to recover civil penalties. All that the government need prove is that a cease and desist order has in fact been violated, which has been done in this case. . . . the lack of intention to violate . . . must be considered in determining the extent of civil penalties to be imposed . . . several factors should be considered in mitigation of such civil penalties, viz., the lack of intent on the part of the defendants, their good faith and due care, their good business record and their cooperation with the government.

The Licensee in this proceeding has requested an opportunity to present facts by way of mitigation. The Staff and the Licensee may confer on a date for the presentation of such facts and a hearing date will be determined after consultation with the parties for a convenient time. Some of the factors to be considered for such mitigation were enumerated in the recent case of *U.S. v. J. B. Williams Co.*, 498 Fed (2d) 414 (1974) (Friendly, CA-J) which held that elements of good faith, the injury to the public and ability to pay were fact questions to be resolved.

The proposed form of order submitted by the Licensee included a section containing proposed findings of fact which are accepted, but the conclusory portions in such factual proposals are rejected, such as No. 5, stating the Licensee had performed all acts of supervision . . . etc., for the protection of the health and safety of the radiographers; and No. 12, stating that the NRC Staff made no suggestion . . . that any specific additional measure should reasonably have been taken, etc.; likewise, No. 13 is rejected about the cooperative effort to develop all conditions necessary to protect the health and safety. The Licensee's proposed conclusions of law and order are rejected as contrary to law.

WHEREFORE, IT IS ORDERED, in accordance with the Atomic Energy Act, as amended, and the Rules of Practice of the Nuclear Regulatory Commission, that the Order of the Commission's Director of the Office of Inspection and Enforcement is affirmed in the imposition of penalties on Pittsburgh-Des Moines Steel Company, Pittsburgh, Pennsylvania, in the total amount of \$2,000 for violations identified in the Director's Order imposing the penalties.

IT IS FURTHER ORDERED that the Staff Motion for Summary Judgment is granted to the extent shown herein and as based upon the entire record including the stipulation of facts; but the Motion is rejected to the extent of a denial of hearing to the Licensee on the issue of mitigation of the civil penalties imposed.

IT IS FURTHER ORDERED, that the request of Pittsburgh-Des Moines Steel Company is granted for opportunity for hearing to present facts in support of its further request in mitigation of the amount of said penalties. The stipulation of the parties reflects the agreement that each party has enumerated all the material items believed necessary to determine the contentions asserted in reference to imposition of the penalties, and thus a complete evidentiary hearing to consider those stipulated facts need not be convened. A date for hearing for the limited purpose of considering claims

for mitigation of the amounts of the penalties will be designated by later Order.

**FOR THE NUCLEAR
REGULATORY COMMISSION**

**Samuel W. Jensch
Administrative Law Judge**

**Issued:
October 13, 1977
Bethesda, Maryland**

[Stipulation of Facts by Parties has been omitted from this publication but is available in the NRC Public Document Room, 1717 H Street, N.W., Washington, D.C. 20555.]

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ADMINISTRATIVE LAW JUDGE
Samuel W. Jensch

In the Matter of

ATLANTIC RESEARCH
CORPORATION
5390 Cherokee Avenue
Alexandria, Virginia 22314

BML 45-02808-04

October 28, 1977

The Administrative Law Judge grants the staff's motion for summary judgment and affirms the order of the Director of the Office of Inspection and Enforcement imposing a civil penalty against a byproduct material licensee for violations of various Commission regulations and license provisions concerning the conduct of radiographic activity. The Judge further grants the Licensee's request for an opportunity for hearing to present facts in support of mitigation of the amount of such penalties.

ATOMIC ENERGY ACT: CIVIL PENALTIES

The NRC's authority to impose civil penalties for license violations is founded upon Section 234 of the Atomic Energy Act, as amended (42 U.S.C. 2282), and the legislative history of that section. In enacting that section, Congress accepted the Nuclear Regulatory Commission's view that effective enforcement of the Act's safety requirements could be aided by the assessment and collection of civil penalties for license violations—such penalties to be measured in part by the gravity of the violation and the attitude toward compliance of a licensee's management—in situations where the Commission deems license revocation to be unwarranted.

ATOMIC ENERGY ACT: CIVIL PENALTIES

The management of a licensee must involve itself in all aspects of operations conducted under the license and must be responsible for instances of license violations, irrespective of its specific knowledge of a violation; this conclusion is directed by the legislative history of Section 234 of the Atomic Energy Act, as amended (42 U.S.C. 2282), and by the Commission's action in *Virginia Electric and Power Company* (North Anna, Units 1 and 2), CLI-76-22, 4 NRC 480 (1976).

ATOMIC ENERGY ACT: CIVIL PENALTIES

In considering civil penalties under Section 234 of the Atomic Energy Act, 42 U.S.C. 2282, issues such as good faith, injury to the public and ability to pay have no bearing on the question whether a license violation has occurred but are relevant in determining whether a proposed penalty should be mitigated.

ORDER AFFIRMING IMPOSITION OF CIVIL PENALTIES

Atlantic Research Corporation is a Licensee by virtue of the issuance by the Nuclear Regulatory Commission, or its predecessor, the Atomic Energy Commission, of Byproduct Material License No. 45-02808-04. That license authorizes the conduct of radiographic activity utilizing an atomic nuclear source form, but ordinarily shielded in properly designed and operated equipment. That radiographic activity is required to be conducted in accordance with Commission regulations and specific provisions of the license. The regulations and license provisions are complete and understandable and are designed in aid of the Commission's legislative mandate to provide protection for the health and safety of the public and the operators of the radiographic equipment.

On February 14, 1977, the Director of Inspection and Enforcement, pursuant to Section 234 of the Atomic Energy Act, as amended (42 U.S.C. 2282), and the regulations of the Nuclear Regulatory Commission (10 CFR §2.205), served upon the Licensee a Notice of Violation, together with a Notice of Proposed Imposition of Civil Penalties. The Director alleged that the Licensee was responsible for eight separate items of noncompliance which were violations of the Commission's regulations and license conditions. The Director specified the proposed civil penalties for the enumerated violations.

Permissible procedures were followed by the Licensee by answer to the aforesaid Notices and a request was made for a hearing. A prehearing conference was held on June 2, 1977, and thereafter an agreement was reached respecting the pertinent facts. While the Regulatory Staff of the Commission (Staff) filed a Motion for Summary Disposition, the record for consideration will include all of the facts deemed pertinent for the determination made.

The following constitutes the statement of material facts as defined by the parties, *viz.*, the Licensee and the Staff:

1. Employee A, a radiographer, was authorized by Atlantic Research

Corporation to conduct radiographic operations in the scope of his employment as a radiographer on December 12, 1976.

2. On December 12, 1976, employee A failed to perform a physical survey to determine that a 166-curie cobalt-60 exposure device had been returned to a shielded position after a radiographic operation at the Pine Ridge Plant of the Licensee.
3. On December 12, 1976, employee A defeated the automatic alarm system which controlled the warning sound of a horn in the system.
4. Employee A conducted radiographic operations on December 12, 1976, without wearing a film badge or a pocket dosimeter or a pocket chamber.
5. On December 12, 1976, employee B, a nonradiographer, accompanied employee A and entered the restricted area of the Pine Ridge Plant without being issued a film badge, a pocket chamber or a pocket dosimeter.
6. On December 12, 1976, employee A received a radiation dose of approximately 1,250 rems to portions of one hand and approximately 9.2 rems whole body dose, and employee B received a radiation exposure of approximately 4.4 rems whole body dose.
7. Employee A failed to record his name and the date of radiographic operations conducted by him on December 12, 1976, in the utilization log.
8. Employee A failed to record the final radiation survey when the source was secured after the last radiographic exposure on December 12, 1976.

Supplementary presentations expanded upon those basic facts. The radiography which was undertaken was performed at the cobalt-60 radiographic facility on Sunday, December 12, 1976.

The Staff describes the events as follows:

The radiographer entered the radiographic facility, tested the alarm system, set up the first shot, then opened the interlocked door to allow excessive heat to escape. The alarm system horn sounded as designed, and to alleviate the noise the radiographer turned off the alarm system at the control panel.

The radiographic exposures continued with the alarm system turned off. At the end of the fifth (5th) shot, the radiographer inadvertently failed to crank the source into the shielded position.

Both individuals then reentered the radiographic cell, replaced the exposed film with a new cassette, set up another shot, and returned to

the control room for the sixth (6th) and final shot. The total time in the cell with the unshielded source was about 60 seconds.

A survey meter was apparently taken into the cell between radiographic exposures but radiographer could not recall observing the meter reading.

At the beginning of the sixth (6th) shot, the radiographer realized from the source crank position that the Co-60 source had been unshielded during the last entry. He also realized that he and the project technician were not wearing film badges or any other type of personnel monitoring device.

The radiographer then notified his supervisor, finished the last exposure, secured the facility and returned to the radiation safety office.

Due to lack of dosimetry during the incident, doses were estimated using T.L.D. (thermoluminescent dosimeter) measurements. These measurements showed that radiographer received $1,250 \pm 15\%$ rem to the left thumb and $9.2 \pm 15\%$ rem dose to the whole body (lens of eyes). The project technician (observer) received a dose to the whole body (lens of eyes) of $4.4 \pm 15\%$ rem. The extremity dose to the radiographer was later substantiated with the development of erythema to the left thumb and first two fingers, and dry desquamation of the tip of the left thumb.

The Licensee does not dispute this presentation; in fact, the Licensee voluntarily reported these matters to the Commission, following which a formal investigation was made which led to the Notices issued respecting alleged violations and proposed penalties in the total amount of \$8,600.

In the Motion for Summary Disposition, the Staff enumerated the violations as follows:

Item A of the Notice of Violation is:

Contrary to 10 CFR §20.101(a) of the Commission's regulations, a radiographer working in a restricted area of the Licensee's Pine River Plant on December 12, 1976, received a dose evaluated to be approximately 1,250 rems to portions of one hand and a dose evaluated to be approximately 9.2 rems whole body dose.

Contrary to 10 CFR §20.101(a) of the Commission's regulations a non-radiographer visiting in a restricted area of the Licensee's Pine River Plant on December 12, 1976, received a dose evaluated to be approximately 4.4 rems whole body dose.

Item B of the Notice of Violation is:

Contrary to 10 CFR §34.43(b) of the Commission's regulations, on December 12, 1976, a required physical radiation survey was not per-

formed to determine that a 166-curie cobalt-60 source had been returned to its shielded position after the completion of a radiographic exposure.

Item C of the Notice of Violation is:

Contrary to condition 16 of the license which incorporates by reference the procedures dated August 9, 1974, the radiographer who received the exposure in item A above on December 12, 1976, failed to comply with procedures 6a, item 3, by turning off the automatic alarm system during a series of radiographic operations.

Item D of the Notice of Violation is:

Contrary to 10 CFR §34.33(a) of the Commission's regulations the radiographer who received the exposure in item A, above, on December 12, 1976, conducted radiographic operations without wearing a film badge, pocket dosimeter, or pocket chamber.

Item E of the Notice of Violation is:

Contrary to condition 16 of the license which incorporates by reference the procedures dated August 9, 1974, procedure 6(d) was violated on December 12, 1976, by permitting a nonradiographer who received the overexposure in item A above, to be allowed to enter a restricted area during radiographic operations without having been issued a film badge, pocket chamber or pocket dosimeter.

Item F of the Notice of Violation is:

Contrary to 10 CFR §34.27 of the Commission's regulations the radiographer who received the overexposure in item A above, failed to record his name and date for use of a radiographic exposure device on December 12, 1976.

Item H of the Notice of Violation is:

Contrary to 10 CFR §34.43(d) of the Commission's regulations and condition 16 of the license which incorporates by reference Section 9.1.2(c) of the Operating Procedures, a record of the final radiation survey after securing the source at the end of the last radiographic exposure was not recorded on December 12, 1976.

While the Staff, in a Supplemental Statement of Position filed on June 21 referred, in one part, to a license number 45-02808-02, this proceeding concerns only Byproduct Material License No. 45-02808-04, and the determination made is solely in reference to the transactions occurring by virtue of that latter license.

The Licensee was not represented at the hearing by legal counsel but was represented by its well informed President who stated the issues as he saw them as:

Was ARC (Atlantic Research Corporation) noncompliant.

Did ARC demonstrate less than established industry standards of care.
Did ARC engage in punishable practices.
Is the punishment just.

While the Licensee asserts that a negative answer should be applied to those four items, the established law in reference to civil penalties compels an affirmative answer to the first and third issues raised by ARC, and answer that the second issue raises an irrelevant issue, and finally, the fourth issue is interpreted as a request¹ to determine the fairness of the level or amount of the civil penalties, and for which issue, a further hearing is needed to enable the Licensee to demonstrate, if it can, its good faith in endeavoring to comply with the regulations, in aid of a requested mitigation in amount of the civil penalties.

The development of the imposition of civil penalties has extended over a fairly lengthy period. The permission given by the Congress by way of authority to various Federal agencies to impose civil penalties is extended only after careful scrutiny of the necessity for such authority and a consideration of the circumstances when such civil penalties might be imposed.

The Licensee has earnestly argued that its radiographer violated all the training and instructions that the Licensee imposed upon its employees. In addition, the Licensee took corrective action, by suspending the employee, before the civil penalties were imposed, so in fact, the penalties are not merely remedial (as argued by the Staff) but are punishments. The argument is that the Licensee did all it could to prevent the occurrence of events like the violations here involved. In fact, the Licensee contends that it knew nothing about these violations until after they had occurred, so there was not any management involvement in the incidents. The Licensee, in effect, asks: What more could it have done to insure complete performance in accordance with the Commission's regulations and the license conditions. Part of the answer to these arguments and the question is that the nature of the activity undertaken with an atomic energy source, the cobalt-60, presents concerns of health and safety far beyond the usual considerations in employer-employee relationships. Increasingly, the Congress and the Courts, in the application of the laws, have accorded special determination to the national importance for protecting the health and safety. Previous legal determinations of these relationships do not apply to the developing arrangements for protection of health and safety. The Nuclear Regulatory Commission (NRC), as the successor to the Atomic Energy Commission,

¹In the brief filed July 1, 1977, the Licensee asserts that it ". . . must be extended an opportunity to rebut the presumption (of *prima facie* liability) and demonstrate mitigating circumstances." (Parentheses added.)

has established the criteria for the imposition of civil penalties and all licensees have been informed of this NRC program, to thus involve management by its possession of knowledge of civil penalties to be imposed for violations occurring in the performance of the specified activity with its unique character.

The imposition of the proposed civil penalties is fully supported, not only by the terms of Section 234, but importantly also, by its legislative history, and the Commission action in an unrelated case but dealing with the effect of violations of the Atomic Energy Act.

In a review of the legislative history, it is significant to observe the status of the Commission's enforcement authority prior to the enactment of Section 234 and the circumstances and purposes to be accomplished that were considered by the Congress. The objectives to be achieved by the legislation are factors which aid in its interpretation and application.

"The policy, as well as the letter of the law, is a guide to decision."
Markham v. Cabell, 326 U.S. 404 (1945).

Prior to Section 234, the Commission's authority in reference to violations was largely directed to revocation or modification of licenses. After some years of experience under this practice, the Commission recommended that legislation be enacted which would permit something less than revocation or modification of licenses, for those offenses not warranting such a drastic change in licensee's operations, and yet provide an effective method for securing compliance with the safety requirements of the Atomic Energy Act, and the regulations issued thereunder. The Commission view was that in some situations not requiring revocation, the licensees could be permitted to continue operations after the assessment and collection of civil penalties, which would be measured, in part, by the gravity of the violation and the attitude of the management of the licensees toward compliance. The Congress accepted that recommendation as an aid to the effective enforcement of safety requirements of the Act.

Civil penalties are not unique to the proceedings conducted pursuant to the Atomic Energy Act. Many agencies of the Federal government, as well some departments thereof, have been authorized to impose civil penalties, with the range of agencies extending from the Interstate Commerce Commission to one of the more recent units, which is the Occupational Safety and Health Review Commission. Respecting this latter agency, a recent Court decision held:

. . . we have now come too far down the road to hold that a civil penalty may not be assessed to enforce observance of legislative policy

Frank Irey, Jr., Inc. v. Occupational Safety and Health Review Commission, 519 Fed (2d) 1200 (1975).

Many Court decisions have upheld the authority of the Congress to provide for imposition of civil penalties by the Federal agencies, and the uniformity of decisions in this regard establishes the validity of Section 234.

The Nuclear Regulatory Commission has consistently followed the practice of dealing promptly with violations of the Atomic Energy Act and the regulations. The remedies for the violations have varied according to the seriousness of the incident involved. When revocation or modification of licenses has not been warranted in its view, the Commission has imposed civil penalties.

The attitude and *modus operandi* of the Commission in not tolerating violations have recently been demonstrated in the decision pertaining to *Virginia Electric Power Company* (VEPCO), which, while it is not related to radiography, does reflect the necessity for responsibility of licensee management in instances of violations. Despite entreaties by the VEPCO management that it had no knowledge of some of the matters considered in that proceeding, the Commission imposed penalties of a substantial nature. The Commission emphasized that the purposes sought to be accomplished by legislation are important elements for consideration in enforcement, and the determination was made that:

. . . licensees bear an unavoidable and heavy responsibility for helping insure that nuclear power is utilized safely

4 NRC 480, at p. 487.

The Commission quoted (at p. 490) with approval language from a Court decision dealing with the SEC Act (*SEC v. Capital Gains Research Bureau*, 375 U.S. 180 (1963)).

. . . based on the purposes of the statute that Congress intended "a broad remedial construction of the Act". . .

and the Commission concluded:

. . . courts have construed statutory language to effectuate statutory purpose, an undertaking equally incumbent upon the agency charged with administering the statute in question.

Id., fn. 9, p. 490.

The legislative history of Section 234 and the Commission's determinations respecting violations direct the conclusion that the management of a

licensee must involve itself in all aspects of its operations conducted under a license. If the technical specifications require certain procedures, then those must be specifically followed. The necessity of safety in operations overcomes the usual need for a showing of management involvement and knowledge of the details of all operations. The use of nuclear power carries with it a continuing and detailed responsibility for all operations. The civil penalties here involved reflect the Commission program that performance under a license involves the entire management as well as the particular operators undertaking the activity. To paraphrase the Commission determination in the VEPCO decision for consideration in this proceeding, the statement can be as follows:

To assert that management "liability (can) attach only if" an incident is known and involving a licensee's management "is inconsistent with the Commission's obligation to protect the public health and safety. . . . The less the (licensee) knew, the less its vulnerability to civil proceedings," such as violations of technical specifications ". . . forgiving innocent mistakes puts a premium on innocence."

Id., at p. 486. (Parentheses added.)

Significantly, the Commission cited *United States v. Park*, 421 U.S. 658, 44 L. Ed. 2d 489 (1975), which considered the Federal Food, Drug and Cosmetic Act, but the determinations made by that case reflect the trend of the law. The Supreme Court held that even a criminal conviction under the statute (and thus it would seem *a fortiori*: for civil penalties) may stand even in the absence of the conventional requirement for awareness by management for some wrongdoing by subordinate employees. The majority of the Court stated:

. . . the liability of managerial officers did not depend on their knowledge of, or personal participation in, the act made criminal by the statute. . . . holding criminally accountable the persons whose failure to exercise the authority and supervisory responsibility reposed in them by the business organization resulted in the violations complained of, has been confirmed . . . Respondent testified . . . that he had employed a system in which he relied upon his subordinates . . . found these subordinates to be "dependable" and had "great confidence" in them . . . once violations were unearthed he did everything possible to correct them.

U.S. v. Park, supra.

The Commission applied this rule to the corporate responsibility and that determination is controlling here.

Additionally, Court decisions reflect the increasing use of the civil penalty procedure to achieve compliance with a variety of government enforcement programs. In the recent case of *U.S. v. Johnson*, 541 Fed (2d) 710 (1976), the Court recited the position of the complaining party:

His (the defendant's) position is that he attempted in good faith to assure compliance with the FTC order by informing TEC salesmen of the order, that any subsequent violations of the order by TEC employes can only be attributed to the corporation

. . . This duty could not be discharged by Johnson if he simply did nothing. (He) argues by providing each salesman with a copy of the FTC order, he acted in good faith

. . . the good faith effort . . . is generally not a defense to an action for civil penalties

. . . Act was designed to protect the public

Where such practices have occurred, liability for civil penalties arises without a need for any showing that the practices were intentional or malicious (Parentheses added.)

In the case of *U.S. v. Vitasafe Corporation*, 212 Fed. Sup. 397 (1962), the government moved to strike out the defenses asserted to the imposition of civil penalties. The Court's determination was as follows:

The first three (defenses) seek to avoid liability by the claim that the violations were not intentional, but were the result of clerical errors made in good faith in processing the voluminous correspondence

. . . sixth, the applicability of these penalties . . . constitutes an unconstitutional delegation of legislative power

All the defenses should be stricken . . . its claimed good faith have no bearing on the question of whether it has violated the order

Defendant may urge its lack of intent to violate the order in mitigation of the penalty. It cannot do so, however, as a defense to liability.

. . . defendant's argument as to the constitutionality of legislative power was long ago held to be valid. (Parentheses added.)

A further case upholding the imposition of civil penalties included the provision for a defendant to have an opportunity to present facts by way of mitigation of the amount of the penalties. The Court ruled in *U.S. v. H.M. Prince Textiles, Inc.*, 262 Fed. Sup. 383 (1966), as follows:

. . . lack of wilfulness or intention is not a valid defense to an action by the government to recover civil penalties. All that the government need prove is that a cease and desist order has in fact been violated, which has

been done in this case. . . . the lack of intention to violate . . . must be considered in determining the extent of civil penalties to be imposed. . . . several factors should be considered in mitigation of such civil penalties, viz., the lack of intent on the part of the defendants, their good faith and due care, their good business record and their cooperation with the government.

The Licensee in this proceeding has, in effect, by its statement of the 4th issue, requested an opportunity to present facts by way of mitigation. The Staff and the Licensee may confer on a date for the presentation of such facts and a hearing date will be determined after consultation with the parties for a convenient time. Some of the factors to be considered for such mitigation were enumerated in the recent case of *U.S. v. J.B. Williams Co.*, 498 Fed (2d) 414 (1974) (Friendly, CA-J), which held that elements of good faith, the injury to the public and ability to pay were fact questions to be resolved.

In considering the claim of good faith in reference to violations caused by alleged clerical errors, one Court has held:

The way in which defendant carries on its operations, and its claimed good faith, have no bearing on the question of whether it has violated the order Defendant may urge its lack of intent to violate the order in mitigation of the penalty. It cannot do so, however, as a defense to liability.

U.S. v. Vitasafe Corporation, supra.

Similarly, a recent case summarized the civil penalty procedures thusly: The Petitioner also argues that the \$600 . . . though labelled a civil penalty is punitive in nature and an unconstitutional abridgment . . .

Civil penalties are not uncommon in federal law, and Congress here clearly intended to create a civil sanction.

American Smelting & R Co. v. Occupational Safety and Health Review Commission, 501 Fed (2d) 504 (1974).

The Licensee in a final presentation indicates its belief that between instances of violations by radiographers and violations that have been cited by NRC for power reactor operations there has been an inconsistent enforcement of remedies, whether as civil penalties, or otherwise. The details of each of other violations and the enforcement action taken by NRC involve

more than encompassed by the issues prescribed by the Commission² for this proceeding. If the Licensee seeks a hearing on mitigation of the amount of the civil penalties, the patterns of enforcement action, if known to the Licensee, may be a factor in good faith compliance with the Commission's regulations, but no determination in that regard is made here.

WHEREFORE, IT IS ORDERED, in accordance with the Atomic Energy Act, as amended, and the Rules of Practice of the Nuclear Regulatory Commission, that the Order of the Commission's Director of the Office of Inspection and Enforcement is affirmed in the imposition of penalties on Atlantic Research Corporation, Alexandria, Virginia, in the total amount of \$8,600 for violations identified in the Director's Order imposing the penalties.

IT IS FURTHER ORDERED that the Staff Motion for Summary Disposition is granted to the extent shown herein and as based upon the entire record including the agreements respecting facts; but the Motion is rejected to the extent of a denial of hearing to the Licensee on the issue of mitigation of the civil penalties imposed.

IT IS FURTHER ORDERED, that the interpreted request of Atlantic Research Corporation is granted for opportunity for hearing to present facts in support of its further request in mitigation of the amount of said penalties. The stipulation of the parties reflects the agreement that each party has enumerated all the material items believed necessary to determine the contentions asserted in reference to imposition of the penalties, and thus a complete evidentiary hearing to consider those stipulated facts need not be convened. A date for hearing for the limited purpose of considering claims for mitigation of the amounts of the penalties will be designated by later Order.

FOR THE NUCLEAR
REGULATORY COMMISSION

Samuel W. Jensch
Administrative Law Judge

Issued:
October 28, 1977
Bethesda, Maryland

²The issues prescribed by the Commission are:

- (a) Whether the Licensee committed violations of the Commission's regulations and condition of the license designated as Items A, B, C, D, E, F and H, in the Notice of Violation issued to Licensee; and
- (b) Whether the Order Imposing Civil Penalties as it relates to Items A, B, C, D, E, F and H in the Notice should be sustained.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**COMMISSIONERS:**Victor Gilinsky
Richard T. Kennedy
Peter A. Bradford

In the Matter of

Docket Nos. 50-443
50-444PUBLIC SERVICE COMPANY OF
NEW HAMPSHIRE, et al.

(Seabrook Station, Units 1 and 2)

November 4, 1977

Upon consideration on the merits of a nontimely motion by an intervenor for a stay of construction pending review of ALAB's 422 and 423 pursuant to 10 CFR §2.788, the Commission denies relief on the ground that the movant failed to show irreparable injury.

RULES OF PRACTICE: STAY PENDING APPEAL

An interlocutory stay is an extraordinary equitable remedy, and no tribunal will be disposed to grant such relief to a party failing to meet the standards for ordinary equitable relief.

ORDER

NECNP has asked us to stay all construction at Seabrook pending completion of our review of ALAB's 422 and 423. That motion is denied.

The Seabrook construction permits were reinstated on the basis of ALAB-423, 6 NRC 115 (July 26, 1977). Our new certiorari rule provides a procedure for parties seeking stays of Appeal Board decisions. 10 CFR § 2.788, 42 *Fed. Reg.* 22128, 22130 (May 2, 1977). The petition was filed more than 7 days after service of ALAB-423, *cf.* §2.788(a). The fact that NECNP did not comply with the procedural requirements of that section could justify denial of its request, *see Kansas Gas & Electric Company* (Wolf Creek Generating Station, Unit No. 1), ALAB-412, 5 NRC 1415, 1417 (June 15, 1977).

However, we have considered the request on its merits.¹

NECNP urges that we use the "equitable balancing" test found in *Coalition for Safe Power v. AEC*, 463 F.2d 954, 956 (D.C. Cir. 1971) instead of the four-part *Virginia Petroleum Jobbers' Ass'n*² standard set forth in 10 CFR §2.788(e). An interlocutory stay is an extraordinary equitable remedy, and no tribunal will be disposed to grant such relief to a party failing to meet the standards for ordinary equitable relief. The NECNP's request was filed only after extended delay.³ NECNP fails to satisfy what the Appeal Board recently noted is the "most crucial"⁴ factor in ruling on stay requests—the showing of irreparable injury to the movant. When the Appeal Board stayed construction at Seabrook in January 1977, the site had been cleared and excavations had begun. NECNP has made no showing that the recent resumption of construction at Seabrook presents any serious danger of additional environmental damage to the site. NECNP's main claim of injury is that continued construction will preclude meaningful review. However, our review of ALAB's 422 and 423 will be completed in the near future. The limited additional construction that will take place during that Commission review will not prejudice and will not tip the overall NEPA cost-benefit balance for Seabrook. Consequently, neither the *Virginia Petroleum Jobbers' Ass'n* standard nor the *Coalition for Safe Power* standard has been met.

For the reasons stated above, it is ORDERED that NECNP's request for a stay is denied.

By the Commission

John C. Hoyle

Assistant Secretary of the Commission

Dated at Washington, D.C.
this 4th day of November 1977.

¹In the future we will expect compliance with 10 CFR §2.788 from any party seeking a stay from us.

NECNP seeks to excuse its failure to comply with that rule by denoting its request as one addressed to the Commission's "inherent supervisory authority over the conduct of proceedings." *U.S. ERDA* (Clinch River Breeder Reactor Plant), CLI-77-13, 4 NRC 67, 75 (1976), *see also Public Service Company of New Hampshire* (Seabrook Station, Units 1 and 2), CLI-77-8, 5 NRC 503, 516-517 (1977). Those comments predate our certiorari review system. But more importantly they refer to the Commission's power in unusual cases to extend its review practices in the interest of resolution of disputes. It was not designed to permit parties to ignore applicable rules.

²*See Virginia Petroleum Jobbers' Ass'n v. FPC*, 259 F.2d 921, 925 (D.C. Cir. 1958).

³It was filed almost two months after NECNP had requested Commission review of the Appeal Board decision. We note that NECNP's request says (at 1) that it is made, among other things, pursuant to 10 CFR §2.788(g). That section calls for "prompt application" for relief.

⁴*Public Service Company of Indiana* (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-437, 6 NRC 632 (October 14, 1977).

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

COMMISSIONERS:

Joseph M. Hendrie, Chairman
Victor Gilinsky
Richard T. Kennedy
Peter A. Bradford

In the Matter of**Docket No. 50-389****FLORIDA POWER & LIGHT COMPANY**

**(St. Lucie Nuclear Power Plant,
Unit No. 2)**

November 8, 1977

The Commission directs the Office of Inspector and Auditor to investigate allegations of improper AEC employee behavior.

ORDER

On October 28, 1977, the Atomic Safety and Licensing Appeal Board entered an order in the above case, noting that the staff had filed with it allegations that employees of the Atomic Energy Commission (AEC) in 1974 failed to provide the Atomic Safety and Licensing Board with information concerning Florida power grid disturbances in the St. Lucie Nuclear Power Plant licensing proceedings.¹ The Appeal Board stated: "Of concern to us are allegations in [Mr. Pollard's] letter relating to the reliability of the offsite power grid serving the St. Lucie nuclear facility, and the implication that this matter was not properly called to the Licensing Board's attention."

Because the allegations and documents submitted therewith raise the question whether AEC employees engaged in concealment of information

¹By letter dated October 13, 1977, Robert Pollard of the Union of Concerned Scientists informed the Attorney General of "misconduct" and "abuses" by AEC/NRC employees. In that letter, he claimed that while initial AEC investigations indicated that instability on the Florida power grid (the offsite supply which is the preferred source of energy for a plant's safety system) might reach as far north as the St. Lucie site, staff concerns that the investigation might affect the St. Lucie licensing proceedings apparently caused the scope of the investigation to be limited to the instability's effect on more southern plants. The NRC staff filed copies of this letter, together with other materials, with the Appeal Board.

which is relevant and material to the licensing process, the Commission has directed its Office of Inspector and Auditor to conduct a thorough investigation into the allegations of improper employee behavior. Upon completion of the investigation, the Inspector and Auditor will report to the Commission. The results of this investigation will be made public and filed with the Appeal Board.²

It is so ORDERED.

By the Commission

Samuel J. Chilk
Secretary of the Commission

Dated at Washington, D.C.,
this 8th day of November 1977.

²However, in the event that the investigation reveals possible criminal violations, the Office of Inspector and Auditor will consult with the Department of Justice before publicly releasing any report.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**COMMISSIONERS:**

Joseph M. Hendrie, Chairman
Victor Gilinsky
Richard T. Kennedy
Peter A. Bradford

In the Matter of

Docket No. 70-2561
License No. XSNM-1116**TRANSNUCLEAR, INC. (Würgassen)****(On Application to Export Special
Nuclear Material)****November 10, 1977**

Upon application to export special nuclear material, the Commission finds that the proposed license meets all the standards relevant for issuance under the Atomic Energy Act and the Energy Reorganization Act of 1974 and directs the Assistant Director for Export-Import and International Safeguards to issue the license. Because delay will adversely affect the conduct of U.S. foreign policy, the Commission decides not to hold a public hearing on the license application.

NUCLEAR REGULATORY COMMISSION: JURISDICITON

Consideration of health and safety effects in foreign countries resulting from export licensing is outside the jurisdiction of the Commission. *Edlow International*, CLI-76-6, 3 NRC 563, 577 (1976).

MEMORANDUM AND ORDER

On May 20, 1977, a timely petition was filed with the Nuclear Regulatory Commission by the Natural Resources Defense Council (NRDC) for leave to intervene and for a hearing on an application for export of special nuclear material (519.182 kgs U²³³ contained in 18,981.415 kgs U, enriched to a maximum of 3.00 percent) for use as fuel at the Würgassen Nuclear Power Station, Federal Republic of Germany (FRG).

NRDC has also filed intervention petitions challenging nine other exports of low-enriched uranium to European Atomic Energy Community (EURATOM) nations.¹ The Commission on October 4, 1977, denied NRDC leave to intervene on these ten applications because NRDC had failed to establish the prerequisite interest in the proceeding required by Section 189 of the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2239.² The Commission deferred its decision whether to hold a public hearing until Congress either enacted pending nuclear non-proliferation legislation or until it recessed without adopting such legislation.³ See *Ten Applications for Low-Enriched Uranium Exports to EURATOM Member Nations*, CLI-77-24, 6 NRC 525 (October 4, 1977).

In that opinion the Commission stated that it would continue to process applications subject to the intervention petitions if present statutory licensing requirements under the Atomic Energy Act could be met and if urgent need for the material could be demonstrated. *Id.* at 534.

The Commission has received expressions of urgent need for the material covered by license application XSNM-1116 from EURATOM. On September 8, 1977, Fernand Spaak, Head of Delegation of the Commission of the European Communities in a letter to NRC Chairman Hendrie stated:

Given the 6 to 7 month lead time for conversion and fuel fabrication . . . the Würgassen reactor, which is integrated in important electrical grids in West Germany, would have to be shut down in June 1978 if shipment . . . takes place after November 15, 1977.

Under the total circumstances of this case, we believe that Commission action on this application is warranted at this time.

In *Westinghouse Electric Company (ASCO II)*, CLI-76-9, 3 NRC 739 (1976) and *Edlow International Company*, CLI-77-20, 5 NRC 1358 (1977), we made reference to the three factors the Commission must consider under the Atomic Energy Act before acting upon export license applications, namely: (1) whether the export would take place within the scope of an applicable agreement for cooperation; (2) whether the export would be inimical to the health and safety of the United States' public; and (3) whether

¹The EURATOM member countries include: Belgium, Denmark, Federal Republic of Germany, France, Ireland, Italy, Luxembourg, Netherlands, and the United Kingdom.

²For a complete discussion of issues concerning the standing of domestic interest groups to intervene in NRC export licensing proceedings, see *Edlow International Company*, CLI-76-6, 3 NRC 563 (1976), *sub judice* in *NRDC v. NRC*, No. 76-1525 (D.C. Cir., filed June 11, 1976).

³Congress is presently addressing issues raised by NRDC and this proliferation legislation has been passed by the House of Representatives 411-0 and has been reported out of committee in the Senate. See 123 Cong. Rec. H. 10286 (September 28, 1977) and S. Rep. No. 95-467, 95th Cong., 1st Sess. (1977).

the export would be inimical to the common defense and security of the United States. The following discussion will address each of these factors.

1. Agreement for Cooperation

The proposed export would take place under the terms and conditions of the Additional Agreement for Cooperation between the United States and EURATOM, as amended, signed at Washington, D.C. and New York, June 1, 1960 (T.I.A.S. 4650). This agreement entered into force on July 25, 1960, and remains in force until 1996. A letter to Vance H. Hudgins, Assistant Director for Politico-Military Security Affairs, Division of International Security Affairs, ERDA, from Fernand Spaak, Head of the Delegation of the Commission of the European Communities dated April 25, 1977, confirms that the special nuclear material to be exported under XSNM-1116 would fall within the ambit of the Additional Agreement for Cooperation.

2. Health and Safety

The Commission does not foresee circumstances in which the export of the low-enriched uranium covered by this license application and intended for use as fuel in a light-water power reactor is likely to create a significant health or safety risk to the United States population. Further, the Commission explained in *Edlow International*, CLI-77-6, 3 NRC 563, 577 (1976), it takes the view that consideration of health and safety effects in foreign countries resulting from export licensing is outside the jurisdiction of the Commission.

3. Common Defense and Security

In determining whether a particular export may be inimical to the common defense or security of the United States, the Commission's approach has been to analyze the license application in light of factors which are mirrored in eight broad questions we routinely pose to the Executive Branch. These questions, which are set forth in *Westinghouse Electric (ASCO II)*, *supra*, *Babcock and Wilcox*, CLI-77-18, 5 NRC 1332 (1977), and *Edlow International*, *supra*, and will not be reiterated here, were developed to give greater definition to our common defense and security inquiry. We shall review these factors as they apply in the instant matter.

The special nuclear material covered by XSNM-1116 will be used to fabricate fuel assemblies to be used in fueling nuclear power reactors at the Würgassen facility. This type of civilian use of nuclear energy to generate

electric power is not in itself inimical to the common defense and security of the United States. Inimicality must arise, if at all, from other circumstances surrounding the export.

With the exception of France (a nuclear weapons state), all EURATOM member states are party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), done at Washington, London and Moscow on July 1, 1968, 21 U.S.T. 483, T.I.A.S. 6839. Pursuant to the NPT, these nations entered into a safeguards agreement with the IAEA on April 5, 1973. On February 17, 1977, the Commission of the European Communities notified the IAEA that all of the necessary steps had been taken for the IAEA/EURATOM Safeguards Verification Agreement to come into force, including adaptation of the EURATOM materials accounting system to be consistent with that of the IAEA. Currently, EURATOM and the IAEA are negotiating the Subsidiary Arrangement and Facility Attachments which are necessary to bring IAEA verification of EURATOM safeguards into practical effect. Pending the completion of these negotiations, the IAEA has the right to apply the procedures of the EURATOM-IAEA Safeguards Verification Agreement even though the Subsidiary Arrangements have not entered into force.

Until these Subsidiary Arrangements come into force, the EURATOM safeguards system will be applied to this material. In the past the application of these safeguards has provided the Commission with an adequate basis for approving exports to the EURATOM countries. We are not reexamining that conclusion at this time.

The Federal Republic of Germany by ratifying the NPT, has forsworn the development of nuclear explosive devices for any purpose and is precluded from assisting other nonnuclear weapons states to develop such devices. This is a most important factor in our decision.

NRDC also contends that this export is inimical to the common defense and security because EURATOM countries may retransfer or reprocess U.S.-supplied material within the European Community without prior United States approval. NRDC notes that reprocessing facilities have been or are being constructed in France and the United Kingdom and that these facilities are currently accepting orders for and shipments of spent fuel for reprocessing. NRDC contends that commercial reprocessing anywhere may lead to weapons proliferation and is therefore a threat to U.S. national security. NRDC argues that before the Commission can determine that exports to EURATOM countries are not inimical to the common defense and security, it must condition each license to require a prior U.S. approval right for any retransfer or reprocessing of the exported fuel.

The issue whether the U.S. government should seek to acquire approval rights over reprocessing or retransfer of U.S.-supplied material within the

EURATOM community is presently being addressed by the Congress in pending non-proliferation legislation.⁴ The Commission believes that it would be inappropriate to withhold urgently needed low-enriched uranium to a close U.S. ally and signatory of the NPT during a time when Congress is actively considering the precise issue whether and to what extent nuclear commerce between the U.S. and EURATOM can continue, and what conditions should be applied to that commerce. We have determined that in these particular circumstances export of a limited quantity of LEU without a prior U.S. approval right is not inimical to the common defense and security of the United States.

In making this determination, the Commission recognizes that this is the central issue raised in NRDC's challenge to each of the ten EURATOM applications. By its action today, the Commission does not prejudice the results of its examination of these nine additional license applications. It will continue to closely monitor this matter and will reexamine this issue in light of the status of the pending non-proliferation legislation when action upon those applications is taken.

Finally, we would note that the decision to issue XSNM-1116 is based in part upon the State Department view that failure to approve this urgently needed fuel export at this time would have an adverse foreign policy impact.⁵ This foreign policy impact is a factor which the Commission may properly consider in exercising its discretion not to order further public proceedings on this application.

Because of the need to act expeditiously in order to avoid this adverse foreign policy impact, the Commission has decided not to hold a public hearing at this juncture on the issues raised by this application. However, we reiterate the holding in our October 4 opinion that the question of whether and to what extent further public participation will be sought on any of the nine remaining applications for exports of low-enriched uranium to EURATOM will be fully addressed at a later date.

⁴In H.R. 8638 which passed the House on September 28, 1977, Sections 504(a)(4) and (a)(5) would specifically require a prior U.S. approval right for reprocessing and retransfers of U.S.-supplied material. Section 305 of S. 897, as reported out of Committee contains a similar provision. However, both of these bills provide an 18-month exemption from these licensing criteria for United States exports to EURATOM during which time the United States government is mandated to seek to negotiate reprocessing and retransfer controls in a new agreement for cooperation with EURATOM. See Section 304(a) of S. 897 and Section 504(a) of H.R. 8638.

The Department of State, on behalf of the Executive Branch, has also informed the Commission that XSNM-1116 should be issued even though the United States does not currently possess the right to approve retransfers and reprocessing of U.S.-supplied material within the EURATOM community.

⁵The State Department's views are contained in a letter from Louis V. Nosenzo, Deputy Assistant Secretary, to James R. Shea, Director, Office of International Programs, NRC.

FINDING AND ORDER

For the reasons set forth above, we find that License No. XSNM-1116 meets all the standards relevant for issuance under the Atomic Energy Act and the Energy Reorganization Act of 1974, and hereby direct the Assistant Director for Export-Import and International Safeguards to issue XSNM-1116 to Transnuclear, Inc.

It is so ORDERED.

By the Commission

Samuel J. Chilk
Secretary of the Commission

Dated at Washington, D.C.,
this 10th day of November 1977.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL PANEL

Alan S. Rosenthal, Chairman

In the Matter of

BML No. 37-02607-02

PITTSBURGH-DES MOINES
STEEL COMPANY
Grand Avenue, Neville Island
Pittsburgh, Pennsylvania 15225

November 1, 1977

Licensee's appeal from decision of Administrative Law Judge finding liability for a proposed civil penalty but granting the licensee's request for a hearing on mitigation of the amount of the penalty dismissed as premature.

Mr. Leon G. Krasinski and Ms. Nancy Jane Palmer,
Pittsburgh, Pennsylvania, for the licensee, Pittsburgh-
Des Moines Steel Company

MEMORANDUM AND ORDER

The Pittsburgh-Des Moines Steel Company (licensee) possesses a byproduct material license which authorizes it to perform industrial radiography under conditions specified therein. On January 5, 1977, acting pursuant to Section 234 of the Atomic Energy Act¹ and 10 CFR 2.205, the Director of Inspection and Enforcement (Director) served on the licensee a notice of an intent to impose civil penalties by reason of certain asserted violations of the license conditions and Commission regulations. Following receipt of the licensee's answer, the Director issued an order on February 25, 1977, imposing civil penalties in the total amount of \$2,000 (\$1,000 on each of two found violations). The licensee exercised its right under 10 CFR 2.205(d) to request a hearing. On March 31, 1977, the Commission issued a notice of hearing. 42 Fed. Reg. 18459 (April 7, 1977). The Commission's Administrative Law Judge was designated to conduct the hearing. Review authority was delegated to an Appeal Board.

¹42 U.S.C. 2282.

On October 13, 1977, the Administrative Law Judge entered an order in which he, *inter alia*, (1) affirmed the Director's imposition of civil penalties upon the licensee "in the total amount of \$2,000 for violations identified in the Director's Order imposing the penalties"; but (2) granted the licensee's request "for opportunity for hearing to present facts in support of its further request in mitigation of the amount of said penalties." ALJ-77-1, 6 NRC 693, 700. The order indicated that a date for a hearing on mitigation would be later established.

The licensee seeks to appeal under 10 CFR 2.762. The appeal must be dismissed as premature. In view of the fact that the amount of the penalties has not as yet been finally determined, the proceeding remains in an interlocutory posture. Thus, an appeal at this time is plainly foreclosed by the provision in 10 CFR 2.730(f) to the effect that "[n]o interlocutory appeal may be taken to the Commission from a ruling of the presiding officer." Section 2.730(f) is a rule of general applicability, governing in civil penalty proceedings to the same extent as it does in licensing proceedings. 10 CFR 2.700. And it is equally clear that the term "Commission" as used therein embraces an appeal board to which the Commission has delegated its appellate review authority. 10 CFR 2.4(e); *Puerto Rico Water Resources Authority* (North Coast Nuclear Plant, Unit 1), ALAB-313, 3 NRC 94, 96 (1976).

The licensee maintains that review now of the order below would promote "judicial efficiency for the reason that reversal of the [order] would be dispositive of the entire case." Additionally, it is asserted that "novel questions of law of general public interest are presented." Considerations of that nature do not, of course, defeat the applicability of Section 2.730(f). Nor, in the absence of truly exceptional circumstances, would they warrant the exercise of appeal board discretion under 10 CFR 2.718(i) to bring up an interlocutory ruling for immediate review by way of directed certification. See *Public Service Company of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-271, 1 NRC 478 (1975). Here, no such circumstances are either asserted or apparent. There is no cause to believe that the additional hearing on mitigation will involve a large expenditure of time or resources. Nor does it appear that the questions presented to and decided by the Administrative Law Judge are such that the public interest demands their definitive resolution without further delay. To the contrary, it seems quite clear that the more appropriate course is to consider those questions in the context of the ultimate determination on the amount of the penalty.²

²In *Virginia Electric and Power Co.* (North Anna Power Station, Units 1 and 2), ALAB-324, 3 NRC 347 (1976), *affirmed in part and reversed in part*, CLI-76-22, 4 NRC 480 (1976), the Licensing Board first determined the question of the Licensee's liability for civil penalties and

(Continued on next page)

Appeal *dismissed* as premature.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL PANEL CHAIRMAN

Margaret E. Du Flo
Secretary to the Appeal Panel

This action was taken by the Appeal Panel Chairman under the authority of 10 CFR 2.787(b).

(Continued from previous page)

then, following a second hearing, established the amount of the penalties. See LBP-75-54, 2 NRC 498, 503. The appeals from the Board's rulings on both scores were not prosecuted until after final action had been taken below. This enabled the reviewing authority to consider at one time both the question of liability and the appropriateness of the penalties assessed and, with respect to one found violation, the amount of the penalty was reduced by 50%. See ALAB-324, *supra*, 3 NRC at 390. In the present case, were the Administrative Law Judge's determination of liability to be reviewed now and affirmed, we might well be later confronted with a second appeal addressed to the quantum of the penalties finally assessed. Such bifurcated appellate consideration of the issues in the proceeding would scarcely serve the ends of "judicial efficiency."

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Alan S. Rosenthal, Chairman
Dr. John H. Buck
Michael C. Farrar

In the Matter of

Docket Nos. 50-443
50-444

PUBLIC SERVICE COMPANY OF
NEW HAMPSHIRE, et al.

(Seabrook Station, Units 1 and 2)

November 2, 1977

Upon consideration of memoranda submitted pursuant to an unpublished order of August 19, 1977, the Appeal Board terminates its jurisdiction over steam generator tube integrity issues which it had retained in Part IX of ALAB-422, 6 NRC 33 (1977), pending the outcome of then-ongoing examination on those issues in *Northern States Power Co.* (Prairie Island Nuclear Generating Plant, Units 1 and 2), ALAB-427, 6 NRC 212 (1977), supplementing ALAB-343, 4 NRC 169 (1976).

TECHNICAL ISSUES DISCUSSED: Steam generator tube integrity.

Messrs. John A. Ritsher, Thomas G. Dignan, Jr., and R.K. Gad III, Boston, Massachusetts, for the applicants Public Service Company of New Hampshire, *et al.*

Ms. Marcia E. Mulkey for the Nuclear Regulatory Commission staff.

MEMORANDUM AND ORDER

In Part IX of ALAB-422, 6 NRC 33, 104-05 (1977), we raised *sua sponte* the issue of the steam generator tube integrity. We there announced that jurisdiction over that issue would be retained pending the outcome of our then-ongoing examination of the same issue in another proceeding likewise involving a pressurized water reactor facility with steam generators of

Westinghouse manufacture and design.¹ On August 15, 1977, we issued a memorandum in that proceeding which supplemented a prior decision on the steam generator tube integrity matter. *Northern States Power Co.* (Prairie Island Nuclear Generating Plant, Units 1 and 2), ALAB-427, 6 NRC 212, supplementing ALAB-343, 4 NRC 169 (1976). ALAB-427 dealt explicitly with the so-called "denting" phenomenon which, as noted in ALAB-422, has been encountered in varying degrees in several pressurized water reactor facilities and which affects tube integrity. Discussed therein were, *inter alia*, the apparent causes of denting and some of the design and construction features which might serve to reduce the likelihood of the occurrence of this phenomenon.

Thereafter, on August 19, we entered a further (unpublished) order in the instant proceeding in which we called upon the applicants to apprise us of the present status of their decisions and actions on the various aspects of steam generator design and construction which we had determined in the two *Prairie Island* decisions to have a possible bearing upon the various problems associated with maintaining tube integrity. In this connection, we noted that, although the Seabrook facility presumably would employ from the inception of its operation the all-volatile (AVT) method for chemically treating the water in the secondary system, the existing record shed no light upon such matters as (1) the nature of the materials in, and flow characteristics of, the secondary system; (2) the precise design of the tube support plates and other essential features of the steam generators; (3) the condenser design features aimed at a reduction of condenser leakage; and (4) whether condensate demineralizers are contemplated.

We now have in hand both the applicants' memorandum submitted in compliance with our order and the responsive memorandum of the NRC staff. Although invited to do so, none of the other parties to the proceeding likewise elected to file a response.

Appended to the applicants' memorandum was the affidavit of their project manager for the Seabrook facility, John D. Haseltine. Rather than endeavor to summarize its content, we are setting forth the full text of the affidavit (together with the attachments to it) as an appendix to this opinion. It suffices here to note that we have analyzed the proposed steam generator and condenser design modifications within the framework of the general conclusions reached in ALAB-343 and ALAB-427 pertaining to the causative mechanisms of tube corrosion and denting. On the basis of that analysis, we are satisfied both (1) that the applicants are taking positive measures to deal with the problem of maintaining steam generator tube in-

¹Although the Commission has elected to review certain portions of ALAB-422, Part IX is not among them.

tegrity; and (2) that these measures are appropriate ones given the present understanding of the nature and root of the problem.

A few additional observations are warranted. Understandably, the subject at hand remains under intensive study by the vendors and, presumably, by the NRC staff as well. It is reasonable to suppose that the fruits of this continuing exploration will be additional enlightenment regarding the causes of corrosion and denting, and the steps that can be taken to obviate those threats to tube integrity. In its responsive memorandum, the staff advised us that, although it agreed that the design modifications proposed for the Seabrook facility "are likely to improve the integrity of the steam generator systems," nonetheless it would conduct a "[f]urther assessment of the detailed design . . . as part of its *final safety review prior to issuance of any [Seabrook] operating license.*"² Needless to say, however, once steam generators have been manufactured and installed, significant alterations are difficult to perform and, in all events, involve a very substantial expense. Thus, there is every reason why the staff should keep a close eye on evolving developments in the ongoing research program and to give effect to any important disclosures at the earliest possible date. This is so with regard to not only Seabrook but, as well, all of the other pressurized water reactors in possession of construction permits.

In accordance with the foregoing, the jurisdiction retained in Part IX of ALAB-422 over the steam generator tube issue is hereby *terminated*.³

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD

Margaret E. Du Flo
Secretary to the Appeal Board

²Emphasis supplied.

³This Board retains before it the exceptions which were filed by the New England Coalition on Nuclear Pollution (Coalition) and the Commonwealth of Massachusetts to the supplemental initial decision rendered by the Licensing Board on July 7, 1977, LBP-77-43, 6 NRC 134. That decision was addressed to the question whether there are alternate sites in southern New England which are clearly superior to the Seabrook site employing a once-through cooling system, a question which the Commission had instructed the Licensing Board to consider. See CLI-77-8, 5 NRC 503, 536-41 (1977). By unpublished order of July 27, 1977, we granted the joint motion of the Coalition and Massachusetts to defer the briefing of their exceptions pending the still awaited decision below on a yet additional matter: the comparison between the Seabrook site with closed-cycle cooling and alternate sites located in both southern and northern New England. This inquiry had been directed in ALAB-366, 5 NRC 39, 73 (1977), *affirmed with modifications*, CLI-77-8, *supra*.

(Continued on next page)

APPENDIX

AFFIDAVIT OF JOHN D. HASELTINE

JOHN D. HASELTINE, being on oath, deposes and says as follows:

1. I am the Project Manager of the Seabrook Project for Yankee Atomic Electric Company. My professional qualifications appear in the record of this proceeding in various places. *E.g.* App. Direct No. 22, *post Tr.* 10546 at 5-7.

Steam Generator Design

2. Seabrook's steam generators are being modified to incorporate improved design features to mitigate the steam generator tube denting and corrosion problems experienced at many PWR's during the last several years. The modified steam generators for Seabrook will essentially be Westinghouse's Model F. The major differences between Model F and the former Westinghouse Model D4 are that the Model F has a feedring rather than a preheater, heat treated Inconel 600 tubes and a markedly different tube support plate design. The Model F design is incorporated into the application for the Sun Desert Station by San Diego Gas and Electric.

3. The Model F, as shown in the attached Figure 1, consists of two integral sections: an evaporator section and a steam drum section. The evaporator section consists of a U-tube heat exchanger while the steam drum section houses moisture-separating equipment. The steam drum section is located in the upper part of the steam generator.

4. High pressure and temperature reactor coolant flows into the channel head, through the Inconel U-tubes, and back to the channel head. A partition plate divides the channel head into inlet and outlet sections. The U-tubes are welded to the tube plate to ensure zero leakage across the tube to tube sheet joint. The tubes are supported at intervals by horizontal support plates.

(Continued from previous page)

It is true that, in his June 17, 1977, decision, the Administrator of the Environmental Protection Agency explicitly approved the use of a once-through cooling system at the Seabrook site. See ALAB-423, 6 NRC 115, 116 (1977). But that decision is now under attack in the Court of Appeals for the First Circuit and may possibly be overturned. For this reason, our unpublished memorandum and order of July 15, 1977, called upon the Licensing Board to "render its findings and conclusions pertaining to [the closed-cycle cooling] comparison at as early a date as is practicable." The extended absence due to illness of one of its members undoubtedly impeded the completion of the Board's task in this regard. There would appear to be no present obstacle, however, to a prompt decision and the Board should give its issuance the highest priority.

5. Feedwater enters the steam generator through a nozzle located on the upper shell and is distributed by a feeding into the "downcomer" annulus formed by the tube wrapper and steam generator shell. The feedwater mixes with the recirculation flow and enters the tube bundle near the tube sheet. Boiling occurs as the flow rises in the tube bundle.

6. A set of centrifugal moisture-separators, located above the tube bundle, removes most of the entrained water from the steam. Steam dryers are then employed to increase the steam quality to a minimum of 99.75 percent (0.25 percent moisture). The steam outlet nozzle contains an integral steam flow restrictor to limit steam flow in the event of a main steam line break.

7. All pressure boundaries, with the exception of the Inconel tubes, are made of carbon or low alloy steel. All surfaces in contact with reactor coolant are made of, or clad with, stainless steel or Inconel.

8. Based on the record to date, it would probably be most informative to compare the specific design features of the Seabrook Model F steam generators with the Prairie Island Model 51 steam generators. A summary of the important design parameters of each type is presented in Table 1. The following is a more detailed explanation of specific parameters.

- a. **Tube support plate**—The Model F has seven tube support plates. Each plate contains quatrefoil holes, Figure 2, for tube supports. The quatrefoil design permits the secondary water-steam mixture to flow along the tube surface through an increased flow area, thereby increasing total flow and permitting higher circulation ratios. In contrast, the Model 51 steam generators use drilled holes, Figure 3, which have a very limited opening or interface between the tube and tube support plate. The majority of flow in the Model 51 is through the circulation holes and very little flows through the interface. Tube denting has occurred in some steam generators when corrosion products have built up in the interface area to an extent that it closes the gap between the tube and tube support plate causing the tube support plate to crimp or dent the tube. The quatrefoil support plate has no circulation holes and all the flow is directed into the interface. This flow pattern results in a continuous flushing and scouring action in the interface region which should prevent any buildup of corrosion products. The quatrefoil tube support plate is made of ferritic stainless steel (type 405) while the drilled support plates are carbon steel. Extensive testing under various steam generator environments has shown that ferritic stainless steel has significantly better corrosion performance than carbon steel. Thus, by changing the support plate to a quatrefoil design and by changing material to a ferritic stainless steel, the Seabrook steam generators should provide a greater

margin against the corrosion and denting problems being experienced with present-day steam generators.

- b. **Tubing**—The Model F and Model 51 steam generators have Inconel 600 tubes. However, the Model F utilizes a process of thermally treating the Inconel at intermediate temperatures which was not available when the Prairie Island steam generators were manufactured. The process has substantially improved the corrosion and stress properties of the Inconel. The new heat treating process along with an improved steam generator tube manufacturing and assembly operations has also resulted in reducing the residual stresses in the tubes. With the combined improvement in corrosion performance and reduced residual stress, the tubes should provide a significant margin in resistance to stress corrosion cracking during operation.
- c. **Flow distribution**—The Model F steam generator has incorporated into its design the improvements developed through experience at other Westinghouse operating steam generators. The feedwater distribution ring preferentially distributes flow to the hot leg portion of the tube bundle. Circulation ratios have been maximized by omitting the downcomer flow resistance plates (between shell and wrapper). The tube lane above the tube sheet has been blocked at the periphery forcing the recirculation flow to pass through the tube bundle. The flow has been redistributed above the tube sheet reducing the sludge accumulation (low velocity) regions. The blow-down pipe has been strategically placed and ported to draw flow preferentially from the sludge accumulation regions. The flow slots in the tube support plate at the top of the bundle have been eliminated in the Model F design.
- d. **Mechanical**—As an aid in secondary side access for inspection and maintenance, additional 6-inch access handholes located at 90-degree intervals around the shell at the top of the tube sheet have been incorporated into the Model F design.

Condenser Design

9. The Seabrook condensers are two-pass, single-pressure, horizontal designs consisting of three shells per unit and are manufactured by Foster Wheeler. The important design features associated with condenser integrity are tube material selection, tube quality control testing and tube installation. For Seabrook a number of materials were investigated; among them were Admiralty, 90/10 Copper/Nickel, 70/30 Copper/Nickel, Aluminum Bronze and Titanium. The investigation considered the tube failure rates in operating saltwater power plants, the costs and the corrosion and erosion

properties of each type of material. The results showed that Titanium had far greater corrosion and erosion properties than the other materials and while there is only limited actual experience with Titanium condensers, those installations that were tubed with Titanium and those installations that were retubed with Titanium after significant failures with other tube materials have shown a very favorable tube failure rate. Titanium has an evaluated economic penalty of 25 percent over the next best evaluated material 90/10 Copper/Nickel. However, this apparent first cost penalty must be weighed against the shutdown costs associated with plugging tubes. Because of the significant costs associated with unscheduled shutdowns or load reductions at Seabrook, the costs are easily compensated for, even if the failure rates of Titanium are only slightly less than Copper Nickel. If the failure rate turns out to be significantly less as we believe it will, then the economic penalty would disappear and Titanium would become superior to other materials even on economic grounds. Therefore, the tube material selected was Titanium, Ti-50A, conforming to the requirements of ASTM B-338-73 Grade 2.

10. After selecting the tube material, a rigorous testing program was imposed on the manufacturer. The testing consists of the following:

- a. Eddy current testing performed in accordance with ASTM E-426 on 100 percent of the tubes. The acceptance criteria is based upon a notch of less than 0.004 inch or 12-1/2 percent of wall depth whichever is greater.
- b. Ultrasonic testing performed in accordance with ASTM E-213 on 10 percent of the tubes in each lot. The acceptance criteria is based upon a longitudinal notch of less than 10 percent of the nominal tube wall thickness. If one or more of the tubes is rejected, the remaining tubes in that lot will be tested.
- c. Pneumatic testing with 100 psi internal air pressure of all tubes under water. The acceptance criteria is no visible leakage.

11. In addition to the tube testing done by the tube manufacturer, Foster Wheeler performed a number of tube to tube sheet pull tests. The results showed that an improvement (approximately 44 percent) in the tube to tube sheet joint could be realized by grooving the tube sheet. The calculated pull load imposed on the tube to tube sheet joint is 1,200 lbs. and the testing has shown an actual pull load of 3,460 lbs. for a grooved tube sheet. Thus, there is considerable margin built into the tube to tube sheet joint.

Secondary System Materials

12. The condenser and steam generator materials are described under

their detailed descriptions. The remaining secondary materials are as follows:

Feedwater Heaters Material	304SS
Moisture Separator Material	90/10 Cu/Ni
Piping, Valves, Pumps Material	Carbon steel

Plant Operation

13. It is Yankee Atomic Electric Company's philosophy that how a plant is operated is equally as important to steam generator integrity as the design features incorporated into its components. Seabrook Station will be operated using the same philosophy as Yankee Atomic has used at Maine Yankee. The philosophy basically involves using all-volatile chemical treatment of the secondary side and detecting and repairing condenser leaks as soon as possible. At Maine Yankee, leaks of 0.001 gpm can be detected and leaks of 0.01 gpm can be located and plugged. Seabrook Station will be designed to detect leaks of the same order of magnitude and will be able to maintain approximately 90 percent power while plugging tubes if the leakage is in a single shell.

Condensate Demineralizers

14. Because Seabrook's condenser will employ Titanium tubes which have excellent corrosion and erosion properties in seawater and the Model F steam generators which have been specifically designed to mitigate the tube denting, corrosion and stress corrosion cracking problems and because of the operating philosophy of detecting and plugging condenser leaks as soon as possible, we do not believe the installation of condensate demineralizers is necessary and it is not contemplated.

John D. Haseltine

COMMONWEALTH OF MASSACHUSETTS

Suffolk, ss

September 13, 1977

Then appeared before me the above subscribed John D. Haseltine and

made oath that he was the author of the foregoing affidavit and that the statements set forth therein are true to the best of his knowledge.

KAREN D. RAMACORTI, Notary Public
My commission expires Dec. 12, 1980

TABLE 1**Steam Generator Design Parameters**

	Prairie Island Model 51	Seabrook Model F
Tube Support Plates		
Material	Carbon Steel (ASTM A285 GrC)	405SS
Design Number	Drilled 7	Quatrefoil 7
Tubing		
Material	Inconel (ASME SB 163)	Inconel (ASME SB 163)
Thermal Treat Number	No-mill annealed 3388	Yes 5646
Separators		
Perforated Plates	Yes	Yes
Swirl Vanes	3-56 in. dia.	16-20 in. dia.
Length (in.)	812	812
Weight (tons)	330	354
Lower shell diameter (in.)	135	135
Upper shell diameter (in.)	176	176
Tube bundle Height (in.)	416	342
Access Handholes	2-6 in.	6-6 in.
Circulation Ratio	4.5 to 5	4 to 4.5

WESTINGHOUSE MODEL F STEAM GENERATOR

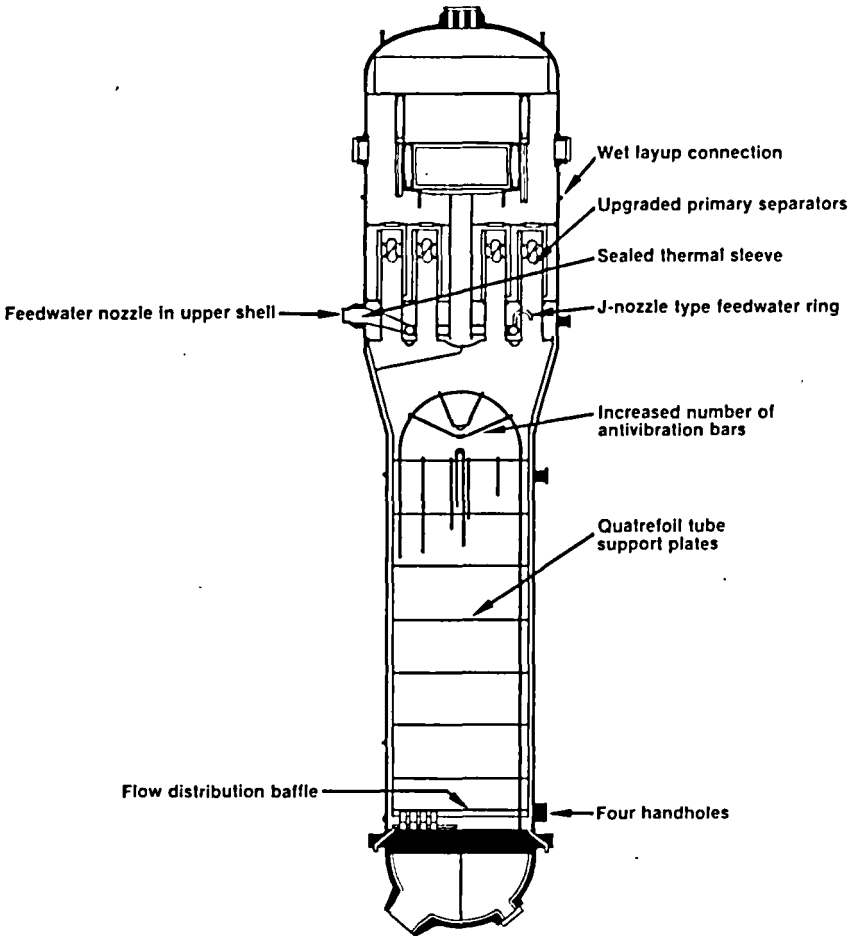


Figure 1

QUATREFOIL TUBE SUPPORT DESIGN

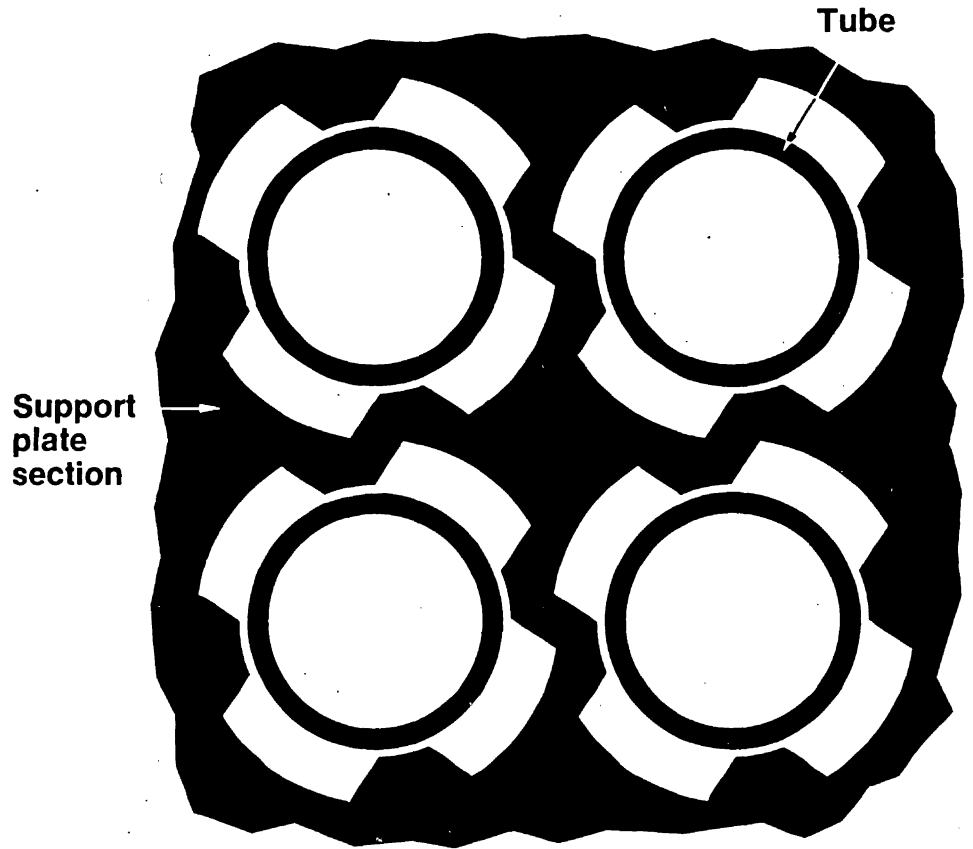


Figure 2

DRILLED TUBE SUPPORT DESIGN

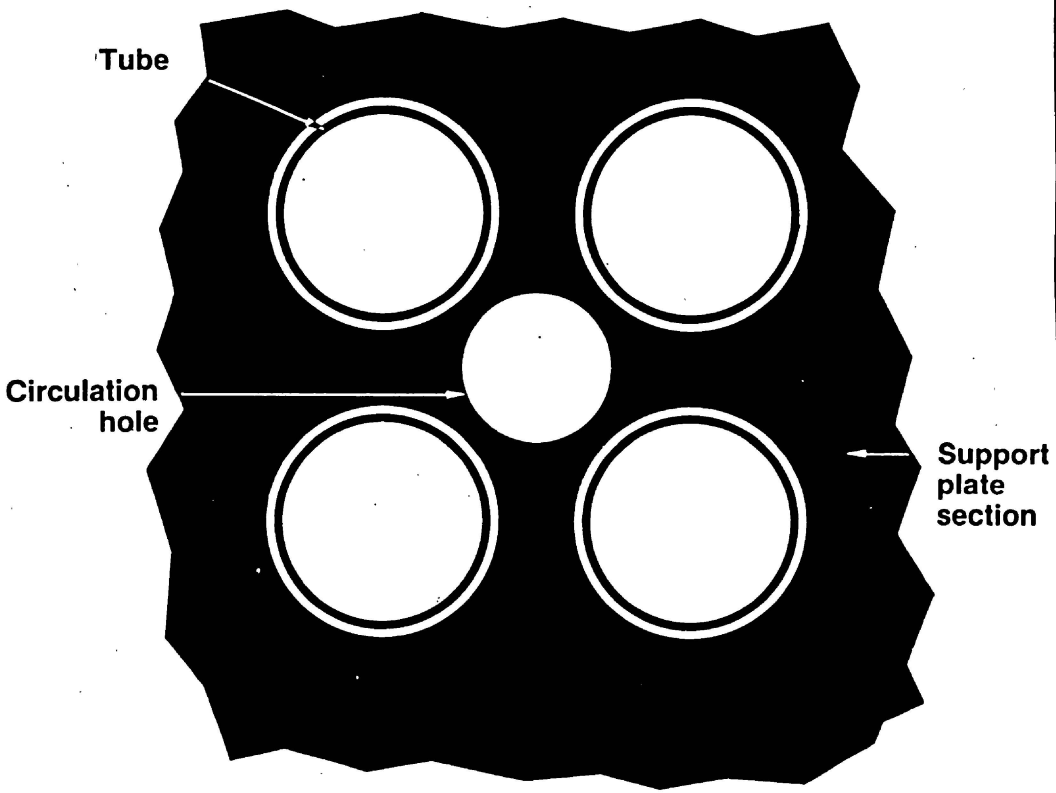


Figure 3

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Jerome E. Sharfman, Chairman
Richard S. Salzman
Dr. W. Reed Johnson

In the Matter of

Docket Nos. 50-440
50-441

**CLEVELAND ELECTRIC ILLUMINATING
COMPANY, et al.**

(Perry Nuclear Power Plant,
Units 1 and 2)

November 8, 1977

Upon appeal by intervenor from LBP-75-73, 2 NRC 946 (1975), the Appeal Board affirms the Licensing Board's decision not to reopen the record on need for power and reverses the grant of summary disposition on the geologic anomalies issue. Exercising its trial authority, the Appeal Board allows movants (the applicants and staff) ten days to renew their motion for summary disposition with a like time for intervenor to file opposing papers. *Upon sua sponte review of other outstanding Licensing Board decisions, the Appeal Board affirms.*

RULES OF PRACTICE: BRIEFS

Failure to brief exceptions waives them.

**CONSTRUCTION PERMIT PROCEEDING: EFFECT OF
CONCURRENT STATE PROCEEDING**

Whether a state regulatory agency's consent is required before construction on a power plant can begin is a question of state law. It would produce little more than untoward delay for each regulatory agency to stay its approval because another agency might withhold necessary approval.

CONSTRUCTION PERMIT PROCEEDING: EFFECT OF CONCURRENT STATE PROCEEDING

There is no occasion to suspend construction on the strength of nothing more than a potentiality of action adverse to the facility by another agency.

LICENSING BOARD: REOPENING OF PROCEEDINGS

A licensing board need not reopen a hearing record on "need for power" as a result of data demonstrating only short-term changes.

RULES OF PRACTICE: TELEPHONE CONFERENCE CALLS

It is not improper for a licensing board to institute a conference call with the parties to ascertain whether circumstances warrant a reopening of the record.

LICENSING BOARD: REOPENING OF PROCEEDINGS

A licensing board may reopen a hearing record based on information in a document not yet introduced into evidence.

LICENSING BOARD: REOPENING OF PROCEEDINGS

The role of the licensing board in a hearing is more than that of an umpire for adversaries appearing before it. A board has discretion to reopen the record for additional evidence if it believes circumstances warrant it.

RULES OF PRACTICE: SUMMARY DISPOSITION

Where the proponent fails to prove the absence of a genuine issue of material fact, summary disposition must be denied even if no opposing evidence is presented.

RULES OF PRACTICE: SUMMARY DISPOSITION

The proponent of a motion for summary disposition bears the burden of proving the absence of a genuine issue of any material fact. 10 CFR §§2.732, 2.749.

RULES OF PRACTICE: SUMMARY DISPOSITION

The same considerations govern the treatment of motions for summary

disposition under the Commission's Rules of Practice and Rule 56(e) of the Federal Rules of Civil Procedure.

RULES OF PRACTICE: SUMMARY DISPOSITION

Affidavits in support of motions for summary disposition shall show that the affiant is competent to testify to the matters stated therein. 10 CFR §2.749(b).

APPEAL BOARD: SCOPE OF REVIEW

The Appeal Board does not review Licensing Board decisions for procedural errors *sua sponte*.

Messrs. Gerald Charnoff, Jay E. Silberg and Ernest L. Blake, Jr., Washington, D.C., for Duquesne Light Company, Ohio Edison Company, Pennsylvania Power Company, Cleveland Electric Illuminating Company and Toledo Edison Company, applicants.

Ms. Evelyn Stebbins, Rocky River, Ohio, for the Coalition for Safe Electric Power, intervenor.

Messrs. William D. Paton and Richard K. Hoefling for the Nuclear Regulatory Commission staff.

DECISION

The Licensing Board has issued a series of seven decisions in this case, over a period of two years and seven months, leading to the issuance of construction permits.¹ In ALAB-294,² we dismissed the exceptions of a nonparty to the Licensing Board's September 9, 1975, partial initial decision but requested briefs from the applicant and staff as to the validity of the September 9th order. In an unpublished order dated November 6, 1975, we reversed that part of the September 9th order authorizing the issuance of a limited work authorization ("LWA-2")³ and remanded the case to the

¹Those decisions are LBP-74-69, 8 AEC 538 (September 18, 1974); LBP-74-76, 8 AEC 701 (October 20, 1974); LBP-75-53, 2 NRC 478 (September 9, 1975); LBP-75-73, 2 NRC 946 (December 31, 1975); LBP-76-17, 3 NRC 621 (May 10, 1976); LBP-76-33, 4 NRC 339 (September 10, 1976); LBP-77-29, 5 NRC 1121 (April 29, 1977).

²2 NRC 663 (October 17, 1975).

³"Under the Commission's rules, an electric utility company may seek approval to perform certain kinds of work on a proposed nuclear power plant before final action is taken on the company's application for a construction permit. Such approval can be obtained only after the

(Continued on next page)

Licensing Board for further proceedings. The reasons for this decision were explained in ALAB-298.⁴ The Coalition for Safe Electric Power ("intervenor") filed exceptions to three of the decisions below—those of December 31, 1975 (issued on remand from ALAB-298),⁵ May 10, 1976,⁶ and April 29, 1977.⁷ No brief was filed in support of the last two sets of exceptions and they are therefore waived.⁸ No party other than intervenor filed exceptions to any of the decisions.

This Board's review *sua sponte* of most of the earlier unappealed decisions was deferred pending a final decision on the construction permit. That decision has now been rendered. We thus have before us an appeal from the December 31, 1975, partial initial decision and will undertake our customary review on our own motion of the remaining unreviewed decisions.

I. THE APPEAL

The Decision Below

As we explained in ALAB-298, *supra*, we reversed the September 9, 1975, partial initial decision because the Licensing Board had authorized the issuance of an LWA-2 in the face of an unresolved safety problem contrary to a Commission regulation. The unresolved issue was whether anomalous features discovered in the bedrock underlying the site made it unsuitable for the plant. We remanded the issue to the Licensing Board for resolution along with a staff motion to supplement the record with its just-completed

(Continued from previous page)

Licensing Board makes certain key findings; the staff then may issue a 'limited work authorization.' In this connection, if the proposed work includes installing the foundations for important structures, the Licensing Board has to determine for itself that there do not exist any 'unresolved safety issues' relating to that work which would 'constitute good cause for withholding authorization' to perform it." ALAB-298, 2 NRC 730, 731 (1975); see 10 CFR §50.10(e).

⁴2 NRC 730 (November 19, 1975).

⁵2 NRC 946, *supra*.

⁶3 NRC 621, *supra*.

⁷5 NRC 1121, *supra*.

⁸See *Tennessee Valley Authority* (Hartsville Nuclear Plant, Units 1A, 2A, 1B and 2B), ALAB-409, 5 NRC 1391, 1397 (1977) and ALAB-367, 5 NRC 92, 104 n. 59 (1977); *Duke Power Co.* (Catawba Nuclear Station, Units 1 and 2), ALAB-355, 4 NRC 397, 413-14 (1976); *Union Electric Co.* (Callaway Plant, Units 1 and 2), ALAB-347, 4 NRC 216, 223 n. 15 (1976); *Commonwealth Edison Co.* (Zion Station, Units 1 and 2), ALAB-226, 8 AEC 381, 382-83 (1974); *Northern Indiana Public Service Co.* (Bailly Generating Station, Nuclear-1), ALAB-207, 7 AEC 957 (1974); *Long Island Lighting Co.* (Shoreham Nuclear Power Station), ALAB-156, 6 AEC 831, 832-33 (1973).

study of the geologic anomalies—Supplement No. 3 to the Safety Evaluation Report (“SER Supp. 3”). The motion was supported by affidavits from those who prepared the Supplement showing their qualifications and representing that the statements in the Supplement were true to the best of their knowledge. Our November 6, 1975, order directed the parties to respond before the Licensing Board to the staff’s motion and to include in their responses “all substantive objections to the conclusions recited in the staff’s papers regarding the bedrock anomalies reported at the reactor site and appropriate affidavits or other evidence to support those objections”

On November 17, 1975, intervenor, previously silent on the geologic anomalies issue, objected to the staff’s motion to supplement the record and filed a countermotion to reopen the hearing. In essence, it listed four reasons for denying the staff’s motion and for granting its own:

1. Need for the Advisory Committee on Reactor Safeguards to review the geologic anomalies.
2. Need for a hearing on the geologic anomalies issue.
3. New evidence of insufficient need for power to warrant building the plant.
4. Need for “consent and approval” by the Public Utilities Commission of Ohio (“PUCO”) before beginning construction.

Accompanying the objection and countermotion was an amended petition for leave to intervene. In that amended petition, intervenor contended that the site was not suitable for a nuclear power plant because (1) construction of the plant without approval of the PUCO would violate an Ohio statute and (2) there is a fault on the south wall of the auxiliary building excavation which “should have additional investigation.” The amended petition did include a paragraph explaining intervenor’s conception of the fault and of the further geologic examination it believed warranted. Intervenor submitted neither affidavits nor other evidentiary material in support of its opposition to the staff’s motion or its amended petition to intervene. The petition was, however, verified by intervenor’s chairman on the basis of her visit to the site accompanied by a geologist and intervenor countermoved that the record be reopened for the reasons stated in its amended petition.

The applicants and staff responded to intervenor’s papers by requesting summary disposition in favor of the applicants on the geologic anomalies issue. On December 11, 1975, the Licensing Board arranged a conference call among counsel for all parties. One of the Board members “questioned whether the Board could utilize the Staff’s conclusions contained in SER

⁹A correction submitted on December 17, 1975, located the fault on the south wall of the off-gas building excavation.

Supplement No. 3 where some of the material (specifically the September 19 submittal by Applicants) on which it was based was not in evidence.”¹⁰ The reference was to a report by Gilbert Associates, Inc. (the architect-engineer for the Perry plant)¹¹ entitled “Geologic Investigation of a Portion of the PNPP Foundation,” together with its three appendices (actually three related reports).¹² Two of the Board members further “stated that the Board did not believe that the record before them—as set forth in Supplement 3 to the SER—was sufficient to serve as the basis for summary disposition, and that the underlying analysis on which Staff conclusions were based was required.”¹³ Again the reference was to the Gilbert report.

The Gilbert Report had been submitted to the staff by letter dated September 19, 1975, from Dalwyn R. Davidson, Cleveland Electric Illuminating Company’s (CEI’s) Vice President-Engineering, and copies of both the letter and the report had been sent simultaneously to the Licensing Board members and all other parties.¹⁴ Attached to the letter was an attestation by Mr. Davidson that “the statements set forth in the report are true and correct to the best of his knowledge, information and belief.” Nevertheless, “in response to the concerns expressed by” the Licensing Board in the December 11th conference call, applicants, that very same day, moved that the record be supplemented by receiving the Davidson letter and the Gilbert report into evidence.¹⁵ Intervenor objected to the filing of the Gilbert Report on the ground that the affidavit accompanying it did not comply with the Commission’s rule concerning summary disposition.¹⁶ The Licensing Board, in its December 31, 1975, decision, granted the motions of both the staff and the applicants to supplement the record over intervenor’s objections.¹⁷

No hearing was held on the geologic anomalies issue. In its December 31, 1975, decision, the Licensing Board resolved the matter by summary disposition on the ground that intervenor had not shown that a genuine issue of material fact existed on this subject.¹⁸ Relying on both the Gilbert Report and SER Supp. 3, the Board found:

¹⁰Letter of December 12, 1975, from Auburn L. Mitchell, Esq., counsel for the staff, to the Licensing Board, setting forth the staff’s recollection of what was said in the conference call, at p. 1.

¹¹Preliminary Safety Analysis Report, §1.4.2.

¹²See 2 NRC at 952-53. The report and appendices will be referred to hereinafter as “the Gilbert Report.”

¹³Letter of December 12, 1975, *supra*, n. 10, p. 2.

¹⁴Applicants’ Motion to Supplement Record of December 11, 1975, p. 2.

¹⁵*Ibid.*

¹⁶Intervenor, Coalition for Safe Electric Power Objection to Granting of Motion of Applicant to Supplement the Record, dated December 19, 1975.

¹⁷2 NRC at 953.

¹⁸*Id.* at 953.

1. That the faulting of the shale at the site is the result of glacial activity, is neither a product of, nor likely to cause earthquakes, and "cannot be considered a hazard to construction."
2. That there is therefore no basis for altering the plant's seismic design.
3. "That the geological anomalies do not constitute a hinderance to the normal and to the safety-related functions of the proposed dewatering system."
4. That the foundation materials underlying the plant structures will be adequate.
5. That the site is suitable for the plant.¹⁹

The Board found no evidence to support the existence of the fault alluded to by intervenor nor any basis "for believing that, if it does exist, the fault is of any greater significance than those analyzed in the Gilbert Report."²⁰

The Licensing Board further found that the new information provided by intervenors on the need for power "provides no basis for either reopening the record or overturning the previous findings of the Board regarding this issue."²¹ It also held that the Ohio statute cited by intervenor does not require construction of a power plant to be approved by the PUCO.²² For all these reasons, the Board denied intervenor's motion to amend its intervention petition and reinstated the authorization for issuance of an LWA-2.

We have before us now intervenor's exceptions to this decision.

A. The Alleged Violation of Ohio Law

Intervenor complains that applicants violated Section 4905.48 of the Ohio Revised Code by not obtaining prior approval of the PUCO before signing contracts for construction of the Perry plant and other plants. The Licensing Board ruled that this was not a violation because the Ohio statute "applies only to the operation of a generating plant or a transmission line."²³ This matter was appropriately presented by intervenor before the PUCO.²⁴ The PUCO held, on April 13, 1976, that the statute did not re-

¹⁹2 NRC at 963-65.

²⁰2 NRC at 965.

²¹*Id.* at 968.

²²*Id.* at 954.

²³2 NRC at 954.

²⁴Intervenor filed motions with us on March 19, May 24 and June 8, 1976, for permission to file with us some of the papers which it filed with the PUCO on this matter. Those motions are *granted*.

quire its approval of these contracts and dismissed intervenor's complaint.²⁵ Although intervenor moved for rehearing,²⁶ it appears that the PUCO denied that motion by order of June 9, 1976.²⁷ On March 9, 1977, the Supreme Court of Ohio reversed the PUCO's decision on the ground that intervenor had raised genuine issues of material fact which could not be resolved because the disputed agreements between the utilities were not in the record and remanded the case to the PUCO "for a hearing on the merits."^{27a}

As we said in *San Onofre*:^{27b}

We are mindful that . . . regulatory jurisdiction over at least some aspects of nuclear power projects is exercised by a number of Federal and state agencies. And we can readily agree that it would be productive of little more than untoward delay were each regulatory agency to stay its hand simply because of the contingency that one of the others might eventually choose to withhold a necessary permit or approval.

These principals are controlling here. Whether the PUCO's consent was required before the construction contracts could be entered into or carried out, and whether, if required, it should be given are questions of Ohio law for decision by the PUCO, subject to review by the Ohio courts. If the Ohio authorities want construction of the plant stopped pending the PUCO's decision on the merits of intervenor's complaint, that is their prerogative. Our job is to decide the Federal issues before us. We see no occasion to suspend construction "on the strength of nothing more than a potentiality of action adverse to the facility being taken by another agency." *Southern California Edison Co.* (San Onofre Nuclear Generating Station, Units 2 and 3), ALAB-189, 7 AEC 410, 412 (1974).

B. The Motion to Reopen on Need for Power

Intervenor alleges that it was error for the Licensing Board to deny the request made in intervenor's amended petition to reopen the record on the

²⁵On May 4, 1976, applicants moved for leave to file this order with us. That motion is granted.

²⁶See the papers attached to intervenor's motions filed with us on May 24 and June 8, 1976.

²⁷Applicants' counsel informed us of this in the footnote on page 4 of its response dated June 15, 1976, in opposition to intervenor's June 8, 1976, motion.

^{27a}The court's opinion is attached to intervenor's motion of March 16, 1977, asking the Licensing Board to reconsider its ruling of December 31, 1975, on the Ohio law issue. That motion was denied in an unpublished order dated April 29, 1977.

^{27b}*Southern California Edison Co.* (San Onofre Nuclear Generating Station, Units 2 and 3), ALAB-171, 7 AEC 37, 39 (1974).

issue of need for power. The Licensing Board had first ruled on this issue in its partial initial decision of September 18, 1974.²⁸ It there found that the evidence showed a need for the electricity to be produced by the plant. In connection with the hearing on applicant's motion of September 23, 1974, to reopen the record on certain site suitability matters, the Licensing Board permitted intervenor to submit new evidence that the plant's electricity would not be needed.²⁹ In its decision of October 20, 1974,³⁰ the Board evaluated this evidence as follows:

The exhibits relevant to this issue consist of data showing decreases in sales and consumption both below those of the previous year, and below the levels forecast and changes in construction of other new electric generating facilities by Applicants. None of these data materially contradicts or changes the findings of the Board on the need for power in the Initial Decision. In fact, the delays of certain other new generating facilities set forth in the exhibits translate into a significant reduction of reserve capacity compared with that considered by the Board at the time it rendered its Initial Decision. The Board thus finds that the need for the PNPP on the Applicants' proposed schedule, as concluded in the Board's Partial Initial Decision, is unaltered by evidence presented by the Coalition.

On February 4, 1975, intervenor again moved to reopen the record to consider the effect of changes in generating plant construction schedules by CAPCO (the power pool to which applicants belong) and electricity sales in 1974 by certain of the applicants upon the need for the Perry plant. The Licensing Board again permitted the reopening³¹ and evidence was offered on the issue at hearings on June 23 and 24, 1975.³² The Board found, in its decision of September 9, 1975, that deferrals of the construction of certain CAPCO plants "together with unanticipated construction delays have eroded projected CAPCO reserves considerably below projections made at the Evidentiary Hearing in 1974."³³ It further found that, using applicant's witness' "lower and more conservative projections," the delay in the time when the plant would be needed would only be one year (1981) and that this "provides an adequate basis for starting construction under the applicants' revised schedule."³⁴ The Board concluded "that the reduced peak demand

²⁸ AEC 538, 545-50.

²⁹ AEC 701, 710 (1974).

³⁰ *Id.* at 710-11.

³¹ See its order of February 28, 1975, approving the parties' stipulation of issues.

³² NRC 478, 492 (1975).

³³ *Id.* at 493.

³⁴ *Id.* at 494.

in 1974 does not invalidate the finding of a need for the [Perry plant] on its current schedule.”³⁵ Intervenor did not appeal from this decision.

It was against this background that intervenor, on November 17, 1975, in response to our invitation to file a response to the staff’s motion to supplement the record, filed its countermotion to reopen the record on the need for power. In support of the motion, it cited 1975 summer peak figures of four of the applicants and third quarter 1975 electricity sales by the fifth applicant, as compared to the previous year’s figures. The Licensing board, in its December 31, 1975, decision here under appeal, after analyzing the data, stated:³⁶

The above, very restricted update of sales and load changes presented by the Coalition has been carefully considered in the light of the body of evidence upon which the Board had based its previous finding regarding the need for the Perry units. Looking at the CAPCO system in its entirety, the rescheduled inservice dates for its various fossil and nuclear units, and the consequent projection of system reserves, the Board finds that the new information offered by the Coalition provides no basis for either reopening the record or overturning the previous findings of the Board regarding this issue. Accordingly, the Board reinstates its affirmative finding of need for the [Perry Plant] on the proposed schedule.

The Licensing Board’s denial of the motion to reopen was correct. Motions to reopen on this issue had been granted twice before. Litigation has to end sometime. As we stated in denying a motion for reconsideration of the need for power issue on the basis of new evidence in *Duke Power Co.* (Catawba Nuclear Station, Units 1 and 2), ALAB-359, 4 NRC 619, 620-21 (1976):

After a decision has been rendered, a dissatisfied litigant who seeks to persuade us—or any tribunal for that matter—to reopen a record and reconsider “because some new circumstance has arisen, some new trend has been observed or some new fact discovered,” has a difficult burden to bear. The reasons for this were cogently given by Mr. Justice Jackson more than thirty years ago in *ICC v. Jersey City*, 322 U.S. 503, 514 (1944):

One of the grounds of resistance to administrative process has been the claims of private litigants to be entitled to rehearings to bring the record up to date and meanwhile to stall the enforcement of the administrative order. Administrative consideration of evidence—par-

³⁵*Ibid.*

³⁶2 NRC 946 at 968.

ticularly where the evidence is taken by an examiner, his report submitted to the parties, and a hearing held on their exceptions to it—always creates a gap between the time the record is closed and the time the administrative decision is promulgated. This is especially true if the issues are difficult, the evidence intricate, and the consideration of the case deliberate and careful. If upon the coming down of the order litigants might demand rehearings as a matter of law because some new circumstance has arisen, some new trend has been observed, or some new fact discovered, there would be little hope that the administrative process could ever be consummated in an order that would not be subject to reopening.

Accord, United States v. ICC, 396 U.S. 491, 521 (1970); *Northern Indiana Public Service Co.* (Bailly Generating Station, Nuclear-1), ALAB-227, 8 AEC 416, 418 fn. 4 (1974).

Moreover, in this case, the new data offered by applicant, which covered peak load and sales for only the summer quarter of one year, were not sufficient to warrant reopening. What we said in *Duke Power Co.* (Catawba Nuclear Station, Units 1 and 2), ALAB-355, 4 NRC 397, 410 (1976) applies here *a fortiori*:

What intervenor attempted in essence is to rest a long term forecast of applicant's peak load demands on changes which took place in the last two years. But, "given the fluctuating nature of the growth of electric power demand, forecasts based on short time periods may be overly influenced by transitory effects and thus not accurately reflect basic long-term trends." [Footnote omitted.] In the circumstances presented, we think the Board below was right in not relying on a prediction so narrowly based.

C. The Propriety of the Conference Call of December 11, 1975

Intervenor argues that the December 11, 1975, conference call, in which the Licensing Board indicated that SER Supp. 3 was not a sufficient basis for summary disposition and that submission into evidence of the Gilbert Report was required, constituted improper partiality toward the applicants and staff. Faced with an insufficient record, the only proper course for the Licensing Board (in the intervenor's opinion) was to deny summary disposition.³⁷

³⁷Intervenor also complains that it was wrong for the Licensing Board to receive the Gilbert Report into evidence because it was submitted on December 11th, 24 days after the deadline for

(continued on next page)

This argument is based on a misconception of a licensing board's role in the hearing process. Its function as the arbiter of important safety and environmental questions "does not permit it to act as an umpire blandly calling balls and strikes for adversaries appearing before it" *Scenic Hudson Preservation Conference v. FPC*, 354 F.2d 608, 620 (2d Cir. 1965). If it believes that circumstances warrant a reopening of the record for the receipt of additional evidence, it has discretion to take that course of action. See *Public Service Electric and Gas Co. (Hope Creek Generating Station, Units 1 and 2)*, ALAB-429, 6 NRC 229, 237 (August 24, 1977); *Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station)*, ALAB-124, 6 AEC 358, 362 (1973).³⁸ That the reason for doing so here stemmed from the Licensing Board's reading of a document which had not theretofore been introduced into evidence did not vitiate its authority to take that step. See *Vermont Yankee, supra*, at 362. Indeed, it is not unusual for a Federal district court, when it finds, on a motion for summary judgment, that a party has not submitted necessary evidence in a proper manner and it is feasible for him to do so, to give that party additional time to make a proper submission. See, e.g., *Hood v. Burnett*, 51 F.R.D. 477, 479 (N.D. Ga. 1971); *Green v. Benson*, 271 F. Supp. 90, 95 (E.D. Pa. 1967).

In sum, we find nothing improper in the Licensing Board's request for submission of the Gilbert Report in support of the motion for summary judgment.

D. The Grant of Summary Judgment on the Geologic Anomalies

1. The Movants' Burden

Intervenor appeals from the grant of summary judgment on the geologic anomalies issue. It will be recalled that the requests for summary disposition were supported by SER Supp. 3 and the Gilbert Report.

The Licensing Board pointed out, in paragraph 53 of the partial initial decision in question,³⁹ that intervenor did not submit any evidence to support its allegation of the existence of a fault not considered in the Gilbert

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responses to the staff's motion set by our November 6th order. One answer to this contention is our statement in ALAB-298 that "we contemplated, of course, that the time period we set for filing responses to the staff's motion would be subject to adjustment by" the Licensing Board. 2 NRC at 739. The other answer is that applicant's submission of the Gilbert Report was not a response to the staff's motion but rather a response to the Licensing Board's request.

³⁸*Cf. National Bureau of Standards*, 2 AEC 323, 324 (1963), where the Commission stated that it is "our affirmative duty to obtain all relevant information in the protection of the public interest, whether or not offered by the parties. . . ."

³⁹2 NRC 946 at 965.

Report and its contention "that additional investigations of the geological anomalies must be made before a finding of site suitability can be made." It stated further that intervenor had not submitted any evidence controverting the conclusions reached by the staff in SER Supp. 3.⁴⁰ It then said: "Thus the Board finds that the Intervenor Coalition has failed to show the existence of any material issue of fact to overturn the findings above."⁴¹ This statement reveals a misconception by the Licensing Board of the legal standards governing summary judgment.

The Supreme Court has clearly held that it is the party seeking summary judgment, not the party opposing it, which has "the burden of showing the absence of a genuine issue as to any material fact . . ." *Adickes v. Kress & Co.*, 398 U.S. 144, 157 (1970). "A summary judgment is neither a method of avoiding the necessity of proving one's case nor a clever procedural gambit whereby a claimant can shift to his adversary his burden of proof on one or more issues." *United States v. Dibble*, 429 F.2d 598, 601 (9th Cir. 1970). The general rule in this Commission is that "the applicant or the proponent of an order has the burden of proof." 10 CFR §2.732.⁴² In this case, the applicants were also proponents of the order granting summary disposition.

Paragraph 53 of its opinion also suggests that the Licensing Board thought that the failure of a party opposing summary judgment to respond with evidentiary materials means that the motion must be granted. Its confusion on this point may be attributable to the last two sentences of 10 CFR §2.749(b), which state:

When a motion for summary decision is made and supported as provided in this section, a party opposing the motion may not rest upon the mere allegations or denials of his answer; his answer by affidavits or as otherwise provided in this section must set forth specific facts showing that there is a genuine issue of fact. If no such answer is filed, the decision sought, if appropriate, shall be rendered.

These sentences are essentially the same as the last two sentences of Rule 56(e) of the Federal Rules of Civil Procedure, which were added to the rule in 1963. 6 MOORE'S FEDERAL PRACTICE ¶56.01[13] at 56-21 (2d ed. 1976).

These provisions, without more, could lead one to believe that, if a motion for summary judgment is supported by evidentiary material on the rele-

⁴⁰*Ibid.*

⁴¹*Ibid.*

⁴²See also Appendix A to Part 2 of our Rules of Practice (10 CFR Part 2), paragraph V(d)(1); *Consumers Power Co.* (Midland Plant, Units 1 and 2), ALAB-283, 2 NRC 11, 17 (1975), clarified on reconsideration, ALAB-315, 3 NRC 101 (1976).

vant issues and the opponent of the motion does not respond with evidentiary material to the contrary, the motion must be granted. This thesis was advanced by the respondent in *Adickes v. Kress & Co.*, *supra*, 398 U.S. at 159. The Supreme Court dealt with it in the following way:⁴³

This argument does not withstand scrutiny, however, for both the commentary on and background of the 1963 amendment conclusively show that it was not intended to modify the burden of the moving party under Rule 56(c) to show initially the absence of a genuine issue concerning any material fact. The Advisory Committee note on the amendment states that the changes were not designed to “affect the ordinary standards applicable to the summary judgment.” And, in a comment directed specifically to a contention like respondent’s, the Committee stated that “[w]here the evidentiary matter in support of the motion does not establish the absence of a genuine issue, summary judgment must be denied *even if no opposing evidentiary matter is presented.*” [Emphasis added by the Supreme Court.]

* * *

As one commentator has said:

“It has always been perilous for the opposing party neither to proffer any countering evidentiary materials nor file a 56(f) affidavit. And the peril rightly continues [after the amendment to Rule 56(e)]. Yet the party moving for summary judgment has the burden to show that he is entitled to judgment under established principles; and if he does not discharge that burden then he is not entitled to judgment. No defense to an insufficient showing is required.” 6 J. MOORE, *FEDERAL PRACTICE* ¶56.22[2], pp. 2824-2825 (2d Ed 1966).

The same considerations call for similar treatment of motions for summary disposition under our own Rules of Practice.

2. The Gilbert Report

Having determined who had the burden on the motion and what the nature of that burden was, the task remains to see whether the burden was met. Two pieces of evidence were offered by the movants—SER Supp. 3 and the Gilbert Report. It is obvious from the conference call of December 11, 1975, that the Licensing Board regarded the latter as the more important document. We shall therefore deal with it first.

As we stated before, intervenor, instead of responding to applicants’ submission of the Gilbert Report with evidence of its own, filed an objec-

⁴³*Id.* at 159-61.

tion to the receipt of that report into evidence. A principal ground was that the Davidson affidavit accompanying the report did not meet the requirement imposed by the first sentence of 10 CFR §2.749(b) on affidavits submitted in connection with motions for summary disposition. That sentence states:

Affidavits shall set forth such facts as would be admissible in evidence and shall show affirmatively that the affiant is competent to testify to the matters stated therein.

The Gilbert Report was submitted with a verified letter to the Staff from Dalwyn R. Davidson, CEI's Vice President-Engineering. The attestation states that this is indeed his position and that "he is duly authorized to execute and file this information and report on behalf of" the applicants. This plainly does not show that he would be competent to testify to the matters covered by the Gilbert Report. There is no suggestion that he participated in its preparation or that he possessed expertise in geology and engineering—the disciplines employed by the report for arriving at expert opinions. While he might be competent to testify to the matters contained in the letter itself, *i.e.*, that the Gilbert Report was received by the applicants and that the applicants accept the conclusions of the report, those matters are not very helpful on the motions for summary disposition. The Davidson letter and attestation do not show enough to make the Gilbert Report admissible in evidence, as §2.749(b) requires.

The staff takes the position that the regulation's requirement for affidavits is irrelevant because the Gilbert Report itself is not an affidavit but a "document." The distinction makes little sense. We fail to see why an unsworn document which is in effect a substitution for testimony should not be subject to the same evidentiary requirements as an affidavit offered to serve that function. To be sure, there may be situations in which documents are admissible without the sponsorship of their authors.⁴⁴ But summary disposition is a harsh remedy. It deprives the opposing litigant of the right to cross-examine the witness, which is perhaps at the very essence of an adjudicatory hearing.⁴⁵ In such circumstances—even in administrative proceedings where the rules of evidence may be relaxed—it is important that a movant for summary disposition be required to hew strictly to the line set out by our Rules of Practice. This the applicants did not do. Mr. David-

⁴⁴See, *e.g.*, *Richardson v. Perales*, 402 U.S. 389 (1971); *Hood v. Burnett*, *supra*, 51 F.R.D. at 479.

⁴⁵That portion on the Administrative Procedure Act governing adjudicatory hearings states: "A party is entitled . . . to conduct such cross-examination as may be required for a full and true disclosure of the facts." 5 U.S.C. §556(d).

son's attestation plainly does not show that he is a person competent to testify to all of the matters discussed in the Gilbert report, as Section 2.749(b) requires.⁴⁶ The Licensing Board's unexplained decision to admit the Gilbert Report as part of the record on the motions for summary disposition was therefore erroneous.

3. SER Supplement No. 3

Of course, to say that consideration of the Gilbert Report was error does not complete our analysis; we must go on to determine whether that error was prejudicial. Applicants argue that it was not because the Licensing Board "could, and indeed should, have granted summary disposition as to the geologic anomaly issue" even without the Gilbert Report, on the basis of SER Supp. 3.⁴⁷ The latter, they state correctly, "was submitted under affidavits of Staff employees whose professional qualifications (set forth in the affidavits) clearly show their competency to testify to the matters set forth therein."⁴⁸ We therefore proceed to consider the adequacy of SER Supp. 3 to support summary disposition of the geologic anomalies issue.

SER Supp. 3 relies in large part upon the opinions of two outside consultants. One of these consultants, Robert H. Morris of the U.S. Geological Survey, based his opinion primarily upon the Gilbert Report.⁴⁹ And the staff concludes its own opinion with an acceptance of the Gilbert Report (referred to there as "applicants' geologic investigation and interpretation of the identified geologic features").⁵⁰ We therefore agree with the Licensing Board's view, expressed in the December 11, 1975, conference call, the SER Supp. 3, without the Gilbert Report to support it, was not a sufficient basis for the grant of summary disposition on the geologic anomalies issue. It was necessary for the Board to look at the much more detailed Gilbert

⁴⁶While the Federal Rules of Civil Procedure do not apply in practice before this agency, they offer guidance because our rules are generally patterned after them. This is certainly true in the case of Section 2.749, for "the summary disposition procedure provided by Section 2.749 finds a judicial counterpart in Rule 56 of the Federal Rules of Civil Procedure" *Alabama Power Co.* (Joseph M. Farley Nuclear Plant, Units 1 and 2), ALAB-182, 7 AEC 210, 217 (1974). In judicial proceedings, the rule is well settled that documents submitted with an affidavit on a summary judgment motion "must be admissible in evidence." 6 MOORE'S FEDERAL PRACTICE ¶56.22[1] at 56-1328 (2d ed. 1976; accord, *United States v. Dibble*, 429 F.2d 598 (9th Cir. 1970); *Douglas v. Beneficial Finance Co.*, 334 F. Supp. 1166, 1169 (D. Alaska 1971); *Hood v. Burnett*, *supra*; *Walpert v. Bart*, 280 F. Supp. 1006, 1010 (D. Md. 1967), *aff'd* 390 F.2d 877 (4th Cir. 1968).

⁴⁷Applicants' Brief, p. 12.

⁴⁸*Id.* at 13.

⁴⁹See Appendix I to SER Supp. 3.

⁵⁰SER Supp. 3, p. 6.

Report in order to satisfy itself that the opinions of the staff and its consultants were correct.³¹

4. The Remedy

Having held that summary disposition was improperly granted on the geologic anomalies issue, we must decide what should be done about it. It appears to us from the posture of the case that the error, albeit a serious one, was quite possibly caused by my counsel's failure to comply with the Rules of Practice and not by the absence of appropriate support for the substantive decision reached. It may be that, were the Gilbert Report proffered with affidavits from those who prepared it, the Licensing Board's result would be sustainable.³² Rather than revoke the construction permit on what may turn out to be a mere formality, we will stay our hand and, exercising our own trial authority,³³ allow applicants 10 days from the date of this decision to renew their motion for summary disposition before us. If they do so, then intervenor may have a like time period in which to file opposing papers, in accordance with 10 CFR §2.749.³⁴ We shall then decide the motion for summary disposition ourselves.

If the motion for summary disposition is not timely renewed with us, however, the construction permit will be vacated and the cause remanded for an appropriate hearing on the geologic anomalies issue. In the interim, the construction permit may remain in effect pending our further order and construction may proceed at applicants' risk.³⁵ Motions for extensions of time will not be favored.

II. SUA SPONTE REVIEW

As is our custom, we have reviewed on our own motion the substance of

³¹See *Higgins, v. Baker*, 309 F. Supp. 635, 639 (S.D.N.Y. 1970) which stated: [A]lthough an adverse party cannot rest on naked denials or pleadings in opposing a motion for summary judgment, it is nevertheless incumbent upon movant to establish to the Court's satisfaction the absence of a genuine issue of fact." (Emphasis added.)

³²We express no opinion as to the adequacy of the Gilbert Report, for the document is not properly before us.

³³This authority is well established. See *Northern States Power Co.* (Prairie Island Nuclear Generating Plant, Units 1 and 2), ALAB-284, 2 NRC 197 (1975); *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), ALAB-194, 7 AEC 431, 448 (1974); *Trustees of Columbia University*, 4 AEC 680, 681-82 (1971), *aff'd sub nom. Morningside Renewal Council v. AEC*, 482 F.2d 234, 239 (2d Cir. 1973), *cert. denied*, 417 U.S. 951 (1974).

³⁴As intervenor has appeared without counsel, we are sending it a copy of Section 2.749 along with this decision.

³⁵See *Public Service Electric and Gas Co.* (Hope Creek Generating Station, Units 1 and 2), ALAB-429, 6 NRC 229, 246 (August 24, 1977); *Southern California Edison Co.* (San Onofre Nuclear Generating Station, Units 2 and 3), ALAB-268, 1 NRC 383, 401 (1975).

the Licensing Board's decisions in this case in addition to the one from which an appeal was taken and the one dealt with by our orders of November 6 and 19, 1975.⁵⁶ We have found no errors warranting correction. Nevertheless, one matter deserves some comment.

In its Supplemental Partial Initial Decision of September 10, 1976, approving additional work under the LWA-2, the Licensing Board found that the design of certain safety-related structures was acceptable except for that of the off-gas building.⁵⁷ In its Final Supplemental Initial Decision of April 29, 1977, the Board made the requisite finding that the design of the Perry facility and its structures is adequate⁵⁸ but did so without specific mention of the off-gas building. The Licensing Board, in its April 29, 1977, decision, did explicitly find that the staff's technical review of the application, as set forth in the Safety Evaluation Report and its five supplements, was "adequate and comprehensive."⁵⁹ In Supplement No. 4 of the SER (January 1977), at p. 7, the staff discussed the design of the off-gas system and concluded that, in view of commitments made by the applicants in Amendment 24 to the PSAR and in a letter of October 8, 1976, the proposed off-gas system design criteria were acceptable. The Licensing Board also found that the radioactive waste management systems, which include the off-gas system, "are acceptable and meet the requirements of the Commission's regulations."⁶⁰ Thus, though the adequacy of the structural design of the off-gas building is not dealt with expressly, we read the Board's final decision as including that within its other above-mentioned findings of adequacy and acceptability.⁶¹

⁵⁶This Board does not review Licensing Board decisions for procedural errors *sua sponte*.

⁵⁷4 NRC at 346. The record reveals that the staff and applicants were not, at the time of the hearings leading to LBP-76-33, in agreement as to what the appropriate design criteria for the off-gas building should be. Tr. 2989, Supplemental Testimony of M. D. Lynch (following Tr. 3027 at pp. 15-16). Counsel for the applicants, in requesting a delay in the consideration of the design of that structure, stated that "we would not proceed with any of the work on that building until a subsequent session before this Board and some decision in connection with that matter." Tr. 2989-90.

⁵⁸LBP-77-29, 5 NRC at 1137.

⁵⁹*Id.* at 1130.

⁶⁰*Id.* at 1131.

⁶¹It may be that the ambiguity in the Licensing Board's findings arises from the fact that the terms "off-gas building" and "off-gas system" were at times used interchangeably in the evidentiary record. The term "system" could either be interpreted to refer only to the equipment used to treat the off-gas or to include the building in which that equipment is housed. However, an examination of the record clarifies the matter. Supplement No. 4 of the SER, at p. 7, notes that the applicant has committed to design the off-gas system in accordance with the provisions of staff document ETSB No. 11-1 (Rev. 1). The supplemental testimony of staff

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For the foregoing reasons, the partial initial decision of December 31, 1975, is *reversed* insofar as it grants summary disposition on the issue of the geologic anomalies. Other issues resolved in that and the other Licensing Board decisions before us which are not dependent upon the summary disposition are *affirmed*. Jurisdiction over this case is *retained* pending further order of this Board.

It is so ORDERED.

FOR THE ATOMIC SAFETY
AND LICENSING APPEAL BOARD

Margaret E. Du Flo
Secretary to the Appeal Board

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witness Lynch (following Tr. 3027 at p. 16) states that adoption of the provisions of that document would provide an acceptable design basis for the off-gas system *and* the off-gas building. Thus, it is clear that the staff has found that an acceptable structural design basis has been proposed for both the off-gas building and the off-gas treatment equipment housed therein. And we think it similarly clear that the Licensing Board's acceptance of the staff's "technical review and safety evaluation" in the SER supplements, which the Board described as reporting "favorable evaluations of outstanding safety-related issues," constitutes an endorsement of that finding.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Alan S. Rosenthal, Chairman
Dr. John H. Buck
Michael C. Farrar

In the Matter of

Docket Nos. 50-458
50-459

GULF STATES UTILITIES COMPANY

(River Bend Station, Units 1 and 2)

November 23, 1977

Upon appeal by the State of Louisiana from LBP-76-32, 4 NRC 293 (1976), and upon *sua sponte* review of LBP-77-6, 5 NRC 446 (1977), the Appeal Board determines (1) that there are no unresolved safety questions which would preclude authorization of construction permits; (2) that the Licensing Board's handling of the uranium fuel efficiency question (remanded to it by ALAB-317, 3 NRC 175 (1976)) was satisfactory; and (3) that the values included in revised Table S-3 incorporated in 10 CFR 51.20(e) do not tilt the NEPA cost-benefit balance against the issuance of construction permits. The Appeal Board also determines that there was no "good cause" for permitting an untimely intervention petitioner to substitute for the State of Louisiana, which had withdrawn.

Initial decisions affirmed; intervention petition denied.

REGULATORY GUIDES: STATUS

Regulatory guides are issued to assist applicants in determining what information the staff will require and what standards will be employed in the staff review of an application. They are not regulations *per se* and are not entitled to be treated as such.

RULES OF PRACTICE: WITNESSES

Members of the Advisory Committee on Reactor Safeguards are not subject to examination in an adjudicatory proceeding with regard to the contents of an ACRS report.

RULES OF PRACTICE: INTERVENTION BY A STATE

An interested state participating in a proceeding pursuant to 10 CFR 2.715(c) is not required to set forth contentions as a precondition to its participation; but, once admitted, it must observe the procedural requirements applicable to other participants.

RULES OF PRACTICE: CROSS-EXAMINATION BY INTERVENORS

An interested state is entitled to conduct cross-examination with respect to matters put into evidence in support of an application, without the necessity of defining the subject matter of its questions as matters in controversy.

RULES OF PRACTICE: CONTENTION REQUIREMENT FOR INTERVENTION

The mere identification of a generic technical issue which is being studied by the staff does not establish an issue in controversy. There must additionally be shown a nexus between the generic study and the reactor being reviewed—*e.g.*, the proponent must show (1) that the generic issue has safety significance for the reactor being reviewed and (2) that the fashion in which the application deals with the matter is unsatisfactory, that because of the failure to consider a particular item there has been an insufficient assessment of a specified type of risk for the reactor, *or* that the short-term solution offered in the application to a problem under staff study is inadequate.

ATOMIC ENERGY ACT: SAFETY FINDINGS

A safety question which has not been resolved generically but for which a satisfactory answer has been provided for the reactor under review presents no barrier to construction permit authorization.

LICENSING BOARD: SCOPE OF REVIEW

Section V(f)(2) of Appendix A to 10 CFR Part 2, expressly requires the Licensing Board to determine whether the staff's safety review in uncontested cases was adequate, and this obligation is equally applicable to the uncontested portions of a contested case.

ATOMIC ENERGY ACT: SAFETY FINDINGS

The Commission's review process is a bifurcated one. All design details of a facility need not be supplied at the construction permit stage, and

answers to all questions bearing on safety need not be reached prior to issuance of a construction permit, since "a definitive safety finding" may be deferred "until operation is actually licensed." *PRDC v. International Union*, 367 U.S. 396, 407 (1961).

RULES OF PRACTICE: NONTIMELY INTERVENTION PETITIONS

Reliance by a belated petitioner on representation of its interests by an interested state which later withdraws from a proceeding does not constitute good cause for untimely intervention, since the private petitioner assumes the risk that the state may withdraw or fail adequately to represent the petitioner's interest.

RULES OF PRACTICE: NONTIMELY INTERVENTION PETITIONS

The "good cause" determination under 10 CFR 2.714(a) involves a consideration of both (1) the substantiality of the justification offered for the late filing and (2) the four factors specifically enumerated in that section.

RULES OF PRACTICE: NONTIMELY INTERVENTION PETITIONS

10 CFR 2.714(a) requires all late petitioners to make a good cause showing for their tardiness, even where the petitioner is seeking to substitute itself for another party.

RULES OF PRACTICE: NONTIMELY INTERVENTION PETITIONS

A finding under 10 CFR 2.714(a) that petitioner's participation will not substantially broaden the issues or delay the proceeding is not dispositive of the question of "good cause."

TECHNICAL ISSUES DISCUSSED: Consideration of generic safety questions in Safety Evaluation Reports; unresolved safety questions.

Messrs. Troy B. Conner, Jr., and Mark J. Wetterhahn, Washington, D.C., for Gulf States Utilities Company, applicant.

Ms. Karin P. Sheldon, Washington D.C., for Union of Concerned Scientists, petitioner for intervention.

Messrs. William J. Guste, Jr., Attorney General, and Richard M. Troy, Jr., Assistant Attorney General, New Orleans, Louisiana, and Mr. Anthony Z. Roisman and Ms. Karin P. Sheldon, Washington, D.C., for the State of Louisiana.

Messrs. Lawrence Brenner and Richard K. Hoefling for the Nuclear Regulatory Commission staff.

DECISION

This construction permit proceeding involves Units 1 and 2 of the River Bend Station, to be located on the east bank of the Mississippi River in West Feliciana Parish, Louisiana. In ALAB-317, 3 NRC 175 (1976), we reviewed the Licensing Board's partial initial decision on environmental and site suitability matters (first decision)¹ and remanded the proceeding for a further hearing on the issue of fuel utilization efficiency.² The Licensing Board held hearings on that question as well as on the radiological health and safety questions with which the first decision had not dealt. On September 2, 1976, it rendered a second partial initial decision (second decision) which encompassed the uranium fuel efficiency issue and all outstanding health and safety issues. LBP-76-32, 4 NRC 293. That decision left open, however, the question of the effect on the facility's NEPA cost-benefit balance of the environmental impacts assigned to the uranium fuel cycle—a question which had become important in this proceeding as a result of *Natural Resources Defense Council v. NRC*, 547 F.2d 633 (D.C. Cir. 1976), *certiorari granted sub nom. Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council*, 429 U.S. 1090 (1977).³

The Licensing Board thereafter rendered a third partial initial decision (third decision) which ruled on the uranium fuel cycle matters LBP-77-6, 5 NRC 446 (February 3, 1977). That decision would have paved the way for the issuance of construction permits for the River Bend units but for one circumstance: the discovery by the reactor vendor—communicated to the staff—of certain calculational errors in the performance evaluation of the facility's ECCS system. The Board concluded that, prior to the authorization of construction permits, the hearing record would have to be supplemented to reflect the staff's analyses of the effect of the calculational er-

¹LBP-75-50, 2 NRC 419 (1975).

²A limited work authorization (LWA) had been issued shortly after the Licensing Board decision. Our remand did not disturb the effectiveness of the LWA.

³A description of the proceedings arising as a result of this decision appears in our opinions in *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-349, 4 NRC 235 (1976), *vacated on other grounds*, CLI-76-17, 4 NRC 451 (1976) and *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Station), *et al.*, ALAB-392, 5 NRC 759 (April 21, 1977) and need not be rehearsed here.

rors. With the consent of all parties, the record was supplemented through affidavits. Upon consideration of the additional matter, we authorized issuance of construction permits—subject, of course, to the outcome of our later appellate review of the second and third decisions. ALAB-383, 5 NRC 609 (March 22, 1977).

Before us now is the appeal taken by the State of Louisiana from the second decision.⁴ That appeal raised essentially two questions: the sufficiency of the Licensing Board's treatment of certain so-called "unresolved safety questions" and the resolution below of the remanded uranium fuel efficiency issue. After filing all of the papers required to support its appeal, the State notified us in July of this year of its intent to withdraw from the proceeding. For reasons that will be set forth in Part IV of this decision, we have nevertheless dealt with the questions raised by the appeal as if the State had continued to participate.⁵ The third decision was not appealed by anyone and therefore has been reviewed *sua sponte* (together with the nonappealed portions of the second decision). We affirm both decisions.

I

Many years ago, the Supreme Court observed that "nuclear reactors are fast-developing and fast changing. What is up to date now may not, probably will not, be as acceptable tomorrow." *Power Reactor Development Co. v. International Union of Electrical, Radio and Machine Workers, AFL-CIO*, 367 U.S. 396, 408 (1961). It is the continuing evolution of nuclear technology which underlies the State's claims pertaining to the "unresolved safety questions." In essence, the State asserts before us that it has identified a number of such questions which bear on the River Bend facility, and that the record on them was not sufficiently developed to enable the Licensing Board to make the ultimate safety findings requisite to the authorization of construction permits. In its second decision, the Board had rejected, on both procedural and substantive grounds, the State's position in this regard.

A. Before inquiring into the specifics of the State's appellate claims, it might be helpful to outline the Commission's procedures for the review of safety questions bearing upon a construction permit application. For the State's appeal is addressed essentially to the adequacy of this review process, rather than to any question or holding unique to the River Bend facility.

⁴The State had intervened below under the "interested state" provisions of 10 CFR 2.715(c).

⁵We also there consider a petition for intervention by an organization which seeks to fill the gap which could have been created by the State's withdrawal.

As a precondition to the institution of the Commission's formal safety review, a construction permit applicant must submit a preliminary safety analysis report (PSAR).⁶ The PSAR must include, at a minimum, (1) a "description and safety assessment" of the proposed site; (2) a "summary description and discussion of the facility, with special attention to design and operating characteristics, unusual or novel design features, and principal safety considerations"; (3) the "preliminary design" of the facility; (4) a "preliminary analysis and evaluation of the design and performance of structures, systems, and components of the facility"; (5) an identification (and justification for their selection) of the "probable subjects of technical specifications for the facility"; (6) a preliminary plan of organization, personnel training and conduct of operations; (7) a description of the quality assurance program for the design, fabrication, construction and testing of the structures, systems and components of the facility; (8) an identification of required research and development, if any, and of any necessary program which will be carried out in connection therewith; (9) a description of the applicant's technical qualifications; and (10) a discussion of preliminary plans for coping with emergencies. 10 CFR 50.34(a). The regulations also impose specific requirements with respect to some of these items: for example, the description of the preliminary facility design must reflect observance of the criteria contained in 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," and the analysis of the required emergency core cooling system must satisfy the provisions of 10 CFR 50.46. In this proceeding, the PSAR (including supplements) was in 9 volumes, each possessing some several hundred pages.⁷

A PSAR is first reviewed by the staff for completeness and, if complete, the application is formally docketed. 10 CFR 2.101. Thereupon, the safety aspects of the facility are canvassed by the staff. Invariably, numerous questions will be directed by staff reviewers to the applicant; the responses normally will take the form of PSAR supplements. The staff's review is extensive and culminates in a safety evaluation report (SER). In this case, the SER was nearly 300 pages in length. It took over a year to prepare and was followed by 2 supplements.⁸ Collectively, these documents analyzed the

⁶Prior to its doing so, it normally will have undertaken numerous discussions of safety matters with the NRC staff. As recently noted by the Commission, the "staff has long encouraged prospective applicants to inform it of a planned application as much as twelve months in advance of actually tendering the application." *Public Service Company of New Hampshire* (Seabrook Station, Units 1 and 2), CLI-77-8, 5 NRC 503, 523 n. 21 (March 31, 1977).

⁷Applicant's Exh. 1, as amended. Tr. 375-77, 1453-57, 1718-26.

⁸Staff Exhibits 2-A through 2-C. Exh. 2-D is an errata sheet for the SER. Tr. 1499. The application was tendered in July 1973 and docketed in September 1973 (SER, §1.1); the SER was issued in September 1974.

material submitted in the PSAR and concluded that issuance of construction permits "will not be inimical to the common defense and security or to the health and safety of the public" (SER §21.0; Tr. 1503).

In addition, each construction permit application is reviewed by the independent Advisory Committee on Reactor Safeguards (ACRS). 42 U.S.C. 2232(b). Here, the ACRS recommendation was favorable to construction permit issuance.

The PSAR, SER, and the ACRS report are made part of the record in the adjudicatory proceeding. The participants therein may raise issues on the basis of disclosures in those documents and, under the Rules of Practice, have extensive discovery rights with respect to any such issues.¹⁰ And the licensing board must render a decision on them. 10 CFR 2.760(c); 10 CFR Part 2, Appendix A, V(f)(1). Even where no safety issues are put into contest by a party, the licensing board—which in a proceeding involving safety questions includes two technically trained members—still must review at least the PSAR and SER; and, if it has any questions about the matters included therein, they must be resolved to its satisfaction. With regard to such uncontested matters, however, licensing boards are explicitly not required to duplicate the review already performed by the staff and the ACRS; the board's role in that situation is "to decide whether the application and the record of the proceeding contain sufficient information, and the review of the application by the Commission's staff . . . has been adequate," to support the findings requisite to issuance of a construction permit. 10 CFR Part 2, Appendix A, V(f)(2).

The Commission's review process is a bifurcated one, with certain determinations required at the construction permit stage of review but others permitted to be deferred until an operating license is sought. *PRDC v. International Union, supra*. Much of the information supplied in connection with a construction permit application is, as contemplated by the terms of the regulation which requires its submission (10 CFR 50.34(a)), preliminary in nature. Thus, definitive answers to a number of safety questions may not be available at the construction permit stage of review. Prior to operation, however, the applicant must provide the Commission with a final safety analysis report (FSAR) which presents, *inter alia*, a "final analysis and evaluation of the design and performance of structures, systems, and components." The purpose of this submission is to enable a further assessment of the risk to public health and safety resulting from operation of the facility, "taking into account any pertinent information

¹⁰The source of this standard is Section 103d. of the Atomic Energy Act, 42 U.S.C. 2133(d).

¹⁰The members of the ACRS are not, however, subject to examination in an adjudicatory proceeding with regard to the contents of an ACRS report. *Arkansas Power & Light Co.* (Arkansas Nuclear One, Unit 2), ALAB-94, 6 AEC 25, 32 (1973).

developed since the submittal of the [PSAR].” 10 CFR 50.34(b)(4). In this connection, the Commission possesses full authority to require new safety features to be incorporated into a reactor, “if it finds that such action will provide substantial, additional protection which is required for the public health and safety” 10 CFR 50.109. This authority may be exercised after a construction permit—and indeed an operating license—has been issued.

At the same time as the Commission is reviewing the safety aspects of a reactor application, it may also be examining safety issues in other contexts. From time to time it resorts to its broad rulemaking authority to consider safety issues applicable to one or more classes of reactors on its own initiative or at the behest of either the NRC staff or a member of the public. 10 CFR 2.800 *et seq.* The result of a particular rulemaking proceeding governs in individual licensing proceedings in accordance with the terms of the rule itself (or the accompanying statement of considerations). See, *e.g.*, 10 CFR 50.46 and Part 50, Appendix K (ECCS criteria); 10 CFR 50.36a and Part 50, Appendix I (releases of radioactive materials to unrestricted areas during normal reactor operations).

Further, the Commission is empowered to undertake programs for establishing standards and initiating technical reviews and studies and to perform or to fund research activities relevant to the performance of its licensing and related regulatory functions. 42 U.S.C. 5843, 5844, 5845. In that regard, the staff has prepared a number of regulatory guides designed to assist applicants in determining what information the staff will require and what standards will be employed in the staff review of an application. Additionally, the Commission analyzes problems which have arisen in reactor construction and operation. Examples of such analyses are the descriptions of 27 ongoing staff investigations of technical issues which were supplied to us for informational purposes during our appellate consideration of this case.¹¹

One product of the Commission’s exercise of its authority to conduct studies and research projects on safety questions received extensive treatment in this proceeding. This was a document entitled “Technical Safety Activities Report” (TSAR),¹² which has now apparently been superseded by

¹¹*Staff Discussion of Fifteen Technical Issues Listed in Attachment to November 3, 1976, Memorandum from Director, NRR to NRR Staff* (NUREG-0138), transmitted to us and the parties on December 23, 1976; *Staff Discussion of Twelve Additional Technical Issues Raised by Responses to November 3, 1976, Memorandum from Director, NRR to NRR Staff* (NUREG-0153), transmitted to us and the parties on January 19, 1977.

¹²State Exh. 1-1976 for identification. Tr. 1660. This TSAR is dated December 1975.

a series of "Task Action Plans."¹³ The Licensing Board described the TSAR as "an internal status report on various developmental or study programs being conducted or contemplated by the NRC." 4 NRC at 312. Both it and the Task Action Plans describe ongoing or contemplated staff inquiries of a generic character seemingly intended to serve one or more of several broad objectives; e.g., the improvement of the "tools" used by the staff in its review of reactors and the more precise assessment of the designed safety margins (and thus the reliability) of the component parts of the facility.

In sum, the Commission's review of safety questions is many-faceted. It includes research activities, the development and promulgation of standards, and the enforcement of those standards in, *inter alia*, the review of each license application. As described by the Commission in a recent report to Congress:

The NRC's role in regulating represents a complete cycle, with the NRC establishing standards and rules; issuing licenses and permits; inspecting for compliance; enforcing license requirements; and carrying on continuing evaluations, studies and research projects to improve both the regulatory process and the protection of the public health and safety.¹⁴

B. Against this background, we turn to the State's arguments. Our starting point is a consideration of whether the State properly raised below its "unresolved safety matters" issues.

1. The State sought admittance to the proceeding as an "interested state." LBP-76-32, *supra*, 4 NRC at 296. It accordingly was not required to set forth contentions as a precondition to its participation. 10 CFR §2.715(c); ALAB-317, *supra*, 3 NRC at 179 (1976). Once let in, however, an "interested state" must observe the procedural requirements applicable to other participants. See ALAB-317, 3 NRC at 180, n. 7.¹⁵ It may—as they may—raise particular issues of interest or concern to it. *Project Management Corp.* (Clinch River Breeder Reactor Plant), ALAB-354, 4 NRC 383, 392-93 (1976). The Board is entitled to insist, however, that any new issue raised be framed with sufficient detail and preciseness. *Cf.* 10 CFR §2.714(a). A hearing participant "must be specific as to the focus of the desired hearing." *BPI v. Atomic Energy Commission*, 502 F.2d 424, 429 (D.C. Cir. 1974). And contentions (or their equivalent in the case of an

¹³The Task Action Plans were not in existence at the time of the Licensing Board safety hearings; as far as we can ascertain, they first were issued in the fall of 1977. We take official notice of their existence.

¹⁴NUREG-0090-8, Report to Congress on Abnormal Occurrences, April-June 1977, p. v.

¹⁵This concept was recently endorsed by the Commission. *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), CLI-77-25, 6 NRC 535, 537, n.1 (October 14, 1977).

“interested state”) serve the purpose of defining the “concrete issues which are appropriate for adjudication in the proceeding.” *Northern States Power Co.* (Prairie Island Nuclear Generating Plant, Units 1 and 2), ALAB-107, 6 AEC 188, 191, *affirmed*, CLI-73-12, 6 AEC 241 (1973), *affirmed sub. nom. BPI v. Atomic Energy Commission, supra*.

Normally, the development with the requisite degree of specificity of the issues to be litigated should take place prior to the hearing on the particular matter involved. 10 CFR 2.715a and 2.752. With that thought in mind, the Licensing Board held a prehearing conference for the purpose, *inter alia*, of identifying the principal issues for the radiological health and safety hearing.¹⁶ The State’s lead counsel was not present at that conference,¹⁷ and as a result the State was not able then to identify those safety issues which it wished to raise. A description of what followed is contained in ALAB-329, 3 NRC 607, 608-09 (1976),¹⁸ and we need do no more than repeat it here:

. . . the State was informed [by the Licensing Board] that it would be expected [within a short time] to identify any additional health and safety issues (beyond those “already in the case”) which it wished to have explored at the hearing (Tr. 1367, 1391-92). The Chairman of the Licensing Board explained that it desired to avoid new issues being suggested by the State during the course of the hearing, which in turn might necessitate a twelfth hour search for expert witnesses to address them and, additionally, a deferral of the completion of the hearing to permit the receipt of their testimony (Tr. 1367). In its Third Prehearing Conference Order issued on March 17, 1976, the Board . . . said with respect to the requirement it had imposed upon the State:

The State’s attorney was also advised that the Board will not countenance the rather loose procedure followed in last year’s hearing sessions, *i.e.*, the State bringing up, *de novo*, new major issues or subject areas as it goes along in its cross-examination during the hearing. The Board allowed this last year because of the State’s very late re-entry into the case (virtually right before the start of the hearing) with little or no prior preparation time. As pointed out by the Appeal Board in ALAB-317 (*cf.*, 3 NRC at 180, n. 7]), an “inter-

¹⁶The prehearing conference took place on March 12, 1976, pursuant to the Licensing Board’s March 4, 1976, Notice and Order for Prehearing Conference (41 Fed. Reg. 9939, March 8, 1976).

¹⁷That absence resulted from lack of sufficient staffing; the State sent substitute counsel (who was essentially unfamiliar with the proceeding) to the conference to represent it (Tr. 1355-56, 1366).

¹⁸In that opinion, we declined to entertain an interlocutory appeal by the State. See fn. 21, *infra*.

ested State” is not, by reason of that status, relieved of the obligation of complying with all procedural rules, and it is subject to all the same requirements which must be observed by other parties appearing before the Board. The State has now been actively participating in this proceeding for over a year. Accordingly, and to avoid proceeding by way of “surprise,” the State has been advised that it must apprise the Board and all parties [within a given period] of precisely what additional issues or particular concerns it believes are directly related, *i.e.*, relevant, to the radiological health and safety phase of this construction permit application and this particular proposed plant, beyond the contested issue already in the case. They need not be in the form of specific contentions, but they must be issues that are relevant, material and narrow enough to permit evidentiary determination in an adjudicatory setting. (See Tr. 1366-1367, 1370-1371.) The Board will promptly rule on the admissibility of such issues. Of course, the Board is distinguishing here between “raising questions” (*i.e.*, major subject areas or issues) and “asking questions” (*i.e.*, relevant cross-examination on issues already in the case). As to the latter, no advance notice is requested or required.

Responding to the further opportunity given it by the Licensing Board to identify the issues it wished to have explored, the State thereafter filed a document entitled “Statement of Safety Issues.” Four days later, it filed a supplement to that statement.

In the statement, the State cast its issues in terms of whether, in light of the alleged existence of certain unresolved safety questions relevant to the facility, the applicant had shown compliance with 10 CFR Sections 50.34(a)(8) and 50.35(a).¹⁹ These questions were generally identified as those described in GESSAR-238,²⁰ in the staff’s safety evaluation of GESSAR-238, and in the staff’s TSAR. In addition, the State sought to raise the issue whether the staff and applicant had been justified in not applying to the reactor certain unspecified regulatory guides for the apparent

¹⁹10CFR 50.34(a)(8) requires identification in the PSAR of further research and development which remains to be carried out after issuance of a construction permit, together with a description of the programs which will be undertaken to that end. See p. 765, *supra*. The relevant provisions of 10 CFR 50.35(a) are set forth *infra*, pp. 776-777.

²⁰This refers to the General Electric Standard Safety Analysis Report for the type of reactor which the River Bend facility is to employ. At the time of the hearings here, the staff’s review of GESSAR was not complete, but the SER for this proceeding incorporates by reference certain information and analysis appearing in the generic GESSAR docket.

reason that the effective dates of those guides postdated the filing of the River Bend application.

To identify those unresolved safety questions it had in mind, the State's statement had attached to it the table of contents of the TSAR, on which 88 of the approximately 200 listed items were circled. The subsequent supplement was of the same genre: it provided (1) a list of the numbers and titles of 14 regulatory guides asserted to be "substantively relevant" to the River Bend reactors but "which will not be applied because of date of publication" of the particular guides; and (2) a list of 24 items appearing in the staff's SER assertedly posing questions which would not be resolved prior to issuance of the River Bend construction permits.

Early in the ensuing hearing, after extensive oral argument, the Licensing Board ruled that the mere notation of TSAR and SER items and of regulatory guides was insufficient (Tr. 1657-59).²¹ Such notations, standing alone, were thought by the Board not to provide "a fair opportunity to other parties to know precisely what the limited issues [are], exactly what proof, evidence or testimony is required to meet that issue and exactly what support the State intends to adduce for its allegations" (Tr. 1658; 4 NRC at 298). What was required in addition were allegations establishing, with respect to each item or guide, a relationship to the River Bend application (4 NRC at 312-13). At the urging of the staff, however, the Board later reconsidered its ruling insofar as it precluded consideration of the 24 SER items, and permitted the State to conduct cross-examination on those items (Tr. 2231-32).²² The State did so with respect to seven of the items but declined to pursue the others. (Tr. 2296). The Board reaffirmed the exclusion of the TSAR and regulatory guide items and (at the State's request) struck the portions of the staff's testimony bearing on those subjects (Tr. 2231-32).

2. The State takes exception to the Board's exclusion from consideration of the TSAR and regulatory guide items. Observing that it had specifically listed the items which it believed needed further exploration, it disagrees with the Board's requirement that there be a demonstration of a nexus between the general discussions in the TSAR and regulatory guides and particular deficiencies in the River Bend application. By imposing such a re-

²¹In ALAB-329, *supra*, we declined to accept the State's invitation to review this ruling on an interlocutory basis. We noted that the appeal was not authorized under 10 CFR §2.714a, since the State remained free to participate on other issues (such as the remanded fuel utilization question).

²²The Board reiterated its misgivings about the manner in which those items were raised (Tr. 2232) but agreed to consider them since the document from which they were derived (the SER) had been put into evidence in support of the application. In this regard, the Board's action was consistent with our own recent ruling in *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-422, 6 NRC 33, 94-95 (1977).

quirement, the State maintains, the Board not only did not discharge its obligation to develop a complete record but also improperly shifted the burden of proof to the State, in violation of the mandate of *Aeschliman v. NRC*, 547 F.2d 622 (D.C. Cir. 1976), *certiorari granted sub nom. Consumers Power Co. v. Aeschliman*, 429 U.S. 1090 (1977).

We are in general agreement with the Licensing Board's assessment of the adequacy of the State's statement of issues. It seems clear to us that, in order to introduce a new issue into a proceeding, a party—and likewise an interested state—must do more than present what amounts to a check list of items contained in the TSAR or in regulatory guides. The very nature of the TSAR and of regulatory guides supports this conclusion.

As previously indicated, the TSAR is a compendium of some of the research activities which (as of the date of its issuance) the staff either had undertaken or proposed to undertake—with a view toward achieving such goals as improving the licensing process or the method by which particular safety questions are considered, or defining more precisely the margins of safety inherent in various component parts of a reactor.²³ That changes could eventuate in some of the areas covered by the TSAR (or its successor, the Task Action Plans) is expected. And application of at least some of these potential modifications to existing reactors or procedures is highly likely. But it does not follow that a safety threat would be presented by the licensing of a plant prior to completion of a particular study which is relevant to that type of plant. Indeed, some of the studies concern potential problems of such character that in no event would they arise in the early years of a reactor's operation. Other studies are aimed at the question whether there might be a mitigation of some requirements currently imposed. Still further, the TSAR spotlights areas in which, although a generic solution to a particular problem may not have been achieved, a satisfactory resolution for one or more reactors has been obtained.

For their part, and as their title suggests, regulatory guides are issued for the basic purpose of providing guidance to applicants with respect to, *inter alia*, acceptable modes of conforming to specific regulatory requirements. But they are not regulations *per se* and are not entitled to be treated as such;²⁴ they need not be followed by applicants; and they do not purport to represent that they set forth the only satisfactory method of meeting a specific regulatory requirement. Indeed, quite the contrary is true; the cover page of each guide states that

Methods and solutions different from those set out in the guides will

²³Once again, the currently available Task Action Plans appear to serve similar purposes.

²⁴See *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), ALAB-179, 7 AEC 159, 174 n. 27 (1974).

be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

In other words, a guide sets forth one, but not necessarily the only, method which an applicant may choose to employ in order to conform to a regulatory standard. While the staff will accept such a method, an applicant is not precluded from utilizing some other method which it can demonstrate is appropriate in the particular case. Nor are other parties precluded from demonstrating that the prescribed method is inadequate in the particular circumstances of the case.

Given the generalized nature of the studies identified in the TSAR, and the status of regulatory guides, it was not erroneous for the Licensing Board to have imposed its nexus requirement. Unlike in the case of the SER, where the relationship to the facility is perforce established by its introduction into evidence in connection with the application, there is no necessary connection between the safety of a facility and any particular TSAR item or regulatory guide. Some connecting link must therefore be supplied.

The mere identification of a generic technical matter which is under further study by the staff (such as a TSAR item or Task Action Plan) does not fulfill this obligation, even if the matter has some patent relationship to the category of reactor under review. For as we have seen, the generic study may have little bearing on safety—*e.g.*, where it concerns the methodology of the staff's review. To establish the requisite nexus between the permit or license application and a TSAR item (or Task Action Plan), it must generally appear both (1) that the undertaken or contemplated project has safety significance insofar as the reactor under review is concerned; and (2) that the fashion in which the application deals with the matter in question is unsatisfactory, that because of the failure to consider a particular item there has been an insufficient assessment of a specified type of risk for the reactor, *or* that the short-term solution offered in application to a problem under staff study is inadequate.²⁵ To bring newly issued regulatory guides into play, it would have to be shown, *e.g.*, that the means adopted by the applicant (as reflected in the application) for satisfying a regulatory requirement are either not efficacious or significantly less satisfactory than those recommended in the guide.

Contrary to the State's view, the nexus requirement does not run afoul of *Aeschliman v. NRC, supra*. Insofar as here relevant, the District of Columbia Circuit there held simply that the Commission could not condition the consideration of the alternative of energy conservation in the en-

²⁵By "short-term," we have in mind the early years of reactor operation during which the staff study may be still in progress.

vironmental phase of the licensing proceeding upon a threshold affirmative *evidentiary* demonstration that that alternative was viable. There is absolutely nothing in the court's opinion to suggest that an intervenor may not be called upon to establish that there is a tie between the matters which it seeks to litigate and the ultimate safety or environmental determinations which the Licensing Board must make in order to authorize the licensing of the reactor for construction or operation.

3. The failure of the State to have asserted the requisite nexus between, on the one hand, the River Bend facility and, on the other, the TSAR items and the newly issued regulatory guides in question is thus dispositive of the complaint respecting the Licensing Board's treatment of the attempt to raise issues on the basis of those items and guides. Nonetheless, a few additional observations are in order at this point.

The responsibilities of a licensing board in the radiological health and safety sphere are not confined to the consideration and disposition of those issues which may have been presented to it by a party or an "interested state" with the required degree of specificity. To the contrary, irrespective of what matters may or may not have been properly placed in controversy, prior to authorizing the issuance of a construction permit the board must make the finding, *inter alia*, that there is "reasonable assurance" that "the proposed facility can be constructed and operated at the proposed location without undue risk to the health and safety of the public." 10 CFR 50.35(a). To be sure, in the absence of a contest on a particular safety matter, the board need not duplicate the staff's review. Nonetheless, as previously noted (*supra*, p. 766), to discharge its functions properly it must pass judgment upon whether that review "has been adequate." 10 CFR Part 2, Appendix A, Section V(f)(2); *Consumers Power Co.* (Midland Plant, Units 1 and 2), ALAB-123, 6 AEC 331, 335 (1973), *reversed on other grounds sub nom. Aeschliman v. NRC, supra*.²⁶ Of necessity, this determination will entail an inquiry into whether the staff review satisfactorily

²⁶Although Section V(f)(2) of Appendix A to Part 2 is expressly directed to licensing board responsibilities in "an uncontested case," the obligation to determine whether the staff safety review was "adequate" obviously is equally applicable to the uncontested portions of a case in which some matters have been placed in controversy. It would make no sense at all to construe the appendix otherwise; *e.g.*, to conclude that the licensing boards must make such a determination if no issues are contested but need not do so if an intervenor has entered the proceeding for the purpose of raising environmental matters. Rather, the only reasonable interpretation is that the intended distinction insofar as licensing board treatment in a construction permit proceeding is concerned is between *issues* in contest and *matters* which have not been placed in controversy. With respect to the former, the board must resolve the controversy and also decide whether the required safety and environmental findings can be made. Section V(f)(1). With respect to the latter, the board must decide whether the staff's review has been adequate to support such findings.

has come to grips with any unresolved generic safety problems which might have an impact upon operation of the nuclear facility under consideration.

The SER is, of course, the principal document before the licensing board which reflects the content and outcome of the staff's review. The board should therefore be able to look to that document to ascertain the extent to which generic unresolved safety problems which have been previously identified in a TSAR item, a Task Action Plan, an ACRS report or elsewhere have been factored into the staff's analysis for the particular reactor—and with what result. To this end, in our view, each SER should contain a summary description of those generic problems under continuing study which have both relevance to facilities of the type under review and potentially significant public safety implications.

This summary description should include information of the kind now contained in most Task Action Plans. More specifically, there should be an indication of the investigative program which has been or will be undertaken with regard to the problem, the program's anticipated time-span, whether (and if so what) interim measures have been devised for dealing with the problem pending the completion of the investigation, and what alternative courses of action might be available should the program not produce the envisaged result.

In short, the board (and the public as well) should be in a position to ascertain from the SER itself—without the need to resort to extrinsic documents—the staff's perception of the nature and extent of the relationship between each significant unresolved generic safety question and the eventual operation of the reactor under scrutiny. Once again, this assessment might well have a direct bearing upon the ability of the licensing board to make the safety findings required of it on the construction permit level even though the generic answer to the question remains in the offing. Among other things, the furnished information would likely shed light on such alternatively important considerations as whether (1) the problem has already been resolved for the reactor under study; (2) there is a reasonable basis for concluding that a satisfactory solution will be obtained before the reactor is put in operation;²⁷ or (3) the problem would have no safety implications until after several years of reactor operation and, should it not be resolved by then, alternative means will be available to insure that continued operation (if permitted at all) would not pose an undue risk to the public.²⁸

²⁷See 10 CFR 50.35(a)(4), quoted at p. 777, *infra*.

²⁸We need not pause to consider whether we might have the power to *direct* (rather than simply to urge) the inclusion in SER's of the information referred to in the text above. In all events, the licensing boards plainly have the authority to insist that the information be supplied on the record—if not through the vehicle of the SER then by other evidence. This being so, the
(continued on next page)

C. We have seen that although the Licensing Board rejected the State's endeavor to inject the TSAR items and newly issued regulatory guides into the proceeding as issues in controversy, it did allow the State to raise issues based upon the indication in the SER that, with respect to certain reactor components and features, additional information would be required before a definitive safety finding were made respecting that component or feature. To the extent deemed necessary, we shall discuss these so-called "SER items" individually in a later portion of this opinion.²⁹ At the threshold, however, some attention must be given to the State's broad claim that, as a matter of law, issuance of construction permits could not be authorized until after the informational gaps pointed to in the SER had been filled.

In advancing this claim, the State has disavowed any assertion that *all* design details of a facility must be supplied at the construction permit stage, or that answers to *all* questions bearing on safety must be reached prior to issuance of a construction permit. Such disavowal was necessary in light of *PRDC v. International Union, supra*, in which the Supreme Court long ago gave its approval to the Commission's two-step licensing procedure and explicitly sanctioned the deferral of "a definitive safety finding until operation is actually licensed." 367 U.S. at 407. Rather, the question which the State poses goes to *the extent* to which safety information must be supplied (or, conversely, need not be supplied) prior to authorization of construction.

Our examination of this question starts with 10 CFR, 50.35(a), which permits issuance of a construction permit so long as the following findings can be made:

- (1) the applicant has described the proposed design of the facility, including, but not limited to, the principal architectural and engineering criteria for the design, and has identified the major features or components incorporated therein for the protection of the health and safety of the public;
- (2) such further technical or design information as may be required to complete the safety analysis, and which can reasonably be left

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interests of the staff—as well as those of the boards and other parties—will be best served by insuring that the information (to the extent available) is at hand before the evidentiary hearing on radiological health and safety matters commences. Otherwise, there will be a high potential of delay in the progress of the hearing. More likely than not, the hearing will have to be adjourned to allow for the belated submission of the information. And, once it has been submitted, the licensing board may be confronted with the necessity to provide time for additional discovery or the preparation of rebuttal evidence.

"As part of our review *sua sponte* of those aspects of the Licensing Board's decision which did not involve matters properly placed in controversy, we will also consider some of the TSAR and regulatory guide questions sought to be raised by the State.

for later consideration, will be supplied in the final safety analysis report;

- (3) safety features or components, if any, which require research and development have been described by the applicant and the applicant has identified, and there will be conducted, a research and development program reasonably designed to resolve any safety questions associated with such features or components;³⁰ and that
- (4) on the basis of the foregoing, there is reasonable assurance that,
 - (i) such safety questions will be satisfactorily resolved at or before the latest date stated in the application for completion of construction of the proposed facility, and (ii) taking into consideration the site criteria contained in Part 100 of this chapter, the proposed facility can be constructed and operated at the proposed location without undue risk to the health and safety of the public.

Whether every one of the first three of these findings will be possible in a given case obviously will depend in large measure upon whether the applicant has furnished the information explicitly required by other provisions of 10 CFR Part 50—such as Section 50.34(a) which specifies what must be set forth in the PSAR submitted as part of the permit application (see p. 765, *supra*).³¹ If it has not been supplied, the findings cannot be made. *Department of Water and Power of the City of Los Angeles* (Malibu Nuclear Plant, Unit No. 1), 3 AEC 179 (Commission, 1967). If it has been supplied, the licensing board's task becomes one of determining whether, on the basis of the totality of the record before it (which will include not merely the revelations in the application itself but, as well, all other information elicited either during the prehearing review or in the course of the hearing itself), the fourth Section 50.35(a) finding can be made. Stated otherwise, in the last analysis whether the absence of information not ex-

³⁰For the purposes of 10 CFR Part 50, "research and development" is defined as (1) theoretical analysis, exploration, or experimentation; or (2) the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials and processes.

10 CFR 50.2(n).

³¹It should be noted that the PSAR must, among many other things, identify and describe any research and development program which will be conducted to resolve outstanding safety questions associated with the facility's systems, structures and components. In this connection, the schedule for the program must show that "such safety questions will be resolved at or before the latest date stated in the application for completion of construction of the facility." Section 50.34(a)(8).

licity required to be supplied at the construction permit stage³² will stand in the way of permit issuance authorization hinges upon the ability of the licensing board to find, without more than has been placed before it, the existence of *reasonable assurance* both (a) that there will be a satisfactory resolution of the outstanding safety questions prior to operation of the facility, and (b) that that operation will not present undue risk to the public health and safety.³³

Needless to say, as the State correctly notes, this ultimate “reasonable assurance” finding cannot be made on the strength of (1) a naked promise that any unresolved safety questions will be dealt with at some later time; or (2) the statement, without more, that work on the questions is in progress. To the contrary, irrespective of whether it is the staff, the applicant, a reactor vendor or yet another instrumentality (such as a national laboratory) which has undertaken the search for a solution, the licensing board very likely will need to have at its disposal information of the stripe which, in the preceding section of this opinion, we have suggested be included in the staff SER. See p. 775, *supra*.

D. It is in the light of this interpretation of 10 CFR 50.35(a) that we now turn to consider the unresolved safety questions said to be reflected by the 24 “SER items” to which the State pointed. In its second decision, the Licensing Board stated that it had independently examined all 24 items and that none stood in the way of the required Section 50.35(a) findings. 4 NRC at 314, 315. Further, it found that there were no safety features or components of the facility which required research and development. *Id.* at 315. The Board did not, however, treat separately any of the items.

Our close examination of the record—particularly the SER and the testimony supplementing its content in certain respects³⁴—gives us no cause to disagree with the Board’s general conclusions. Insofar as 17 of the 24

³²The State argues at some length that Section 50.35(a) should be read to require explicitly that all “principal or major information critical to the architectural and engineering or safety features and components of the facility” be supplied at the construction permit stage. We find no merit in that assertion.

³³The State complains of the failure of the Commission to have provided a more precise standard for determining what technical or design information may be left for later development and consideration. That complaint is not properly addressed to us.

³⁴The State challenges the qualifications of the staff’s witness on the SER items, William F. Kane (the project manager for the River Bend Station). While not taking issue with the witness’ general competence, the State insists that Mr. Kane’s technical background was not broad enough to qualify him to testify on each of the 24 SER subject areas for which he was offered. The Board found otherwise, pointing to “his articulate answers and his background and qualifications” and noting that “his position as a manager of specialists has given him all the familiarity he needs with these matters” to explain them to the Board. 4 NRC at 315. We accept the Board’s appraisal on the basis of our own review of the Kane testimony.

items are concerned, we are satisfied to leave it at that. It was only with respect to the remaining seven items that the State made any endeavor during the course of the hearing (through cross-examination and not the presentation of affirmative evidence of its own) to establish its claim. As to those items, the Licensing Board should have made more specific findings. *Seabrook*, ALAB-422, *supra*, 6 NRC at 40-41. But, because *Seabrook* postdated the second decision here, we will make those findings ourselves rather than remand to the Licensing Board for that purpose.

Two of the seven items require the applicant to perform tests to confirm the adequacy of the drywell³⁵ once it has been constructed. Specifically, what is called for are (1) a structural proof test of the drywell at design pressure to verify its structural integrity (SER and SER Supps. 1 and 2, §3.8.2); and (2) a preoperational leak test at approximately design pressure to assess its bypass capability and provide adequate assurance that it will satisfy its design bases (*id.*, §6.2.1.5). With respect to each of these matters, the results of the test—which could not possibly be performed prior to drywell construction—must be submitted prior to operation. It should be noted that the SER and its supplements include not only the applicant's commitment to perform the tests but also the criteria which will be applied to assess their adequacy and their results. In the totality of circumstances, it is doubtful that these "proof test" items represent "unresolved safety questions" at all; be that as it may, the items do not preclude the requisite Section 50.35(a) findings.

Two items concern proposals to effect changes in the original design of certain facility components—the pressure relief valves of the overpressure protection system (SER, §5.2.4) and the containment atmosphere cleanup system (SER, §6.2.3).

As to the first, the SER reported that a small fraction of the pressure relief valves in some boiling water reactors (BWR's)³⁶ had inadvertently opened during certain transients. Although not compromising the integrity of the reactor containment structure, this event nevertheless represented "a deviation from the anticipated performance of an essential safety system . . . that has safety implications" (SER, §5.2.4, p. 5-7). The SER noted that changes in design would have to be submitted prior to operation and that newer valves being offered by General Electric (of a different design) were considered to be an improvement. In Supplement 2 to the SER (§5.2.4), the staff noted that it had been provided with design details and drawings of the newer valves, together with "bench" test data to verify

³⁵The drywell is a structure that completely encloses the reactor vessel and coolant recirculation system.

³⁶River Bend is to utilize General Electric boiling water reactors.

their improved performance. Further, the data are to be supplemented by a surveillance program once the new valves become operational on any BWR. Based on its review of this information, the staff concluded that the "over-pressure protection" is acceptable (*id.* at pp. 5-2, 5-3).

The containment atmosphere cleanup item concerns primary containment leakage paths which could bypass the filtration system (SER, §6.2.3). Supplement 2 to the SER indicated that the applicant had made a commitment to supply a leakage control system which would conform to applicable criteria. The staff found such commitment to be acceptable for purposes of the construction permit review, with further review required prior to operation (SER, Supp. 2, pp. 6-9, 6-10). By way of elaboration at the hearing, the staff witness pointed out that one of the approaches identified by the applicant for meeting the criteria for leakage control systems was to design one which would be comparable to another which had already been reviewed and approved by the staff (Tr. 1671). If so designed, the system would minimize potential bypass leakage from the containment (SER, Supp. 2, p. 6-9). Further, the staff concluded, there is reasonable assurance that a design comparable to that which had been approved could be satisfactorily employed in the River Bend facility (Tr. 1671).

For both of these items, then, the staff's acceptance of the proposed solutions was based on its prior acceptance of comparable components and designs. And in both cases it had formulated standards and criteria by which the acceptability of the solutions could be judged. Although each solution will, of course, be subject to further review at the operating license stage, in the totality of these circumstances we perceive no impediment to the required Section 50.35(a) findings.

The item involving the residual heat removal system concerns a staff determination in the SER (§5.4.5) that the proposed design for the system required changes in order to meet one of the performance standards set forth in the General Design Criteria (Appendix A to 10 CFR Part 50). The applicant was told that a modified design would have to be submitted and approved by the staff prior to issuance of construction permits. SER, §5.4.5. At the hearing, the staff witness explained that the applicant had submitted two alternative designs to meet the applicable criteria, that the staff had looked at these designs and "found certain deficiencies, but not very big ones," and that, with a single feasible change, one of the designs submitted by the applicant would meet the criteria (Tr. 2261). Whether that design will in fact be employed has not as yet been finally determined; it will depend upon whether the generic consideration of the GESSAR-238 Nuclear Island Standard Design¹⁷ produces a still further and at least equal-

¹⁷See fn. 20, *supra*.

ly acceptable design.³⁸ Since, however, an acceptable design is available, it can scarcely be said that the continuing uncertainty respecting what design will be eventually selected gives rise to an unresolved safety question.

The item regarding the facility's emergency core cooling system (ECCS) is of much the same character. In Supplement 2 to the SER, the staff concluded that the ECCS meets applicable criteria, as spelled out in 10 CFR 50.46 and Appendix K to Part 50. In its PSAR, the applicant indicated that it would adopt that ECCS design which received staff approval in the GESSAR-238 generic review. Noting this fact, the staff observed that the applicant "will be required to incorporate all appropriate changes" suggested by that review. SER, Supp. 2, p. 6-11. Here too, therefore, it would not appear that an unresolved safety question exists.³⁹

The last of the seven SER items upon which the State conducted cross-examination relates to a subject in which the Board also expressed an interest: the capability of recorders for postaccident monitoring to continue to function normally in the event of a safe shutdown earthquake. In the SER, the staff indicated that it would require assurance of such capability. The applicant accepted this requirement but noted that only one recorder under current production had the potential for meeting both it and other specified requirements (SER, Supp. 2, §7.5). In making this commitment, the applicant pointed out that

seismic input to the recorder is a function of recorder mounting location, and the ability of any recorder to pass seismic qualification for River Bend cannot be determined until final panel location, floor accelerations, and panel amplification factors are known. This information is not available until the FSAR stage.

Ibid. The staff also noted that the design and qualification program for the recorder would be reviewed at the operating license stage. At the hearing, a staff witness added "that recorders are available [beyond those known by the applicant] which will meet [the] criteria"⁴⁰ which had been established for the seismic qualification of instrumentation and electrical equipment (Tr. 2298).

The short of the matter thus is that, as in the case of the other six items, the recorder matter does not involve what could be fairly treated as an

³⁸In this respect, the applicant has committed itself to accept the results of the generic consideration.

³⁹Some changes in the generic ECCS analysis have come about as a result of the discovery of certain calculational errors in the analysis originally provided. These changes have been factored into the assessment of the River Bend ECCS design. See ALAB-383, *supra*.

⁴⁰See SER, Supp. 1, §3.10.

unresolved safety question standing in the path of construction permit authorization. Seismic design criteria for the recorders have been established and there appears to be at least one existing instrument which would satisfy these criteria. True, there must be final testing and approval of the instrument. But that cannot take place until after installation.⁴¹

E. Moving on to the various TSAR and regulatory guide items which we have examined as part of the *sua sponte* review, none appears to raise any safety issues which must be resolved at the construction permit stage of the licensing of this facility.

1. Once again, the TSAR is an internal working document which amounts to a status report on various technical inquiries which are being pursued by the staff for the purpose of improving regulatory requirements. Although circling in its statement of issues below the identification numbers for 88 of the some 200 separate items contained therein, in its appellate brief the State confined its detailed consideration to two of them. We agree with the State that the items it selected for such treatment are appropriate illustrative examples. For this reason, they likewise will be discussed in some detail here.

The first TSAR item (II.A.A.5) relates to the response of safety structures to turbine missiles (*i.e.*, projectiles resulting from the failure of high speed moving parts in the turbine). The TSAR stated that “[i]nformation in the area of structural response to impacts of turbine missiles is seldom available if not totally lacking”; that safety concerns with respect to this problem have appeared in numerous ACRS letters; and that an experimental program “to develop design procedures and criteria for use in the protection barrier design against turbine missiles is urgently needed.” The State contrasts these statements with the assurance in the River Bend SER that “facility protection from internally generated missiles is acceptable” for this facility (SER, §3.5, at p. 3-7).

In most of its review letters, the ACRS has referred to a variety of generic problems applicable to reactors of the type then under review. The January 14, 1975, ACRS letter in this case (SER, Supp. 2, App. B) was no exception, for it specifically referenced a number of generic problems which it had identified in a February 13, 1974, report to the Commission. Among the subjects addressed in that report had been that of turbine missiles. But a close examination of the discussion of the subject in the ACRS letter and the TSAR indicates that the turbine missile problem may not exist for the River Bend facility and, if it does, need not be resolved at the construction permit stage of review.

⁴¹It need be added only that it does not appear that further “research and development” (as defined in 10 CFR 50.2(n) quoted in fn. 30, *supra*) will be required with respect to the subject matter of any of the 24 SER items.

That problem, as delineated by the ACRS, involves three distinct areas of inquiry: (1) failure probability of turbines, (2) turbine orientation and (3) experimental data on penetration and damage of structures housed in the containment. But the lack of information referred to in the TSAR, and the studies described in that document, relate only to the third facet of the problem.

Insofar as the first area of inquiry is concerned, there is a difference of opinion respecting what value should be assigned to the failure probability of turbines: historical failure data yield a failure probability value of about 1 in 10,000 (10^{-4}) per turbine per year, although the industry claims that a lower value is more consistent with improved materials and designs. In its February 1974 generic report, the ACRS concluded that the 10^{-4} value was acceptable as one of the bases for calculating the likelihood of a turbine missile striking an essential safety system.

With respect to the second turbine missile problem area, that of turbine orientation, the ACRS noted that a poorly chosen location of the turbine *vis-a-vis* critical safety structures might unacceptably enhance the chances that a low-trajectory missile would collide with a safety system. This matter was subsequently considered in Regulatory Guide 1.115 ("Protection Against Low-Trajectory Turbine Missiles"), issued in March 1976.⁴² The staff determination was that:

Protection of essential systems or structures against direct strikes by low-trajectory turbine missiles can be provided by appropriate placement and orientation of the turbine units.

The guide went on to indicate that the ACRS had been consulted and concurred in its content.

Although the regulatory guide was issued after the staff's review of this application, the SER (§3.5, pp. 3-7 through 3-9) clearly reflects the position later adopted in the guide that primary protection against turbine missiles is afforded by orientation of the turbine so that any missiles that are generated will have trajectories which minimize the possibility of impact on essential components. And the SER concluded that the applicant's choice of orientation for River Bend substantially reduced the probability of a low-trajectory strike (*id.* at pp. 3-7, 3-8).

In determining that the resolution of the turbine missile question was satisfactory for the River Bend facility, the SER took into account an ongoing "generic study on the matter of turbine missiles." This study was said to involve an evaluation of the effects of turbine missiles on structures which they might strike—the third area of ACRS concern. It appears to be the

⁴²This guide employed the 10^{-4} turbine failure probability.

same study as was described in the TSAR. The SER indicated that the study would be used to assess whether "additional protection is required beyond that already offered by the present turbine orientation and structural barriers described in the applicant's PSAR" (SER, p. 3-8). It then went on to outline the analytic steps which would be taken in conducting this study. It concluded that the proposed methodology was acceptable since it would "provide a conservative basis for engineering design" (*id.* at p. 3-9).

As posed by the TSAR, the "unresolved" turbine missile question thus covers a limited sphere of inquiry. The primary means for reducing the threat of missile impact is orientation, which has been taken into account in the design of newer facilities such as River Bend. According to the ACRS, the focus of the inquiry referred to in the TSAR should be on "older plants with non-optimum turbine orientations." In any event, any further protection found warranted by the TSAR study might take the form of additional barriers which very likely could be added subsequent to facility construction and would not require the rebuilding of existing structures.

In sum, insofar as River Bend is concerned, the turbine missile question has been dealt with in a manner deemed satisfactory by a newly issued regulatory guide, which has been approved by the ACRS. No suggestion that the chosen method of resolution is unsatisfactory appears on this record. Contrary to the State's claim, the SER took account of the ongoing study described in the TSAR item; and to the extent that further protection may be found warranted by that study, it can be later supplied. That being so, we are here confronted with one of those questions which have not been resolved generically but for which a satisfactory answer has been provided for the particular reactor under review. In such circumstances, no barrier to construction permit authorization exists. See *Wisconsin Electric Power Co.* (Point Beach Nuclear Plant, Unit 2), ALAB-78, 5 AEC 319, 329 (1972); *id.*, ALAB-137, 6 AEC 491, 507-08 (1973); *Consumers Power Co.* (Midland Plant, Units 1 and 2), ALAB-123, 6 AEC 331, 349 (1973), *reversed on other grounds sub nom. Aeschliman v. NRC, supra*; *Long Island Lighting Co.* (Shoreham Nuclear Power Station), ALAB-156, 6 AEC 831, 844-45 (1973); *Georgia Power Co.* (Alvin W. Vogtle Nuclear Plant, Units 1 and 2), ALAB-291, 2 NRC 404, 412-13 (1975).

The other TSAR item (I.A.B.3) discussed by the State in its appellate brief relates to "station blackout," *i.e.*, the loss of both onsite and offsite AC power. Should that event occur, the TSAR stated, adequate core cooling "can be assured by sufficient design diversity." The State claims that the SER discussed neither the problem nor whether the River Bend design is sufficiently diverse.

We fail to perceive any "unresolved" question here, and the State has pointed to none. Onsite AC power normally is provided by the nuclear

power unit itself, which furnishes power for all station auxiliary loads when the main generator is functioning (SER, §8.2). If that generator is not in operation, the auxiliary loads can be carried by available offsite power sources (*ibid.*). If all of the offsite sources are lost at a time when the generator is not operating, the electrical power for safe shutdown of the reactor will be supplied by onsite diesel generators (SER, §8.3). It would appear, therefore, that there is the requisite design diversity. In this connection, the SER noted (*ibid.*) that measures will be taken to insure the sufficiency of the diesel generators to fulfill their function as a “standby power source.”

Just as the two TSAR items which we have specifically addressed, so too the other items pointed to by the State do not upon analysis reflect “unresolved safety questions” which might bar allowing River Bend to be built now. More particularly, we have been unable to identify any area of inquiry embraced by those items (and the State suggests none) which might uncover a safety problem applicable to River Bend which could not be resolved either by system alterations using available techniques and equipment or by operational modifications (*e.g.*, reduction in permissible power levels or changes in procedures).

2. The regulatory guides to which the State pointed were seemingly singled out not because they assertedly raised specific safety questions applicable to River Bend, but rather solely because their effective dates were after the submission of the construction permit application and consequently (so the State thought) would not have been routinely referred to in the safety evaluation of the application. An examination of the two guides upon which the State placed reliance in its appellate brief graphically demonstrates why the fact that a guide has been newly issued cannot, standing alone, give rise to an affirmative licensing board duty to investigate its possible impact upon the safety findings which the board must make.

The first is Regulatory Guide 1.96 (“Design of Main Steam Isolation Valve Leakage Control Systems for Boiling Water Reactor Nuclear Power Plants”), which provides a basis for implementing General Design Criterion 54. The State claims that

No explanation is offered in the record of the River Bend proceedings as to how the method used by the Applicant to implement Design Criterion 54 will provide a margin of safety for the facility equal to that of the method described in the Regulatory Guide.

But an examination of Supplement 2 to the SER reveals that the applicant had made a commitment to install a main steam isolation valve leakage control system which “will meet the staff’s criteria as delineated in Regulatory

Guide 1.96” and which, on that basis, was considered by the staff to be “acceptable” (SER Supp. 2, §9.3.5, at pp. 9-1, 9-2).⁴³

The second guide is Regulatory Guide 1.20 (“Comprehensive Vibration Assessment Program for Reactor Internals During Preoperational and Initial Startup Testing”). The record establishes that the applicant has committed itself to establish a vibratory test program in conformity with this guide. Although the details of the program remain to be formulated, it will be patterned after that of the Browns Ferry facility, which was designed with the requirements of the guide in mind. PSAR, Amendment 5, p. R3-43. It would appear that the State entirely overlooked this consideration.

F. We have also scrutinized the 27 “technical issues” considered in the two documents (NUREG-0138 and NUREG-0153) transmitted by the staff to us during the course of our appellate review of this proceeding (see fn. 11, *supra*). None suggests a safety problem of the type which must be resolved prior to authorization of River Bend construction permits.

Eleven of them⁴⁴ are pertinent only to pressurized water reactors and a twelfth⁴⁵ focuses upon liquid metal fast breeder reactors. Consequently, our attention can be restricted to the remaining 15, of which two are applicable to BWR’s alone and 13 are applicable to light-water reactors generally.

One of the two BWR issues⁴⁶ can be dismissed summarily on the basis that, in terms, it is restricted to older reactors which employ a different fuel bundle design than that of River Bend. The other⁴⁷ relates to a possible requirement for improvement in the shutdown reactivity performance of the reactor during later stages of the core life. Because of the control rod configuration near the end of a fuel cycle, the power reduction rate (measured from full power operation) might not be sufficient to avoid fuel damage during certain operational transients. This possibility was adequately dealt with in the River Bend SER. Supp. 2, pp. 15-1 to 15-2. That document reflects that design modifications are under active consideration. The staff believes that these modifications will provide an appropriate long-term

⁴³This section of the SER was included among the SER “unresolved” questions—presumably because the applicant was reserving the right to submit an alternate design. With respect to a similar situation, we have earlier held that, when one design already meets applicable criteria and an alternate can be approved only if it also does so, no unresolved problem is presented. See p. 780, *supra*, and Tr. 1671.

⁴⁴NUREG-0138, issues numbered 1, 4, 5, 6, 7, 9, 14, 15; NUREG-0153, issues numbered 20, 23, 25. We note that, while issues 4 and 7 might appear to be generic in nature, our review has disclosed that the concerns identified therein are applicable only to certain PWR designs.

⁴⁵NUREG-0138, issue 8. This issue relates to the application of probabilistic evaluation techniques in the design of the Clinch River Breeder Reactor.

⁴⁶NUREG-0138, issue 3.

⁴⁷NUREG-0153, issue 26.

solution. For the present, the staff imposes operating limits through technical specifications which serve to insure safe operation during the latter stages of the fuel cycle. *Id.* at p. 15-2.

With regard to the 13 issues extending to light water reactors generally, it appears that each is susceptible of resolution by the operating license stage of this proceeding. Three⁴⁸ have either already been resolved or can be satisfied by administrative actions. Another three⁴⁹ involve compliance with existing regulatory guides or guides under revision; whether there has been such compliance can be ascertained before River Bend is licensed for operation.

Three of the seven remaining items—involving the load/generator breaker, soil-structure interaction analysis and offsite power availability issues⁵⁰—can be addressed only on a case-by-case basis. Our analysis indicates that the River Bend facility does not use the breakers in question (PSAR §8.1.4); the geology of the River Bend site is such that there is no problem regarding soil-structure interaction analysis (PSAR, pp. 3.7-3, 4); and, lastly, the two sources of offsite power are both immediately accessible (PSAR §§8.1.4, 8.3.1). The other four⁵¹ involve studies that are underway to determine if additional design improvements are required. If the need for such improvements is established, it will be incumbent upon the staff to assure that the requirements are met by the River Bend design. This can be accomplished when the FSAR comes before it for review.

II

The remanded fuel utilization efficiency issue arose from the State's claim that there had been an insufficient demonstration that sufficient fuel will be available to permit operation of the River Bend facility over its projected lifetime. In ALAB-317, we discussed the Licensing Board's earlier determination on this question in terms of two disparate issues: (1) the extent of uranium resources; and (2) the efficiency of utilization of uranium fuel. On the first issue, we found that the Licensing Board had justifiably relied upon the estimate of the likely total available uranium supply (1,980,000 tons of U₃O₈) which had been tendered by the staff's expert witness. 3 NRC at 180-81.⁵² On the second issue, however, we observed that

⁴⁸NUREG-0138, issue 2; NUREG-0153, issues 16, 27. Issue 27 is specifically removed from consideration by 10 CFR 50.13.

⁴⁹NUREG-0153, issues 13, 18, 21.

⁵⁰NUREG-0138, issue 12; NUREG-0153, issues 19, 24, respectively.

⁵¹NUREG-0138, issues 10, 11; NUREG-0153, issues 17, 22.

⁵²That estimate assumed a U₃O₈ forward cost of \$30/lb. The current market price of over \$40/lb (of which we take official notice) should provide an incentive for mining the existing lower uranium content ores. This would expand the resources that might be included in an inventory.

“an informed judgment on whether the projected supply will be sufficient to meet the fuel needs of all [light-water reactors which foreseeably will be operated during the life span of River Bend] cannot be made without an ascertainment of the amount of uranium which they are likely to consume,” and we concluded that there was insufficient evidence in the record to support the Licensing Board’s findings on that question. *Id.* at 182, 185. The remand which we thereupon directed was confined to the fuel utilization efficiency question.

In considering this question in its second decision, the Licensing Board took as its starting point the same projected uranium supply (1,980,000 tons of U₃O₈) which it previously had accepted and we had left standing. It went on to divide the remanded issue into the following four areas of inquiry, which it found to encompass the various record deficiencies particularized in ALAB-317:

- (1) Fuel cycle process losses (ALAB-317, 3 NRC at 184).
- (2) Basis for projecting existing fuel burnup experience to values anticipated for BWR and PWR equilibrium cycles (*ibid.*).
- (3) The analytical methods used to calculate fuel burnup and spent fuel enrichment and their empirical bases (*id.* at 183-84).
- (4) The ultimate determination of the adequacy of uranium resources to meet uranium requirements (*id.* at 182-83).

The Licensing Board made extensive findings on each of these subjects, and it reached the same ultimate conclusion as it previously had reached: “that the resources of uranium are sufficient to supply the 236 reactors under consideration [including the River Bend reactors].”³³ 4 NRC at 336. In doing so, it measured the predicted available supply of 1,980,000 tons of U₃O₈ against the applicant’s forecasted requirement of 1,520,000 tons and the staff’s forecasted requirement of 1,328,000 tons (*id.* at 335). The Board pointed out that, in arriving at these estimates, the applicant and staff had used differing methods of analysis and had made independent calculations.

For its part, the applicant attempted to carry over the actual fuel burnups that have been experienced in several reactors to the overall group of 236 reactors. Its testimony³⁴ included empirical data concerning the fuel

³³This number includes all reactors currently in operation, under construction, and on order. It does not take into account the effect of recent cancellations and delays in power plant orders; as should be apparent, to do so would result in a reduction of the demand for U₃O₈ in the time scale relevant for the River Bend Station.

Insofar as licensing future reactors is concerned, the availability of sufficient uranium to meet their needs will likewise have to be determined on the basis that the satisfaction of the fuel demands of existing reactors over the full span of their projected lifetime will take priority.

³⁴Prepared testimony fol. Tr. 1542; supplemental testimony fol. Tr. 1856.

burnup that has actually occurred in several commercial reactors.⁵⁵ A comparison of predicted batch discharge burnup with the actual discharge burnup was provided to illustrate the accuracy of the analytical methods that are available to predict fuel burnup. The data also included initial and discharge U-235 assays.

The applicant utilized the data, together with estimates for gaseous diffusion plant tails assay (0.3%) and fuel cycle process losses (8.5%), to estimate duty factors⁵⁶ for different fuel use assumptions, *i.e.*, with and without uranium recycle.⁵⁷ It then plotted the duty factors obtained for each individual discharge batch as a function of years of operation. This calculation demonstrated that an "equilibrium value" for a duty factor is achieved within five or six years for BWR's and sooner for PWR's.⁵⁸ Using all of the available data the applicant then averaged these values and plotted the resulting duty factors as a function of the number of completed refueling cycles for BWR's and PWR's separately. It assumed the equilibrium value for the duty factors to be equal to the fifth cycle value thus obtained⁵⁹ and, on this assumption, calculated a cycle-weighted lifetime (30-year life) average duty factor for BWR's and PWR's. Using a capacity for the 236 plants of 155,000 MWe (all PWR's) plus 80,000 MWe (all BWR's), and further assuming a 75% capacity factor and uranium (but not plutonium) recycle (Tr. 1875), the applicant derived its 1,520,000 ton estimate of U₃O₈ requirements.⁶⁰

On the other hand, the staff initially had employed a number of computer codes for various aspects of its analysis—most notably, the NUFUEL code for calculating the amount of fuel burnup to be expected from various types of reactors. In ALAB-317, we declined to accept the staff's ultimate conclusions because of the absence of empirical data to validate a number of assumptions embodied on those codes. At the remand hearing, the staff introduced evidence directed to those assumptions—*e.g.*, the 0.3% U-235

⁵⁵Burnup and U-235 isotopic content data were first presented for four reactors: Connecticut-Yankee, San Onofre, Unit 1, Nine Mile Point, Unit 1, and Oyster Creek. These data were supplemented by information from 9 other reactors.

⁵⁶We here use the term "duty factor" in the same sense as we did in ALAB-317, as "short-hand terminology for the 'efficiency of utilization of the uranium fuel in a reactor.'" 3 NRC at 182, n. 12.

⁵⁷See App. prepared testimony, particularly Table II and Attachments A and B.

⁵⁸The four reactors for which complete data were supplied were all said to be "approaching equilibrium" (Tr. 1601). Two had reached that state (Tr. 1872). Testimony also was introduced with respect to nine additional operating reactors (fol. 1856, pp. 1, 2).

⁵⁹The applicant's witness characterized this assumption as "conservative," since "[t]he duty factor is increasing with each cycle. We believe it will go higher" (Tr. 1926). But the witness also conceded that unscheduled events could result in a lower fuel burnup (Tr. 1931).

⁶⁰App. prepared testimony, p. 4.

enrichment tails assay for the gaseous diffusion plant feed assumption;⁶¹ certain process losses;⁶² and fuel failures (past and predicted) and their effect on fuel requirements.⁶³ The staff also touched upon mill-site losses,⁶⁴ as well as the manner in which the codes took account of fuel use by reactors which had not yet reached equilibrium.⁶⁵ The end result reached by the staff was a total fuel requirement for the 236 reactors of 1,328,000 tons of U₃O₈ if uranium recycle were assumed and 1,577,000 tons if no recycle were assumed.⁶⁶ Even though reducing the estimate of uranium supply from 1,980,000 tons to 1,782,000 tons (to account for mill-site losses), the staff thus was able to adhere to its position at the original hearing that there will be sufficient uranium available to fuel the 236 reactors.⁶⁷

In finding that the supply of uranium will be adequate to fuel the River Bend facility, the Board narrowed the difference between the two estimates by reducing the applicant's estimate (which had been based on a 75% capacity factor) to the 66% capacity factor employed by the staff.⁶⁸ On that basis, the Board calculated the applicant's forecast to be 1,337,600 tons of U₃O₈ which, it found, "agrees well" with the staff's forecast of 1,328,000 tons. 4 NRC at 335.

The State's appeal on this aspect of the case asserts the continuing inadequacy of the record on uranium fuel efficiency to support the conclusion reached. We disagree. The record is both extensive and acceptably comprehensive, and the Licensing Board's analysis of it appears to us to have been commendably thorough. We need add only a few thoughts of our own to that analysis.

1. The State's claim is founded upon its belief that sufficient empirical evidence to develop a meaningful prediction is still not available. It does not take the position that the projected uranium supply will be inadequate to fuel the River Bend reactors, but only that the record does not demonstrate the adequacy of the supply. It focuses particularly on the undeniable fact

⁶¹David C. Thomas, prepared testimony, fol. Tr. 1974-A.

⁶²P. M. Wood, prepared testimony, pp. 10-12, fol. Tr. 2041.

⁶³M. D. Houston, prepared testimony, fol. Tr. 2037.

⁶⁴R. M. Wilde, prepared testimony, fol. Tr. 1997.

⁶⁵Wood, *supra*, at p. 14.

⁶⁶Wood, *supra*, table 23a.

⁶⁷The staff also presented testimony on the significance of the U-236 isotope at various stages of the fuel cycle. This testimony is relevant only if recycle were to be assumed. See Wood, *supra*, pp. 12-14; A. DeLa Garza, prepared testimony, fol. Tr. 1994. In response to a Licensing Board inquiry, the staff also discussed the relative importance of world market conditions as a cause of recent increases in the domestic price of uranium fuel. M. B. Spangler, prepared testimony, fol. Tr. 1988.

⁶⁸The record reflects that the reduction could be calculated on a linear basis (Tr. 1962).

that actual operating data reflect a lower uranium use efficiency than has been projected by the staff. In particular, it faults the staff for failing to account adequately for “undesigned” events which would reduce a reactor’s fuel use efficiency.

In this connection, the State suggested to the Licensing Board that reported operating experiences be used to calculate fuel efficiency and projected fuel requirements. The applicant and staff, and the Board, properly rejected this approach, since the data base included an overwhelming proportion of reactors which were too young to have reached equilibrium status—and hence overemphasized the relatively lower fuel efficiency of those reactors. Both the applicant and staff offered evidence derived from reactors which had reached or were approaching their equilibrium status (see fn. 58, *supra*; Wood, tables 4, 7, 12, 20) and were essentially achieving the efficiency for which they were designed (a marked improvement over the efficiency generally achieved in the early cycles).⁶⁹

Beyond the equilibrium matter, the staff, in seeking to verify the fuel burnup assumptions which its codes employed, sought to isolate the particular events which had caused most reactors to operate at less than predicted efficiency. It cited premature fuel failure (actual or potential) as the major cause of the discrepancies (Tr. 2060-62). With limited exceptions, failed fuel is removed from a reactor prior to its complete burnup,⁷⁰ and many utilities have also prematurely removed fuel which they feared would prove to be flawed (even though it may not as yet have shown any evidence of failure) (Tr. 2062). The staff identified three mechanisms for premature fuel failure: (1) hydriding, (2) pellet/cladding interaction, and (3) fuel densification (Houston, at pp. 1-2, 7). It testified, however, that those problems now have been resolved and that “future fuel performance should be unaffected by [such] fuel failure mechanisms” (*id.*, p. 7; Tr. 2095). There thus remained no reason for utilities prematurely to remove fuel because of the fear of fuel failure (Tr. 2095-96).

The State questions the staff’s nonrecognition of other particular potential failure mechanisms. The staff incorporated a 5% uncertainty factor into its predictions (Tr. 2069-70)⁷¹ but it specifically did not look at available past performance data to derive that figure (Tr. 2070, 2084). Its witness

⁶⁹In some cases, where the data presented indicated less efficiency than predicted, the evidence also identified specific causes for such discrepancies. As we shall see, other testimony discussed why such causes should no longer be regarded as a reason for concern.

⁷⁰A staff witness testified that it is possible to operate with some failed fuel in the reactor (Tr. 2153-55).

⁷¹The staff used a 5% uncertainty factor for its no-recycle option and a 3% factor for the uranium-recycle option. Wood, p. 22. For reasons described later in this decision (*infra*, p. 793), we will limit our discussion to the no-recycle option.

stated that the figure was “a matter of professional judgment” (Tr. 2084). Nonetheless, the staff did indicate that other failure mechanisms which it had identified were of minor importance (Tr. 2155-56).⁷² Further, it emphasized that some of the premature fuel withdrawals had been motivated by economic considerations—a reactor which was shut down for some other reason might also have its fuel changed during that shutdown, even though the fuel was not completely used up (Tr. 2060-61). The staff witness added, however, that “[i]f [the reactor operator] has a problem with fuel supplies, I assure you he won’t do that” (Tr. 2140). Finally, as the Board pointed out, these contingencies were sufficiently accommodated by the 5% uncertainty factor which the staff had incorporated into its predictions. 4 NRC at 336.

The staff, therefore, has taken into account the major reasons why reactor performance has been less than predicted; it has done so by explaining why these reasons should no longer be a cause for concern. What the State’s claim concerning “undesigned” events amounts to, therefore, is a disagreement with the adequacy of the 5% uncertainty allowance. But the State has given us no cause to require a larger or different allowance. That being so, we see no warrant (or basis in the record) for substituting another uncertainty figure.

2. The State voices no objection before us to any particular aspect of the applicant’s demonstration of fuel efficiency—which, once again, was derived from the actual performance of specified nuclear plants (see fn. 55, *supra*). Instead, the State would discount that demonstration completely, on the ground that it rested on the “duty factor” concept.

The State places its entire reliance on the statement of a staff witness (Mr. Wood) explaining why the staff had not used fuel data in the form of “duty factors” in its prediction of uranium requirements. In advancing this argument, the State takes Mr. Wood’s statement out of context. The primary reason assigned by him for not using data based on the “duty factor” concept in developing the staff’s estimates was that such data do not properly treat the residual fuel in the reactors at the end of the forecast period (Tr. 2044, 2053-54). At the end of any given fuel cycle, some—indeed most—of the fuel will remain in the reactor to be used during forthcoming cycles. This is as true at the end of the forecast period as earlier. Thus, more uranium will be available than calculations based on the duty factor concept would account for—irrespective of any recycle. For those reasons, Mr. Wood’s predictions, based on the NUFUEL code, did not employ such calculations. If anything, however, Mr. Wood’s testimony illustrates how a duty-factor calculation would overstate rather than understate predicted uranium requirements. In these circumstances,

⁷²*E.g.*, fretting and corrosion.

therefore, the State's criticism of the applicant's forecast as being based on "duty factor" calculations is wide of the mark.

There is, however, one difficulty inherent in the use of the applicant's estimates: those estimates assumed uranium (although not plutonium) recycle. We have recently averted to the uncertainties as to whether spent fuel will in fact ever be recycled. *Exxon Nuclear Co. Inc.* (Nuclear Fuel Recovery and Recycling Center), ALAB-425, 6 NRC 199 (August 3, 1977). "[N]ational policy on reprocessing and alternative fuel cycles is under reconsideration in Congress and in the Executive Branch. . . . The Commission itself is . . . also reassessing its policies in this area and is well aware of the similar activities elsewhere in the government." *Id.* at 204. This reassessment is still in progress. That being so, our present consideration of fuel supply should be based on the lower efficiencies and greater fuel requirements which, as the record clearly indicates, will be occasioned by a failure to recycle. See, e.g., Wood, figure 8 and table 23a.

The applicant's testimony included data by which fuel requirements assuming no recycle might be calculated. But the applicant has not done so. The staff, however, has calculated U_3O_8 requirements for the 236 reactors—assuming no recycle—to be 1,577,000 tons (Wood, table 23a). For reasons already discussed, we see no valid basis for not accepting the staff's prediction of uranium requirements. Since this amount is 205,000 tons less than the uranium available after mill losses (1,782,000 tons), we have no hesitation in agreeing with the Licensing Board that sufficient uranium resources are available to fuel the River Bend reactors.

3. One other point deserves a brief comment. The State points out that the indicated 205,000-ton excess of uranium resources over requirements amounts to only 11-1/2% of a "largely undiscovered 'resource.'" It characterizes this margin as "chillingly little." But the figures for both uranium supply and uranium requirements have many built-in conservatisms.

To mention the most obvious, because of the many plant cancellations which have occurred (and of which we take official notice), the population of reactors for which fuel must be supplied is substantially less than the 236 utilized by the applicant and staff and accepted by the Licensing Board. Moreover, the 0.3% tails assay assumed in the calculations of fuel requirements is substantially in excess of the 0.2% assay currently being used.⁷³ The lower the tails assay, the less uranium feed will be required to produce a given quantity of enriched uranium.

⁷³See, e.g., AEC and ERDA notices with regard to toll enriching policy and charges, 32 Fed. Reg. 16289 (November 29, 1967), as most recently amended, 42 Fed. Reg. 51635, 51636 (September 29, 1977), of which we take official notice. See also Thomas, prepared testimony, fol. Tr. 1974-A, at p. 11.

III

In 1974, the Atomic Energy Commission undertook a quantification of the environmental effects associated with the uranium fuel cycle and incorporated the determined values in a table identified as S-3. That table was eventually embodied in 10 CFR 51.20(e), which directed that the values be taken into account in making the NEPA cost-benefit analyses for individual reactors. See *Vermont Yankee*, ALAB-392, *supra*. In its first decision (LBP-75-50, 2 NRC 419, 445 (1975)), the Licensing Board considered the effect of those values on the River Bend cost-benefit analysis.

Insofar as it dealt with fuel reprocessing and waste management, Table S-3 was later invalidated by the District of Columbia Circuit in *Natural Resources Defense Council v. NRC*, *supra*. Thereafter, in its third decision, the Licensing Board reconsidered the River Bend cost-benefit balance using the values included in a revised Table S-3, which had been incorporated into a proposed interim rule (41 Fed. Reg. 45849 (October 18, 1976)).⁷⁴ Noting its previous finding that the environmental effects of the fuel cycle as they pertained to River Bend were "negligible," it went on to determine, using the revised Table S-3, that "the impacts are so small that there is no significant change" and that "inclusion of the revised values for reprocessing and waste management into the River Bend cost-benefit analysis would not tilt [the balance] against the issuance of construction permits." 5 NRC at 450.

Subsequent to the third decision, the Commission adopted the proposed interim fuel cycle rule, with minor modifications of little significance. 42 Fed. Reg. 13803 (March 14, 1977). In later delegating to us the authority to make new fuel cycle determinations in various cases before us (based on the revised Table S-3 in the interim rule), the Commission commented that the new values "are not substantially different from the values either in the proposed rule or those in the original rule." *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), *et al.*, CLI-77-10, 5 NRC 717, 717b (April 1, 1977).

In the circumstances, we have necessarily reviewed the third decision on the basis of the values found in the revised Table S-3 in the interim rule. As pointed out in our *Seabrook* decision, the effects assigned by the interim rule to the uranium fuel cycle are so small that "they could not possibly serve to call for the abandonment of any particular nuclear facility unless the cost-benefit balance for that facility was otherwise in virtual equipoise." ALAB-422, *supra*, 6 NRC at 104. See also *Public Service Electric & Gas Co.*

⁷⁴The Board was responding to directions provided by the Commission in its *Supplemental General Statement of Policy on the Environmental Effects of the Uranium Fuel Cycle*, 41 Fed. Reg. 49898 (November 11, 1976).

(Salem Nuclear Generating Station, Units 1 and 2), *et al.*, ALAB-426, 6 NRC 206 (August 8, 1977). We are satisfied that the "virtual equipoise" situation does not here obtain. Thus, factoring the revised Table S-3 values into the cost-benefit analyses performed by the Licensing Board in its first and third partial initial decisions does not affect the validity of the conclusions there reached by that Board.

IV

As previously noted, on July 11, 1977, the State advised us that it would no longer participate in this proceeding—a course of action it stated was motivated not by a change in its perception of the facts and issues in the case but by a "limitation of resources." At that time, the issues presented by the State on appeal had been fully briefed and we had commenced our deliberations. All efforts necessary for the State to perfect its appeal thus had already been undertaken. For these reasons, we have treated the issues presented by the State's appeal in the same manner as if the State had not elected to withdraw.

On August 2, 1977, shortly after our receipt of the State's notice of withdrawal, the Union of Concerned Scientists (UCS) filed a petition for leave to intervene. UCS asserted an interest in the proceeding based upon the residency of certain of its members in Baton Rouge, Louisiana, approximately 24 miles from the plant site.⁷⁵ Although prompted by the State's withdrawal, the petition stated the UCS sought to participate only with respect to the "unresolved safety matters" issues. And it went on to make it clear that UCS was not endeavoring to broaden those issues as developed by the State but, rather, proposed to take "the case as it finds it."⁷⁶

1. Acknowledging, as it must, the lateness of the hour, UCS nonetheless argues that its petition should be granted without regard to whether it has established "good cause for failure to file on time," within the meaning of 10 CFR 2.714(a) as interpreted in *Nuclear Fuel Services, Inc.* (West Valley Reprocessing Plant), CLI-75-4, 1 NRC 273 (1975). In UCS' view, this follows from the fact that it is endeavoring simply to substitute itself for a prior participant in the proceeding which has withdrawn and to pursue the same issues which that participant had advanced.

⁷⁵Those persons were said to have both an interest in the safety of the facility and an economic interest as ratepayers. The latter interest is, however, not cognizable in NRC construction permit proceedings. *Portland General Electric Co.* (Pebble Springs Nuclear Plant, Units 1 and 2), CLI-76-27, 4 NRC 610 (1976); see also *Tennessee Valley Authority* (Watts Bar Nuclear Plant, Units 1 and 2), ALAB-413, 5 NRC 1418 (June 20, 1977).

⁷⁶UCS is represented by one of the same attorneys who had represented the State on the "unresolved safety matters" issues.

In passing upon this theory, we need not explore whether the applicant and the staff are right in their insistence that a private organization or person may not be substituted for a governmental instrumentality which had invoked the "interested State" provisions of 10 CFR 2.175 (c) to obtain entry into the proceeding. For, as we read it, Section 2.714(a) requires *all* belated petitioners to make the "good cause" showing for their tardiness—no matter whether intervention is being sought on a substitution basis or, instead, for some other reason. Certainly, the section contains no explicit exception to the "good cause" requirement. And we fail to perceive any justification for freighting the section with an implied exception of the stripe pressed upon us by UCS. If, in the circumstances of the particular case, there is a sound foundation for allowing one entity to replace another, it can, of course, be taken into account in the making of the "good cause" determination.

Smuck v. Hobson, 408 F.2d 175, 178-82 (D.C. Cir. 1969) does not aid UCS in this respect. It is enough to note that *Smuck* involved the application of Rule 24(a)(2) of the Federal Rules of Civil Procedure. The Commission itself observed long ago that Rule 24(a)(2) is without a counterpart in the NRC Rules of Practice. *Philadelphia Electric Co.* (Peach Bottom Atomic Power Station, Units 2 and 3), 4 AEC 151, 152-53 (1968).⁷⁷

2. The question thus becomes whether UCS has made the required "good cause" showing. We conclude not.

The "good cause" determination involves a consideration of both (1) the substantiality of the justification offered for the late filing and (2) the four factors specifically enumerated in 10 CFR 2.714(a).⁷⁸ *West Valley, CLI-75-4, supra; Duke Power Co.* (Perkins Nuclear Station, Units 1, 2 and 3), ALAB-431, 6 NRC 460, 462 (September 8, 1977). And, in circumstances where no good excuse is tendered for the tardiness, the petitioner's demonstration on the other factors must be particularly strong. *Ibid.*

UCS' explanation for its late filing is simply that it and its members "were lulled into inaction by the State of Louisiana." But what we had to

⁷⁷The Rules of Practice have not been altered since 1968 in any respect which might affect the correctness of that observation. But notwithstanding the absence of a counterpart to Rule 24(a)(2), basically the same factors thought relevant by the District of Columbia Circuit in its application of that rule in *Smuck* are considered in making the "good cause" determination called for by 10 CFR 2.714(a). See immediately following discussion in the text.

⁷⁸Those factors are:

- (1) The availability of other means whereby the petitioner's interest will be protected.
- (2) The extent to which the petitioner's participation may reasonably be expected to assist in developing a sound record.
- (3) The extent to which petitioner's interest will be represented by existing parties.
- (4) The extent to which the petitioner's participation will broaden the issues or delay the proceeding.

say very recently in response to a similar suggestion made by a belated petitioner in another proceeding is just as applicable here:

That explanation . . . will not carry the day. It is not claimed the State undertook to represent the interests of the petitioner specifically, as opposed to the public interest generally. This being so, [the petitioner] assumed the risk that the State's degree of involvement in the proceeding would not fulfill her expectations. And a foreseeable consequence of the materialization of that risk was that it would then no longer be possible to undertake herself the vindication of her interests.

*Duke Power Co. (Cherokee Nuclear Station, Units 1, 2 and 3), ALAB-440, 6 NRC 642, 645 (October 26, 1977).*⁹ Also pertinent is the observation of the District of Columbia Circuit in the course of its affirmance of a Commission order which had denied a late intervention petition:

We do not find in statute or case law any ground for accepting the premise that proceedings before administrative agencies are to be constituted as endurance contests modeled after relay races in which the baton of proceeding is passed on successively from one legally exhausted contestant to a newly arriving legal stranger. We find such a scheme especially abhorrent in a situation where, as here, counsel for the expiring intervenor appears newly garbed as counsel for the successive contestant.¹⁰

Easton Utilities Commission v. AEC, 424 F.2d 847, 852 (1970).

Nor need the four factors set forth in 10 CFR 2.714(a) (see fn. 78, *supra*) detain us long. At this juncture, UCS intervention—sought for the sole purpose of replacing the State—could scarcely serve either to further the interests of UCS' Louisiana members before this Board or to assist in the development of a sound record. To be sure, if allowed to intervene, UCS would acquire perforce the right to petition for Commission review of any of our holdings on the merits of the State's appeal which might not be to its liking. We may, however, properly leave it to the Commission itself to

⁹The distinction between different types of interests which was alluded to in *Cherokee* is a potentially important one. The broad public interest which the governmental intervenor is called upon to protect may well not coincide with the more confined personal interest possessed by the private intervenor. Thus, even though the same issues might be raised, there could be a marked variance in the objective sought to be attained. Cf. *West Valley, CLI-75-4, supra*, 1 NRC at 275. For this reason, there is at least some room for doubt as to the validity of the UCS assumption that governmental and private intervenors may be readily substituted for one another. As previously indicated, however, we have found it unnecessary to pursue the matter further in this opinion. See p. 796, *supra*.

¹⁰As earlier noted (fn. 76, *supra*), that is precisely the situation here.

decide whether UCS should be extended this right notwithstanding its total lack of involvement in the proceedings prior to the time that the State's appeal had been fully briefed and submitted. What that leaves is the fourth factor. Although, in light of the organization's willingness to take the case as it finds it, that factor is in UCS' favor, "Section 2.714(a) cannot be 'read as making the fourth factor dispositive; *i.e.*, as manifesting a Commission judgment that, irrespective of the conclusions reached on the other factors, an untimely petition should always be accepted so long as no broadening of issues or delay in the progress of the proceeding is involved.' " *Project Management Corp.* (Clinch River Breeder Reactor Plant), ALAB-354, 4 NRC 383, 394 (1976).

The decisions of the Licensing Board under review are *affirmed*. The UCS petition for leave to intervene is *denied* as untimely.

It is so ORDERED.

FOR THE ATOMIC SAFETY
AND LICENSING APPEAL BOARD

Romayne M. Skrutski
Secretary to the Appeal Board

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Samuel W. Jensch, Chairman
R. Beecher Briggs
Franklin C. Daiber

In the Matter of

Docket No. 50-247

**CONSOLIDATED EDISON COMPANY
OF NEW YORK, INC.**

(Indian Point Station,
Unit No. 2)

November 23, 1977

Upon consideration of a motion by the Hudson River Fishermen's Association (HRFA) filed pursuant to ALAB-399, 5 NRC 1156 (1977), the Licensing Board determines that all governmental approvals needed to begin construction of a closed-cycle cooling system have been received.

**ORDER GRANTING MOTION FOR DETERMINATION THAT
ALL GOVERNMENTAL APPROVALS HAVE BEEN RECEIVED**

Hudson River Fisherman's Association (HRFA) filed a motion dated August 31, 1977, for an order determining that all governmental approvals have been received and thus, in effect, Consolidated Edison Company of New York, Inc. (Con Ed), has received all governmental approvals needed to proceed to the construction of a closed-cycle cooling system for the Indian Point No. 2 nuclear facility.

The HRFA motion was filed in accordance with the specific schedule prescribed for the Licensing Board by the Nuclear Regulatory Commission Atomic Safety and Licensing Appeal Board (NRC-AB) in its decision designated ALAB-399. That decision considered at length the circumstances related to the denial of a construction variance by the Village of Buchanan, New York Zoning Board of Appeals. That denial prevented the construction by Con Ed of a closed-cycle (cooling tower) cooling system for its Indian Point nuclear power facility No. 2. The denial by the Village was issued on June 19, 1975, and NRC-AB concluded that the matter of application

could not remain "in limbo" (5 NRC at 1170) any longer. NRC-AB directed that:

If, within 45 days¹ of the service of this order, it (Buchanan Zoning Board of Appeals) does not issue variances embodying whatever local and incidental regulation of the construction of the cooling tower it desires to effectuate or if it attempts to impose regulation which is inconsistent with the carrying out of the license conditions, any party will be free to come back to the Licensing Board and ask that it find that the Zoning Board of Appeals' inaction or local and incidental regulation is inconsistent with and hence preempted by Federal law. Should the Licensing Board make such a finding, the Zoning Board's permission to build a cooling tower will no longer be a required governmental approval under paragraph 2.E. (1)(b) of the license. (Parentheses added.)

5 NRC 1156 at 1170-71. [The NRC Appeal Board decision, ALAB-399, was served on May 23, 1977.]

Other portions of the NRC-AB decision are important by way of background for the directed schedule of actions to be taken by the Licensing Board:

While we have decided, therefore, that a zoning variance or variances from the Village's Zoning Board of Appeals is a required governmental approval . . . that does not put the matter to rest. (pg. 1168) . . . The Zoning Board's attempt to prevent construction of a cooling tower is preempted . . . (pg. 1169) [The Zoning Board has power] . . . to "regulate local and incidental conditions relative to the construction of the proposed facility" . . . (1169) If the Zoning Board uses this declaration of its power under state law in such a way as substantially to obstruct or to delay the license conditions . . . then its "regulation" would be preempted by Federal law. (1169) . . . It would therefore be premature to rule at this time on whether the Zoning Board's local and inci-

¹The reason for granting an allowance of only 45 days for action is not known. No statute or regulation, Federal or state, requires that limitation. The Buchanan Zoning Board of Appeals is undoubtedly part-time and may be composed largely of local citizens with other business occupations. To assemble the Board and to give perhaps a 30-day notice of hearing before evidence could be presented, after which deliberations would be given, all might have entailed more than 45 days. In any event, however, since no action was taken, the Buchanan Zoning Board apparently concluded that it had no obligation to conform to the allowance from the NRC Appeal Board.

dental regulation might be preempted by this Commission's license conditions. (1170)² (Brackets added.)

NRC-AB has thus recognized the need for determination of these matters to go forward and its direction to the Licensing Board is compelling. The NRC-AB 399 decision carries forward the same theme expressed by a previous Appeal Board in ALAB-188 pertaining to the Indian Point No. 2 facility. The ALAB-188 decision commented at length (cf. pages 388-395 in 7 AEC) on the suggested schedules set forth in that proceeding for the design planning and construction of the cooling tower. In part, some comments are as follows:

It is obvious that the applicant must have a reasonable time to carry out the necessary design, contracting, and construction steps for converting to closed-cycle cooling. . . . the applicant must act with due diligence in carrying out its responsibilities (389) We see no reason why the work force cannot be obtained and excavation started while these detailed drawings are being completed. (392) . . . we find that a period of 48 months, to run from the date at which all governmental approvals . . . have been received, is a reasonable time to allow for that construction. (394) . . . if some phase of the design and construction program is found to require less time than allowed herein, it is expected that the completion date will be advanced accordingly. (395) . . . The various phases of the required work and work flow chart were presented in this testimony. (396) . . . applicant must proceed with due diligence . . . it should not be the victim of governmental inaction which extends beyond the 12-month period allowed herein (406-7) . . . the construction should be completed at the earliest feasible date (407)

The Licensing Board recognizes that ALAB-399 is to be construed and interpreted by the entire record of related proceedings, including ALAB-188. The direction to the Licensing Board in ALAB-399 is clear and specific and on that basis this Order is issued.³

²The Appeal Board, in another context (at 1173), advised:

Indeed, any experienced litigator knows that conceding a point which would be lost anyway is usually a wise tactical move because it increases one's credibility with the court.

³The Licensing Board notes that the Nuclear Regulatory Commission has ordered its review of ALAB-399 but the Commission has not stayed the effect of the 399 decision. The Commission review was granted on the basis of the Regulatory Staff petition seeking review which objected to the NRC-AB determination of the preemption rulings. The Commission in its Order granting review (August 26, 1977) defined the issues as follows:

The issues to be addressed in our review of ALAB-399 are the Appeal Board's holding that the approval of the Village of Buchanan Zoning Board of Appeals is a "necessary governmental approval" required by the license prior to commencing construction on the closed-

(Continued on next page)

The NRC Appeal Board arrangement provides for alternative bases of action by the Licensing Board: either (a) inaction by the Buchanan Zoning Board of Appeals, or (b) regulations inconsistent with and hence preempted by Federal law. [This basis is not pertinent under the present state of facts; because of complete inaction, no regulation of any kind has been issued.]

The HRFA motion is predicated upon the alternative (a) basis; *i.e.*, that the Village of Buchanan Zoning Board of Appeals has done nothing by way of response to the NRC Appeal Board determinations respecting the Buchanan Zoning Board of Appeals' actions or inactions. The NRC Appeal Board has declared:

That is not to say, however, that the Zoning Board may sit back and continue to block construction of the cooling tower by either inaction or unreasonably restrictive regulation. . . . in view of the long delay already occasioned by the New York litigation, we cannot in good conscience permit this matter to remain in limbo . . .

5 NRC 1156 at p. 1170.

The Appeal Board thus equates blocking construction with inaction and on that basis the Licensing Board finds that the inaction is blocking construction. The construction is a broad term that includes the planning and design as described by the previous Appeal Board in ALAB-188. Con Ed cannot develop its so-called critical path for construction until its governmental approval issue is resolved and the Appeal Board in ALAB-399 directs action now.

The NRC Appeal Board further determined the scope of action that could be undertaken by the New York Court of Appeals (the highest appellate court) under New York law, as follows:

(Continued from previous page)

'cycle cooling system (ALAB-399, slip op. at 20-25) and the discussion to the effect that NEPA preempts the Zoning Board of Appeals' power to deny a zoning variance for the facility (*id.* at 25-31).

The Staff has urged the Licensing Board to withhold ruling until after the Commission review is completed; however, the direction to the Licensing Board has not been stayed by the Commission. In addition, while the Commission ruling will be an important one on preemption, and applicable to all proceedings (without the usually claimed need of a "generic scenario" or the rulemaking process), the Licensing Board has concluded that the New York law is uniform, and agreed to by all parties to the proceeding, that the zoning powers of a town or village in New York cannot be exercised to prevent construction of a generating plant determined to be needed by the New York Public Service Commission. That determination has been made and is applicable to Indian Point 2.

. . . the Court of Appeals could not give the Zoning Board of Appeals any greater powers than those afforded to it by the decision of the Appellate Division and still remain consistent with Federal law.

5 NRC at 1170.

Thus, the HRFA motion rests upon alternative (a) and in effect recites that despite the admonitions of the NRC Appeal Board, the Village of Buchanan Zoning Board of Appeals has continued in inaction respecting the denial of Con Ed's request for a variance. No party to this proceeding has asserted any facts contrary to the HRFA motion that the Zoning Board has continued its inaction.

The Atomic Safety and Licensing Board, in a consideration of the NRC Appeal Board's determinations and the alternative bases for action thus provided, concluded that alternative basis (a), *i.e.*, inaction by the Buchanan Zoning Board of Appeals, does exist. The Licensing Board, therefore, pursuant to the arrangement made by the NRC Appeal Board further concludes that granting the HRFA motion now is compelled by ALAB-399. The New York Court decision⁴ has determined that the variance sought should issue and the further Court review is primarily directed to the contested preemption issue. Any delay in the granting of the HRFA motion, now that there is a specific issue for determination, might be construed as bordering ". . . on the edge of a denial of due process . . . which does not inspire confidence in the justice and impartiality of our proceedings." 5 NRC at 1174.

The NRC Appeal Board has also determined the preemption issue for both inaction and inconsistent regulations in response to the construction of the cooling towers (which determination is energetically disputed by the Regulatory Staff in its appeal to the Commission). The NRC Appeal Board declared:

⁴The NRC ALAB-399 held that the New York Court decision gave the Zoning Board power to issue regulations pertaining to local and incidental conditions relative to the construction of the proposed facility. The court decision referred to the authority of the Village to issue such regulations. The Court held:

. . . the variance sought should issue, with the *proper village authorities* being permitted limited regulation of local and incidental conditions with respect to the proposed facilities, in accordance with the Zoning Ordinance, so long as such regulation is reasonable and is not inconsistent with the construction of the proposed facility. (Emphasis added.)

The Court has thus made a distinction between the Zoning Board and the ". . . proper village authorities . . ." which latter may embrace the Village Council who would regulate the use of the streets for heavy traffic, etc. The direction in ALAB-399 that the Zoning Board issue regulations for local and incidental conditions may be directed to the wrong municipal unit.

If we were now confronted simply by the Zoning Board of Appeals' decision. . . denying the variances, we would be compelled to hold that its power to make such a decision is preempted by NEPA. . . . The Zoning Board's attempt [*sic*] to prevent construction of a cooling tower is preempted under all of these tests. And the fact that there may be some permissible scope for the operation of local zoning laws with respect to nuclear power plants does not matter.

5 NRC at 1169.

In summary, it would seem clear that the Village's delay has prevented the prompt compliance with the Commission's direction to terminate once-through cooling by 1982 or to install the preferred type of cooling system. The prevention is an obstacle by limiting the full amount of time available to the Licensee to undertake its planning effort. The Licensee apparently concludes therefore that the 1982 termination has thus become a flexible time period, implying that it would need the full amount of time intended to be used for planning and construction. The inaction by the Village prevents the full performance of the license condition.

The Licensing Board¹ finds, pursuant to the Appeal Board direction, that the Village of Buchanan Zoning Board of Appeals has continued inaction after a denial of the Con Ed request for variance from building restrictions, therefore the Zoning Board's approval is no longer a governmental approval under paragraph 2.E.(1)(b) of the Con Ed license; further, therefore, all governmental approvals to proceed with the construction of a closed-cycle cooling system have been received.

WHEREFORE, IT IS ORDERED, in accordance with the Atomic Energy Act, as amended, and the Rules of Practice of the Nuclear Regulatory Commission, and the Appeal Board's determinations and directions set forth in ALAB-399, the HRFA motion is granted and it is here determined that the Village of Buchanan's Zoning Board of Appeals' ". . . permission to build a cooling tower . . . (is) no longer . . . a required

¹Our colleague's difference with the majority is primarily related to the Licensing Board's September 1977 Order allowing an extra year to complete the ecological study. His view is that Con Ed is thereby enabled to relax a bit in its planning and design work for the termination of once-through cooling, and as indicated, for the construction of cooling towers if operation of the nuclear facility is to be continued. This delay would be contrary to one of the main themes of ALAB-188 issued in 1974. The Commission, in ordering a review of ALAB-399, had full knowledge of this provision for an extra year for the environmental study. However, the Commission did not stay, nor modify, the direction in ALAB-399 and the 45-day limit, which were apparently intended to move this case along by issuing a final determination on governmental approvals.

governmental approval under paragraph 2.E.(1)(b) of the license." (Parentheses added.)

ATOMIC SAFETY AND
LICENSING BOARD

Franklin C. Daiber

Samuel W. Jensch, Chairman

Issued:

November 23, 1977

Bethesda, Maryland

Dissenting Opinion by R. Beecher Briggs:

In ALAB-399, the Appeal Board said:

If the Zoning Board uses this declaration of its power under state law in such a way as *substantially to obstruct or to delay* the license conditions imposed on Con Ed by this Commission pursuant to NEPA, then its "regulation" would be preempted by Federal law.⁶ (Emphasis added.)

The Appeal Board stated further that after 45 days

. . . any party will be free to come back to the Licensing Board and *ask that it find* that the Zoning Board of Appeals' inaction or local and incidental regulation is inconsistent with and hence preempted by Federal law. *Should the Licensing Board make such a finding*, the Zoning Board's permission to build a cooling tower will no longer be a required governmental approval under paragraph 2.E.(1)(b) of the license.⁷ (Emphasis added.)

As I understand the directions of the Appeal Board in ALAB-399, the Licensing Board should find that the inaction or the incidental regulation by the Zoning Board of Appeals is obstructing or delaying construction of the

⁶5 NRC 1169.

⁷*Id.*, 1171.

cooling tower before declaring that such inaction or regulation is preempted by Federal law. When ALAB-399 was issued on May 20, 1977, the operating license for Indian Point, Unit 2, OL No. DPR-26, ordered that operation with once-through cooling cease by May 1, 1980. This termination date was predicated on the Licensing Board's determination that all necessary governmental approvals had been obtained in December 1976 and on the construction schedule decreed by the Appeal Board in ALAB-188.¹ The ruling in ALAB-399 that a variance from the Zoning Board was a necessary governmental approval required that the May 1, 1980, termination date for once-through cooling be extended by several months. In that circumstance any delay in issuance of the variance would have resulted in delaying the construction.

However, in a parallel proceeding, the Licensing Board, in a decision issued on June 17, 1977, set May 1, 1982, as a new date for termination of once-through cooling.² This decision is now final. In accordance with ALAB-188, all necessary governmental approvals must be obtained by December 1, 1978, for once-through cooling to be required to cease on May 1, 1982.

Con Ed's expressed concerns about the type of local and incidental regulation that the Village of Buchanan might attempt to impose on construction of the cooling tower and the record of efforts by the Village to prevent such construction, give reason to believe that waiting until December 1, 1978, for a variance from the Zoning Board is likely to result in the construction being delayed. However, I do not find support in the record for a finding that inaction by the Zoning Board at the present time, or for the next few months, would in any way delay construction of a cooling tower on a schedule consistent with the termination of once-through cooling on May 1, 1982.

By its Order of August 26, 1977, the Commission granted a petition by the Staff to review those parts of ALAB-399 which held that the approval of the Zoning Board of Appeals is a "necessary governmental approval" and that NEPA preempts the Zoning Board of Appeals' power to deny a zoning variance. The parties submitted briefs on the issues on October 14 and reply briefs were submitted on October 31. It seems reasonable to expect that the Commission's review will be completed within a few months.

The issues being reviewed by the Commission are the issues dealt with by the Licensing Board in this Order. I believe that the Licensing Board need not and should not issue an order intended to resolve those issues prior to

¹LBP-76-43, 4 NRC 598; LBP-76-46, 4 NRC 659; ALAB-188, 7 AEC 394,
²LBP-77-39, 5 NRC 1452.

completion of the review by the Commission or a determination that further inaction would delay construction of the cooling tower on a schedule consistent with a May 1, 1982, date for termination of once-through cooling. Consequently, I conclude that the Board should deny without prejudice the motion by the Hudson River Fishermen's Association.

R. Beecher Briggs

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Frederic J. Coufal, Chairman
R. Beecher Briggs
Dr. Paul W. Purdom

In the Matter of

Docket Nos. 50-338 OL
50-339 OL

**VIRGINIA ELECTRIC AND
POWER COMPANY**

(North Anna Power Station,
Units 1 and 2)

November 26, 1977

The Licensing Board authorizes the Director of Nuclear Reactor Regulation to issue a temporary license pursuant to 10 CFR §50.57(c) to load fuel into North Anna Power Station, Unit 1, to put the unit into cold shutdown condition and to maintain the unit in that condition until such time as an operating license is issued or denied.

**INITIAL DECISION ON APPLICANT'S
MOTION FOR TEMPORARY LICENSE TO LOAD FUEL**

1. Before this Board for decision is the question of whether to authorize the issuance of full-power, full-term operating licenses for the North Anna Power Station, Units 1 and 2. Two sets of evidentiary hearings have been held (November 30-December 3, 1976, and May 31-June 2, 1977). The only outstanding matters are a motion to reopen the hearings, filed by counsel for Intervenor Geraldine Arnold, and this Board's request for certain information from the NRC Staff, including the Staff's report of their review of Virginia Electric and Power Company's (VEPCO) "Analysis and System Modification for Recirculation Spray Pumps Net Positive Suction Head" dated September 16, 1977.

2. On November 14, 1977, after announcing his intention to do so in a conference call of November 11, counsel for VEPCO served by hand on the presiding officer and parties the "Applicant's Motion for Temporary License to Load Fuel." The motion requests permission to load nuclear fuel into North Anna Power Station, Unit 1, to put the unit into a cold shut-

down condition (Operational Mode 5 of the North Anna Technical Specifications) and to maintain the unit in that condition until such time as an operating license is either issued or denied. VEPCO seeks this authority under 10 CFR §50.57(c). The Commonwealth of Virginia and Intervenor Arnold filed answers to VEPCO's motion on November 18, 1977. The Staff served its answer on November 23, and it was received by the Board on November 25, 1977.

3. VEPCO requests this temporary license because Unit 1 is ready for fuel loading (Affidavit of S.C. Brown, Jr., filed by VEPCO October 18, 1977; Sylvia Affidavit).¹ The activities to be licensed would take approximately 16 days. If VEPCO is permitted to load fuel before this Board issues its initial decision on the application for a full-power, full-term operating license, the delay will be that much less in bringing the unit into operation if this Board ultimately determines that the operating license should issue. Every day that operation is delayed, we are told, costs approximately \$200,000 in increased fuel costs for power from plants fueled with oil and increases the completed cost of the North Anna project by over \$117,500 just for interest on the capital invested (Affidavit of S.C. Brown, Jr., filed by VEPCO October 18, 1977).

4. Section 50.57(c) of the CFR reads as follows:

(c) An applicant may, in a case where a hearing is held in connection with a pending proceeding under this section, make a motion in writing, pursuant to this paragraph (c), for an operating license authorizing low-power testing (operation at not more than 1 percent of full power for the purpose of testing the facility), and further operations short of full power operation. Action on such a motion by the presiding officer shall be taken with due regard to the rights of the parties to the proceeding, including the right of any party to be heard to the extent that his contentions are relevant to the activity to be authorized. Prior to taking any action on such a motion which any party opposes, the presiding officer shall make findings on the matters specified in paragraph (a) of this section as to which there is a controversy, in the form of an initial decision with respect to the contested activity sought to be authorized. The Director of Nuclear Reactor Regulation will make findings on all other matters specified in paragraph (a) of this section. If no party opposes the motion, the presiding officer will issue an order pursuant to §2.730(e) of this chapter, authorizing the Director of Nuclear Reactor Regulation to make appro-

¹Affidavit of B. Ralph Sylvia, filed with Applicant's Motion for Temporary License to Load Fuel.

priate findings on the matters specified in paragraph (a) of this section and to issue a license for the requested operation.

The "matters specified in paragraph (a)" of 10 CFR §50.57 are the following:

- (1) Construction of the facility has been substantially completed, in conformity with the construction permit and the application as amended, the provisions of the Act, and the rules and regulations of the Commission; and
- (2) The facility will operate in conformity with the application as amended, the provisions of the Act, and the rules and regulations of the Commission, and
- (3) There is reasonable assurance (i) that the activities authorized by the operating license can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the regulations in this chapter; and
- (4) The applicant is technically and financially qualified to engage in the activities authorized by the operating license in accordance with the regulations in this chapter; and
- (5) The applicable provisions of Part 140 of this chapter have been satisfied; and
- (6) The issuance of the license will not be inimical to the common defense and security or to the health and safety of the public.

VEPCO's motion for the limited temporary license is supported by the Commonwealth and the Staff. The motion is opposed by Intervenor Arnold, so this Board must make findings on the above matters "as to which there is a controversy." Mrs. Arnold argues that this Board cannot now find affirmatively on matters (3), (4) and (6), and so it is those three issues this Board must now address.² However, even as to those matters as to which there is a controversy we need only make findings "with respect to the contested activity sought to be authorized," 10 CFR §50.57(c). In the present case that activity is the loading of fuel and the maintaining of the reactor in a cold shutdown condition (Applicant's Motion for Temporary License to Load Fuel, November 14, 1977).

Public Health and Safety

5. Intervenor Arnold contends that the Board cannot find, as required by 10 CFR §50.57(a)(3), that there is reasonable assurance (i) that loading fuel and maintaining the reactor in a cold shutdown condition can be con-

²The Board adopted two of Mrs. Arnold's contentions after she had abandoned them. These issues, if in controversy, would require findings under paragraph (2) of Sec. 50.57(a). However we do not place them in controversy in this limited proceeding.

ducted without endangering the health and safety of the public and (ii) that those activities will be conducted in compliance with NRC regulations. For the limited activities to be performed under the temporary license sought, the average coolant temperature will not exceed 200° F, the system will not be pressurized above 450 psig, and the reactivity condition (K_{eff}) will not be permitted to exceed 0.90 (Sylvia Affidavit). These conditions are consistent with the limits of Operational Mode 5 of the North Anna Technical Specifications (the cold shutdown mode), and the limit on the reactivity condition is much below that permitted by the Technical Specifications.

6. Until the reactor has been made critical and nuclear power has been generated, the fuel will contain no appreciable amount of radioactive fission products and there is no significant danger to the health and safety of the public. In order for the reactor to be critical, K_{eff} must be made 1. The Technical Specifications for normal operations limit K_{eff} to 0.99 for cold shutdown with the reactor vessel head installed and 0.95 for refueling operations with the head removed. The limiting value for K_{eff} of 0.90, proposed for this temporary license, provides a margin against the reactor becoming critical that is substantially greater than is considered to be necessary for the protection of plant personnel and the public even during normal refueling. This additional margin provides assurance that an operator error or equipment malfunction would not cause the reactor to become critical. Restrictions incorporated in the Technical Specifications will provide further assurance against criticality being achieved during fuel loading and cold shutdown conditions (attachment to Domerick Affidavit).³

7. Before the reactor is ready for fuel loading, a preoperational testing program must be completed. The preoperational testing is described in the FSAR (Section 14.1.1) and includes a cold hydrostatic test and hot functional testing of the reactor coolant system to show that the plant is ready for operation, the nominal operating pressure and temperature being 2,235 psig and in excess of 540°F, respectively (FSAR Table 5.1-1). Preoperational testing of all systems required for Operational Mode 5 has been completed and the results have been accepted by the Station Nuclear Safety and Operating Committee and by NRC Region II Inspection and Enforcement inspectors (Sylvia Affidavit). It is hardly conceivable that a reactor coolant system, having just completed those tests, could fail at 200° F and 450 psig in such a manner as to discharge the coolant into the containment as in a major loss-of-coolant accident. However, even such an event as this would not create a hazard to the health and safety of the public. The coolant, being at 200°F or less and essentially unradioactive, would not flash into

³Domerick Affidavit filed with Staff's response to VEPCO's motion.

steam. The core assembly would not become critical. Since the fuel rods would contain essentially no fission products, forced cooling would not be necessary to prevent the cladding from exceeding the temperature and other requirements of Section 50.46 and Appendix K to 10 CFR Part 50 (attachment to Domerick Affidavit).

8. Before fuel can be loaded into a reactor, some of the operations staff must have reactor operator licenses. All the operators for Unit 1, including operations supervisory personnel, have been tested by and received licenses from the NRC (Sylvia Affidavit). The record of the proceeding shows that VEPCO has provided a competent staff to operate the North Anna units.

9. Finally, if VEPCO is allowed to load fuel into the reactor and this Board later decides not to authorize an operating license for Unit 1, the risk to the health and safety of the public will not have been increased. The unirradiated fuel can be removed from the reactor and handled like any other new fuel (Sylvia Affidavit).

10. Accordingly, this Board finds that there is reasonable assurance that the activities of loading fuel into Unit 1 and maintaining that unit in a cold shutdown condition (i) can be conducted without endangering the health and safety of the public and (ii) will be conducted in compliance with the regulations in 10 CFR Chapter I.

Technical and Financial Qualifications

11. Although Mrs. Arnold has withdrawn her contention about VEPCO's technical qualifications (Issue 1), her Issue 4 raises the question whether VEPCO is financially qualified to own and operate the North Anna Station. In Mrs. Arnold's answer to VEPCO's motion, she contests even the financial ability of VEPCO to carry out the limited activities of fuel loading, and so there is a controversy respecting the matter specified in 10 CFR §50.57(a)(4).

12. There is evidence in the record that VEPCO is financially qualified to own and operate North Anna, Units 1 and 2 (for record references, see NRC Staff's Proposed Findings, July 5, 1977, paragraphs 101-108; VEPCO's Proposed Findings, June 17, 1977, paragraphs 45-52). The nuclear fuel for Unit 1 is already on site, 95% paid for, and in VEPCO's possession. The personnel necessary to load fuel and operate the plant are present and ready to carry out those activities (Sylvia Affidavit). If a full-term operating license is ultimately denied, the fuel, which will not be irradiated can be unloaded as noted above. There is no evidence in the record to suggest that the operations of loading fuel, maintaining the reactor in the cold shutdown condition until an operating license for the unit is issued or

denied, and, if necessary, removing the fuel from the reactor would appreciably increase VEPCO's financial burden. Accordingly, we find that VEPCO is financially qualified to load fuel into Unit 1 and maintain it in a cold shutdown condition until an operating license for the unit is issued or denied.

13. That VEPCO's nuclear operating personnel possess adequate technical qualifications is amply supported by the record (for record references, see NRC Staff's Proposed Findings, July 5, 1977, paragraphs 17-79; VEPCO's Proposed Findings, June 17, 1977, paragraphs 65-98). As indicated above, we are informed that all the operators for Unit 1 have received licenses from the NRC. Accordingly, we find that VEPCO is technically qualified to load fuel into Unit 1 and to maintain the unit in a cold shutdown condition until an operating license is either issued or denied.

Common Defense and Security and Health and Safety of the Public

14. There has been no allegation that the limited activities for which VEPCO seeks a temporary license will be inimical to the common defense and security. Accordingly, this Board directs the Director of Nuclear Reactor Regulation to make a finding on that matter (see 10 CFR §50.57(a)(6)).

15. On the basis of all the evidence in the record, and for the reasons already given above, we find that the limited activities of fueling Unit 1 and maintaining it in a cold shutdown condition until an operating license is either issued or denied will not be inimical to the health and safety of the public.

Uncontested Matters

16. There is no controversy over matters specified in 10 CFR paragraphs 50.57(a)(1), (2) or (5). The Director of Nuclear Reactor Regulation is directed to make findings with regard to those matters.

17. In her answer in opposition to VEPCO's motion for a temporary license, Mrs. Arnold requested that the Board impose three conditions on any license to load fuel. The Board finds that those conditions will be fulfilled without making them part of the license and declines to do so. The Staff has stated that the physical security plan for the plants will be fully implemented before an operating license is granted (Tr. 3295). The Board understands and directs that this applies to a temporary license to load fuel. As indicated above, the Board considers any additional cost of loading or unloading fuel to be small in comparison with the cost of maintaining a staff at the site to operate the facility. Those additional costs could not be

a factor in the Board's determination of whether modifications should be made to the facility. Finally, a temporary license to load fuel, authorized by this Board, cannot be modified to permit the reactor to be made critical and to operate at any power unless authorized by the Board or by the Appeal Board or the Commission on appeal if this Board were to decide not to issue operating licenses for Units 1 and 2.

Conclusions of Law

18. There is reasonable assurance (i) that the activities authorized by the temporary license to load fuel can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the regulations in 10 CFR Chapter I.

19. The applicant is technically and financially qualified to engage in the activities to be authorized by the temporary license to load fuel in accordance with the regulations in 10 CFR Chapter I.

20. The issuance of the temporary license to load fuel will not be inimical to the common defense and security or to the health and safety of the public.

WHEREFORE, IT IS ORDERED, in accordance with the Atomic Energy Act of 1954, as amended, and the Rules of Practice of the Commission, and based on the findings and conclusions set forth herein, that the Director of Nuclear Reactor Regulation is authorized to make findings on certain matters specified in 10 CFR §50.57(a) as indicated above and, upon making affirmative findings on those matters, to issue a temporary license to load fuel consistent with the terms of this Initial Decision. The temporary license shall authorize the applicant to load fuel into the North Anna Power Station, Unit 1, and to place the unit in a cold shutdown condition (Operational Mode 5 of the North Anna Technical Specifications) until an operating license for the unit is either issued or denied. The temporary license shall include a limiting condition of operation that requires that the reactivity condition (K_{eff}) be maintained at no greater than 0.90.

IT IS FURTHER ORDERED, in accordance with Sections 2.760, 2.762, 2.764, 2.785, and 2.786 of the Commission's Rules of Practice, that this Initial Decision shall be effective immediately and shall constitute the final action of the Commission subject to review thereof under the above cited rules. Exceptions to this Initial Decision may be filed by any party within seven days after the service of this Initial Decision. A brief in support of the exceptions shall be filed within fifteen days thereafter (twenty days in the case of the Staff). Within fifteen days after the service of the brief of appellant (twenty days in the case of the Staff), any other party may file a brief in support of, or in opposition to, the exceptions.

**ATOMIC SAFETY AND
LICENSING BOARD**

Frederic J. Coufal, Chairman

**Dated at Bethesda, Maryland,
this 26th day of November 1977.**

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

John M. Frysiak, Chairman
Marvin M. Mann
Ernest O. Salo

In the Matter of

Docket Nos. 50-443
50-444

PUBLIC SERVICE COMPANY OF
NEW HAMPSHIRE, et al.

(Seabrook Station, Units
1 and 2)

November 30, 1977

Upon consideration, pursuant to ALAB-366, 5 NRC 39 (1977) and CLI-77-8, 5 NRC 503 (1977), of the suitability of the proposed Seabrook site if closed-cycle cooling were required, the Licensing Board finds that the benefits of the Seabrook facility with natural-draft cooling towers outweigh the costs and that none of the proposed alternative sites is obviously superior to Seabrook, without considering the relative costs of completion of facilities at the various sites.

**SUPPLEMENTAL INITIAL DECISION
(Construction Permit)**

Appearances

Thomas G. Dignan, Jr., Esq., R.K. Gad, III, Esq., and
John A. Ritsher, Esq., for the Applicants.

Robert A. Backus, Esq., for Intervenors Seacost Anti-
Pollution League, The Audubon Society of New Hamp-
shire, and Society for the Protection of New Hampshire
Forests.

Karin P. Sheldon, Esq., for Intervenor New England Co-
alition on Nuclear Pollution.

Donald W. Stever, Jr., Assistant Attorney General for the State of New Hampshire.

Ellyn R. Weiss, Deputy Assistant Attorney General for the State of Massachusetts.

Richard C. Browne, Esq., and **Marcia E. Mulkey, Esq.**, for the U.S. Nuclear Regulatory Commission.

I. INTRODUCTION AND BACKGROUND

1. The Atomic Safety and Licensing Board filed its Initial Decision (I.D.) in the above captioned matter on June 29, 1976.¹ That Decision authorized the issuance of construction permits for Seabrook, Units 1 and 2, with once-through cooling as previously approved by the Environmental Protection Agency (EPA).² It also rejected the proposed alternative cooling system of closed-cycle and denied authorization of the units in the contingency that EPA should reverse its approval of once-through cooling and sanction a closed-cycle cooling system.³

2. The I.D. was appealed before the Atomic Safety and Licensing Appeal Board (Appeal Board). During the course of this appeal and on November 9, 1976, the EPA Regional Administrator revoked EPA's prior approval of the once-through condenser cooling system as well as the prior Determinations regarding the intake location.⁴

3. On January 21, 1977, the Appeal Board issued a Memorandum and Order (ALAB-366) which suspended the construction permits in light of the EPA Decision.⁵ ALAB-366 also vacated the I.D. insofar as it found Seabrook unacceptable with cooling towers on the grounds that the record was incomplete on this issue and did not support the Licensing Board's ruling. The Appeal Board remanded the issue of the cooling towers to the Licensing Board with the following instruction:

[S]o long as there exists a substantial possibility that EPA will ultimately resolve the cooling system controversy in favor of cooling towers, the Seabrook site cannot be approved in the absence of (1) an in-depth

¹LBP-76-26, 3 NRC 857 (June 29, 1976).

²*Public Service Company of New Hampshire*, EPA Dkt. No. NH0020338, Region 1, Determinations issued October 24, 1975.

³I.D., 3 NRC at p. 937.

⁴*Public Service Company of New Hampshire*, EPA Dkt. No. NH0020338, Regional Administrator's Initial Decision (November 9, 1976).

⁵*Public Service Company of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-366, 5 NRC 39 (1977).

evaluation of the economic costs and environmental impacts which that option would entail; and then, (2) a comparison of the Seabrook site to sites in light of that evaluation. (ALAB-366 at 65.)

4. On March 31, 1977, the Commission issued a Memorandum and Order on review of ALAB-366.⁶ It approved the Appeal Board's remand and further directed the Licensing Board to consider on the issue of alternate sites southern New England sites proposed by intervenor New England Coalition on Nuclear Pollution (NECNP). The Commission's Memorandum and Order also provided the Licensing Board with guidelines to follow in deciding the remanded issue.

5. On June 17, 1977, (three weeks after the completion of our evidentiary hearing on remand) the EPA Administrator reversed the EPA Regional Administrator's Decision to revoke his earlier Determinations and reinstated the Determinations approving once-through cooling with the proposed intake structure some 7,000 feet offshore.⁷

6. On July 7, 1977, the Licensing Board issued a Supplemental Initial Decision wherein it found that none of the proposed additional alternative sites were "obviously superior" to Seabrook with once-through cooling. The Licensing Board deferred ruling on the remanded issue of cooling towers until the Appeal Board ruled whether the issue was mooted by the June 17, 1977, EPA Order approving once-through cooling.⁸

7. The Appeal Board affirmed the Licensing Board's authorization of the issuance of construction permits for Units 1 and 2 of the Seabrook facility and instructed the Licensing Board to render its findings and conclusions on the remanded issue of cooling towers because of the possibility that judicial review of the EPA Decision may lead to an eventual requirement of closed-cycle cooling at Seabrook.⁹ The construction permits were reinstated by Appeal Board Order of July 26, 1977.¹⁰

8. An evidentiary hearing on the remanded matters was conducted on May 23, 24, 25, and 26, 1977 (Tr. 12754-13522). Direct evidence was presented by five of the parties: the Applicants, the Staff, NECNP, and Seacoast Anti-Pollution League (SAPL), and the Audubon Society of New Hampshire (Audubon), acting jointly. The Commonwealth of

⁶*Public Service Company of New Hampshire, et al.* (Seabrook Station, Units 1 and 2), CLI-77-8, 5 NRC 503 (1977).

⁷*Public Service Company of New Hampshire, et al.* (Seabrook Station, Units 1 and 2), NPDES Permit Application No. 0020338, Case No. 76-7 (June 17, 1977).

⁸LBP-77-43, 6 NRC 134.

⁹ALAB-422, 6 NRC 33 at 73 Footnote 47, 105. See also, unpublished Appeal Board order of July 15, 1977.

¹⁰ALAB-423, 6 NRC at 115.

Massachusetts (Commonwealth) and the Attorney General of the State of New Hampshire (NHAG) also participated in the proceedings.

9. The Applicants' direct testimony was presented by a panel of nine witnesses and consisted of a description of the preferred closed-cycle system, an analysis of the environmental impacts associated with that system, and a comparison of Seabrook utilizing natural-draft cooling towers with the alternative sites. Applicants' Direct Testimony No. 27 as corrected Tr. 12771-72, and appearing Tr. following 12782 (hereinafter App. Dir. 27).

10. The Staff's direct testimony was presented by two panels of witnesses. The first addressed the acceptability of the Seabrook site utilizing the preferred closed-cycle cooling system. NRC Staff Supplemental Testimony: *Analysis of the Acceptability of the Seabrook Site Assuming Closed-Cycle Cooling* as corrected Tr. 13216-19, appearing Tr. following 13220 (hereinafter Staff on Closed-Cycle Cooling). The second addressed the comparison of Seabrook with alternate sites. *NRC Staff Supplemental Testimony on Comparison of Seabrook with Alternative Sites* as corrected Tr. 13222, appearing Tr. following 13223 (hereinafter Staff No. 2).

11. SAPL-Audubon presented testimony of four witnesses. Mr. Charles F. Tucker, (Tr. 13373) SAPL Ex. 14, testified on the subject of the effect of cooling towers upon tourism in the Seabrook area. Mr. Mark Kelley, (Tr. 13393) SAPL Ex. 15, a professional artist, presented a representation of the visual impact of the cooling towers. Mr. Tudor Richards, (Tr. 13426) SAPL Ex. 16, testified with respect to the impact of the cooling towers upon migratory birds. Ms. Betsy Woodward Proudfit, (Tr. 13446) SAPL Ex. 17, presented testimony on the prediction of atmospheric effects and terrestrial impacts of cooling tower operation.

12. NECNP presented the testimony of Ms. Barbara Yeaman, (Tr. 13480) NECNP Exs. 26 and 27, who is a graphic designer and photographer. She presented color photographs of the Seabrook site with scale overlays of the cooling towers superimposed thereon.

13. Any proposed findings of fact or conclusions of law submitted by the parties hereto, which are not incorporated directly or inferentially into this Supplemental Initial Decision, are herewith rejected as being unsupported in law or in fact, or as being unnecessary to the rendering of the Supplemental Initial Decision.

II. ANALYSIS OF THE ACCEPTABILITY OF SEABROOK ASSUMING CLOSED-CYCLE COOLING

A. System Design

14. As an alternative to the approved once-through cooling system the

Applicants have proposed a closed-cycle system which would employ wet natural-draft cooling towers. App. Dir 27 at 4-7, Table 1, Figs. 2, 3.

15. Both Staff and Applicants have analyzed and evaluated various alternate cooling systems for the Seabrook Station. FES §9.2.1, 11.9.2; 2 ER §10.1, 3 ER App. F and App. Dir 27 at 3-4. They both concluded that once-through cooling is the preferable alternative for the Seabrook site and that the wet natural-draft cooling tower system is the most acceptable of the closed-cycle systems. *Id.*

16. The Seabrook Station would require two towers (one per unit) each with a base diameter of 490 feet and a height of 590 feet. App. Dir. 27 at 71 (Table 1), Figs. 2, 3. The top diameter of each tower would be 320 feet and the throat diameter, 295 feet. Tr. 13082-3. The towers would be located westerly of the Boston and Maine railroad tracks and on either side of the access road. App. Dir. 27 at 5, Figs. 2, 3. Pumps for the circulating water systems are located in two structures, one near each cooling tower. App. Dir. 27 at 5. The reactor containment, turbine building, and other structures of the generating station would be left as designed. *Id.* at 5-6. Other features of the site remain essentially as designed for once-through cooling with the exception of a possible relocation of gas-insulated [electricity] transmission busses to avoid congestion around the cooling towers. *Id.* at 6.

17. Makeup water for the cooling towers would be obtained from the Atlantic Ocean and blowdown is returned to the Atlantic Ocean. *Id.* at 6. The water would be carried via a tunnel which goes under the surrounding salt marsh and Hampton Harbor and extends out under the Atlantic Ocean. *Id.* at 6. A single 19-foot diameter, 13,000-foot long tunnel with a divider wall to separate makeup and blowdown is proposed. *Id.* at 6. This design would enable the use of some of the already fabricated tunnel and marine construction equipment. *Id.* at 6. The single tunnel will be vertically divided by a cast-in-place, reinforced concrete wall. *Id.* at 6.

18. At the ocean terminus of the tunnel a single intake-discharge structure would be constructed. *Id.* at 5, 6. The riser shaft from the tunnel and the intake-discharge structure would be internally divided like the tunnel. *Id.* at 6. Conceptually the structure would appear much like the previously proposed velocity cap intake except that approximately two quadrants would be blank and the other two would be designed to function either as an intake or a discharge. App. Dir. 27 at 6, Fig. 4. The water leaving the discharge quadrant would have sufficient velocity to mix with the ambient water by jet action and sufficient momentum to carry it away from the structure before significant reentry occurs. App. Dir. at 7. The quadrant through which intake is occurring would have a sufficiently large perimeter to allow an approach velocity of about one foot per second to be achieved. *Id.* at 7. Recirculation would not be a problem. Tr. 13043-44.

19. Periodic reversal of flow between the two sides of the system would be used as a major step to prevent biofouling by temperature and higher salinity. If growth is still noted, additional measures may be required, such as periodically increasing the blowdown temperatures or chlorine treatment. App. Dir. at 7. See Tr. 13170.

20. The cooling tower design wet bulb temperature would be 71°F, the approach to wet bulb 14°F and the range 28°F. The circulating water flow would be 544,760 gal/min per unit; normal design intake flow would be 81,000 gal/min for both units; the nominal design blowdown for both units would be 54,000 gal/min; the discharge velocity will be 7 ft/s. App. Dir. 27 at 15-17, 71 (Table 1) as corrected Tr. 13107, Fig. 1.

B. Cost-Benefit Analysis

21. It appears that both the Applicants and the Staff estimated the differential costs of the two cooling modes, *i.e.*, once-through cooling with the intake 7,000 feet offshore, and natural-draft cooling towers. App. Dir. 27 at 8, 72 (Table 2), 76 (Table 6); see also *Id.* at 47-49 (App. A); Tr. 12916 ff, 12988 ff; Staff on Closed-Cycle Cooling at 16 (Table 5), 17-19.¹¹

22. The Applicants estimate that a switch to cooling towers as of July 1977 would result in an increased capital cost of \$526,300,000 plus a penalty in the cost of operation of approximately \$143,000,000 by virtue of lost capability and efficiency. App. Dir. 27 at 2 (Table 2), 76 (Table 6); Tr. 13193, 13202-04.

23. The breakdown is as follows: the differential capital cost of the two systems is \$3,100,000. App. Dir. 27 at 72 (Table 2); Tr. 12915; the loss of

¹¹There is some confusion in the record as to the exact location of the intake-discharge structure. The coordinates of the proposed location are given as 42°-54'-3" North Latitude, 70°-47'-57" West Longitude. App. Dir. 27 at 5. These coordinates indicate that the location would be 4,000 feet northwest of the intake location originally proposed by the Applicants for once-through cooling. EPA Determinations issued October 24, 1975, EPA Dkt. No. NH 0020338 Region I. However, at App. Dir. 27 a reference is made to a 13,000-foot long tunnel and Staff lists the tunnel as 3,000 feet offshore from Hampton Beach. Staff on Closed-Cycle Cooling at 4. Both of these references would indicate the location of the intake to be as originally proposed by the Applicants. Again at Tr. 13041 Applicants' witness Mr. McPherson indicates the intake location to be as originally proposed. The cost of the tunnel is given as 38.8 million dollars (1976 dollars) which was based on a 15,000-foot length computing to \$2,500 per foot. Tr. 12986-87. See also Staff on Closed-Cycle Cooling at 17. It would seem then that the cost estimates given for the tunnel in the record probably are for the intake at the originally proposed location. If that were the case, and should the actual intake location be the one that is referred to in the EPA Determinations, then the cost of the tunnel would be increased by 5 to 10 million dollars.

However, this possible increase is not at all controlling in light of our finding that the range of incremental costs are 50 to 150 million dollars. See paragraph 28 below.

items already procured but which cannot be used in the closed-cycle system which have a value of \$9,500,000; interest at 9.5% per annum and an annual escalation rate of 7%, App. Dir. 27 at 49, will increase the differential cost by \$6,700,000. App. Dir. 27 at 72 (Table 2). A switch to cooling towers as of July 1977, would incur an additional delay of 39 months at a cost of \$13,000,000 per month for \$507,000,000. App. Dir. 27 at 72 (Table 2), 76 (Table 6). This 39 months is composed of 27 months for reengineering, reapplying for permits and operation of the regulatory process and 12 months to remobilize for construction. App. Dir. 27 at 8, 76 (Table 6). Remobilization would be delayed until construction permits were secured and would require negotiation of contracts for onsite work and reassembling necessary personnel. Tr. 13061, 13195-7.

24. Staff estimates that the differential monetary cost of using natural-draft cooling towers in place of once-through cooling at the Seabrook Station is \$50,500,000. Staff on Closed-Cycle Cooling at Table 5. This compares to a differential figure of \$162,000,000 by Applicants' estimate. App. Dir. 27 at 72 (Table 2). Both of these figures include a \$19,300,000 difference in capital costs and the remainder of the differential represents the lost capability and efficiency that cooling towers would entail. Staff on Closed-Cycle Cooling at Table 5.

25. The Staff has also reviewed construction cost estimates of two other power stations that have considered the use of natural-draft cooling towers (and freshwater coolant sources) as an alternative to once-through cooling. Based on estimates of the capital costs at these stations as modified by escalation and needs special for Seabrook, such as corrosion-resistant materials and considering the savings gained by eliminating one of the two tunnels, Staff finds that the completed construction costs will be increased by about \$9,000,000. *Id.* at 17. Staff however, does not believe Applicants' estimate of differential capital costs to be unreasonable.

26. Staff believes that, given the ability of the Staff or the Applicants to estimate the actual or differential costs of construction including escalation and interest charges until 1982, the values given above are well within the confidence interval. *Id.*

27. The Applicants and the Staff did calculate the cooling tower penalty differently. The Staff figure of \$31,200,000 is based on capitalized annual costs for extra fuel due to turbine back pressure change, for pumping power and for operating and maintenance. Staff on Closed-Cycle Cooling at Table 5; Tr. 13359-61. The Applicants' figure of \$143,000,000 values lost capability at the cost per kilowatt for the plant, App. Dir. 27, at 5, Tr. 13202, and also incorporates updated fuel costs for the loss of heat rate, App. Dir. 27 at 5, Tr. 13204.

28. The Board concludes that the additional costs of utilizing natural-

draft cooling towers (putting aside the effects of delay) will be in the range of \$50,000,000 to \$150,000,000. In relation to the overall cost of the project these differential costs do not appear to be significant.

29. Applicants estimate that the eight-month delay in construction following the EPA Regional Administrator's Decision last November added to the finished cost of the plant \$120,000,000 or approximately \$15,000,000 per month. App. Dir. 27 at 72 (Table 2); *Id.* at 8, 47-49 (App. A). The Board is unable to assess with greater particularity the effect that any future decision to change to closed-cycle cooling would have upon delay of completion of construction and consequently upon ultimate completion costs. Since the costs of delay occur simultaneously with the delay of completion of needed power, and since the power will be needed by the mid-1980's (ALAB-422 at 97), the Board finds that the costs of delay do not outweigh the benefits of the project. The fact that any future decision to change to closed-cycle cooling will engender delay does not warrant abandoning the project.

C. Environmental Impacts of the Proposed Closed-Cycle System

1. Entrainment and Entrapment Effects

30. In the original Initial Decision, a majority of this Board found that the entrainment and entrapment effects of Seabrook with open-cycle cooling were acceptable. LBP-76-26 at 894-86.

31. The effect of a change to a closed-cycle condenser cooling system will be to reduce the entrainment effects by a factor of 10. App. Dir. 27 at 18-19. See also Staff on Closed-Cycle Cooling at 8-9.

32. Unlike entrainment, the relationship between intake volume and entrapment is not linear, however, entrapment will probably be reduced. App. Dir. 27 at 19-20; Staff on Closed-Cycle Cooling at 8-9.

33. Based upon the foregoing the Board concludes that losses due to entrainment and entrapment will not be of such a magnitude as to significantly affect local fish populations. Staff on Closed-Cycle Cooling at 8-9.

2. Discharge Effects

34. It is estimated by both Staff and Applicants that the sinking plume from the discharge will affect less than one acre of the sea bottom. App. Dir. 27 at 21; Staff on Closed-Cycle Cooling at 9 as corrected Tr. 13218; Tr. 12984, 13239, 13249. This will have no significant effect on the ecosystem.

35. The Staff analyzed the effects of temperature and salinity in the blowdown water, and concluded that, given the rapid dilution and the small

area affected, it is unlikely that significant mortality would result. Staff on Closed-Cycle Cooling at 9-11. The Staff analysis examined the potential effects upon aquatic biota of "cold shock" from the plume when it has temperature below ambient (November-March) and the potential effects upon organisms from increased salinity. *Id.* at 9-10. Applicants presented testimony which reached the same conclusions that demonstrated that the plume with higher temperatures than ambient will have no significant environmental impact. App. Dir. 27 at 21-24. The Staff also analyzed the discharge effects if the cooling water is chlorinated, and concluded that dilution will rapidly reduce halogen concentration below a chronic threshold for sea life, such that a very small area is likely to be affected if any such mortality occurs. Staff on Closed-Cycle at 10-11.

36. Based upon all of the foregoing, the Board finds that no significant effects upon the aquatic ecosystem will result from operation of a closed-cycle cooling system. In fact, the closed-cycle system is preferable to once-through cooling insofar as aquatic effects are concerned.

3. Atmospheric and Terrestrial Impacts

37. The predominant atmospheric and terrestrial effects occur because evaporated cooling water is emitted from the natural-draft cooling towers. The plume formed by the evaporated water is occasionally visible and always contains water droplets (salt water droplets in this instance) which are airborne and eventually deposited on the land. Both the Staff and the Applicants presented analyses of the predicted atmospheric and terrestrial effects. SAPL-Audubon also provided testimony on the subject of the measurement of the atmospheric (and consequent terrestrial) effects.

38. The approach taken by the Staff and the Applicants was to utilize meteorological data and design parameters of the cooling towers as inputs to a computer model which predicts the effects which will occur as a result of tower operation. App. Dir. 27 at 9; Staff on Closed-Cycle Cooling at 6; Tr. 13369-72.

39. The Applicants utilized surface meteorological data from the National Weather Service's Logan Airport collection location, Tr. 12799, and upper air data collected at Portland, Maine. Tr. 12790, 12958. The FOG computer program of the NUS Corporation of Rockville, Maryland, analogizes and extrapolates these data for the Seabrook site. Tr. 12958, 13095-96. The data base used appears to generally correlate well with data collected at the site, Tr. 12791, 13226-27, and may lead to projections of conservative results insofar as the Logan data overstates wind speeds and consequently understates plume rise. Tr. 12791, Tr. 13472-73.

40. The Staff utilized the ORFAD computer code which was developed

at Oak Ridge National Laboratory. Tr. 13307, 13350. The Staff utilized one year of onsite data taken at 30 feet from the Seabrook surface and at 130 feet for purposes of extrapolating to upper air data. Staff on Closed-Cycle Cooling at 6; Tr. 13308-10. The ORFAD code has been verified on the basis of the limited operating data available, and permits predictions which reflect the state-of-the-art. Tr. 13309-10.

41. If one takes into account that the two models utilized a different drift loss rate for salt (*i.e.*, a different salt source term), the predictions of the two models are very similar, with the Staff's model yielding slightly more conservative results. Tr. 13369-72.

42. Ms. Betsy Woodward Proudfit, appearing as a witness for SAPL-Audubon, criticized the meteorological data used primarily on the basis that they were either collected offsite (in the Applicants' analysis) or did not include upper-air data. SAPL Ex. 17. Although Mr. Proudfit is correct in stating that onsite surface plus upper-air data would probably be the most appropriate data, she does not offer any solution to the realistic problems associated with a year-long onsite data collection program which would include upper air data. Further, the correlation between Logan and onsite data, Tr. 12791, 13226-27, and the Staff's independent use of onsite data, Staff on Closed-Cycle Cooling at 6, appear to obviate problems associated with lack of complete onsite data. Similarly, no specific reason to reject the Portland, Maine, upper air data was offered. In light of the closeness of predictive results from the use by Applicants and Staff of independent computer codes with different data bases as inputs, the Board finds that the predictions are reasonable.

43. No ground level fogging or icing is predicted as a result of operation of the cooling towers. App. Dir. 27 at 12, 14-15; Staff on Closed-Cycle Cooling at 6, 12.

44. With respect to salt drift, the Applicants, utilizing drift loss rate of 0.01%, App. Dir. 27 at 13; Tr. 12846, predicted a salt deposition rate of 11.2-65.6 lbs/acre-year. The maximum deposition would occur in the area 8 km ESE of the site, App. Dir. at 75 (Table 5).

45. The Staff, utilizing a more realistic drift rate of 0.002% predicted substantially lower levels of deposition. Staff on Closed-Cycle Cooling at 6, Figs. 2, 3; See also Tr. 13369-72.

46. The uncontradicted testimony of both the Applicants' and the Staff's biologists, botanists, and ecologists is that the salt deposition rates expected will have no significant effect on either the marsh or upland vegetation and the Board so finds. App. Dir. 27 at 24-33; Staff on Closed-Cycle Cooling at 13-15; Tr. 12807, 12813-14, 12817, 12967-68, 13097, 13123.

47. No significant impact from shadowing caused by visible plumes is expected. Tr. 12857.

4. Wildfowl

48. Audubon witness Tudor Richards testified that in his opinion the cooling towers as proposed for Seabrook would be a hazard to migrating birds especially under adverse weather conditions, notwithstanding the fact that birds migrate usually well over 1,000 feet altitude. SAPL Ex. 16 at 1. He felt also that the plumes associated with the towers "would be bound to make things worse for night-flying migrating birds by causing fog or clouds to obscure them." *Id.* at 2.

49. In support of his opinion Mr. Richards cited a U.S. Department of the Interior report, Migration of Birds, Circular 16, U.S. Government Printing Office, 1950. *Id.* at 2. However, upon cross-examination Mr. Richards allowed that he could not quantify the losses which result from birds striking tall building structures, nor could he quantify the potential loss at Seabrook were towers to be installed. Tr. 13438-41.

50. Dr. Roger Lee Kroodsma testified for the Staff and stated that in his opinion the cooling towers at Seabrook would have a small impact on wildfowl which would amount to a slight increment to all of the other impacts that occur already from radio, TV towers, and tall buildings. Tr. 13342-43.

51. Based on the foregoing the Board finds that the impact upon wildfowl is not significant.

5. Aesthetic Impacts

52. All concerned agree that the natural-draft cooling towers would constitute a major aesthetic impact at Seabrook and we so held in our Initial Decision, 3 NRC at page 929.

53. The towers and the associated visible plume will extend more than 400 feet above onsite vegetative cover and may be visible for long distances. Staff on Closed-Cycle Cooling at 11. The visibility and extent of the plume is highly variable but the plume most frequently would move to the NE which would lessen the visual impact on the more westerly inhabitants. *Id.* at 12. The plumes will be visible to a relatively small number of hours per year. App. Dir. 27 at Table 4. Close to the towers and inland from the tower location, the population is relatively low. Staff on Closed-Cycle Cooling at 12, see FES pp. 2-6. For example, within one mile of the site in the segments SW to NW inclusive, there are fewer than 400 persons, and about 1,200 within two miles. Staff on Closed-Cycle Cooling at 12. The greatest concentration of people would be at the beach. However, the distance between the beach and the towers is approximately two miles and that distance should soften the impact. *Id.* at 12.

54. The record contains several attempts to represent the visual impact of the cooling towers. The Applicants submitted photographs on which cooling towers were drawn to scale, ¹² App. Dir. 27, Figs. 5A-5E, as did NECNP, NECNP Ex. 26. Audubon presented an artist's rendition of the towers, SAPL Exs. 15 and 15A. Each of these exhibits portray the dominance of the towers over the existing landscape. Ms. Barbara Yeaman, a Professor of Design for Graphic Design Majors at American University and a freelance graphic designer testified for NECNP. Ms. Yeaman took the photographs and drew the overlays that are the subject of NECNP Ex. 26. In her opinion the towers at Seabrook would appear even larger than actual size because they would be out of proportion to the existing landscape. Tr. 13509. Ms. Yeaman, however, for herself, does not find towers objectionable in appearance if they are in a related scene. Tr. 13509.

55. That the severity of impact of cooling towers upon Seabrook and environs is measured subjectively could not be better illustrated than by the diversity of opinion among the parties and various witnesses.

56. In light of the subjective nature of the impact, we find that although the visual effect of the towers will be substantial, the aesthetic impact together with all other costs does not outweigh the benefits of the entire project.

6. Tourism

57. In our Initial Decision we held that there was no basis for finding that Seabrook would have any adverse effect on tourism. *Id.* at 882.

58. Since then and at the remanded hearing SAPL witness Charles F. Tucker, the Planning Director of the Southeastern New Hampshire Regional Planning Commission has changed his opinion as to the public's attitudes to nuclear facilities. Unlike as before, Tr. 4819, 4911, Mr. Tucker now believes that the "general public is becoming increasingly apprehensive about the safety of nuclear power plants," SAPL Ex. 14 at 3. He grounds this belief on media coverage of "radiation dangers that there have been in the past two years" and more recently on the votes of town meetings held in the Seabrook and Salisbury areas "on the question of whether they (residents) favor radioactive material transported through their town," Tr. 13378, and some recent state referendums on nuclear power, Tr. 13379. Mr. Tucker reasons that although the residents may continue to live in the area, the tourist "who has a choice of similar resorts is not likely to continue to

¹²Although the Applicants argue in favor of cooling towers at Seabrook, it is understood that they do so in the alternative that once-through cooling should be disallowed by EPA.

choose the Hampton/Seabrook/Salisbury area where the towers serve as constant reminders of whatever dangers the visitor may perceive." SAPL Ex. 14 at 3.

59. On cross-examination Mr. Tucker stated that although his office did some opinion sampling in the summer of 1972 and the summer of 1974 in part to get information as background for the NRC hearings, no sampling with regard to attitudes toward cooling towers was made, Tr. 13387-88, nor did he have any information of the correlation between the presence of nuclear plants with cooling towers and tourism in any area. Tr. 13388.

60. Based on the foregoing the Board concludes that Mr. Tucker's opinion that cooling towers will make an adverse impact upon tourism in the Seabrook area is conjecture. The Board finds no basis for departing from its earlier finding, I.D. at 882, that there exists no basis at the time for finding that Seabrook will adversely affect tourism.

III. CONCLUSIONS OF COST-BENEFIT ANALYSIS

61. Utilization of natural-draft cooling towers at the Seabrook site will lead to reduced impact upon aquatic organisms as compared with once-through cooling. The towers will have insignificant atmospheric and terrestrial effects. They may increase wildfowl mortality, but this effect is not considered significant. The incremental cost is relatively small except for the cost associated with delay. The impact upon aesthetics is substantial, although the impact upon tourism is not deemed to be significant.

62. The Board, therefore, finds the use of the Seabrook site with natural-draft cooling towers acceptable and that the benefits from the project outweigh the costs thereof.¹³

IV. ANALYSIS OF ALTERNATE SITES FOR OBVIOUS SUPERIORITY

63. Having found that the Seabrook site with a closed-cycle condenser cooling system is acceptable, we must now compare Seabrook with cooling towers with alternate sites.

64. The Commission has ruled that in evaluating alternate sites Licensing Boards should consider the following guidelines:

- (1) That an application should not be denied on the basis of a comparison between the Applicant's proposed site and an alternative site un-

¹³Although we find cooling towers acceptable for Seabrook in the present circumstances, we reiterate our belief that the optimum cooling system at Seabrook is the open-cycle system.

less the alternative site appears to be obviously superior to the proposed site; Commission's Order 5 NRC at 514, 526, 535.¹⁴

- (2) That a cost-benefit comparison between an Applicant's proposed site and any alternative site must reflect the actual cost and time necessary to complete a facility at each of the locations in question. *Id.* at 514, 530-32, 535. However, should the comparative analysis reveal that no alternative site is obviously superior to Seabrook, then no weight need be given to Seabrook's lower forward costs. *Id.* 535-36.

65. On alternate site comparisons the Commission notes further: To reject an application—the only means available for indicating the preferability of an alternate site—at this late stage in the licensing process requires substantial confidence that one's judgment is correct—a confidence that can only arise where an alternate site is obviously superior.

This conclusion appears the stronger when one considers that the applicant's proposed site comes before the Board after having been intensively studied by the applicant, staff and intervenors for a period of years. The applicant is required to have produced an inventory of information about the geology, hydrology, meteorology and ecology of the proposed site. Through this required monitoring it is hoped that every major environmental impact that may result from construction of the facility will have been located and the potential problems with the site will have been identified. The alternative sites to which the proposed site is compared have undergone no comparable study. Common sense teaches that the more closely a site is analyzed, the more adverse environmental impacts are likely to be discovered. It would, therefore, be mistaken to conclude that an alternate site which appeared marginally superior to the proposed site, would remain superior upon further investigation, considering all of the possible but unknown disadvantages of the alternate site. Nor does, as one intervenor has suggested, the solution to this problem lie in requiring more intensive analysis of alternate sites by applicants before they submit their applications. Absent a mechanism which would permit banking of any sites which might be previously approved—a mechanism this Commission has sought

¹⁴In sum, we think it appropriate that a licensing board refuse to take the proposed "major Federal action," *i.e.* deny the requested license, not when some alternative site appears marginally "better" but only when the alternative site is obviously superior. Commission's Order 5 NRC at 530.

legislatively—the costs of that approach could not conscionably be imposed on private applicants and their ratepayers. 5 NRC at 528-29.

66. A total of nineteen alternate sites have been investigated for Seabrook. Staff No. 2 at 9.

67. For purposes of discussion these may be broken into six groups viz. estuarine sites in New Hampshire, seacoast sites in New Hampshire, seacoast sites in Maine, inland sites in northern New Hampshire, inland sites on the upper Merrimack River watershed, and, finally, the prime alternate, Litchfield. App. Dir. 27 at 38-44. Staff No. 2 at Table 5.

1. Estuarine Sites in New Hampshire

68. Three of the nineteen alternate sites are located on the Piscataqua River-Great Bay estuary—Rollins Farm, Fox Point and Dover Point. App. Dir. 27 at 38. Staff No. 2 at Table 5.

69. Each of these sites is a relatively confined area which is not capable of enlargement without serious displacement of other facilities and communications routes. App. Dir. 27 at 38.

70. Closed-cycle saltwater cooling would probably be required at each of these estuarine sites; and the salt drift would fall primarily on upland vegetation. App. Dir. 27 at 38. Staff No. 2 at 10.

71. Natural-draft towers may be precluded at these sites due to the proximity to Pease Air Force Base and if mechanical-draft towers were required increased fogging and icing on highways could be anticipated. Proximity to Pease would likely require further hardening of the facility beyond that required at Seabrook. App. Dir. 27 at 38-39; Tr. 13031. Staff No. 2 at Table 5.

72. Based upon the foregoing, the Board finds that neither Rollins Farm, Fox Point or Dover Point are “obviously superior” to Seabrook.

2. Seacoast Sites in New Hampshire

73. The sites in New Hampshire which would use ocean water for cooling system makeup, other than Seabrook, included Odiornes Point, Philbrick Pond, Lamprey Pond, Isles of Shoals and a floating nuclear plant.

74. Odiornes Point is now a state park; it is small and its use as a power plant site would require alteration of nearby salt marshes. App. Dir. 27 at 40. Staff No. 2 at Table 5. The environmental impacts from construction would be high. Staff No. 2 at Table 5.

75. The Philbrick Pond and Lamprey Pond sites are located in residen-

tial areas which would be disrupted for exclusion area reasons. App. Dir. 27 at 40. Staff No. 2 at Table 5 and some of which would be displaced during construction Staff No. 2 at Table 5. Lamprey Pond has poor construction access and is near an airport. *Id.*

76. The only island in the Isle of Shoals group big enough to take a plant the size of Seabrook is located in Maine where the Applicants have no power of eminent domain; it also would require underwater 345 kV transmission. FES at p. 9-7. Staff No. 2 at Table 5. The area has sensitive historical, religious, and ecological aspects. Staff No. 2 at Table 5, FES 9-7.

77. The floating power plant remains an unrealistic solution at this time. App. Dir. 27 at 39; App. Dir. 14, post Tr. 10162 at 35-36; FES at p. 9-7. Even if realistic it would involve transmission distances. Staff No. 2 at Table 5.

78. Both Applicants, App. Dir. 27 at 39-40, and the Staff, Staff No. 2 at 10, assume that saltwater cooling towers would be required at each of these seacoast sites. However, even if these alternative ocean sites would be permitted to use once-through cooling, they do not gain sufficiently in comparison to Seabrook to overcome the other relative disadvantages referred to herein. Staff No. 2 at 10.

79. Based on the foregoing, the Board concludes that none of the New Hampshire seacoast sites are obviously superior to Seabrook.

3. Seacoast Sites in Maine

80. Five locations in Maine were reviewed—Gerrish Island, Raynes Neck, Argo Point, Phillips Cove and Elms. App. Dir. 27 at 40. Staff No. 2 at Table 5.

81. All of these sites would require higher transmission and transportation costs than Seabrook. App. Dir. 27 at 41. Staff No. 2 at Table 5.

82. All the seacoast sites except Elms lack reasonable access to a railroad. Staff No. 2 at Table 5. Gerrish Island which the Staff considers the most likely candidate among the Maine seacoast sites, has very poor transportation access. *Id.* at Table 6.

83. It is possible that closed-cycle cooling would be required at each of these sites also. App. Dir. 27 at 40-41. Staff No. 2 at 10.

84. There is no power of eminent domain for the taking of generation sites in the State of Maine. App. Dir. 27 at 40; FES at 9-7.

85. Based on all of the foregoing, the Board finds that no Maine seacoast site is obviously superior to Seabrook.

4. Inland Sites in Northern New Hampshire

86. Three inland sites in northern New Hampshire were considered.

These are Moore Pond, Shelburne and Dummer. App. Dir. 27 at 41. Staff No. 2 at Table 5.

87. Each, as a freshwater site, would be required to use evaporative cooling towers. App. Dir. 27 at 41.

88. Replacement water in low-flow periods would not be available from the river but would have to come from greater drawdown of Lake Francis or the Richardson Lakes, *Id.*

89. The freshwater consumed at these sites would be more valuable than the saline water used at Seabrook. App. Dir. 27 at 41. Staff No. 2 at 4.

90. At each location towers would cause an aesthetic impact although the degree of it would be in proportion to the population density at each site. App. Dir. 27 at 37.

91. Construction costs at any of these sites would be far greater than at Seabrook due to the less accessible labor market and the distance from barge delivery points. *Id.* at 41. Transmission costs will be greater. *Id.*

92. The environmental and socioeconomic impacts from construction are likely to be high. Staff No. 2 at 12, Table 5 and Table 6.

93. Based upon the foregoing, the Board concludes that none of the inland sites in northern New Hampshire are obviously superior.

5. Inland Sites on the Upper Merrimack River Watershed—Other Than Litchfield

94. Other than Litchfield, two sites were considered on the Upper Merrimack River Watershed—Gavins Falls and Jackman Reservoir. App. Dir. 27 at 42. Staff No. 2 at Table 5.

95. Jackman Reservoir is without sufficient water to supply the necessary makeup water for two 1,150 MWe units. App. Dir. 27 at 42; FES at p. 9-9. Staff No. 2 at Table 5. It has poor construction access and will require lengthy transmission. Staff No. 2 at Table 5.

96. Gavins Falls is located within the city limits of Concord, the state capitol. App. Dir. 27 at 42; FES at p. 9-9. Staff No. 2 at Table 5.

97. The Board finds that neither Gavins Falls nor Jackman Reservoir is obviously superior to Seabrook.

6. Litchfield

98. For the reasons given below and using the standards as given by the Commission, although Litchfield continues to be the primary alternate site, App. Dir. 27 at 42, Staff No. 2 at 12, we find that it is not obviously superior to Seabrook.

99. In our I.D. we summarized the advantages of the Litchfield site to

be: less miles of transmission lines, less cooling water requirement and small impact on biota. These advantages result from comparing the Litchfield site with Seabrook with open-cycle cooling. In comparing Litchfield with Seabrook with closed-cycle the latter two advantages are lessened. The cooling water requirements are now alike and the biota impact at Seabrook with cooling towers is reduced by a factor of 10.

100. Transmission costs would be reduced by approximately \$20,000,000 if Litchfield were used. App. Dir. 27 at 76 (Table 6) and the cooling system would cost \$53,700,000 less. Tr. 12990. However, these amounts are more than offset by the estimated increased costs at Litchfield for foundation costs (\$8,600,000), additional site hardening (\$28,600,000), additional excavation (\$16,900,000), additional access roads (\$6,900,000), additional transportation costs (\$7,800,000) and an additional service water cooling tower (\$9,900,000). Tr. 12990.

101. Cooling towers at Litchfield would consume more valuable fresh-water. App. Dir. 27 at 43, 44. Staff No. 2 at 4, 12.

102. Use of the site would require relocation of New Hampshire Route 3-A, the taking of approximately 300 acres of agricultural land and twenty-one residences in order to have a clear exclusion area. App. Dir. 27 at 43, 44.

103. Because it is a soil site, different design parameters for structures and components would be required to meet the applicable seismic criteria. App. Dir. 27 at 43-44; Staff No. 2 at 12. The additional construction costs due to flood plain location include the costs of constructing dikes. Staff No. 2 at Table 6.

104. The cooling towers at both sites would create an aesthetic impact. At Litchfield the population in a 10-mile radius is approximately 140,000 which is twice the population of the same area for the Seabrook site (72,000). Staff No. 2 at Table 6. However, more tourists would be exposed to the cooling towers at Seabrook than at Litchfield.

105. From the foregoing we conclude that Litchfield is not obviously superior to Seabrook with cooling towers. Were we to find that it were, we would have to place controlling weight on aesthetics. Considering our findings at paragraph 56 we are unable to do so.

106. Based upon the foregoing, the Board finds that Litchfield is not obviously superior to Seabrook.

7. Southern New England Sites

107. The Commission directed the Licensing Board to decide upon the remanded hearing whether to consider as additional alternative sites, sites in

New England where other nuclear plants either exist or were planned. CLI-77-8, 5 NRC at 514-15.

108. There are a total of nine such sites in New England: the Millstone site in Waterford, Connecticut, and the Montague site in Massachusetts, both owned by Northeast Utilities or its subsidiaries; the Pilgrim site in Plymouth, Massachusetts, owned by Boston Edison Company; the Charlestown, Rhode Island, site owned by the United States at this time but for which New England Power Company has filed a construction permit application; the Sears Island and Maine Yankee sites in Maine; the Vermont Yankee site in Vernon, Vermont; the Connecticut Yankee site in Haddam Neck, Connecticut; and the Yankee Atomic site in Rowe, Massachusetts. App. Dir. 27 at 44-45; Staff No. 2 at 5.

109. In our Supplemental Initial Decision of July 7, 1977, LBP-77-43, 6 NRC at 134, in considering these sites in comparison with Seabrook with once-through cooling, we concluded that none of these sites is obviously superior to Seabrook and that an individual comparison of Seabrook with one or more of these sites is unnecessary. *Id.*, 6 NRC at 139.

110. We make the same analysis in comparing these nine alternative southern New England sites with Seabrook with cooling towers. We conclude that the findings that we made in our July 7, 1977, Supplemental Initial Decision apply equally as well to Seabrook with cooling towers. Accordingly, we adopt those findings (paragraphs 19 through 34) and make them a part of this Decision.

8. Ultimate Findings on Alternate Sites

111. Based upon all the foregoing, the Board finds that none of the alternate sites are obviously superior to Seabrook assuming that Seabrook would be required to use closed-cycle cooling. Since we are able to reach this conclusion without consideration of the fact that Seabrook is closer to completion, further analysis of the relative costs of completion is unnecessary. CLI-77-8, 5 NRC at 535-536.

V. CONCLUSIONS OF LAW

112. Based upon all of the foregoing, the Licensing Board concludes as follows:

- (a) The benefits of the Seabrook project with natural-draft cooling towers outweigh the costs thereof.
- (b) None of the proposed alternative sites is obviously superior to Seabrook, even if one ignores the fact that Seabrook is closer to completion.

113. IT IS ORDERED, in accordance with 10 CFR Sections 2.760, 2.762, 2.764, 2.785, and 2.786 of the Commission's Rules of Practice, that this Decision shall constitute the final decision of the Commission subject to the review thereof under the above cited rules. Pursuant to Section 2.762 exceptions to this Supplemental Initial Decision must be filed within seven (7) days after service of that decision and a brief in support of the exceptions must be filed within fifteen (15) days thereafter (twenty days in the case of the Staff). Within fifteen (15) days of the filing and service of the brief of the appellant (twenty days in the case of the Staff), any other party may file a brief in support of or in opposition to, the exceptions.

THE ATOMIC SAFETY AND
LICENSING BOARD

Marvin M. Mann, Member

John M. Frysiak, Chairman

Dated at Bethesda, Maryland,
This 30th day of November 1977.

Dissenting Opinion of Dr. Ernest O. Salo:

The Commission's Memorandum and Order of March 31, 1977, remanded the issues of the acceptability of closed-cycle cooling at the Seabrook site and the comparison of Seabrook with closed-cycle cooling with alternative sites with or without closed-cycle cooling. I shall give my opinion on the latter issue first.

1. According to the Commission's Memorandum and Order, the Board received instructions¹ that an application should not be denied on the basis of a comparison between the Applicant's proposed site and an alternative site unless the alternative site appears to be "obviously superior" to the proposed site. The Commission also points out the difficulty in assessing cost-benefit analyses in quantitative terms and any evaluation of a particular site must inevitably have a wide margin of uncertainty. "But where the data to be compared necessarily present a wide margin of uncertainty, one site must appear to be substantially 'better.' To reject an application—the only means available for indicating the preferability of an alternate site—at this late stage in the licensing process requires substantial confidence that one's

¹CLI-77-8, 5 NRC 503 at 528-529.

judgment is correct. A confidence that can only arise where an alternate site is obviously superior.”

2. In the case of Seabrook, the Board’s understanding of factoring in the costs, when comparing alternative sites, is that first a determination should be made on the relative status of an alternate regardless of the stage of completion of Seabrook. If an alternate is found to be “obviously superior,” then a comparison should be made considering the forward costs of Seabrook and only if the alternate retains its obvious superiority should Seabrook be rejected.

3. On the basis of the record of the remanded hearing, which is not substantially more extensive, on the issue of alternate sites, than that of the initial evidentiary hearings, no obvious superiority for any one site can be defined. Applicants’ Direct Testimony 27 (Tr. 12782) has an analysis of alternate sites (pp. 38-46) in which Litchfield was being acceptable and the best alternate.³ The NRC Staff’s Supplemental Testimony (Tr. 13223) consists of eleven pages plus six tables and includes much the same analyses as their original testimony (Tr. 10403-10412). According to the record, the Staff apparently revisited by helicopter, weather permitting, some of the principal alternate sites (Tr. 13264-5, 13295-13302, and 13344-5).³ The testimony of the Applicants and the Staff did make comparisons of the alternate sites assuming Seabrook with closed-cycle cooling.

4. The record is not adequate for me to have “high confidence” that the Litchfield site is better than the Seabrook site regardless of whether total or only forward costs are taken into consideration. The alternate sites, including Litchfield, have not undergone comparable studies of the Seabrook site nor does it appear realistic to have the Applicants conduct such studies at this stage of the licensing process.

5. Consequently, I concur with the majority of the Board that the other sites, including Litchfield, which is considered a suitable site, do not have an obvious superiority (by the definition of the Commission) to the Seabrook site.

6. Considering only environmental matters, Litchfield appears to be superior to Seabrook. Although data were not presented, and I assume they are not available, on the effects of water consumption during low-water years, my opinion is that the impact on the aquatic environment would be significantly less at Litchfield than at Seabrook. The Applicants’ Direct Testimony, pp. 42-44 (Tr. 12782) leaves one with the impression that Litchfield is a distinct possibility but the closing statement claims that Litchfield

³Applicants’ Direct 27, p. 42 “. . . (Litchfield is) considered as the best alternate to the Seabrook site by the Company and the New Hampshire Bulk Power Facilities Site Evaluation Committee.”

³About 15 minutes was spent at Litchfield, the leading alternate site.

is not obviously superior. A comprehensive analysis has not been made on the aesthetics of cooling towers at Litchfield (they are described merely as significant, high, or the same as Seabrook) but one assumes after listening to, seeing, and reviewing the testimony of NECNP witness Ms. Barbara Yeaman (Tr. 13497) that the aesthetic impact of cooling towers at Litchfield may not be significant when compared to Seabrook. Thus, my opinion is that cooling towers at Litchfield are superior to open-cycle cooling at Seabrook, and my opinion (paragraph 9 below) is that cooling towers at Seabrook are unacceptable.

7. The minor use of agriculture land taken up by the plant located at Litchfield would not be significant, the costs of building the plant above the flood plain do not appear to be restrictive, and the actual aesthetic costs of transmission lines are less than those at Seabrook.

8. The Staff (Staff Direct on Alternate Sites, Table 6) mentions that Litchfield is closer to a population center, but in my opinion this is not a fact to be given weight as it still meets the requirements (10 CFR Part 100). Furthermore, it is my opinion, not only at Litchfield but generically, that, in most cases, nuclear plants should be located as near as possible to population centers and areas of energy demand. In other words, a nuclear plant should not be forced into environmentally attractive and ecologically important areas because of the confusion generated over safety issues.

9. As to the issue of cooling towers at Seabrook, I am in dissent with the opinion of the majority of the Board that cooling towers are acceptable at Seabrook.

10. Cooling towers at Seabrook are the ultimate in backfitting of a site that has developed through the unfortunate and unplanned sequence of (a) once-through cooling with water drawn from within the harbor to (b) water drawn from the open sea by means of long and expensive tunnels⁴ to (c) final correction of aquatic impacts by means of cooling towers.⁵

11. If cooling towers are acceptable at Seabrook, aesthetically they are acceptable "anywhere" and aesthetics become a nonissue. The tremendous impact of cooling towers at Seabrook⁶ is more than enough to tip the cost-benefit balance of the Seabrook plant regardless of expended costs.

⁴Once-through cooling provided, in my opinion, inadequate protection of the aquatic biota. (ASLB I.D. Dissenting Opinion, LBP-76-26,3 NRC 857 at 939 (1976)).

⁵I concede that cooling towers will minimize the impact on the aquatic environment; however, the substituting of one significant adverse impact with another is hardly enough reason for me to change my original dissenting opinion. Further, I do not consider this inconsistent with conceding that no obviously superior site is available; for the Board's charge is limited to making a recommendation on the licensing of Seabrook not to find an alternate.

⁶The testimony, including NECNP Ex. 26 of witness Ms. Barbara Yeaman following Tr. 13480.

12. In my opinion the licensing procedure has been abused when the sequence of events allows a location, such as Seabrook on New Hampshire's eighteen-miles of coastline, to be considered for a nuclear power plant with cooling towers when obviously other sites are available. It is at this point that the policy "the Applicant has proceeded to this point at his own risk" must be adhered to.

Ernest O. Salo, Member
Atomic Safety and Licensing Board

November 30, 1977

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

**Frederic J. Coufal, Chairman
Dr. A. Dixon Callihan
Dr. Richard F. Cole**

In the Matter of

**Docket Nos 50-471
50-472**

BOSTON EDISON COMPANY

**(Pilgrim Nuclear Power Station,
Units 2 and 3)**

November 30, 1977

Upon consideration of a request for a Limited Work Authorization (LWA) pursuant to 10 CFR §50.10(e), the Licensing Board finds that the staff's alternative site evaluation is inadequate as there is no record of a careful physical or other examination of sites other than the one proposed. Application for LWA denied.

**PARTIAL INITIAL DECISION REGARDING
REQUEST FOR LIMITED WORK AUTHORIZATION**

Appearances

George H. Lewald, Esq., Ropes and Gray, 225 Franklin Street, Boston, MA; and **Dale G. Stoodley, Esq.**, 800 Boylston Street, Boston, MA, for the Applicant, Boston Edison Company

Henry Herrmann, Esq., 151 Tremont Street, Boston, MA, for the Intervenor, Massachusetts Wildlife Federation

William S. Abbott, 50 Congress Street, Boston, MA, appearing on behalf of Alan and Miriam Cleeton, 22 Mackintosh Street, Franklin, MA, sometimes appearing *pro se*

Ellyn R. Weiss and Laurie Burt, Asst. Attorneys General, One Ashburton Place, Boston, MA, for the Commonwealth of Massachusetts

Barry H. Smith, Esq., and Marcia E. Mulkey, Nuclear
Regulatory Commission, Washington, D.C., for the NRC
Regulatory Staff

Background

1. On October 13, 1976, Applicants submitted a request for the issuance of a Limited Work Authorization (LWA) pursuant to the provisions of 10 CFR §50.10(e). That regulation permits one holding an LWA to conduct certain activities relative to the proposed plant pending a determination as to whether or not a construction permit will be issued. The LWA may be granted only after a Board makes certain findings, favorable to the applicant, including all of those required by 10 CFR §51.52(b) and (c). The findings include those which a Board must make in order to satisfy its NEPA responsibilities including those having to do with alternatives to the proposal such as alternative plant locations. The Commission, in *Seabrook*, recently stated: "The need to compare the . . . facility with other possible sites arises directly from NEPA which requires that the cognizant Federal agency consider alternatives to a proposed major Federal action . . . Consideration of alternatives has been called the 'linchpin' of environmental analysis."¹

2. St. Lucie² provides further guidance. There the Intervenor contended that the Staff's review of the alternate sites was inadequate. The Licensing Board summarily rejected the contention and the Intervenor appealed. During the appeal process, it became apparent that the alternate site analysis which the Staff had done involved a comparison of the site in question with "a composite of characteristics which would typify the best alternative coastal site."³ While the Appeal Board did not reject that approach, it did reinstate the contention and ordered the matter heard. After a new hearing held after the Staff had done a new site review which considered specific alternate sites, the Licensing Board found that much information had been discovered in the new review.⁴ It commented: "Employment of the [original] evaluation 'methodology' totally failed to reveal significant facts which actual site visits would undoubtedly have revealed. Common experience overwhelmingly suggests that one cannot truly know the physical characteristics of a particular *site* without at least some study of that par-

¹*Public Service Company of New Hampshire, et al.*, CLI-77-8, 5 NRC 503 at 522 (March 31, 1977).

²*Florida Power and Light Company* (St. Lucie Nuclear Power Project, Unit No. 2).

³ALAB-335, 3 NRC 830 at 838 (June 29, 1976).

⁴LBP-77-27, 5 NRC 1038 (April 19, 1977).

ticular *site* (not a generalized 'region' containing many sites). The point is forcefully made by what actually happened here." The Board went on to indicate items which a detailed examination of two sites revealed which had not been disclosed under the "composite" approach. On appeal,⁵ the Appeal Board agreed with the Licensing Board's finding that the Staff alternative site review had been adequate taking into account the work that had been done after the first Appeal Board decision. It said further that the Licensing Board was able to reach "that conclusion only after it had conducted a searching and critical analysis of the Staff's procedures; indeed, it held that the Staff's earlier efforts, standing alone, were inadequate. We adopt as our own the essence of the Board's well reasoned opinion and add two brief comments." The first comment included the assertion that "[P]erhaps the most important environmentally related task the Staff has is to determine whether an application should be turned down because there is some other site at which the plant ought to be located (footnote omitted). No other environmental question is both so significant in terms of the ultimate outcome and so dependent upon facts particular to the application under scrutiny. Consequently, we would expect the Staff to take unusual care in performing its analysis and in disclosing the results of its work to the public." And further: "[A] Staff conclusion that an Applicant's proposal passes muster is valuable only to the extent it represents the results of vigorous probing for possible shortcomings. Where that has been done, there is much more reason to trust the validity of the conclusion." The second comment was by way of noticing, with approval, the contribution made by the Intervenor in probing the matter at issue.

3. Against this, we turn to a discussion of the present situation. There are two contentions relating to the question of alternate sites. These are:

Commonwealth Contention 4: The Applicants and the Staff have not given adequate consideration to underground siting, offshore siting and inland siting using closed-cycle cooling systems, as alternate types of sites.

Commonwealth Contention 12: Neither Applicants nor Staff have adequately considered the alternative of locating the proposed plant at a site more suitable from a population density and environmental standpoint.⁷

4. The Commonwealth presented no evidence on these contentions, relying on cross-examination of witnesses for the Staff and the Applicants.

⁵ALAB-435, 6 NRC 541 (October 7, 1977).

⁶Footnote 6 not used.

⁷The contentions of the Intervenor admitted in these proceedings are stated in a Memorandum and Order of the Board dated February 18, 1975.

Applicants' Alternative Site Review

5. The site of the Pilgrim Nuclear Power Station, encompassing more than 500 acres, is located at Rocky Point on the western shore of Cape Cod Bay south of Plymouth Bay. The site is about 38 miles south and east of Boston. It is proposed that Pilgrim Unit 2 occupy about 14 acres of that plot.

6. On the Pilgrim site is the Pilgrim I boiling water reactor presently operating. The Pilgrim Unit 2, as proposed, will be adjacent to Pilgrim Unit 1. Accordingly, the environmental impact of Unit 2 will be less than were an entirely new site to be opened. Land ownership, access roads, transmission corridors, and other requirements common to the two plants are already provided and establish an initial balance favorable to the Pilgrim site.

7. The Planning Committee on NEPOOL forecasts power needs by geographic area throughout New England and encourages the installation of adequate sources within the respective areas to minimize transmission losses. The capability in 1983 to supply the peak power and the reserve required for reliability within the Plymouth-Pilgrim Station area, without Pilgrim Unit as a source, is shown by NEPOOL to be marginal.⁸

8. Applicants' witnesses testified to a program of site evaluation of long-standing⁹ dating back to 1964. The earlier considerations do not, of course, address the detailed requirements of the National Environmental Policy Act.

9. The Applicants purported to present through witness Morton¹⁰ a comparison of the environmental impacts to be expected from the installation of a nuclear generating power plant at each of six sites. Although this testimony was addressed to the support of the selection of the Rocky Point site, an evaluation of the impact on that site is not included in the comparison. This absence was rationalized by the categorization of Site 18, one in the comparison, as being similar to Rocky Point.¹¹ None of the six sites was otherwise identified.¹²

10. The six sites were ranked after "quantifying" the assumed impacts and applying "weight factors" leading to the conclusion that "none of the possi-

⁸Applicants' witness Stein, at 11ff of Applicant Exhibit C following Tr. 1656; see also Applicants' Exhibit S-2 attached to that testimony.

⁹Applicants' witnesses White at 19ff and Morton at 60ff both following Tr. 1656; also Tr. 1678ff.

¹⁰Morton, at 62 following Tr. 1656; see especially Applicants' Exhibit S-7 attached thereto.

¹¹Site 18 was described at Tr. 1678 to 1682 as being south of the Town of Plymouth in Plymouth County.

¹²The location of the six sites were subsequently identified in appendices to Applicants' Exhibit 10 following Tr. 5917.

ble siting areas discussed appears to have any distinct advantages over the Pilgrim site region.”¹³

11. An evaluation of the Rocky Point site appears in later testimony by witness Morton where, in fact, a comparison, advantageous to Rocky Point, is made with Site 18, formerly alleged to provide a base for comparison of other sites with Rocky Point. In cross-examination the witness stated that Applicants’ Exhibit S-8, which reported a relative evaluation of six potential nuclear sites was “not intended to [indicate] how good Rocky Point is.”¹⁴

12. In his later testimony, prepared at the request of the Board, Applicants’ witness Morton reported that 24 sites were identified through a regional evaluation, a preliminary engineering study, and an environmental assessment for the location of electric generating stations.¹⁵ Of the 24 sites, six were considered suitable for nuclear installations.¹⁶ They were subjected to a study of their penalties (peculiar to the environmental impacts of nuclear plants), engineering flexibility, and specific environmental impacts. The resulting relative environmental evaluations including weight factors for various impacts led to a ranking of the sites.¹⁷

13. Additionally, each environmental factor was reduced to a capital cost necessary to minimize its impact. These increments, for each of the six sites considered earlier plus Rocky Point, are intended to represent costs of fulfilling requirements in a number of environmentally oriented areas.¹⁸ Of all the sites considered, excluding Rocky Point, the one designated as No. 2 required the least expenditure, 68 million dollars, to effect those construction costs considered site specific. With that site as a base the cost differential of each other site was rated. These differentials ranged from plus 143 to minus 34 million dollars, the latter representing Rocky Point. The conclusion drawn by the witness was that, of the seven sites considered, the site requiring the lowest capital investment for these environmental items is Rocky Point and that, based on economic considerations only, Rocky Point is preferable to the others.

14. The six candidate sites, excluding Rocky Point, were qualitatively analyzed in engineering safety and environmental impact evaluations resulting in the selection of two for final comparison with Rocky Point.¹⁹

¹³Morton, Applicants’ Exhibit C, at 62 following Tr. 1656.

¹⁴Tr. 5999.

¹⁵Morton, Applicants’ Exhibit 10 following Tr. 5917.

¹⁶*Id.* at 3. The testimony says 10 were considered to be satisfactory for nuclear plants. Apparently this number derives for various combinations of cooling systems at one or more of the six sites. Of the six, three are coastal and three are inland.

¹⁷Applicants’ Exhibit S-7, a part of the Morton testimony.

¹⁸Applicants’ Exhibit S-10, a part of the Morton testimony.

¹⁹One of the two selected was most like Rocky Point in physical characteristics and was most proximate. The other had the highest preference rating in the proceeding selective process.

15. In the final evaluation,²⁰ Rocky Point is alleged equal to or superior to the two "best" candidates, previously selected, in all characteristics evaluated.

Staff's Alternate Site Review

16. There is about a page and one-half of information on alternate sites in the FES.²¹ It includes information from an engineering report apparently commissioned by Applicants and other Applicant material. Comments are made that many of the sites named by Applicants are already identified with other actual or proposed plants; that other locations are remote from demand centers; that offshore siting and inland siting utilizing dry cooling towers were not evaluated because the long lead times needed to study the availability and suitability of those sites were preclusive; and that economics militates against sites needing dry cooling towers. The Pilgrim 2 site was said to be desirable because of its proximity to Boston, its location in an area of low population and its access to water and transportation. Four other sites reported on by the Applicants were rejected because they were too near population centers. The Staff suggested that while other sites could "probably" be developed, some were impossible for Boston Edison Company because of indenture terms restricting construction to Massachusetts and adjoining states.

17. Staff's supplemental testimony, supplied by R.W. Froelich²² and Jerry Harbour,²³ was no more specific. The Harbour testimony was largely confined to negating underground sites in general and is largely irrelevant here except that it rejected Pilgrim as having too high a water table for such construction.

18. The Froelich testimony considered only the Pilgrim 2 site specifically and placed heavy emphasis on the existence of an operating reactor at that location. He said that the Staff is "not quite as strict on demanding specific alternate sites and will accept discussions in terms of general site areas" in such a case.²⁴

19. In its general studies, Staff allegedly considered coastal, inland, and offshore installations. Inland sites were assumed to require closed-cycle cooling provided by mechanical or natural-draft cooling towers since dry

²⁰Applicants' Exhibit S-11, a part of the Morton testimony.

²¹Section 9.1.2.2.

²²Following Tr. 1931.

²³Following Tr. 1493.

²⁴Tr. 2179.

cooling towers are not perfected technologically or economically. Locations are therefore limited to those providing an adequate water supply.²³

20. Coastal site areas in New Hampshire, Northern Massachusetts, Rhode Island and on Cape Cod and Buzzards Bay were considered by the Staff; the plant to be close enough to the shore to utilize ocean water cooling.²⁴

21. Offshore siting was not considered by the Staff because of the uncertainties in a schedule for selection and evaluation necessary to meet the energy requirements of Pilgrim Unit 2.²⁵ Additionally much of the Massachusetts coast is unavailable for offshore construction under state laws creating sanctuaries.

Conclusions

22. The Board upon careful review of the record of the Staff's assessment of the sites for Pilgrim Unit 2 proposed by the Applicants finds the Staff's analysis to be couched in generalities. The Staff assigned much weight to the Applicants' selection of Rocky Point primarily because of the presence there of the operating Pilgrim Unit 1. There is no record of a careful examination, either physically or by review of proffered descriptions of other than Rocky Point. We return to *Seabrook*. A discussion of the Staff's functions is there set out at some length, prefaced by a disclaimer that the process to be described meets the necessary standards.²⁶ It was noted that in preparation for their analysis of the site, the Staff (and its consultants) reviewed Applicants' material, several independent studies and sources, and consulted with three state commissions in addition to physically inspecting more than eight other sites.

23. The Board concludes the Staff's evaluation of alternate sites is inadequate, and the Board rules, therefore, that this deficiency requires the denial of the Applicants' application for a Limited Work Authorization. The action is without prejudice to the consideration of other issues in these proceedings.

24. The Board has elected to issue on this very narrow consideration in order not to further delay proceedings which have already extended over an inordinate time.

25. A decision on other matters will issue shortly.

²³Froelich at 3.

²⁴Froelich at 8ff.

²⁵Froelich at 11 and 12.

²⁶5 NRC at page 523.

ORDER

Based on the Board's Findings and Conclusions and pursuant to the Atomic Energy Act of 1954, as amended, and the Commission's regulations, IT IS ORDERED that this Board cannot, on the record before it, make all the findings referred by 10 CFR §51.52(b) and (c) and that therefore, a Limited Work Authorization as provided for by 10 CFR §50.10(e) may not be issued.

It is further ORDERED, in accordance with §§2.760, 2.762 and 2.764 of the Commission's Rules of Practice, 10 CFR Part 2, that this Partial Initial Decision shall be effective immediately and shall constitute the final action of the Commission thirty (30) days after the date of issuance hereof, subject to any review pursuant to the Rules of Practice. Exceptions to this Partial Initial Decision may be filed by any party within seven (7) days after service of this Partial Initial Decision. A brief in support of the exceptions shall be filed within fifteen (15) days thereafter (twenty (20) days in the case of the Regulatory Staff). Within fifteen (15) days after the service of the brief of appellant (twenty (20) days in the case of the Regulatory Staff), any other party may file a brief in support of, or in opposition to, the exceptions.

Board Member, Dr. Callihan, has authorized the undersigned to state that he concurs in the foregoing decision.

THE ATOMIC SAFETY AND LICENSING BOARD

Dr. Richard F. Cole, Member

Frederic J. Coufal, Chairman

Dated at Bethesda, Maryland,
this 30th day of November 1977.

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

COMMISSIONERS:

Joseph M. Hendrie, Chairman
Victor Gilinsky
Richard T. Kennedy
Peter A. Bradford

In the Matter of

Docket Nos. 50-335A
50-389A
50-250A
50-251A

FLORIDA POWER & LIGHT COMPANY

(St. Lucie Plant, Units Nos. 1 and 2)
(Turkey Point Plant, Unit Nos. 3 and 4)

December 9, 1977

The Commission denies a motion by intervenors seeking permission to lodge certain documents and make them part of the "decisional record" in proceedings involving four facilities. As to St. Lucie, Unit No. 1, and Turkey Point, Unit Nos. 3 and 4, the Commission (1) notes the finality of the Licensing Board's decision denying the antitrust review requested by those intervenors and (2) directs the staff to include the referenced documents in materials forwarded to the Attorney General for possible antitrust enforcement action. As to St. Lucie, Unit No. 2, the Commission holds that, because the issues for briefing established by the Commission order of October 19, 1977, involve no substantive antitrust matters, the documents offered by the intervenors are not relevant to issues presently before the Commission.

RULES OF PRACTICE: FINALITY OF DECISIONS

A licensing board decision becomes final when, following an appeal board affirmance, the Commission declines to review that decision.

ORDER

The intervenors in the above-captioned matter, known collectively as the "Florida Cities"¹ have filed a motion with the Commission requesting per-

¹Florida Cities consist of the Fort Pierce Utilities Authority of the City of Fort Pierce, the Gainesville-Alachua County Regional Electric Water and Sewer Utilities, the Lake Worth Utilities Authority, the Utilities Commission of the City of New Smyrna Beach, the Orlando Utilities Commission, the Sebring Utilities Commission, and the Cities of Alachua, Bartow, Fort Meade, Key West, Mount Dora, Newberry, St. Cloud and Tallahassee, Florida, and the Florida Municipal Utilities Association.

mission to lodge certain documents and make them part of the "decisional record." This motion is opposed by the applicant and the staff. The motion is denied for the reasons stated below

By order dated October 25, 1977 (CLI-77-26, 6 NRC 538), the Commission declined to review ALAB-428, 6 NRC 221 (1977), an Appeal Board decision affirming the Licensing Board's decision to deny the antitrust review requested by Florida Cities as to St. Lucie, Unit No. 1, and Turkey Point, Unit Nos. 3 and 4, all of which are operating facilities. The decision of the Licensing Board dismissing the Florida Cities' petition to intervene has therefore become final; no proceeding involving those plants is presently before the Commission. We also note that our order of October 25, 1977, directed NRC staff promptly to refer to the Attorney General the antitrust allegations of the Florida Cities, as well as any related information staff may have which may support such allegations. 42 U.S.C. 2135(b). The material referenced by the Florida Cities in its motion may contain such information. Staff is therefore directed to include the documents cited in the motion of the Florida Cities' among the materials forwarded to the Attorney General for any possible enforcement action.

As to St. Lucie, Unit No. 2, the Commission has requested briefing by parties on questions raised by a petition to intervene filed by the Orlando Utilities Commission some 31 months after the statutory period established by Section 105 of the Atomic Energy Act, as amended, for opportunity to petition for antitrust review of a license application. The issues for briefing established by the Commission's order dated October 19, 1977, do not involve substantive antitrust issues, and thus the documents offered by the Florida Cities are not relevant to the issues before the Commission at this time.

It is so ORDERED.

By the Commission

Samuel J. Chilk
Secretary of the Commission

Dated at Washington, D.C.,
this 9th day of December 1977.

**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

COMMISSIONERS:

**Joseph M. Hendrie, Chairman
Victor Gilinsky
Richard T. Kennedy
Peter A. Bradford**

In the Matter of

TRANSNUCLEAR, INC.	Docket No. 70-2566 License No. XSNM-1117
TRANSNUCLEAR, INC.	Docket No. 70-2568 License No. XSNM-1119
TRANSNUCLEAR, INC.	Docket No. 70-2608 License No. XSNM-1142
EXXON NUCLEAR COMPANY, INC.	Docket No. 70-2614 License No. XSNM-1145
TRANSNUCLEAR, INC.	Docket No. 70-2647 License No. XSNM-1162
TRANSNUCLEAR, INC.	Docket No. 70-2657 License No. XSNM-1167
TRANSNUCLEAR, INC.	Docket No. 70-2667 License No. XSNM-1176
TRANSNUCLEAR, INC.	Docket No. 70-2674 License No. XSNM-1180
TRANSNUCLEAR, INC.	Docket No. 70-2675 License No. XSNM-1181

**(Low-Enriched Uranium Exports
to EURATOM Member Nations)**

December 22, 1977

Pursuant to its earlier statement (in CLI-77-24, 6 NRC 525) that it would address the issue of the desirability of discretionary public proceedings on ten pending export license applications after Congress either enacted nuclear non-proliferation legislation or recessed, the Commission invites

comments on those applications and states that it will continue to process applications for exports to EURATOM nations while comments are being solicited. The Commission also denies a motion by petitioner Natural Resources Defense Council (NRDC) to consolidate consideration of and decision on the ten applications; also, because there will be no hearing, the Commission holds that the question of financial assistance to NRDC does not arise, and denies NRDC's request for such assistance.

RULES OF PRACTICE: CONSOLIDATION

Consolidation of export license applications is undesirable from a practical standpoint where contingencies affecting the issuance of individual licenses are unpredictable.

MEMORANDUM AND ORDER

Background

Between May and September 1977 petitions seeking leave to intervene and a hearing on ten¹ pending export applications were filed with this Commission by the Natural Resources Defense Council, Inc. ("NRDC"). Each petition raised issues concerning the export of low-enriched uranium to nations in the European Atomic Energy Community (EURATOM).² Applications still before the NRC are:

- (1) XSNM-1117 (304.823 kg of U-235 contained in 11,234 kg of U, enriched to a maximum of 3.00 percent for use as fuel at the Philippsburg 1 reactor—Federal Republic of Germany).
- (2) XSNM-1119 (502.234 kg of U-235 contained in 15,528.25 kg of U, enriched to a maximum of 2.8 percent for use as fuel at the Borselle Nuclear Power Station—The Netherlands).
- (3) XSNM-1142 (45.823 kg of U-235 contained in 1,367.8 kg of U, enriched to a maximum of 3.35 percent for use as working stock for the manufacture of fuel assemblies by RBU—Federal Republic of Germany).
- (4) XSNM-1145 (265.1 kg of U-235 contained in 11,088 kg of U, enriched to a maximum of 2.8 percent for use as fuel at the Gundremmingen Atomic Power Station—Federal Republic of Germany).

¹The Commission on November 10, 1977, issued one of the licenses covered by these applications—License No. XSNM-1116. See *Transnuclear, Inc.* (Würgassen), CLI-77-29, 6 NRC 719. That matter therefore is no longer before the Commission and will not be addressed in this order.

²The EURATOM member countries include: Belgium, Denmark, Federal Republic of Germany, France, Ireland, Luxembourg, Netherlands, and the United Kingdom.

- (5) XSNM-1162 (812.1612 kg of U-235 contained in 24,243.615 kg of U, enriched to a maximum of 3.35 percent for use as fuel at the Tihange Nuclear Power Plant—Belgium).
- (6) XSNM-1167 (489.915 kg of U-235 contained in 11,057 kg of U, enriched to a maximum of 5.73 percent for use as fuel at the SENA nuclear power reactor—France).
- (7) XSNM-1176 (6,526.8743 kg of U-235 contained in 217,363.4 kg of U, enriched to a maximum of 3.3 percent for use as fuel at the following nuclear reactors in France: Bugey 4, Bugey 5, Tricastin 1, Gravelines 3, Bugey 1 and Saint Laurent B1).
- (8) XSNM-1180 (390.988 kg of U-235 contained in 10,712 kg of U, enriched to a maximum of 3.65 percent for use as fuel at the Doel 1 nuclear power reactor—Belgium).
- (9) XSNM-1181 (1,000.136 kg of U-235 contained in 36,338 kg of U, enriched to a maximum of 3.40 percent for use as fuel at the Isar nuclear power reactor—Federal Republic of Germany).

In response to these petitions, the Commission on October 4, 1977, issued an order concluding that Petitioner lacked standing to intervene as a matter of right. *Ten Applications for Low-Enriched Uranium Exports to EURATOM Member Nations*, CLI-77-24, 6 NRC 525. The Commission, however, decided not to address the subject of whether further discretionary public proceedings would be desirable at that time because Congress was actively considering nuclear non-proliferation legislation which, if enacted, would have substantially resolved issues raised by Petitioner.³ The Commission stated it would address the issue of further public proceedings when the legislation was enacted, or in the event Congress did not enact such legislation, at the time Congress recessed. It is now apparent that final Congressional action upon the legislation cannot occur before January 1978. In addition, pursuant to Executive Order 11902, Executive Branch views have been received on eight of these applications.⁴ The NRC Staff has submitted its views on all of these applications. In each case, the Executive Branch and the NRC Staff has stated that the exports covered by these applications would take place within the terms of an agreement for cooperation and would not be inimical to the common defense and security of the United States. Therefore, it is now appropriate for the Commission to address the desirability of further proceedings.

³Petitioner seeks to raise the issue whether the United States should insist upon a right of prior approval for retransfer and reprocessing of U.S.-supplied nuclear material within EURATOM.

⁴All applications except XSNM-1142.

Further Discretionary Proceedings

Petitioner has not established a right under Section 189 of the Atomic Energy Act to a public hearing.¹ Nevertheless, the Commission invites comments in connection with these license applications, including comments on the issues raised in the NRDC petitions on the pending export license applications for low-enriched uranium to EURATOM nations. Any comments received will be carefully considered. A notice to this effect will be published in the *Federal Register* in the near future.

With respect to the instant applications, the Commission further notes that the issues Petitioner raises are presently being addressed by Federal Government agencies and the Congress. Congress will soon resume consideration of pending nuclear non-proliferation legislation. The Executive Branch has undertaken preliminary discussions with EURATOM nations on revised agreements for civil nuclear cooperation. The multilateral review called the International Nuclear Fuel Cycle Evaluation (INFCE), which is in its formative stages, may affect the nuclear development plans of recipient nations and, therefore, may have a bearing on Petitioner's concerns. The Commission is closely following these developments. None of these developments has altered the Commission's responsibility to protect the public health and safety or the common defense and security, but they do indicate that considerations bearing on this statutory mandate are in flux. Even though we are soliciting public comments, the Commission will continue to process these license applications for exports to EURATOM nations.

Consolidation of Petitions

Petitioner filed motions on August 17, 1977, requesting that the Commission consolidate consideration of applications subject to intervention petitions and issue a single decision on these exports.

The Commission denies this motion. Since it is not possible to predict the contingencies which may affect the issuance of individual licenses, it would be undesirable from a practical standpoint for the Commission to preclude separate action on individual applications.

Financial Assistance

Petitioner has also requested financial assistance to enable it to present its views to the Commission. The Commission denies this request because the question does not arise since there will be no hearing in this matter.

¹See, *Ten Applications for Low-Enriched Uranium to EURATOM Nations*, *supra*.

In any event, in two decisions issued in 1976, the Comptroller General stated that funding of intervenors in the absence of specific Congressional authorization was permissible where participation by the intervenor is required by statute or necessary to represent adequately opposing points of view and the intervenor is indigent or otherwise unable to bear the financial cost of participation. Recently the Second Circuit Court of Appeals has ruled that the Comptroller General's opinions notwithstanding, an agency cannot fund participants in its proceedings without a specific grant of authority from the Congress. *Greene County Planning Board, et al. v. Federal Power Commission*, Docket Nos. 1516, 1517 (2nd Cir., June 30, 1977); petition for cert. filed, 46 U.S.L.W. 3243 (U.S. December 27, 1977) (No. 77-481).

For the Commission

Samuel J. Chilk
Secretary of the Commission

Dated at Washington, D. C.,
this 22nd day of December 1977.

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

COMMISSIONERS:

Joseph M. Hendrie, Chairman
Victor Gilinsky
Richard T. Kennedy
Peter A. Bradford

In the Matter of**TRANSNUCLEAR, INC.**

**(Three Applications for High-
Enriched Uranium Exports to
the Federal Republic of Germany)**

Docket No. 70-2421
License No. XSNM-1026
Docket No. 70-2600
License No. XSNM-1138
Docket No. 70-2694
License No. XSNM-1195
December 22, 1977

Upon petitions by Natural Resources Defense Council (NRDC) seeking leave to intervene and a hearing in proceedings regarding three license applications for export of high-enriched uranium (HEU) to the Federal Republic of Germany, the Commission holds that NRDC lacks standing to intervene as a matter of right under Section 189a of the Atomic Energy Act, as amended, 42 U.S.C. 2239(a).

The Commission further decides to request public comments in connection with the license applications but retains the right to act on any proper license applications for export of HEU pending consideration of such comments. It denies as "undesirable from a practical standpoint" NRDC's motion to consolidate consideration of and decision on the three applications and, on the merits of application XSNM-1026, it finds that all applicable statutory licensing requirements have been met and that no environmental impact statement is required.

RULES OF PRACTICE: STANDING TO INTERVENE

Petitioner seeking leave to intervene in export licensing proceeding must establish an interest which "may be affected by the proceeding" and demonstrate that it would be "injured in fact" by action in question before it can show it is entitled to a hearing as a matter of right. *Linda R. S. v. Richard D.*, 410 U.S. 614, 617 (1973); *Warth v. Seldin*, 422 U.S. 490, 499

(1975); *Simon v. Eastern Kentucky Welfare Rights Organization*, 426 U.S. 26 (1976).

RULES OF PRACTICE: COMMISSION DISCRETION TO DIRECT PUBLIC PROCEEDINGS

Even where a petitioner fails to establish a right under Section 189 of Atomic Energy Act to intervene or demand a public hearing, the Commission may in its discretion direct further public proceedings that it determines would be in the public interest. *Edlow International*, CLI-76-6, 3 NRC 563, 580 (1976).

EXPORT LICENSE: CRITERIA

Positive action on an export license application is warranted if the export in question (1) will take place under an agreement for cooperation, (2) is unlikely to create a significant health or safety risk to the U.S. population, and (3) will not be inimical to the common defense and security of the U.S. In making its licensing determination, the Commission will also consider whether failure to act would have an adverse impact on U.S. foreign relations.

EXPORT LICENSE: ENVIRONMENTAL IMPACT STATEMENT

No environmental impact statement need be prepared in connection with an export of high-enriched uranium where the individual export license in question is not a "major Federal action."

MEMORANDUM AND ORDER

I. BACKGROUND AND SUMMARY

Between December 27, 1976, and October 6, 1977, the Natural Resources Defense Council, Inc. ("NRDC"), filed three petitions with this Commission seeking leave to intervene and a hearing in proceedings regarding three pending export license applications for export of high-enriched uranium to the Federal Republic of Germany ("FRG"). The applications subject to NRDC intervention petitions are:

XSNM-1026 (16.01 kg of U-235 contained in 20.35 kg of U₃O₈, enriched to a maximum of 93.30 percent) for use in the AVR high temperature gas-cooled reactor prototype at Julich; for the FRM liquid metal fast breeder reactor prototype operated by the Technische Universität

München at Garching; and the KNK-II high temperature gas-cooled reactor prototype at Karlsruhe.

XSNM-1138 (9.353 kg of U-235 contained in 10.025 kg of uranium enriched to a maximum of 93.30 percent) for use in the AVR high temperature gas-cooled reactor prototype operated by the Kernforschungsanlage Jülich.

XSNM-1195 (103.138 kg of U-235 contained in 119.298 kg of uranium enriched to a maximum of 93.30 percent) for use in a liquid metal fast breeder reactor prototype operated by the Gesellschaft für Kernforschung Karlsruhe.

In accordance with procedures set forth in Executive Order 11902, these three applications were transmitted to the Department of State to obtain the coordinated views of the Executive Branch on issuance of the licenses. On July 20, 1977, the State Department provided the Commission with the Executive Branch analysis of XSNM-1026. The Executive Branch concluded that the proposed export would take place pursuant to the Additional Agreement for Cooperation between the United States and ("EURATOM") signed at Washington, D.C., and New York on June 11, 1960, (T.I.A.S. 4650)¹ and that issuance of XSNM-1026 would not be inimical to the common defense and security of the United States. The State Department has not yet provided the Commission with Executive Branch views on XSNM-1138 or XSNM-1195.

On October 11, 1977, in accordance with the Commission's internal procedures, the NRC staff forwarded its recommendation that license application XSNM-1026 be issued. Consequently, the Commission may now consider the merits of the petitioner's intervention and hearing claims.

The Commission has reviewed the submissions filed by all participants in this matter. In a public meeting of the Commission on November 7, the threshold procedural issues posed by the NRDC intervention petition were discussed. At that meeting the Commission determined that NRDC lacks the requisite legal interest in these proceedings to entitle it to intervene as a matter of right under Section 189a of the Atomic Energy Act, as amended, 42 U.S.C. 2239(a). Nevertheless, the Commission intends to invite and consider any public comments submitted in connection with these license applications, including comments on the issues raised in the three NRDC petitions filed between December 27, 1976, and October 6, 1977, regarding these

¹This agreement has been subsequently amended several times. The most recent revision occurred on September 20, 1972. See T.I.A.S. 5103; T.I.A.S. 5104; T.I.A.S. 5444; and T.I.A.S. 7566.

three export license applications. A *Federal Register* notice to this effect will be published shortly.

II. PETITIONER'S CONTENTIONS

Petitioner NRDC is a national, nonprofit membership organization which seeks to intervene in these export licensing proceedings on behalf of itself and its members. NRDC describes itself as an environmental organization concerned about nuclear proliferation and committed to the protection of the human environment and the public health and safety.

NRDC asserts that these proposed exports of high-enriched uranium to the FRG would be inimical to the common defense and security of the United States because (a) high-enriched uranium is inherently unsafeguardable; and (b) both the high temperature gas-cooled reactor and liquid metal fast breeder reactor programs being conducted by the Federal Republic of Germany (FRG) necessarily involve the presence of substantial quantities of weapons-grade nuclear material as fuel and require development of reprocessing plants. In NRDC's view, such developments pose an unacceptable risk to United States national security interests because of the risk that such materials would be diverted for nuclear explosive purposes at a national or subnational level.

NRDC also contends, among other things, that before acting upon these applications the NRC must prepare an environmental impact statement considering the impacts and alternatives of United States support for the breeder reactor program of the FRG.

III. STANDING

The Commission has previously held in two Commission export licensing proceedings that NRDC lacked standing to intervene because it had failed to establish an interest which "may be affected by the proceeding." Section 189 of the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2239. In *Edlow International*, CLI-76-6, 3 NRC 563 (1976) and in *Ten Applications for Low-Enriched Uranium Exports to EURATOM Member Nations*, CLI-77-24, 6 NRC 525 (October 4, 1977), the Commission held that NRDC had failed to demonstrate that it would be "injured in fact" by the issuance of a nuclear export license—an element it must establish before it could show that it was entitled to a hearing as a matter of right. *Linda R. S. v. Richard D.*, 410 U.S. 614, 617 (1973); *Warth v. Seldin*, 422 U.S. 490, 499 (1975); and *Simon v. Eastern Kentucky Welfare Rights Organization*, 426 U.S. 26 (1976).

The character of Petitioner's contentions in the instant proceeding is virtually identical to that of these earlier intervention petitions. The Commission finds no basis for reaching a different conclusion on the standing issue here. Although we will not repeat previous discussions of NRDC standing, we adopt the reasoning of our previous decisions.

IV. FURTHER DISCRETIONARY PROCEDURES

Petitioner has not established a right under Section 189 of the Atomic Energy Act to intervene or to demand a public hearing. Nonetheless, the Commission may in its discretion direct further public proceedings if it determines that such proceedings would be in the public interest. *Edlow International, supra*, at 580.

While the Commission does not now propose to undertake hearings or other structured procedures for receiving public views on these license applications, the Commission has decided to publish a notice in the Federal Register requesting public comments in connection with these license applications, the Commission has decided to publish a notice in the *Federal Register* requesting public comments in connection with these license applications, including comments on the issues raised in the three NRDC petitions filed between December 27, 1976, and October 6, 1977, regarding these responsibilities. In the meantime, the Commission will remain free to act on license applications for the export of high-enriched uranium if statutory licensing requirements under the Atomic Energy Act are met.

V. CONSOLIDATION OF PETITIONS

Petitioner filed a motion on October 11, 1977, requesting that the Commission consolidate consideration of the applications subject to intervention petitions and issue a single decision with respect to these exports.

The Commission denies this motion. As stated in Part I of this opinion, Executive Branch and NRC Staff views have already been received on XSNM-1026. Routinely, the Executive Branch's views on individual licenses are received at varying times. Since it is not possible to predict the contingencies which may affect the issuance of individual licenses, it would be undesirable from a practical standpoint for the Commission to preclude separate action on individual applications.

VI. COMMISSION DECISION ON XSNM-1026

The Commission believes that approval of XSNM-1026 will not significantly increase the risks with which Petitioner is concerned, since this

particular export involves a relatively small quantity of HEU and is one in a series of past such actions on exports to the Federal Republic of Germany. In a letter dated November 8, 1977, Louis V. Nosenzo, Deputy Assistant Secretary of State, informed the Commission that in the view of the Department of State failure to act upon XSNM-1026 at this time would have "an adverse impact on United States foreign relations." Under these circumstances, the Commission believes that action on this application is warranted now.

The Commission finds that this application meets all applicable statutory licensing requirements under Atomic Energy Act of 1954, as amended.

The proposed export will take place under the terms and conditions of the additional agreement for cooperation between the U.S. and EURATOM, as amended, signed at Washington, D.C., and New York, June 1, 1960 (T.I.A.S. 4650). The Commission does not foresee circumstances where the export of this high-enriched uranium is likely to create a significant health or safety risk to the U.S. population. Nor do we find that the proposed export will be inimical to the common defense and security of the U.S. Furthermore, because the individual license in question is not a "major Federal action," no environmental impact statement need be prepared for this export. *Edlow International*, CLI-76-6, 3 NRC 563, 585 (1976). This decision does not constitute a finding that no environmental impact statement is required for U.S. HEU export activities in general.

IT IS SO ORDERED.

For the Commission

Samuel J. Chilk
Secretary of the Commission

Dated at Washington, D.C.,
this 22nd day of December 1977.

CONCURRING STATEMENT OF COMMISSIONERS GILINSKY AND BRADFORD:

For the reasons stated in the main opinion, we believe that issuance of license XSNM-1026 is appropriate at this time. Public comments will be received as a result of the *Federal Register* notice described in Part IV of the opinion. We believe that, after such comments are thoroughly reviewed, the Commission should publish an opinion or policy statement on HEU exports

to EURATOM countries which addresses the issues raised by Petitioner in the instant matter.

SEPARATE VIEWS OF COMMISSIONER BRADFORD:

The Commission has decided that petitioner lacks standing in this case as it did in *Edlow International*, CLI-76-6, 3 NRC 563 (1976) and in *Ten Applications for Low-Enriched Uranium Exports To EURATOM Member Nations*, CLI-77-24, 6 NRC 525 (October 4, 1977). It is not clear to me that so comprehensive a denial of standing is warranted. However, the issue is settled for now, and I will not pursue it at greater length here.

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

In the Matter of**MIXED OXIDE FUEL****Docket Nos. RM-50-5****50-201****50-332****50-564****70-1327****70-1432****70-1821****December 23, 1977**

Commission terminates GESMO proceedings.

ORDER

Under a November 1975 policy statement (40 *Fed. Reg.* 53056), the Commission has been conducting proceedings on the Generic Environmental Statement on Mixed Oxide Fuel (GESMO) to determine whether and under what conditions uranium and plutonium might be recycled from spent light water nuclear reactor fuel and fabricated into fresh mixed oxide fuel on a wide scale. Under the same policy statement, the Commission has also been processing applications for the construction, operation, and modification of facilities to reprocess spent fuel, fabricate mixed oxide fuel, and perform related functions. The U.S. Court of Appeals for the Second Circuit held that the Commission could not issue such licenses for commercial-scale activities until it had completed the GESMO proceedings. *Natural Resources Defense Council, Inc. v. Nuclear Regulatory Commission*, 539 F.2d 824 (1976), *cert. granted*, 430 U.S. 944 (1977).

On April 7, 1977, President Carter announced a nuclear non-proliferation policy which called for the indefinite deferral of domestic commercial reprocessing and recycling of plutonium and the commencement of domestic and international studies of alternative fuel cycles. The Commission suspended the GESMO proceeding in April and in May announced its intention to reassess the November 1975 policy statement and sought public comment and the President's views on the appropriate future course for plutonium recycle-related proceedings. Public comments were received in June and a letter stating the President's views in October. The Commission then sought public comment on the President's views and on

several specified alternative courses of action. Comments were received in November.

In light of these events and after consideration of all the comments received, the Commission decided at public meetings in December 1977—

- (1) to terminate the GESMO proceeding;
- (2) to terminate the proceedings on pending or future plutonium recycle-related license applications, except for—
 - (a) proceedings on licenses for the fabrication or use of small quantities of mixed oxide fuel for experimental purposes, and
 - (b) those portions of proceedings which involve only spent fuel storage, disposal of existing waste, or decontamination or decommissioning of existing plants;
- (3) to reexamine the above matters after the completion of the ongoing alternative fuel cycle studies, now expected to take about two years;
- (4) to publish the draft safeguards supplement to the GESMO document as a staff technical report;
- (5) as a consequence of the above decisions, to withdraw the November 1975 policy statement; and
- (6) to reserve for decision, if it arises, the question of whether a facility such as the Barnwell facility may be licensed for experimental and feasibility purposes on a noncommercial basis to investigate processes which support the nation's non-proliferation objectives.

The proceedings affected by this decision are the *Generic Environmental Statement on Mixed Oxide Fuel* (Docket No. RM-50-5), *Allied-General Nuclear Services* (Barnwell Nuclear Fuel Plant Separations Facility, Uranium Hexafluoride Facility, and Plutonium Product Facility) (Docket Nos. 50-332, 70-1327, and 70-1821), *Exxon Nuclear Company, Inc.* (Nuclear Fuel Recovery and Recycling Center) (Docket No. 50-564), *Westinghouse Electric Corporation* (Recycle Fuels Plant) (Docket No. 70-1432), and *Nuclear Fuel Services, Inc.* (West Valley Reprocessing Plant) (Docket No. 50-201). This order shall be filed in these dockets and shall be served on all parties of record.

Commissioner Gilinsky notes that he considers the inclusion of item (6) above unnecessary and inappropriate in this order.

Commissioner Kennedy notes that he would prefer the use of the term "defer" to "terminate" in items (1) and (2) above.

The Commission will shortly publish a statement of the reasons underlying this decision. This statement will include the separate views of Commissioner Kennedy on the above-mentioned matter.

It is so ORDERED.

For the Commission

**Samuel J. Chilk
Secretary of the Commission**

**Dated at Washington, D. C.,
this 23rd day of December 1977.**

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Alan S. Rosenthal, Chairman

In the Matter of

Docket Nos. STN 50-566
STN 50-567

TENNESSEE VALLEY AUTHORITY

(Yellow Creek Nuclear Plant,
Units 1 and 2)

December 8, 1977

Upon request by prospective limited appearer for review of Licensing Board's refusal to postpone evidentiary hearing, considered as an application for emergency relief, the Chairman of the Appeal Panel concludes that the Licensing Board did not violate 10 CFR 2.104(a) by failing to publish a notice of hearing in the Federal Register at least 30 days prior to its commencement.

Application for emergency relief denied.

RULES OF PRACTICE: SCHEDULING

Standing to challenge scheduling order for evidentiary hearing in connection with construction permit proceeding is "at best doubtful" with regard to persons who have requested to make limited appearances at such hearing.

RULES OF PRACTICE: AUTHORITY OF APPEAL BOARD

Although appeal boards will entertain petitions seeking discretionary review of interlocutory orders via directed certification (10 CFR 2.718(i)), they will rarely grant such relief in connection with scheduling controversies.

RULES OF PRACTICE: AUTHORITY OF APPEAL BOARD

It is generally inappropriate for appeal board to interfere during licensing board proceeding with determinations relating to scheduling controversies.

RULES OF PRACTICE: NOTICE OF HEARING

Although 10 CFR 2.104(a) requires that the notice of hearing initiating a construction permit proceeding be published in the Federal Register at least 30 days prior to commencement of the hearing, it does not require that such notice establish dates for commencement of all evidentiary phases of proceeding; the section contemplates that the latter notice will normally follow issuance of the initiating notice.

MEMORANDUM AND ORDER

On February 1, 1977, the Commission issued a notice of hearing in this construction permit proceeding involving Units 1 and 2 of the proposed Yellow Creek Nuclear Plant to be located in Tishomingo County, Mississippi. 42 Fed. Reg. 8441 (February 10, 1977). The notice indicated, *inter alia*, that the Licensing Board assigned to the proceeding would conduct the necessary prehearing conferences within specified periods "or at such other time[s] as the Board" might decree. It further provided that the Board would "set the time and place for any special prehearing conference, prehearing conference and evidentiary hearing," and that notice thereof would be published in the Federal Register.

No petitions for leave to intervene under 10 CFR 2.714(a) having been filed within the time period prescribed in the notice of hearing,¹ the proceeding is an uncontested one within the meaning of the Commission's Rules of Practice. A brief prehearing conference was held in May 1977. On November 18, 1977, the Licensing Board issued an "order and notice of evidentiary hearing," which was published in the Federal Register on November 25, 1977. 42 Fed. Reg. 60236. The order and notice stated that the evidentiary hearing on the environmental phase of the proceeding would commence on December 13, 1977, at a specified time and place in Iuka, Mississippi. The public was further apprised that the hearing on the radiological health and safety phase "is planned for the early part of 1978."

Requests to make limited appearances at the hearing had been filed by, among others, Linda L. Lewis and Ronald W. Lewis. On November 17, 1977, Ms. Lewis (who is the Chairperson of a local unit of the Sierra Club located in Oxford, Mississippi) sent a letter to the Licensing Board protesting the failure of the Board to have noticed the environmental hearing in

¹The State of Mississippi, as well as the States of Alabama and Tennessee (the borders of which are in close proximity to the Yellow Creek site), requested and apparently obtained leave to participate under the "interested State" provisions of 10 CFR 2.715(c).

the Federal Register at least 30 days prior to the date of its scheduled commencement.² The protest was based upon the asserted requirements of 10 CFR 2.104(a).

By letter of December 1, 1977, the Chairman of the Licensing Board rejected the protest in a letter to Mr. Lewis.³ Following his receipt of the rejection, Mr. Lewis telephoned me this morning to advise that he proposed to file a written appeal later in the day. He indicated that he was advising me orally to that effect because of the imminence of the hearing.

I informed Mr. Lewis of the following: (1) his standing (or that of Ms. Lewis or any other prospective limited appearer) to appeal from the scheduling order was at best doubtful; (2) 10 CFR 2.730(f) expressly proscribes appeals from interlocutory orders; (3) although appeal boards will entertain petitions asking that they exercise their discretion to review interlocutory orders by way of directed certification under 10 CFR 2.718(i), such relief almost never will be granted with regard to a scheduling controversy; and (4) in any event, because his papers would not reach us before next Monday (the eve of the commencement of the hearing), there would be insufficient time for an appeal board to consider his grievance. In light, however, of Mr. Lewis' stout insistence that a flagrant violation of the Commission's Rules of Practice is involved, I agreed to treat his telephone call as an *ex parte* application for emergency relief under 10 CFR 2.718(i) addressed to me in my capacity as Chairman of the Appeal Panel. He was told that I would rule promptly, obtaining orally (if necessary) the views of other parties.

Having fully considered the matter, the application is *denied*. The denial might rest solely on either (1) the lack of standing in limited appearers to challenge scheduling orders or (2) the inappropriateness of our interference during the course of a licensing board proceeding with determinations of the kind herein involved. Nonetheless, I have chosen in this instance—without intending to set a precedent by so doing—to reach the merits of Mr. Lewis' grievance.

10 CFR 2.104(a), upon which both Mr. and Ms. Lewis rely, does require that the notice of hearing *initiating a construction permit proceeding* in connection with a proposed nuclear power reactor be published in the Federal Register at least thirty days "prior to the date set for hearing in the notice." But there is nothing in Section 2.104(a) which obliges the Commission to fix in that *initiating* notice of hearing the dates for the commencement of each phase of the evidentiary portion of the proceeding. And for obvious

²The letter was also signed by another official of the local Sierra Club.

³The Chairman's letter reflects that, on December 1, Mr. Lewis had a telephone conversation with the legal assistant to the Licensing Board Panel.

reasons: it is not until well after the proceeding is underway and the pre-hearing steps have been taken (e.g., refinement of issues and discovery) that the Board will be in a position to determine when the hearing might start.

Indeed, that the notice of the holding of the evidentiary hearing will normally follow the issuance of the initiating notice required by Section 2.104(a) is explicitly recognized in footnote 1 to that section. More than that, the footnote directly refutes Mr. Lewis' claim that the notice here had to be published in the Federal Register 30 days in advance of December 13. For it explicitly provides:

The thirty (30) day requirement of this paragraph *is not applicable* to a notice of the time and place of hearing published by the presiding officer after the notice of hearing described in this section has been published.

[Emphasis supplied.] In adding the footnote to the section in 1972 (in connection with other alterations not here pertinent), the Commission had this to say:

Section 2.104 has been changed so that the provision for publication of a notice of hearing at least 30 days prior to the date set for hearing will apply only to applications for construction permits for power and test reactors and fuel reprocessing plants. In the case of an application for a construction permit for any other type of facility, or an operating license for any facility, the notice of opportunity for hearing pursuant to section 189 of the Atomic Energy Act gives 30 days' opportunity to file a petition for leave to intervene. If such a petition is received, and the Commission thereupon issues a notice of hearing, an additional 30 days before commencement of the hearing is not required. *The section has also been amended to clarify that an additional 30-day notice is not required when the time and place of hearing are set by order of the presiding officer after the notice of hearing has been published.*

37 Fed. Reg. 15127 (July 28, 1972) (emphasis supplied).

Only one other observation need be made. It appears from the correspondence between the Lewises and the Licensing Board Chairman that Mr. Lewis cannot attend the hearing on December 13 because he is slated to take a law school examination on that date. Presumably, that conflict would have existed even had the notice of hearing in question been published in the Federal Register on or before November 13. In any event, there are other courses available to him. As the Licensing Board Chairman pointed out in his December 1 letter, Mr. Lewis is not required to present his limited appearance statement orally; if he so desires, he may submit his views in writing. Beyond that, as also emphasized by the Board Chairman, Mr. Lewis will be given the opportunity to make his limited appearance at

the as yet unscheduled hearing on the health and safety aspects of the construction permit application.

Application for emergency relief *denied*.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL PANEL CHAIRMAN

Margaret E. Du Flo
Secretary to the Appeal Panel

This action was taken by the Appeal Panel Chairman under the authority of 10 CFR 2.787(b).

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

**Alan S. Rosenthal, Chairman
Dr. John H. Buck
Michael C. Farrar**

In the Matter of

**Docket Nos. STN 50-522
50-523**

**PUGET SOUND POWER & LIGHT
COMPANY, et al.**

**(Skagit Nuclear Power Project,
Units 1 and 2)**

December 9, 1977

Upon unopposed appeals by applicants and NRC staff, the Appeal Board reverses the Licensing Board's September 15, 1977, order, LBP-77-56, 6 NRC 478, to the extent that it held that the applicants are not entitled to engage in "reduced scope road work" prior to receipt of a limited work authorization (LWA). Cause is remanded to Licensing Board for entry of further order consistent with Appeal Board's determination.

PRE-LWA AUTHORITY: STANDARD

The standard for determining whether proposed pre-LWA construction activities are permissible is whether they would have a "trivial" environmental impact, as distinguished from "zero" impact.

APPEAL BOARD: SCOPE OF REVIEW

Because a determination concerning the impact of proposed pre-LWA activities calls for judgment based on the facts of each case, an appeal board will not readily overturn licensing board findings on such matters.

Mr. F. Theodore Thomsen, Seattle, Washington, for the applicants, Puget Sound Power & Light Company, et al.

Mr. Joseph R. Gray for the Nuclear Regulatory Commission staff.

DECISION

On the unopposed appeals of the applicants and the NRC staff, we summarily reverse so much of the Licensing Board's September 15, 1977, order as held that the applicants are not entitled, in advance of receipt of a limited work authorization, to engage in the so-called "reduced scope road work" considered in that order. LBP-77-56, 6 NRC 478, denying reconsideration of LBP-77-44, 6 NRC 141 (1977). We are in full agreement with the appellants that the record below convincingly establishes that this work would have

so trivial an [environmental] impact that it can be safely said that no conceivable harm would have been done to any of the interests sought to be protected by [the National Environmental Policy Act] should the eventual outcome of [the] proceeding be a denial of the [construction permit] application.

Kansas Gas & Electric Company (Wolf Creek Nuclear Generating Station, Unit No. 1), ALAB-331, 3 NRC 771, 777 (1976), *affirmed*, CLI-77-1, 5 NRC 1 (1977). This conclusion is not affected by the fact, stressed by the Licensing Board (6 NRC at 479), that the road work in question would entail the removal of some trees which could not be replaced within a short time span. The governing standard is "trivial" and not "zero" impact. ALAB-331, *supra*, 3 NRC at 776, 777.¹ None of the trees to be removed is of an unusual species. Additionally, the general area is heavily wooded.² In these circumstances, the environmental consequences plainly would be *de minimis*.³

¹It is only if the impact would be more than trivial (*i.e.*, "significant") that the question of redressability must be considered. *Wolf Creek*, CLI-77-1, *supra*, 5 NRC at 12.

²There is no claim that the area is one of special scenic attractiveness, which would be reduced significantly by the removal of a relatively small number of unexceptional trees.

³In the September 15 order, the Licensing Board suggested the need for "further elucidation" of the *Wolf Creek* standard. 6 NRC at 480. But no additional refinement of the standard would appear to be possible. Whether a particular impact would be trivial is not susceptible of determination by resort to a yardstick; rather what is called for is an exercise of judgment on the basis of the sum total of the facts of record in the particular case. For this reason, we will be very slow indeed to overturn a licensing board finding with regard to the triviality or significance of an environmental impact which would attend upon a specific pre-LWA activity; *i.e.*, considerable latitude must be given to those boards in the making of the required judgment. Our action in this instance is prompted solely by the firm conviction that, giving all due recognition to the impreciseness of the standard, the finding below is beyond justification.

The September 15, 1977, order of the Licensing Board is *reversed* to the extent indicated above and the cause is *remanded* to that Board for the entry of a further order consistent herewith.

It is so ORDERED.

FOR THE ATOMIC SAFETY
AND LICENSING APPEAL BOARD

Margaret E. Du Flo
Secretary to the Appeal Board

Mr. Farrar did not participate in the consideration or disposition of this matter.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Jerome E. Sharfman, Chairman
Richard S. Salzman
Dr. W. Reed Johnson

In the Matter of

Docket No. 50-564

EXXON NUCLEAR COMPANY, INC.

**(Nuclear Fuel Recovery and
Recycling Center)**

December 13, 1977

Upon appeal from a Licensing Board order (LBP-77-59, 6 NRC 518) granting intervention, the Appeal Board agrees that a distant state may be admitted as an "interested State" pursuant to 10 CFR §2.715(c).

Licensing Board order affirmed.

RULES OF PRACTICE: INTERVENTION BY A STATE

A state seeking intervention pursuant to the "interested State" provision of 10 CFR §2.715(c) need not be the state in which the reactor is located.

ATOMIC ENERGY ACT: PARTICIPATION BY A STATE

Section 274.1 of the Atomic Energy Act, 42 U.S.C. §2021(1), which directs the Commission to permit the State where nuclear activities are to be located to participate in a licensing proceeding without necessarily becoming a party, does not preclude the Commission from permitting other states similarly to participate.

**Messrs. Edward L. Cohen, Leonard M. Trosten and
M. Reamy Ancarrow, Washington, D.C., for Exxon
Nuclear Company, Inc.**

Ms. Kathryn Burkett Dickson, Sacramento, California, and **Messrs. Herbert H. Brown and Lawrence Coe Lanpher**, Washington, D.C., for the California Energy Resources Conservation and Development Commission.

Messrs. Myron Karman and Bruce A. Berson for the Nuclear Regulatory Commission staff.

DECISION

Opinion of Mr. Sharfman:

This is a proceeding on the application of Exxon Nuclear Company (“Exxon”) for a permit to construct a facility for the storage and reprocessing of spent fuel from light-water nuclear power reactors. In ALAB-425,¹ we decided, on a certified question from the Licensing Board, that the proceeding should not be suspended pending decision by the Commission of what direction to take in its rulemaking proceeding on the use of mixed oxide fuel. The Licensing Board thereupon issued an order disposing of various petitions to intervene and to participate in the proceeding.² Exxon appeals from that portion of the order permitting the participation of the California Energy Resources Conservation and Development Commission (“the Energy Commission”) as an “interested State” pursuant to 10 CFR §2.715(c). The staff supports the decision below, as does the Energy Commission itself.³

Section 2.715(c) of this Commission’s Rules of Practice states:

The presiding officer will afford a representative of an interested State which is not a party a reasonable opportunity to participate and to introduce evidence, interrogate witnesses, and advise the Commission without requiring the representative to take a position with respect to the issues.

The question before us is the meaning of the term “interested State” in that rule.

¹6 NRC 199 (August 3, 1977).

²LBP-77-59, 6 NRC 518 (September 30, 1977).

³The Energy Commission filed its brief on appeal late, representing that the lateness was caused by the recent resignation of its general counsel and the resulting reorganization of its general counsel’s office. No other party having objected, we accept its late filed brief.

In its Notice of Participation,⁴ the Energy Commission stated that it has exclusive authority for the "certification of proposed thermal power plants, transmission lines, and related facilities in California." It further asserted⁵ that §25524.1 of the California Public Resources Code

prohibits Commission certification of any new nuclear power plant requiring the reprocessing of fuel rods until (1) "the commission finds that the United States through its authorized agency had identified and approved, and there exists a technology for the construction and operation of nuclear fuel rod reprocessing plants," and (2) the Energy Commission's findings are reviewed by the California Legislature. Furthermore, the Commission is required "to find on a case-by-case basis that facilities with adequate capacity to reprocess nuclear fuel rods from a certified nuclear facility or to store such fuel if such storage is approved by an authorized agency of the United States are in actual operation or will be in operation at the time such nuclear facility requires such reprocessing or storage" Cal. Pub. Res. Code §25524.1(b).

The Energy Commission therefore argues that it "has a vital interest in the issues involved in and the ultimate decision on this application to construct a nuclear fuel rod reprocessing plant."⁶

Exxon's main argument is that §274.1 of the Atomic Energy Act (42 U.S.C. §2021(l))⁷ prohibits the Commission from permitting any state other than the one in which the reactor in question is to be located to participate in a licensing proceeding as an interested State. Neither §274.1 itself nor anything in its legislative history supports that thesis. Indeed, if it were valid, then the Commission's longstanding practice of permitting states whose borders are close to the site of a proposed nuclear facility to participate in its licensing proceeding under §2.715(c)⁸ would be unlawful—an

⁴At p. 1.

⁵*Id.*, p. 2.

⁶*Ibid.*

⁷Section 274.1 provides:

With respect to each application for Commission license authorizing an activity as to which the Commission's authority is continued pursuant to subsection c., the Commission shall give prompt notice to the State or States in which the activity will be conducted of the filing of the license application; and shall afford reasonable opportunity for State representatives to offer evidence, interrogate witnesses, and advise the Commission as to the application without requiring such representatives to take a position for or against the granting of the application.

⁸See, e.g., *Philadelphia Electric Co.* (Peach Bottom Atomic Power Station, Units 2 and 3), CLI-74-32, 8 AEC 217, 217-18 (1974) (participation of Maryland; reactors in Pennsylvania); *Northern Indiana Public Service Co.* (Bailly Generating Station, Nuclear-1), ALAB-241, 8

Continued on next page

absurd result. Section 274.1 and the legislative history alluded to by Exxon establish only that the state of location has a right to participate; they do not prohibit the Commission from granting other states permission to do likewise.

In fact, I think it clear that the Commission had done more than §274.1 required it to do in affording states the opportunity to participate in its licensing proceedings without having to establish a right to intervene as a party. Section 2.715(c) extends this opportunity to "an interested State," not merely to a state in which the reactor will be located. Had the Commission meant to limit participation to the latter category of state, it could easily have used appropriate language to express that purpose. That it did not do so manifests an intent to afford recognition to a broader range of interests.

My construction of §2.715(c) is reinforced by the recent decision of the Commission in *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), CLI-77-25, 6 NRC 535 (October 14, 1977). In that case, Massachusetts had been allowed to participate as an interested State even though the reactors were to be built in New Hampshire.⁹ However, it had not petitioned for review of the Appeal Board's decision. After the Commission granted such review, Massachusetts asked to be made a party to the review proceeding, stating that it had previously remained silent because it supported a petition for review of another party. The Commission construed its rule governing review of our decisions (10 CFR §2.786) to require all those supporting review to petition the Commission for it. Nevertheless, the Commission agreed to let Massachusetts participate in the review proceeding. One of the factors which persuaded it to do so was that "the participation of an interested sovereign state in our licensing process, as a full party or otherwise, is always desirable"¹⁰

Exxon argues that, even if geography is not a limiting factor, it was error to permit the Energy Commission to participate as an interested state because its interest is only informational. While the Energy Commission

Continued from previous page

AEC 841, 843 (1974) (participation of Illinois; reactor in Indiana); *Public Service Co. of Indiana* (Marble Hill Nuclear Generating Station, Units 1 and 2), Licensing Board Order of March 12, 1976, at p. 16 (unpublished) (participation of Kentucky; reactors in Indiana); *Public Service Electric & Gas Co.* (Hope Creek Generating Station, Units 1 and 2), Licensing Board Order of April 3, 1974, at p. 6 (unpublished) (participation of Delaware; reactors in New Jersey); *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), Licensing Board Order of March 15, 1974, at pp. 1-2 (unpublished) (participation of Massachusetts; reactors in New Hampshire).

⁹Licensing Board's unpublished order of March 15, 1974, at pp. 1-2.

¹⁰6 NRC 535 at 537.

does hope to obtain information from this proceeding,¹¹ its interest goes much deeper than that. Under its statute, the Energy Commission may not license a nuclear power plant unless it finds that there will be facilities available offsite for either the reprocessing or storage of the spent fuel which will be produced by that plant.¹² At present, there does not exist in the United States an operating commercial reprocessing plant or a facility for the storage of spent nuclear fuel which is available to new customers. For this reason, California has a significant interest in the decision as to whether the construction of a facility of the type proposed by Exxon in this proceeding should be authorized.¹³

Exxon also argues that "other mechanisms are available to the Energy Commission for obtaining information which might be necessary to carry out its state statutory mandate."¹⁴ As I have concluded that the Energy Commission has a right to participate in this proceeding on a ground other than its need for information, this argument is irrelevant. Similarly irrelevant is Exxon's fear that a construction of §2.715(c) which would grant the Energy Commission the right to participate would foster confusion and delay in all nuclear licensing proceedings. I fail to see why such a decision, which simply applies a Commission rule, should create confusion. And §2.715(c) does not condition an interested State's right to participate on a

¹¹See its brief at p. 5.

¹²Section 25524.1 of the California statute also prohibits the Energy Commission from licensing a nuclear power plant "requiring the reprocessing of fuel rods" unless it finds that the Federal government "has identified and approved, and there exists a technology for the construction and operation of nuclear fuel rod reprocessing plants." I am not certain as to whether this provision will have any practical consequence because, presently, virgin uranium fuel is available and it might therefore be difficult to say that any plant *requires* reprocessing of its spent fuel.

¹³On September 28, 1977, two days before issuance of the decision below, California added a new Section 25524.25 to its Public Resources Code. Chapter 1144, Laws 1977, Assembly Bill No. 1852. This section requires the Energy Commission to transmit to the legislature by January 16, 1978, "its determination as to whether all of the findings required by Sections 25524.1 and 25524.2 can be made at that time." If the findings cannot then be made, the Commission is required to recommend to the legislature whether any facilities for which a notice of intention has been filed with the Commission before January 1, 1977, should be exempted from the requirements of Sections 25524.1 and 25524.2. In making the latter determination, the Commission is directed to consider the latest "energy and demand forecast" and the extent to which the need can be met by "nongenerational alternatives," "reasonable conservation measures" or any "practical alternative technology." While this new provision may conceivably result in some proposed nuclear plants being exempted from the basic provisions of the statute, those provisions are still on the books and apply to all proposed plants not granted, or not qualifying for, an exemption. Therefore, the recent amendment does not change my conclusion that the Energy Commission's interest in this proceeding is sufficient to give it the right to participate under §2.715(c).

¹⁴Brief, p. 10.

finding that such participation will not contribute to delay.¹³ Once it is determined that a state is an interested State within the rule's meaning, its right to take part in the proceeding is established. That right is not dependent on discretionary factors.

For these reasons, I am of the view that the Licensing Board's decision to admit the Energy Commission was correct.

Opinion of Mr. Salzman:

The Commission's rules permit "a representative of an interested State" that is not a party to participate in licensing proceedings. 10 CFR §2.715(c). The Licensing Board invoked that rule in letting the California Energy Resources Commission appear in this case. Exxon protests, relying on subsection 1 of Section 274 of the Atomic Energy Act of 1954, 42 U.S.C. §2021(1). That subsection directs the Commission to allow agencies of the state where the nuclear activities will be conducted to participate in a "non-party" status. Exxon, however, would read into the subsection an additional purpose, a Congressional intent—unspoken—to deny that privilege to any other state. And the company would read a similar implicit restriction into our Rule 2.715(c).

I do not agree. Congress appended subsection 1 in 1959 to an Atomic Energy Act provision entitled "Cooperation With States."¹⁴ Had it intended the new subsection to shackle in the manner Exxon suggests the Commission's ability to cooperate with the states, that was an odd way to go about it. The two sentences from the Senate committee report on the bill adding subsection 1 which the company calls to our attention do not support its thesis; they merely paraphrase the new subsection.¹⁵ It is an elementary canon of construction that we "cannot interpret federal statutes to negate their own stated purposes."¹⁶ Subsection 1 was added to facilitate state participation in Commission proceedings, not to curtail it.

Second, for fifteen years "interested States" other than the one in which a nuclear facility is proposed have regularly been allowed to participate in our proceedings. To be sure, that practice has never been challenged directly. But it is hornbook law that an agency's reasonable, consistent and contemporaneous interpretations of its governing statute and regulations are entitled to great deference. *Northern Indiana Public Service Co. v. Porter*

¹³I do not mean to imply that delaying tactics by an interested State should be tolerated. See 10 CFR §2.718.

¹⁴Subsection 1 was added by P.L. 86-373, §1, 73 Stat. 688 (1959).

¹⁵S. Rep. No. 870, 86th Cong., 1st Sess. (1959).

¹⁶*New York State Department of Social Services v. Dublino*, 413 U.S. 405, 419-20 (1973).

County Chapter, 423 U.S. 12, 14-15 (1975). The years of satisfactory practice under the rule as presently interpreted sufficiently dispel the *in terrorem* arguments that the applicant raises against it.

Third, the California commission has far more than what Exxon characterizes as a "general" interest in the outcome of these proceedings. Under California law, before nuclear power plants may be licensed for future operation there, that agency must determine (among other things) the adequacy of facilities for reprocessing or storing used nuclear fuel rods. *Cal. Pub. Res. Code* §25524.1(b). The proceeding at hand involves an application to build just such a fuel reprocessing and storage facility. Although the facility would be in Tennessee, I do not think it can fairly be said that the California commission has no direct and important interest in it, given pending proposals to build additional nuclear power plants in that state. To reach that conclusion does not compel us—as my colleague Dr. Johnson appears to believe—to allow every state to participate in every proceeding to license a nuclear power plant. "Interest" in the context of individual power plants may indeed be more limited; but this case involves a recycling and storage facility.

Moreover, the California commission's interest is not limited to the outcome of the proceeding as my dissenting colleague suggests. What is at stake is the agency's right to participate in the development of the record, to insure that the matters of particular concern to California are fully explored, to ask hard questions about them and to probe the answers given. It is precisely those privileges which Section 2.715(c) was designed to afford state governments without demanding that they prejudge the situation to take advantage of them.⁴ In short, in our proceedings a state agency is not to be analogized to a private party but enjoys a more advantageous position precisely because it represents an aspect of the public interest.

Finally, even were the question a close one, I would not come down on the side of restricting the right of state governments to participate in our proceedings. In the long run, public confidence in our ability to regulate nuclear power responsibility in an evenhanded, dispassionate manner is ill-served by closed hearings and a crabbed reading of regulations.

ORDER OF THE BOARD

In view of the agreement of Messrs. Sharfman and Salzman on the disposition of the appeal, that portion of the Licensing Board's order of September 30, 1977, which permits the Energy Commission to participate in

⁴In pertinent part Rule 2.715(c) provides that a party allowed to participate under its terms may "introduce evidence, interrogate witnesses, and advise the Commission without [being required] to take a position with respect to the issues."

this proceeding as an "interested State" pursuant to 10 CFR §2.715(c) is *affirmed*.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD

Margaret E. Du Flo
Secretary to the Appeal Board

Dr. Johnson, dissenting:

My colleagues uphold the Licensing Board's decision to permit the participation of the California Energy Resources Conservation and Development Commission (the Energy Commission) as an interested state pursuant to 10 CFR §2.715(c). I cannot agree with their conclusion in this matter.

States in which the activity being licensed is to take place have been admitted to hearings routinely under Section 2.715(c). In addition, in a number of cases neighboring states have been allowed to participate in the licensing hearings¹ and the rule was used to permit the participation of a faraway state when that state was identified specifically as the proposed storage location for radioactive waste generated by the nuclear power plant for which a license was being sought.² A significant aspect of all cases in which states have been allowed to participate under Section 2.715(c) is that the interest of the state was directly pertinent to the issues being adjudicated in the licensing hearing. These issues are spelled out in the regulations and, in short, include matters related to the safety of the proposed facility, whether the applicant is technically and financially qualified to design and construct the proposed facility, whether the proposed facility would be inimical to the common defense or to the health and safety of the public, and whether the proposed facility would have a significant impact upon the environment (see 10 CFR §2.104). It is the resolution of these issues that the NRC must consider in making a decision to license a facility.

The Energy Commission's interest in the Exxon proceeding, embodied in Section 25524.1 of the California Public Resources Code, is to ascertain

¹See fn. 8, pp. 875-876, *supra*.

²*Vermont Yankee Nuclear Power Corporation (Vermont Yankee Nuclear Power Station)*, LBP-73-8, 6 AEC 130 (1973).

the existence of approved fuel reprocessing technology, and that facilities for reprocessing and/or storage of irradiated nuclear fuel may be expected to be in operation when required by nuclear power plants in California (see p. 875, *supra*).³

Thus, the Energy Commission is interested in the final outcome of the proceeding and beyond this it does not identify any interest in the issues to be addressed in the Exxon hearings. The proposed Exxon facility presumably is merely one of a number of fuel reprocessing and/or storage facilities which may be established throughout the country and there is no indication that this facility, planned to be built in Oak Ridge, Tennessee, would be the facility which might serve reactors in the State of California.

Unless the phrase "interested State" in §2.715(c) is to be accorded no more restrictive effect than simply to allow the participation of any state, it is my opinion that the Energy Commission's interest in the Exxon proceeding is not sufficiently pertinent to the matters being adjudicated to allow it to participate under this section of the regulations. Further, the Energy Commission has made no showing that it would contribute to the decisionmaking process. The ability to make such a contribution has been found by the Nuclear Regulatory Commission to be significant, at least in determining whether a private party should be allowed to participate in a licensing hearing at the discretion of a licensing board. *Portland General Electric Company* (Pebble Springs Nuclear Plant, Units 1 and 2), CLI-76-27, 4 NRC 610 (December 23, 1976). Applying this finding as a reasonable guideline in this instance, I could not admit the Energy Commission on a discretionary basis.

In my consideration of this matter, I have taken into account the Energy Commission's role of serving the people and the legislature of the State of California in the search for safe and reliable energy sources. However, since all of the information brought forth at the Exxon hearings will be available to the public, I am not persuaded that participation by the Energy Commission is necessary in order to enable it to carry out its duties under the California Code. Thus, I must conclude that the Energy Commission's participation in the hearing is not justified.

³This is an interest which is, of course, held in common by all who participate in the utilization and regulation of nuclear power. All nuclear power plants are licensed under the assumption that facilities will exist to receive, reprocess and/or store used nuclear fuel. See for example, 10 CFR § 51.20(e).

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Michael C. Farrar, Chairman
Dr. John H. Buck
Dr. W. Reed Johnson

In the Matter of

Docket Nos. 50-277
50-278PHILADELPHIA ELECTRIC
COMPANY, et al.(Peach Bottom Atomic Power
Station, Units 2 and 3)

December 13, 1977

Upon *sua sponte* review, the Appeal Board adopts as its own and affirms the Licensing Board decision (LBP-77-62, 6 NRC 680) which found it unnecessary to incorporate additional emission control equipment at the facility.

DECISION

On review of our decision to allow the operation of the second unit of the Peach Bottom Station, the Court of Appeals for the District of Columbia Circuit remanded the proceeding to the Commission to analyze the appropriateness of requiring further reductions in radioactive emissions.¹ Because the intervenors eventually withdrew from participation, the issue became uncontested. Nonetheless, the Licensing Board determined that the public interest required a hearing. On its own initiative, that Board probed deeply into the matter at hand and wrote a careful decision analyzing the evidence before it. LBP-77-62, 6 NRC 680 (October 28, 1977).

No exceptions having been filed, the matter is before us now for review *sua sponte* of the Board's conclusion that it is not worthwhile to require the

¹*York Committee for a Safe Environment v. Nuclear Regulatory Commission*, 527 F.2d 812 (1975). Although the Court had before it only the Unit 2 license, its decision quite rightly affected Unit 3 as well (see 527 F.2d at 813-14, fns. 4 and 5). On remand, the necessary analysis was performed for both units.

licensee to incorporate additional radioactive emission control equipment at Peach Bottom. We adopt the Board's opinion as our own and *affirm* on that basis.

It is so ORDERED.

FOR THE ATOMIC SAFETY
AND LICENSING APPEAL BOARD

Margaret E. Du Flo
Secretary to the Appeal Board

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Jerome E. Sharfman, Chairman
Richard S. Salzman
Dr. W. Reed Johnson

In the Matter of

Docket Nos. 50-440
50-441

CLEVELAND ELECTRIC
ILLUMINATING COMPANY, et al.

(Perry Nuclear Power Plant,
Units 1 and 2)

December 14, 1977

Upon renewed motion by the applicants for summary disposition of the issue of "geologic anomalies," filed in accordance with the terms of ALAB-443, 6 NRC 741, the Appeal Board (1) concludes that there is no issue of material fact concerning the characteristics of the geologic anomalies, (2) grants the motion and (3) affirms the Licensing Board's authorization of the issuance of construction permits.

TECHNICAL ISSUES DISCUSSED: Geologic anomalies, seismic design.

Messrs. Gerald Charnoff and Ernest L. Blake, Jr.,
Washington, D.C., for Duquesne Light Company,
Ohio Edison Company, Pennsylvania Power Company,
Cleveland Electric Illuminating Company and Toledo
Edison Company, applicants.

Mr. Edwin J. Reiss and Ms. Ellen B. Silberstein for the
Nuclear Regulatory Commission staff.

DECISION

In ALAB-443,¹ we reversed the Licensing Board's partial initial decision of December 31, 1975, insofar as it granted summary disposition in favor of

¹6 NRC 741 (November 8, 1977).

the applicants and the staff on the issue of the so-called geologic anomalies. At the same time, we affirmed those parts of that decision not dependent upon the summary disposition. Our decision was based on applicant's failure to comply with the requirements for relief under that procedure. We permitted applicants ten days in which to renew their motion before us and allowed the construction permit to remain in effect pending our decision.

Applicants renewed that motion on November 18, 1977, this time accompanying it with appropriate affidavits. The staff filed affidavits in support of the motion but the Coalition for Safe Electric Power, the intervenor which had contested this issue both below and on appeal to us, neither opposed the motion within the period specified nor requested additional time to do so.

Having examined carefully the evidence filed in support of the motion,² we conclude first, that there is no genuine issue of material fact about the characteristics of the geologic anomalies and second, that the applicants' motion should be granted because we find that the record establishes that:

1. The faults and other irregularities in the shale at the site (a) are non-tectonic in origin, (b) are the result of glacial activity and (c) cannot be expected to cause earthquakes.
2. There is no reason to alter the seismic design of the plant.
3. As a result of applicants' removal of the degraded shale and replacement of it with suitable fill material, the foundation for the plant is adequate.
4. The anomalies in the shale at the site will not interfere with the proper functioning of the underdrain system.
5. The site is a suitable location for the Perry plant.

Applicants' motion for summary disposition is therefore *granted* and the authorization of the issuance of the construction permits is *affirmed*.

²This consisted of the evidence submitted in support of the original motion made below (Supplement No. 3 to the Safety Evaluation Report ("SER Supp. 3"), with affidavits by its authors, and the Gilbert Report, this time with affidavits from two of its authors) plus new material—an addendum to the Gilbert Report written on January 21, 1976, a second such addendum prepared in May 1976 and two additional affidavits from a staff geologist and a staff engineer who participated in the preparation of SER Supp. 3. The new materials confirm the conclusions reached in the papers supporting the original motion.

It is so ORDERED.

**FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD**

**Margaret E. Du Flo
Secretary to the Appeal Board**

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL PANEL

Alan S. Rosenthal, Chairman
Dr. John H. Buck, Vice Chairman
Michael C. Farrar
Richard S. Salzman
Dr. W. Reed Johnson
Jerome E. Sharfman

In the Matter of

Docket Nos. 50-329
50-330

CONSUMERS POWER COMPANY

(Midland Plant, Units 1 and 2)

December 14, 1977

In circumstances where an Appeal Panel member might well be in the "intolerable position" of having to judge the merits of a controversy in which the credibility of other Panel member(s) was placed in issue, all members of the Panel recuse themselves from appellate review of determinations made by a specially constituted Licensing Board considering charges of professional misconduct against three lawyers who have appeared in the remanded construction permit proceeding involving the Midland facility.

MEMORANDUM

Now pending before a specially constituted Licensing Board (special board) are charges of professional misconduct leveled against three lawyers who have appeared for certain of the parties in the remanded construction permit proceeding involving the Midland facility.¹ Those charges were referred to the special board for adjudication by a November 4, 1977, order of the Licensing Board presiding over the remanded proceeding (hearing board). The referral was grounded upon the provisions of 10 CFR 2.713(c)

¹See *Aeschliman v. NRC*, 547 F. 2d 622 (D.C. Cir. 1976), *certiorari granted sub nom. Consumers Power Co. v. Aeschliman*, 429 U.S. 1090 (1977).

relating to suspension or debarment from participation as an attorney in a proceeding.²

Normally, by reason of a delegation of authority from the Commission,³ appellate review of the special board's determinations would be undertaken by an appeal board drawn from the membership of the Appeal Panel. Unusual circumstances present here, however, prompt all members of the Appeal Panel to recuse themselves.

More specifically, it appears from the hearing board's November 4 order that debarment of one of the lawyers is being sought on the basis of his written representations to the hearing board regarding an incident in the Emergency Core Cooling System rulemaking proceeding (Docket No. RM 50-1) several years ago. These representations have been formally characterized as wholly false by the members of the ECCS hearing board.⁴ Two of those members (Drs. John H. Buck and Lawrence R. Quarles) also serve on the Appeal Panel.⁵ Thus, any Appeal Panel member reviewing the special board's determinations might well find himself in the intolerable position of having to pass judgment on the merits of a controversy in which the credibility of his colleagues was placed in issue.⁶

We announce our recusal at this juncture so that the Commission may, if it deems it advisable to do so, either (1) authorize the submission directly to it of any papers which would otherwise be filed with an appeal board; (2) delegate its review authority in this matter to a specially constituted appeal board (not drawn from the members of the Appeal Panel); or (3) take some other action considered to be appropriate in the circumstances.⁷

FOR THE ATOMIC SAFETY AND LICENSING APPEAL PANEL

Margaret E. Du Flo
Secretary to the Appeal Panel

²See *Toledo Edison Co.* (Davis-Besse Nuclear Power Station, Units 1, 2 and 3), ALAB-332, 3 NRC 785 (1976) and ALAB-378, 5 NRC 557 (1977).

³See 10 CFR 2.785(a).

⁴See ALAB-395, 5 NRC 772, 787-88 (1977).

⁵Although Dr. Quarles retired from general service on the Appeal Panel last June, he continues as a member of the appeal board for one proceeding to which he had been previously assigned.

⁶Insofar as Dr. Buck is concerned, there is an even more obvious reason why it would be inappropriate for him to participate in such review. Additionally, there may be other considerations (unrelated to those discussed in the text) which might have induced some of the members of the Appeal Panel to recuse themselves. No present necessity exists to elaborate upon them.

⁷The recusal of the entire Appeal Panel extends, of course, only to the disciplinary matter before the special board. The members of the Panel assigned to the Appeal Board for the remanded construction permit proceeding will continue to serve on that Board.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Alan S. Rosenthal, Chairman

Dr. John H. Buck

Dr. W. Reed Johnson

In the Matter of

**PORTLAND GENERAL ELECTRIC
COMPANY, et al.**

(Trojan Nuclear Plant)

**Docket No. 50-344
(Proposed Amendment
for Fuel Storage Pool
Modification)**

December, 20, 1977

Upon petition by intervenors for directed certification (under 10 CFR 2.718(i)) of interlocutory rulings made by the Licensing Board in a proceeding considering an operating license amendment to permit expansion of the Trojan Nuclear Plant's spent fuel pool, the Appeal Board finds no warrant for interlocutory review since it does not appear that, if review is not granted, the public interest will suffer or that unusual delay or expense will be encountered.

Petition denied.

RULES OF PRACTICE: CERTIFICATION

Where activities "preparatory" to the enlargement of a spent fuel pool are not of "significant proportions," there exists no safety or other public interest consideration to justify interlocutory review of their legality.

Mr. Warren Hastings, Portland, Oregon, for the applicants Portland General Electric Company, *et al.*

Ms. Susan M. Garrett, Portland, Oregon, *pro se* and on behalf of the Coalition for Safe Power.

Mr. Joseph R. Gray for the Nuclear Regulatory Commission staff.

MEMORANDUM AND ORDER

This is a proceeding to consider the application of the Portland General Electric Company, *et al.*, for an amendment to their outstanding operating license for the Trojan Nuclear Plant. The amendment would allow the expansion of the capacity of the facility's spent fuel pool from 280 to 651 fuel assemblies "by replacing the existing storage racks with those of a design capable of accommodating an increased number of assemblies." 42 Fed. Reg. 9068 (February 14, 1977).

Before this Board is the petition of intervenors Susan M. Garrett and Coalition for Safe Power for a directed certification under 10 CFR 2.718(j)¹ of certain interlocutory rulings made by the Licensing Board during the course of its prehearing conference held on October 14, 1977, or in its October 31, 1977, order entered in the wake of that conference. At the time that petition was filed, the Board below still had under submission objections filed by the intervenors to the October 31 order—which objections challenged the rulings we are asked now to review. On December 14, however, those objections were rejected. LBP-77-69, 6 NRC 1179.

Upon careful consideration of the petition and the responses of the applicant and the NRC staff thereto,² we conclude that there is no warrant for our interlocutory review of the rulings in question. More particularly, it does not appear that, in the absence of such review, the public interest will suffer or unusual delay or expense will be encountered. *Seabrook*, ALAB-271, *supra*, fn. 1, 1 NRC at 483.

Only one of the rulings requires specific discussion. The intervenors unsuccessfully sought below an order requiring the applicants to cease and desist from the present performance of certain activities said to be "preparatory" to the enlargement of the Trojan spent fuel pool. Had those activities been of significant proportions, the intervenors might well have been right that we should examine their legality without further delay. It appears, however, that what the applicants are doing is of little consequence indeed. The preparatory work is in two phases. The first phase—presumably now completed—involved detaching the spent fuel rack leveling shims (*i.e.*, the pieces of metal used to assure that each rack is level) from the pool liner plate and attaching them instead to the existing racks themselves. The second phase—which commenced on or about November 1, 1977—is likewise designed simply to facilitate the process of installing the new racks when and if the required license amendment is authorized by the

¹See *Public Service Company of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-271, 1 NRC 478 (1975).

²The applicant and the staff both oppose the petition.

Licensing Board and issued by the staff. That work too would not affect either the structural integrity of the pool or the performance capability of the racks currently therein. In short, there is a total absence of any safety or other public interest consideration attendant upon the work which might justify our stepping into the controversy at this juncture.³

Petition for directed certification *denied*.
It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD

Margaret E. Du Flo
Secretary to the Appeal Board

³Although, in light of the foregoing, we need not decide the point, there is some question whether the Licensing Board was the proper forum to entertain *ab initio* the intervenors' complaint that the applicants were engaging in activities beyond the ambit of the authority conferred by the Trojan operating license. The contemplation of the Commission's Rules of Practice would appear to be that relief be sought in the first instance by application to the staff, which has the primary responsibility for monitoring the conduct of utilities under their licenses. See 10 CFR 2.206(a). *Cf. Public Service Company of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-356, 4 NRC 525, 538-39 (1976).

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Alan S. Rosenthal, Chairman
Michael C. Farrar
Richard S. Salzman

In the Matter of

Docket Nos. 50-329A
50-330ACONSUMERS POWER COMPANY
(Midland Plant, Units 1 and 2)

December 30, 1977

On review of antitrust decision of Licensing Board (LBP-75-39, 2 NRC 29), the Appeal Board concludes that Consumers Power Company possesses monopoly power in the relevant product and geographic markets; that the company has monopolized those markets in contravention of Section 2 of the Sherman Act and its underlying policies; and that it is reasonably probable that licensing the Midland units without appropriate remedial conditions would maintain a situation inconsistent with the antitrust laws within the meaning of Section 105c of the Atomic Energy Act, 42 U.S.C. §2135(c).

Licensing Board decision reversed and remanded for formulation and imposition of appropriate license conditions.

DECISION

Mr. Wm. Warfield Ross, Washington, D.C., argued the cause for the applicant, Consumers Power Company, *appellee*; with him on the brief were Messrs. Keith S. Watson, Thomas W. Brunner, Mark Schattner, and Gerald B. Wetlaufer, Washington, D.C., and James B. Falahee and Wayne A. Kirkby, Jackson, Michigan.

Mr. Robert A. Jablon, Washington, D.C., argued the cause for the intervening Michigan municipalities and cooperatives, *appellants*; with him on the briefs was Mr. Daniel I. Davidson, Washington, D.C.

Mr. C. Forrest Bannan argued the cause for the Attorney General of the United States, *appellant*; with him on the briefs were **Assistant Attorney General Kauper, Miss Judy L. Goldstein, and Messrs. Jonathan C. Rose, Joseph J. Saunders, Milton J. Grossman, David A. Leckie, and Mark M. Levin.**

Mr. Robert J. Verdisco argued the cause for the Nuclear Regulatory Commission staff; with him on the briefs were **Messrs. Joseph Rutberg and Andrew F. Popper.**

CONTENTS

I. NATURE OF THE CASE	896
A. Introductory	896
B. The Attorney General's recommendation	897
C. The proceedings below	898
D. The decision below	901
1. Section 105c analysis	901
2. Antitrust analysis	902
3. Matters outside the "issues in controversy"	905
4. Matters not dealt with below	906
5. The result	906
II. THE APPLICATION OF SECTION 105c	907
A. Situations inconsistent with the antitrust laws	907
1. Violation of antitrust policies	907
2. FTC Act jurisprudence as a guide in Section 105c cases	909
3. "Anticompetitive conduct" as the basis of situations inconsistent with the antitrust laws	912
B. "Nexus"	915
III. KEY ANTITRUST CONSIDERATIONS	917
A. The Sherman Act	918
B. The Federal Trade Commission Act	924
IV. BACKGROUND	927
A. The setting	927
1. Consumers' service area	928
2. Municipal systems	929

3. Cooperatives	930
4. Interconnections	931
B. The electric utilities	933
1. Consumers Power Company	933
a. Consumers' franchises	933
b. State and Federal regulation of Consumers	934
c. Consumers' bulk power facilities	936
2. The small utilities	937
a. The cooperatives	938
b. The municipalities	940
c. Investor-owned systems	942
d. Summary	942
3. The parties' coordination arrangements	942
a. Consumers' coordinating arrangements	943
b. Coordination among the small utilities	944
V. THE RELEVANT MARKETS	945
A. Geographic market	945
B. Product markets	945
1. The coordination services market	945
a. The "agreement" that the only relevant product market is for coordination services	945
b. Coordination services as a relevant market	949
(i) Benefits of coordination arrangements	950
(ii) Coordination transactions	952
(iii) Market analysis	957
(a) Functional differences	960
(b) Price differentials	964
(c) Commercial practices	970
(d) Industry structure	972
(e) Coordination as a "bundle of services"	975
(f) Geographic market for coordination services	976
2. The retail market	977
3. The wholesale power market	990
VI. MONOPOLY POWER	997
A. Coordination services market	997
B. The wholesale and retail power markets	1009

VII. MONOPOLIZATION	1019
A. Preliminary questions	1020
1. Matters "beyond" the scope of the controversy	1020
2. Deference due the Licensing Board's findings	1022
B. Refusals to deal	1025
C. Consumers' acquisition of other utilities	1031
D. Consumers' refusal to wheel for the smaller utilities	1036
E. Consumers' coordination practices	1046
1. The applicable standard	1047
a. The Licensing Board's decision	1047
b. The parties' proposed standards	1048
c. Analysis	1049
2. Consumers' refusals to coordinate	1051
a. Facts	1051
(i) Consumers' refusal to coordinate with Northern Michigan and Wolverine Electric	1051
(ii) Consumers' refusal to coordinate with Northern Michigan	1053
(iii) Consumers' refusal to coordinate with Edison Sault	1054
b. Consumers' position	1056
c. Appellants' position	1056
d. Discussion	1057
e. Effect of Consumers' refusals to coordinate	1061
3. Consumers' refusal to share reserves on an equalized percentage basis with the small utilities	1065
a. Background	1065
b. The Licensing Board's decision	1067
c. Gainesville	1067
d. The parties' positions	1071
e. The Holland formula measured against FPC standards elucidated in Gainesville	1073
f. Benefit to Consumers	1076
g. Summary	1078
4. Consumers' refusal to grant the small utilities access to the Midland facilities	1079
F. Exclusion of the small utilities from the Michigan Pool	1085
1. Consideration of third-party membership in 1968	1085
2. The current provision for third-party membership	1086
3. Conclusion	1090

G. Other allegations of anticompetitive conduct	1090
1. Contract provisions precluding interconnections	1090
2. Reverter provisions in deeds disposing of Consumers' old hydroelectric facilities	1092
3. Wholesale territorial agreements	1093
VIII. "NEXUS"	1094
IX. REMEDIES	1098

**Opinion of the Board by Mr. Salzman, in which Messrs. Rosenthal and Far-
rar join:**

The question in this case is whether licensing Consumers Power Company to build and operate a commercial nuclear power plant at Midland, Michigan, would "create or maintain a situation inconsistent with the antitrust laws" within the meaning of Section 105c of the Atomic Energy Act of 1954, 42 U.S.C. §2135(c). The Licensing Board held that it would not and therefore declined to place antitrust restrictions on the Midland "construction permit," Consumers' license from the Commission¹ to build the plant. LBP-75-39, 2 NRC 29. This appeal is taken by the three parties who prosecuted the Section 105c proceeding—the Commission's antitrust staff, the intervening Michigan municipalities and cooperatives, and the Attorney General of the United States. It brings before us the first full-fledged antitrust decision on the merits rendered by a licensing board.

I. NATURE OF THE CASE

A. Introductory

The antitrust laws embody fundamental national economic policy.² It is a "now settled axiom that after *Otter Tail Power Co. v. United States*, 410 U.S. 366, 'there can be no doubt about the proposition that the federal an-

¹The Energy Reorganization Act of 1974 abolished the Atomic Energy Commission on January 19, 1975, and transferred its regulatory responsibilities to the Nuclear Regulatory Commission. See 42 U.S.C. §§5814 and 5841. In this opinion, "Commission" refers either to the AEC or the NRC as the context requires.

²*FMC v. Seatrain Lines, Inc.*, 411 U.S. 726, 733 (1973); *Gulf States Utilities Co. v. FPC*, 411 U.S. 747, 759 (1973); *Otter Tail Power Co. v. United States*, 410 U.S. 366, 372-75 (1973); *United States v. Topco Associates*, 405 U.S. 596, 610 (1972); *Carnation Co. v. Pacific West-bound Conference*, 383 U.S. 213, 218-19 (1966).

trust laws are applicable to electric utilities.’ ” *City of Mishawaka v. Indiana & Michigan Electric Co.*, 560 F.2d 1314, 1321 (7th Cir. 1977), quoting from *Cantor v. Detroit Edison Co.*, 428 U.S. 579, 596 n. 35 (1976).

Congress has given the Commission specific antitrust responsibilities.³ Under Section 105c of the Atomic Energy Act, it must review applications for permits to construct commercial nuclear power facilities to determine if the activities sought to be licensed would create or maintain situations inconsistent with the antitrust laws or their underlying policies. Where such a result would follow, the Commission may refuse a license (or rescind one previously issued) or attempt to rectify the anticompetitive consequences by attaching appropriate conditions to the license.⁴ As the Commission has reiterated, the Atomic Energy Act’s antitrust provisions reflect “a basic Congressional concern over access to power produced by nuclear facilities” and represent legislative recognition “that the nuclear industry originated as a Government monopoly and is in great measure the product of public funds [which] should not be permitted to develop into a private monopoly via the [NRC] licensing process. . . .”⁵

B. The Attorney General’s recommendation

We have previously described the procedures under Section 105c in some detail.⁶ For purposes of this appeal it is sufficient to note that in due course the Commission referred Consumers’ application to build the Midland facility to the Attorney General of the United States for advice about its possible antitrust ramifications.⁷ That official responded⁸ with a critique of

³Even without express statutory obligation to do so, Federal regulatory agencies must structure their decisions to ameliorate if not avoid anticompetitive consequences. *Gulf States Utilities Co. v. FPC*, *supra*, 411 U.S. at 759-61; *Denver and Rio Grande W. RR. Co. v. United States*, 387 U.S. 485 (1967); *California v. FPC*, 369 U.S. 482, 484-85 (1962). See also, *Cities of Statesville v. AEC*, 411 F.2d 962 (D.C. Cir. 1969); *Municipal Electric Assoc. v. SEC*, 413 F.2d 1052 and 419 F.2d 757 (D.C. Cir. 1969).

⁴Section 105c(6), 42 U.S.C. §2135(c)(6); see *Kansas Gas and Electric Co. (Wolf Creek Generating Station, Unit No. 1)*, ALAB-279, 1 NRC 559, 564 (1965) (*Wolf Creek I*).

⁵*Louisiana Power & Light Company (Waterford Steam Electric Generating Station, Unit 3)*, CLI-73-7, 6 AEC 48-49 (1973) (*Waterford I*), and CLI-73-25, 6 AEC 619, 620 (1973) (*Waterford II*).

⁶See ALAB-279, *Wolf Creek I*, *supra*, fn. 4.

⁷Section 105c was amended in 1970 to impose precicensing antitrust review. Consumers had applied for permission to construct Midland in 1969. Because a construction permit was not issued before the effective date of the amendment, antitrust review of its application was necessary. Under a “grandfather clause” in the amending legislation, however, it was not necessary to complete that review before a construction permit could issue. See *Toledo Edison Co. (Davis-Besse Nuclear Power Station, Unit 1)*, ALAB-323, 3 NRC 331 (1976). Construction of Midland is currently underway.

⁸The letter of advice to the Commission over the signature of Richard McLaren, then Assistant Attorney General in charge of the Antitrust Division, appears at 26 Fed. Reg. 17881.

Consumers' relationships with neighboring smaller utilities, mostly competing municipally owned systems or rural electric cooperatives. The Attorney General stressed that Consumers is one of Michigan's largest utilities, that its service area extends over the state's "lower peninsula" save for its southwest corner and areas in and around metropolitan Detroit, and that it dominates the generation and transmission of electricity in its area of operations. The Attorney General's concern was the likelihood that the utility had impermissibly used its "substantial market power *vis-à-vis* its smaller competitors" to preserve its market position and to foreclose competition. The letter raised the possibility that Consumers' actions had violated antimonopoly provisions of Section 2 of the Sherman Act, 15 U.S.C. §2.⁹ The Attorney General advised the Commission that granting Consumers' application for the Midland facility might well serve to "maintain a situation inconsistent with the antitrust laws." Accordingly, he recommended "that a hearing be held pursuant to Section 105 of the Atomic Energy Act to provide a factual basis upon which the Commission may appropriately determine those questions."

C. The proceedings below

The Atomic Energy Act makes the Attorney General's "recommendation" for a Section 105c antitrust hearing in connection with a construction permit application binding on the Commission.¹⁰ This being so, the Commission convened a Licensing Board¹¹ comprised of two lawyers and an engineer to hear and decide the antitrust allegations.¹² Four separate parties took active roles at the antitrust trial before the Board: the Attorney General (represented by attorneys from the Antitrust Division of the Department of Justice) exercising his statutory right under Section 105c(5) "to participate as a party in the proceedings"; Joint Intervenors (the Michigan Municipal Electric Association; the municipalities of Coldwater,

⁹The Sherman Act (" 'An Act to protect trade and commerce against unlawful restraints and monopolies,' approved July second, eighteen hundred and ninety") is among the antitrust laws the Commission must apply under Section 105 of the Atomic Energy Act.

¹⁰*Wolf Creek I, supra*, ALAB-279, 1 NRC at 565.

¹¹The antitrust aspects of an application to build a nuclear power plant are reviewed by a separate licensing board and not referred to the one convened to consider its health, safety and environmental features. *Public Service Co. of Indiana* (Marble Hill, Units 1 and 2), ALAB-316, 3 NRC 167 (1976).

¹²One of the lawyer members died after the record closed but before the decision was rendered. The parties agreed to have the surviving Board members decide the matter rather than retry the case. See 2 NRC at 40 fn. 3.

Grand Haven, Holland, Traverse City and Zeeland, Michigan; and Northern Michigan and Wolverine rural electric cooperatives);¹³ the antitrust staff of this Commission; and the applicant, Consumers Power Company.

The three complaining parties sought to establish a case against Consumers along the lines of the Federal government's successful civil antitrust action against another electric utility. *Otter Tail Power Co. v. United States*, 410 U.S. 366 (1973). The Supreme Court there affirmed a district court decision¹⁴ that a regulated electric utility violates the antitrust laws by acting unjustifiably to foreclose competition, to gain competitive advantages or to destroy competitors. The Court held, among other things, that Otter Tail's use of its "strategic dominance" over the power transmission network to prevent municipalities from reaching other sources of electricity and forming competing power systems was an exercise of monopoly power that violated the Sherman Act. 410 U.S. at 317.

In this case the complaining parties led by the Department of Justice attempted to demonstrate, *first*, that Consumers Power possessed "strategic dominance" not only over the transmission but also over the generation of electric power in its service area by virtue of its control over key transmission lines and the number and size of its power plants and, *second*, that Consumers had used its dominance to foreclose the possibility of competition from smaller cooperative and municipal systems in its service area. In particular, they introduced evidence purporting to demonstrate that Consumers had consistently and unjustifiably refused to "wheel" (*i.e.*, transmit from sources outside Consumers' system)¹⁵ power to the municipalities and the cooperatives, or to "coordinate" (plan and operate their power plants jointly to achieve reliability and efficiency not otherwise attainable)¹⁶ with those smaller systems on any reasonable basis, although Consumers both transmitted power for and regularly coordinated with other, larger utilities

¹³The intervening municipalities and cooperatives generate or distribute electricity within or adjacent to areas served by Consumers Power Company.

¹⁴*United States v. Otter Tail Power Co.*, 331 F. Supp. 54 (D.Minn. 1971).

¹⁵"Wheeling" is a term of art in the electric power industry; it refers to the "transfer by direct transmission or displacement of electric power from one utility to another over the facilities of an intermediate utility." *Otter Tail Power Co. v. United States*, *supra*, 410 U.S. at 368.

¹⁶"Coordination" has been defined by the Federal Power Commission as "joint planning and operation of bulk power facilities by two or more electric systems for improved reliability and increased efficiency which would not be attainable if each system acted independently." FPC, *1970 National Power Survey*, Part 1, p. 1-17-1.

close by. These and other anticompetitive acts on Consumers' part,¹⁷ the smaller companies said, blocked their access to cheaper sources of power, prevented them from using their own generating capacity most efficiently, and kept them dependent on purchases of wholesale power from Consumers, thereby preventing them from competing effectively against that larger company and preserving its dominant market position. It was also contended that Consumers' conduct violated Section 5 of the Federal Trade Commission Act, 15 U.S.C. §45(a)(1), which makes unlawful "unfair methods of competition" and "unfair or deceptive acts or practices in commerce."¹⁸

According to the complaining parties, this anticompetitive situation would be "maintained" in violation of Section 105c of the Atomic Energy Act by allowing Consumers to build and operate the Midland facility. This situation would not be cured, the complaining parties contended, by acceptance of Consumers' offer to sell the intervening utilities power from the nuclear plant. They pointed out that the offer to sell is at rates based on the average wholesale cost of power on Consumers' entire system. This, they asserted, retains the cost advantages of the nuclear facility for Consumers, thus enhancing its monopolistic dominance over the available sources of cheaper power.

Consumers denied all the charges against it, asserting either their untruth or their justification as accepted practices in sound public utility management. Consumers also defended on the ground that the accusations, even if true, were unrelated to its operation of the nuclear plant. Without such a "nexus" with the nuclear facility, Consumers argued, as a matter of law relief under Section 105c is not available. Consumers accordingly insisted that the placement of anticompetitive restrictions on its license was not in order.

¹⁷The other anticompetitive acts charged were that Consumers had (1) prevented the small utilities from joining the coordination agreement between it and the Detroit Edison Company; (2) acted to preclude coordination among the smaller utilities; (3) forestalled competition with nearby larger utilities for the sale of wholesale power to small utilities by entering wholesale territorial agreements with these larger utilities; (4) acted to acquire certain of the small utilities; (5) limited the right of small utilities to interconnect with third parties by inserting a provision to that effect in its wholesale and coordination contracts with the small utilities; and (6) prohibited the use of its old hydroelectric facilities for electric power generation by inserting restrictive covenants to that effect in their deeds of sale.

¹⁸The Federal Trade Commission Act ("An Act to create a Federal Trade Commission, to define its power and duties, and for other purposes" approved September twenty-six, nineteen hundred and fourteen") is another of the antitrust laws the Commission must apply under Section 105.

D. The decision below

1. **Section 105c analysis.** Authority under Section 105c of the Atomic Energy Act to condition an applicant's license to alleviate antitrust problems is keyed to the existence of a "situation inconsistent with the antitrust laws" or the likelihood of one arising as the result of granting the license. That critical provision, however, is not further defined in the Act. The Licensing Board therefore began its decision by analyzing what it deemed "basic legal concepts" in an effort to elucidate what Congress intended. Starting from the premise that the antitrust laws' goal is to promote and to preserve competition, the Board below reached the conclusion "that a 'situation inconsistent with the antitrust laws' must mean *anticompetitive conduct*." (2 NRC at 49, emphasis in original.) It declined to limit such conduct to practices which either the Federal courts or the Federal Trade Commission had previously held to be antitrust violations. Rather, the Board ruled that Congress intended Section 105c to reach as well conduct (*id.* at 50):

(1) which offends public policy as it has been established by statutes, the common law, or otherwise, or, in other words, is within at least the penumbra of some law, statutory, or other established concept of unfairness; (2) which is immoral, unethical, oppressive or unscrupulous; and (3) which causes substantial injury to consumers or competitors or other businessmen.

The Board did state that anticompetitive conduct alone does not justify invoking the sanctions of Section 105c. It rested this ruling on the Commission's statement in *Waterford II, supra*, that there is "an overriding requirement that there be a reasonable nexus between the alleged anticompetitive practices and the activities under the particular nuclear license." 6 AEC at 621. The Board therefore went on to consider the kind of connection between the proscribed conduct and a nuclear facility which must be demonstrated in order to justify placing antitrust conditions on an applicant's license. After sketching the use of the term by authorities ancient and modern, the Board held that (2 NRC at 55):

[n]exus exists between otherwise lawful activities under a license or proposed license and a situation inconsistent with the antitrust laws if, and only if, the said activities are misused so as to be a material element and a substantial factor in a scheme or conspiracy, the purpose of which is to cause the creation of maintenance of said situation.

This distinction between the "use" and the "misuse" of licensed activities the Board derived from patent and labor cases cited in its opinion.

It read these as laying down a rule of law that (*id.* at 60):

the *use* of activities under a Federal grant within the scope and for the very purpose contemplated by the grant is immunized from the anti-trust laws.

It deduced therefrom the proposition that activities licensed by the Commission cannot “create or maintain a situation inconsistent with the antitrust laws” unless “misused.” *Ibid.*

2. **Antitrust analysis.** The Licensing Board required the complaining parties to bear the burden of proving their accusations against Consumers. These the Board understood as amounting to charges, *first*, that Consumers had engaged in “anticompetitive conduct” *vis-à-vis* the smaller utilities in the relevant geographic and product markets and, *second*, that licensing Consumers to build Midland would maintain that anticompetitive situation unless the license were freighted with appropriate antitrust restrictions. The Board found the geographic market to be “all of the lower peninsula of Michigan except the eastern section served by the Detroit Edison Company and the southwest section served by . . . subsidiaries of American Electric Power Company,” the areas where Consumers is franchised to sell power or into which it could reasonably extend its service (2 NRC at 45).

Based on its interpretation of representations made by Justice and assertedly accepted by the other parties regarding the scope of the matters in controversy, the Board determined the product market to be one for “coordination services” (*ibid.*). “Coordination” refers to the electric power utilities’ practice of interchanging power and sharing responsibility for building new generating facilities to achieve economic benefits unattainable by an individual utility acting alone.¹⁹ The practice encompasses both “operational coordination,” which is the unified control of generation and transmission facilities,²⁰ and the sharing of one or more of reserve,²¹

¹⁹The Licensing Board defined “coordination” as “the interchange of beneficial services between cooperating electric utilities through an agreement which confers on each party a net benefit not attainable by such electric utilities operating independently.” 2 NRC at 34-35. See also fn. 16, *supra*.

²⁰“Unified control or economic dispatch of generation or transmission facilities” means the control of the generation or transmission facilities of each of two or more utilities by one central control authority. 2 NRC at 35.

²¹“Reserves” means extra generating capacity maintained to generate power in the event of unexpected demand for power or loss of a generating facility or unit or scheduled outage of a generating facility or unit. *Ibid.*

emergency,²² maintenance,²³ economy,²⁴ dump,²⁵ seasonal and time diversity²⁶ power or energy, and “developmental coordination,” which includes the cooperative planning of new facilities to allow their construction as joint ventures or on staggered time schedules (2 NRC at 34-35).

The Board also believed that certain additional legal concepts governed the decision it was being called upon to make. Foremost among these was what it denominated the “net benefit rule.” Purportedly derived from strictures against wasting corporate or utility assets, in the Board’s understanding the rule permits coordination between utilities only if each receives a “net benefit” from the arrangement because (2 NRC at 66):

To coordinate with a competitor without any net benefit would either injure the public served or the stockholders or both and would be a waste of the assets of the corporation. The offices and directors are obligated to do just the opposite.

From the above, we conclude as a matter of law, that the management of Applicant is forbidden from entering into alleged coordination agreements which said management believes will result in a net detriment to Applicant.

Another rule the Board thought applicable was one it analogized to the parable of the Good Samaritan. In the Board’s view, a large utility has no legal duty to come to the “aid” of a smaller competitor—either by entering into a coordination agreement or otherwise—where the former did not cause the latter’s distress. Only where the refusal is part of an “anticompetitive scheme,” the Board held, may an “otherwise lawful refusal to coordinate . . . give rise to a situation inconsistent with the antitrust laws.” 2 NRC at 73.

²²“Emergency energy or power” means energy or power needed, supplied, or received in an emergency situation, *i.e.*, an unscheduled outage. *Ibid.*

²³“Maintenance energy or power” means energy or power supplied or received to replace needed energy or power which is unavailable because a generating unit or transmission unit is out for scheduled maintenance. *Ibid.*

²⁴“Economy energy or power” means energy or power supplied to or received by a utility from another utility which power costs less than the receiving utility’s current production cost. *Ibid.*

²⁵“Dump energy or power” is energy or power available from a utility and which energy or power must be produced anyway. (An example is a hydroelectric plant which must be run to monitor river flow or lake level and the production of energy or power is in excess of needs of the utility owning the plant.) *Ibid.*

²⁶“Diversity” means the difference in electric loads on two different utilities resulting from noncoincident maximum load demands of two different utilities. “Seasonal diversity” means diversity caused by differences in load demand during different seasons of the year. “Time diversity” means diversity caused by differences in load demand during the day. (Usually occurs between two time zones and if so, is called “time zone diversity.”) *Ibid.*

The Licensing Board also ruled that a utility's refusal to wheel power for a competitor is not *per se* anticompetitive conduct but must be shown to be part of a scheme to violate the antitrust laws. In that Board's judgment, this remained true even where the utility controls the high voltage lines necessary to transmit the power and its refusal to cooperate blocks the transaction. In reaching this conclusion, the Board noted but declined to apply the "bottleneck theory" of monopolization. Under that theory, those with strategic dominance over an essential facility which is impractical to duplicate may be obliged to allow competitors to use the "bottleneck" on reasonable terms. In the judgment of the Board below, however, "all of the bottleneck cases involve conspiracies" and, therefore, "as a matter of law, the bottleneck situation applies only to conspiracies and hence is inapplicable to a unilateral refusal to wheel." 2 NRC at 76-78.

Finally, the Board below held that a finding of anticompetitive conduct may not rest simply on a utility's unilateral refusal to grant access to a nuclear facility. As in its "nexus" analysis, *supra* pp. 901-902, the Board reasoned that (2 NRC at 79):

the use of activities under a grant authorized by Congress is immune from the reach of the antitrust laws. Only if it can be shown that the activities under the license will be misused as a material element and substantial factor in an anticompetitive scheme or conspiracy is it possible to deem refusal of access by joint ownership or unit power to be unlawful.

This led it to the legal conclusion that (*id.* at 80):

if an Applicant for a license intends to construct and operate a nuclear power facility solely for the purpose of supplying power to its customers, unilateral refusal to provide its competitors with access to such facilities is not anticompetitive conduct and is not a scheme or conspiracy the purpose or effect of which is to cause the creation or maintenance of a situation inconsistent with the antitrust laws.

The Licensing Board then examined the evidence underlying the charges against Consumers Power Company in light of the foregoing legal principles. It viewed the charges as falling naturally into eight "situations," but, having held the contested issues to be limited to "coordination activities,"²⁷ ruled only five of them properly before it.²⁸ These were (using the numbers assigned by the Board below) whether to deprive the smaller utilities of the

²⁷"The relevant matters in controversy in this proceeding all deal with 'coordination' activities." 2 NRC at 64; *see also id.* at 40-45; 105; and p. 902, *supra*.

²⁸See 2 NRC at 92-102.

advantages of coordination, Consumers (1) inserted provisions in its contracts with them, limiting their right to coordinate with each other or with nearby larger utilities absent Consumers' consent, (2) refused to coordinate its own operations with them on reasonable terms, (3) excluded them from the Michigan Power Pool,²⁹ (4) refused to wheel power among them and (5) refused them access to power from the Midland nuclear facility on reasonable terms. The Board reviewed these five situations separately without determining whether Consumers had monopoly power in the relevant market. In each instance the Board exonerated Consumers of the charges of anticompetitive conduct and, additionally, found no "nexus" between the utility's conduct and activities under the Midland license. 2 NRC at 92-102.

3. Matters outside the "issues in controversy." Evidence suggestive of anticompetitive actions on Consumers' part was noted by the Licensing Board in two of the three situations it had held beyond the issues in controversy. (The Board evaluated these "for the sake of completeness.") With respect to "situation (6)," the Board below found that Consumers had specifically sought to monopolize relevant retail and wholesale power markets by acquiring neighboring smaller utilities, thereby "destroying competition from a group of healthy, growing, effective and aggressive competitors." 2 NRC at 104. The Board determined that Consumers had acquired three such competitors and "found as a fact" that these, together with a larger number of unsuccessful attempted acquisitions, were part of an "anticompetitive scheme to monopolize" on Consumer's part, and that, in the Board's words, "the scheme still exists." *Ibid.* The Board concluded, however, that this course of conduct did not run afoul of the Sherman Act, but only because Consumers lacked the "power to carry out the scheme," and that in any event there was no "nexus" between the "scheme" and activities under the Midland license. 2 NRC at 102-05.

Situation (7) involved allegations of "gentlemen's agreements" not to compete between Consumers and its large neighboring utilities. Although labelled "Conspiracies to Limit Retail Competition," this section of the Board's opinion covered evidence relating to restrictive wholesale practices as well. It characterized the evidence in the record bearing on these allegations as having "no substance," although it did discern evidence of an in-

²⁹A "power pool" in the electric utility industry "is two or more interconnected electric systems planned and operated to supply power in the most reliable and economical manner for their combined load requirements and maintenance program." Edison Electric Institute, *Glossary of Electric Utility Terms* (1970 ed.), p. 64 (hereafter "EEI Glossary"). The Michigan Power Pool is comprised of Consumers Power Company and the Detroit Edison Company, which serves the city of Detroit and environs. D. J. Exh. No. 67.

formal "boundary agreement" between Consumers and the Detroit Edison Company. On investigation, the Board decided that, rather than precluding the right of a customer near a service area boundary to choose which utility will serve it, the arrangement merely called for the utilities "to accept the customer's decision as final." The Board concluded that this fairly implemented Michigan Public Utility Commission policy. 2 NRC at 105-07.

The last "situation," number (8), concerned Consumers' obligation to wheel power to the smaller utilities from the "regional power exchange market," *i.e.*, from utilities other than Consumers itself. The Board found that the smaller utilities were, as a practical matter, too remotely situated to obtain power economically from those outside sources unless Consumers wheeled it to them (2 NRC at 108), that Consumers, however, had evidenced "a general refusal to wheel" for them (*id.* at 99), and, consequently, that the smaller utilities were left dependent on Consumers for bulk power except to the extent they could afford to build or operate their own generating plants (*id.* at 108). The Board expressed the opinion that "[i]f as a matter law the smaller utilities have a right to exchange wholesale power with utilities outside the relevant geographic market using [Consumers'] transmission facilities . . . then we cannot excuse [Consumers] on the plea that the smaller utilities can build their own" The Board added, however, that in its judgment they "have no such right," that even if they did an NRC antitrust proceeding "is the wrong forum for enforcement thereof," that "the alleged right to such wheeling . . . is not within the scope of this proceeding," and that even if it were, no nexus exists between Consumers' refusal to wheel and its activities under the Midland license. *Id.* at 108-09.

4. Matters not dealt with below. The complaining parties also attacked two other actions undertaken by Consumers. First was a charge of "preemptive coordination," *i.e.*, that Consumers had entered into anticompetitive agreements with two smaller systems that effectively precluded their coordinating with other small systems.³⁰ The other was an allegation that Consumers had inserted restrictive covenants in the deeds for its old hydroelectric facilities to prevent the purchasers from selling electric power to the smaller utilities.³¹ The opinion below discusses neither.

5. The result. The Licensing Board found no "situation inconsistent with the antitrust laws" which would be "maintained" by the activities under the Midland license within the meaning of Section 105c of the Atomic Energy Act. Accordingly, it allowed Consumers Power Company to retain

³⁰See *Justice's Prehearing Brief*, pp. 48-50, and *Brief and Proposed Findings of Fact*, p. 160.

³¹See *Justice's Prehearing Brief*, pp. 51-52, and *Brief and Proposed Findings of Fact*, p. 121.

its permits to construct the Midland nuclear plant "as issued . . . without the imposition of any antitrust conditions." 2 NRC at 114.

II. THE APPLICATION OF SECTION 105c

As we mentioned, this is the first antitrust case under Section 105c in which a comprehensive decision on the merits has been rendered by a licensing board. Appreciating this, the Board below rendered a lengthy opinion seeking to explain fully the reasons for the course it chose and the result it reached.

Appellants have launched a broad-gauged attack on that decision, asserting that the Board below misconstrued key principles under both Section 105c and the antitrust laws it calls into play. Those misconceptions, say appellants, distorted the Board's view of the facts, causing it to overlook well-recognized patterns of anticompetitive conduct. Consumers Power Company, on the other hand, without endorsing every ruling of the Board below, urges that we uphold its decision as permissible in approach, correct in result and supported by the record.

In light of the precedential nature of this case and the profound legal and factual disagreements between the parties, our discussion will follow a format similar to that used in the Licensing Board's opinion. We will examine here (Part II) what we perceive as the governing legal principles in Section 105c proceedings. In the next part (III) we discuss certain antitrust law concepts that are key to evaluating this case. In Part IV we paint the background against which the charges against the company are based. The succeeding parts evaluate those charges.

A. Situations inconsistent with the antitrust laws

1. **Violation of antitrust polices.** Under Section 105, antitrust conditions are added to construction permits where the licensed activities would create or maintain a "situation inconsistent with the antitrust laws." The circumstances intended to be included thereby are not further explained in the Act. The Board below held such a "situation" to embrace more than actual violations of the antitrust laws and to reach activities running counter to the "public policy" embodied in such legislation as well. 2 NRC at 47-49. It ruled that there may be considered in determining whether an inconsistent situation exists (2 NRC at 50):

- (a) conduct which is a violation of the antitrust laws enumerated in Section 105a of the Atomic Energy Act, including conduct heretofore determined to be unfair by the FTC pursuant to Section 5 of the FTC Act; and
- (b) conduct, without necessarily having been previously con-

sidered unlawful, (1) which offends public policy as it has been established by statutes, the common law, or otherwise, or in other words, is within at least the penumbra of some common law, statutory, or other established concept of unfairness; (2) which is immoral, unethical, oppressive or unscrupulous; and (3) which causes substantial injury to consumers or competitors or other businessmen. The term "violations of the antitrust laws" as used in this Board opinion means practices which have been determined to be violations of the antitrust laws in authoritative Federal court opinions.

The Licensing Board was correct in holding that proof of an actual violation of the antitrust laws is not required to show the existence of a situation "inconsistent with" them for Section 105c purposes. The Congressional framers of the section (the members of the Joint Congressional Committee on Atomic Energy) were originally divided between those who favored proof of an antitrust violation before allowing Section 105c remedies to be imposed and those who thought a showing of circumstances merely "tending" to such a violation should suffice to allow that relief. An accommodation between the two views was eventually reached. The members of the Joint Committee agreed that proof of conditions which ran counter to the *policies* underlying those laws, even where no actual violation of statute was made out, would warrant remedial license conditions under Section 105c.³² We need not linger over the matter; this compromise is expressly manifested in the report of the Joint Committee³³ and is reflected in

³²S. Rep. No. 91-1247 and H. R. Rep. No. 91-1470, 91st Cong., 2nd Sess., 14-15 (1970). (Reports of the Joint Committee on Atomic Energy on Amending the Atomic Energy Act of 1954 to Provide for Prelicensing Antitrust Review of Production and Utilization Facilities, *inter alia*.) (Hereafter the "*Joint Committee Report*.") An earlier draft report had been issued wherein arguably a majority of the committee intended that a situation inconsistent with the antitrust laws be tantamount to one in violation of those statutes. See, Joint Committee on Atomic Energy, Draft Report on H. R. 18679, 14-15 (July 1970). Senator Aiken, a strong proponent of prelicensing antitrust review, wrote a vigorous dissent urging defeat of the amendments to Section 105c unless the Joint Committee's report were revised. See Senator Aiken's dissenting views on H. R. 18679, September 14, 1970, in particular pp. 11-12. The committee's report was rewritten to Senator Aiken's satisfaction and accordingly he supported passage of amended Section 105c. 116 Cong. Rec. 19254 (Daily ed. December 2, 1970).

³³*Joint Committee Report* at 14-15: "The legislation proposed by the committee provides for a finding by the Commission 'as to whether the activities under the license would create or maintain a situation inconsistent with the antitrust laws as specified in subsection 105a.' The concept of certainty of contravention of the antitrust laws or the policies clearly underlying these laws is not intended to be implicit in this standard; nor is mere possibility of inconsistency. It is intended that the finding be based on reasonable probability of contravention of the antitrust laws or the policies clearly underlying these laws. It is intended that, in effect, the Commission will conclude whether, in its judgment, it is reasonably probable that the activities under the license would, when the license is issued or thereafter, be inconsistent with any of the antitrust laws or the policies clearly underlying these laws." (Emphasis supplied.)

the Commission's decisions.³⁴

We have touched this point because the Justice Department raises it to counter what it perceives as a contention by Consumers that only proof of violation of the antitrust laws authorizes the triggering of Section 105c relief.³⁵ We think Justice has misconstrued the company's position on this question. In its brief on appeal, Consumers acknowledges that it told the Licensing Board that an "inconsistent situation" could be found "by showing that the Company had violated the antitrust laws or the policies thereunder,"³⁶ a position which it reiterates for our benefit.³⁷ In light of this, Consumers' brief can not be fairly read as asserting that a "situation inconsistent with the antitrust laws" can exist only in the presence of an actual statutory violation; on the contrary, it recognizes unqualifiedly that relief under Section 105c is also available if needed to remedy a situation in conflict with antitrust policies.³⁸ (Of course the company asserts that no such situation exists here.) As we discuss next, the company's dissatisfaction with the standards announced by the Board below is focused elsewhere.

2. **FTC Act jurisprudence as a guide in Section 105c cases.** Consumers Power Company does object to certain criteria which the Licensing Board said were appropriate for determining whether Section 105c had been violated (see pp. 907-908, *supra*). In the company's view, the Board improperly read Section 105c as reaching conduct that "offends public policy" generally or is "immoral" in a broad sense. These "open ended" criteria, Consumers urges, are inapposite under Section 105c. It argues that the provision is directed at actions that transgress antitrust law and antitrust policy only. The company therefore contends that assessments of "contemporary mores, traditional ethical and religious standards and the public weal," divorced from an antitrust setting, have no place in Commission proceedings and "cannot be reconciled with the language and legislative history of section 105c."³⁹

³⁴See, e.g., *Waterford I, supra*, 6 AEC at 49: "The specific standard which Congress intended the Commission to use in such reviews—'whether the activities under the license would create or maintain a situation inconsistent with the antitrust laws as specified in subsection 105a'—is a limited one. The standard requires that: (1) the allegations raised by petitioners describe a situation inconsistent with the antitrust laws or the policies clearly underlying those laws (Emphasis supplied.)

³⁵Compare p. 34 of *Consumers' Appeal Brief* with p. 38.

³⁶*Consumers' Appeal Brief*, p. 33 (emphasis supplied).

³⁷See, e.g., *id.* at pp. 34-35, 38.

³⁸Let there be no doubt about our own position. If Consumers is indeed insisting that a situation contrary to antitrust policy, albeit not an actual violation of law, is insufficient to allow remedial conditions under Section 105c, we reject that position. See pp. 911-912, *infra*.

³⁹*Consumers' Appeal Brief*, p. 34.

Consumers has missed the point which the Licensing Board was making. Its reasoning does not meander in realms of abstract morality. On the contrary, the passages that Consumers finds objectionable were explicitly addressed by the Board to "guidelines for construing Section 5 of the FTC Act."⁴⁰ The Federal Trade Commission Act is of course one of the laws which Congress expressly commanded the Commission to apply in Section 105c proceedings.⁴¹ Section 5 of that Act, 15 U.S.C. §45(a)(1), forbids "unfair methods of competition in commerce, and unfair or deceptive acts or practices in commerce." The criteria recited by the Board below with which Consumers finds fault are none other than those adopted by the Trade Commission itself as an aid in determining whether given business practices are deceptive or unfair within the meaning of Section 5. It was, of course, entirely appropriate for the Licensing Board to "apply [antitrust] principles developed by the . . . Federal Trade Commission."⁴² Indeed, these particular criteria have been cited with approval by the Supreme Court of the United States.⁴³

That Congress intended FTC jurisprudence to be used in Commission antitrust proceedings under Section 105c is scarcely debatable. The FTC Act is expressly included among the laws this Commission must apply under Section 105c, and the Joint Committee's final report on the amendments to Section 105c stressed that its inclusion among them was quite deliberate.

It is important to note that the antitrust laws within the ambit of subsection 105c of the bill are all the laws specified in subsection 105a. These include the statutory provisions pertaining to the Federal Trade Commission, which normally are not identified as antitrust law. *Accordingly, the focus for the Commission's finding will, for example, include consideration of the admonition in section 5 of the Federal Trade Commission Act, as amended, that "Unfair methods of competition in commerce, and unfair and deceptive acts in commerce, are declared unlawful."*⁴⁴

⁴⁰2 NRC at 50. The quoted passage is in the paragraph of the Board's opinion immediately preceding the one containing the standards to which the company objects. Indeed, the paragraph containing those guidelines itself refers to "practices determined to be unfair by the use of the criteria quoted in *Heater v. FTC.*" *Heater* in turn quotes from *FTC v. Sperry & Hutchinson Co.*, 405 U.S.233(1972), a Supreme Court decision (also cited by the Board below) commenting favorably on the use of those criteria for judging whether business practices are deceptive. Although Consumers devotes 6 pages of its brief on appeal to the proposition that the Board's standards are overly broad and open-ended, it nowhere mentions, much less discusses, the cited cases or Section 5 of the Federal Trade Commission Act. The company evidently overlooked these points.

⁴¹See fn.3, *supra*.

⁴²*Houston Lighting and Power Co.* (South Texas Project, Units Nos. 1 and 2), CLI-77-13, 5 NRC 1305, 1316 (1977).

⁴³See *FTC v. Sperry & Hutchinson Co.*, 405 U.S. 233, 244 n.5 (1972).

⁴⁴*Joint Committee Report*, p. 14 (emphasis supplied).

To the extent that Consumers wishes its conduct judged on some "established antitrust law and policy" standard which ignores the Federal Trade Commission Act in general (or Section 5 in particular), we can not be accommodating. The company's desire comes too late and is pressed in the wrong forum; Congress has decided otherwise.

Again, we need not give this point more space than it deserves. It is true that Section 5 permits proscription of unfair or deceptive business practices that infringe neither the letter nor the spirit of what Consumers calls the "established" antitrust laws,⁴⁵ *i.e.*, the Sherman and Clayton Acts. But no accusations of this nature are levelled in this proceeding. The "unfair conduct" charges against Consumers relate strictly to assertedly anticompetitive actions on its part akin to those proscribed by the Sherman Act.⁴⁶ And in evaluating such charges, the FTC itself looks to Sherman (and Clayton) Act precedents for guidance in judging whether conduct is "unfair" within the meaning of Section 5.⁴⁷ Thus, though the broadly phrased criteria articulated by the Board below may be appropriate in other Section 105c proceedings, they did not and do not come into play in this case.⁴⁸

We do not mean that decisions rendered under Section 5 are irrelevant here. It is to be recalled that in Section 5 proceedings proof of a full-blown violation of the Sherman or Clayton Acts is not required; there need only be shown a "conflict with the basic policies of [those] Acts"⁴⁹ because, as has been explained, "the Federal Trade Commission Act was designed to sup-

⁴⁵*FTC v. Sperry & Hutchinson Co.*, *supra*, 405 U.S. at 239:

The Commission presented two questions in its petition for certiorari, the first being [w]hether Section 5 of the Federal Trade Commission Act, which directs the Commission to prevent "unfair methods of competition...and unfair or deceptive acts or practices," is limited to conduct which violates the letter or spirit of the antitrust laws.

* * *

In reality, the question is a double one: First, does § 5 empower the Commission to define and proscribe an unfair competitive practice, even though the practice does not infringe either the letter or the spirit of the antitrust laws? Second, does § 5 empower the Commission to proscribe practices as unfair or deceptive in their effect upon consumers regardless of their nature or quality as competitive practices or their effect on competition? We think the statute, its legislative history, and prior cases compel an affirmative answer to both questions.

⁴⁶See App. Tr. 82-83.

⁴⁷*Atlantic Refining Co. v. FTC*, 381 U.S. 357 at 369-70 (1965), and other cases cited in fn. 49, *infra*.

⁴⁸There will be time enough to deal with allegations of unfair competitive practices that violate neither the letter nor the spirit of the "traditional" antitrust laws when, as and if such charges come before us.

⁴⁹*FTC v. Brown Shoe Co.*, 384 U.S. 316, 321 (1966); *Atlantic Refining Co. v. FTC*, *supra*, fn. 47; *FTC v. Texaco, Inc.*, 393 U.S. 223 (1968); *L.G. Balfour Co. v. FTC*, 442 F.2d 1, 9 (7th Cir. 1971).

plement and bolster the Sherman Act and the Clayton Act...to stop in their incipiency acts and practices which, when full blown, would violate those Acts ... as well as to condemn as 'unfair methods of competition' existing violations of them." *FTC v. Brown Shoe Co.*, 384 U.S. 316, 322 (1966), quoting *FTC v. Motion Picture Adv. Co.*, 344 U.S. 392, 394-95 (1953).

Section 105c similarly applies to situations in conflict with the policies underlying the antitrust laws. Like Section 5 of the FTC Act, Section 105c was also designed by Congress to "nip in the bud any incipient antitrust situation," albeit via the NRC preclicensing review process. *Wolf Creek I, supra*, ALAB-279, 1 NRC at 572 (quoting the *Joint Committee Report*, p. 14). This similarity in purpose and standards leads us to agree with the staff¹⁰ that Section 5 precedents may be helpful guides to determining whether a situation not violative of the antitrust laws is, nevertheless, inconsistent with their underlying policies.¹¹

3. "Anticompetitive conduct" as the basis of situations inconsistent with the antitrust laws. Starting from the premise that "the purpose of the antitrust law is to promote and preserve competition" (2 NRC at 49), the Licensing Board reasoned that a "situation inconsistent with the antitrust laws" within the meaning of Section 105 amounts to "anticompetitive conduct," presumably on the part of an applicant for a Commission permit or license. *Ibid.* The Department of Justice is highly critical of this analysis, arguing in its opening brief (p. 15) that

A situation is, by definition, a state or condition at a given point in time—as opposed to conduct. We would characterize the "situation inconsistent with the antitrust laws" in this case as a highly concentrated, anticompetitive market structure which is the result of exclusionary conduct engaged in by the dominant firm in the market. It is readily apparent that a focus solely upon conduct would ignore essential elements in such a situation.

The Department contends that by working from this "false premise"—*i.e.*, that the focus of a Section 105c inquiry is *conduct*—the Board below was led to a distorted understanding of the law of monopolization, an inappropriate antitrust analysis, and an isolated, abstract evaluation of the allegations of anticompetitive conduct instead of one undertaken in the context of relevant market realities.

We do not agree that the Licensing Board's determination to concentrate on the applicant's conduct necessarily caused it to go astray in the

¹⁰See *Staff Opening Brief*, p. 38.

¹¹Obviously we do not share the Licensing Board's view (2 NRC at 49) that cases dealing with violations of the Sherman or Clayton Acts provide little guidance regarding their underlying policies.

manner suggested by the Department. What an inquiry is labelled is of lesser moment than how it is carried out. In our judgment, evaluation of business "conduct" in a case like this one, exploring charges essentially bot-tomed on Section 2 of the Sherman Act and its underlying policies, requires the application of the same monopolization and policy concepts as an in-vestigation of an anticompetitive "situation." This is so because, as with other statutes, actions permissible under the antitrust laws in one situation may be proscribed in another.⁵² An antitrust analysis of an applicant's con-duct must therefore be undertaken in the context of the "situation" in which that conduct occurred—in other words, against the background structure of the relevant market.⁵³ Of course that analysis of a utility's con-duct must (among other things) be sensitive to judicial and FTC antitrust rulings that the actions of a dominant business enterprise have to be tested against a more stringent standard than applies to actions of smaller concerns in highly competitive markets,⁵⁴ and must also take account of the general rule that electric utilities are not exempt from the Federal antitrust laws, particularly where they voluntarily enter into commercial relation-ships governed in the first instance by business judgment and not regulatory coercion.⁵⁵

⁵²*E.g., Schine Chain Theatres v. United States*, 334 U.S. 110, 119 (1948) (citations omitted): "Even an otherwise lawful device may be used as a weapon in restraint of trade or in an effort to monopolize a part of trade or commerce. Agreements not to compete have at times been used for that unlawful purpose. If we had here only agreements not to compete, the inferences drawn by the District Court might not be warranted. But in the setting of this record and against the background of Schine's other monopolistic practices, it seems to us that the District Court might infer that the requisite purpose was present and that these agreements were additional weapons in Schine's arsenal of power through use of which its monopoly was sought to be extended."

See also, *United States v. United Shoe Machinery Corp.*, 110 F. Supp. 295, 344-45 (D. Mass. 1953), *affirmed per curiam*, 347 U.S. 521 (1954); *United States v. IBM*, Trade Cases (CCH) par. 60,495 (at p. 67,176) (S.D.N.Y. 1975).

⁵³"To establish monopolization or attempt to monopolize a part of trade or commerce under § 2 of the Sherman Act, it would then be necessary to appraise the exclusionary power of the [challenged conduct] in terms of the relevant market for the product involved. Without a definition of the relevant market there is no way to measure [a defendant's] ability to lessen or destroy competition." *Walker Process Equipment, Inc. v. Food Mach. & Chem. Corp.*, 382 U.S. 172, 177 (1965).

⁵⁴*United States v. Aluminum Co. of America*, 148 F.2d 416 (2nd Cir. 1945); *American Tobacco Co. v. United States*, 328 U.S. 781, 812-14 (1946); *United States v. United Shoe Machinery Corp.*, 110 F. Supp. 295 342-46 (D. Mass. 1953), *affirmed per curiam*, 347 U.S. 521 (1954); *cf. U.S. Steel Corp. v. Fortner Enterprises*, ___ U.S. ___, 51 L.Ed 2d 80, 85 fn. 1 (1977).

⁵⁵*Otter Tail Power Co. v. United States*, *supra*, 410 U.S. at 373-75 (Sherman Act); *Cantor v. Detroit Edison Co.*, *supra*, 428 U.S. at 594-98 (Sherman Act); *International Tel. & Tel. Corp. v. General Telephone and Electronic Corp.*, 518 F.2d 913, 935-36 (9th Cir. 1975) (Clayton Act); *Almeda Mall, Inc. v. Houston Lighting and Power Co.*, ___ F. Supp. ___, Trade Reg. Rep. par. 61,485 at p. 71,880 (S.D. Tex. 1977).

Finally, on this point, it should hardly be necessary to add that where a series of anticompetitive actions are alleged, the entire course of conduct must be reviewed for a monopolistic pattern. The courts have stressed the importance of viewing the evidence as a whole to give the antitrust plaintiff the full benefit of his proof, rather than tightly compartmentalizing the case and wiping the slate clean after considering each piece of evidence.³⁶

We have ourselves observed in a related context that the Commission's task under Section 105c necessarily obligates it to consider an applicant's activities in context, not in isolated segments. *Wolf Creek I, supra*, 1 NRC at 572. That obligation devolves on us (and the other adjudicatory boards assigned to hear these cases) as the Commission's delegates.

In sum, for antitrust purposes, whether an applicant's "conduct" was impermissibly anticompetitive usually depends on the "situation" in which the actions took place; in most instances proper consideration of one factor requires evaluation of the other.³⁷ A review of the decision below indicates that the Licensing Board at least purported to measure Consumers' conduct against the background of the electric power generation and distribution situation in lower Michigan, discussed relevant market considerations, and touched on allegations of applicant's monopoly power. See 2 NRC at 45, 84-91, 102-03 and 112-13. (Whether its analysis was correct is a discrete question which we address in Part VII, below.) We therefore reject the Department's criticism of the Licensing Board for electing to approach this case by focusing on the applicant's conduct. This does not strike us as an *inherently* unreasonable way to begin an antitrust review under Section 105c.

³⁶*United States v. Empire Gas Corp.*, 537 F.2d 296, 299 (8th Cir. 1976), *certiorari denied*, ___ U.S. ___ (1977). See also, *United States v. IBM*, Trade Cases (CCH) par. 60,495 (S.D.N.Y. 1975), where the court explained that (p. 67,176): "The government in a monopolization case under 15 U.S.C. §2 need not prove that each practice of the defendant is in itself illegal. 'Even an otherwise lawful device may be used as a weapon in restraint of trade or in an effort to monopolize a part of trade or commerce.' *Schine Chain Theatres v. United States*, 334 U.S. 110, 119 (1948). When a practice concededly not in and of itself illegal is alleged to have been used in violation of the Sherman Act, 'facts and circumstances must be adduced to show that it was in purpose or effect employed as an instrument of monopoly power.' *Schine Theatres, supra*, 334 U.S. at 120-21. Though the constituent elements of the alleged scheme . . . may be lawful if examined separately, 'they are bound together as parts of single plan. The plan may make the parts unlawful' *Swift & Co. v. United States*, 196 U.S. 375, 396 (1905)." See also, *Continental Ore Co. v. Union Carbide and Carbon Co.*, 370 U.S. 690, 699 (1962).

³⁷Exceptions would involve activities of the kind held to be "*per se*" violations of the antitrust laws. *E.g.*, *Otter Tail Power Co. v. United States, supra*, 410 U.S. at 378; *United States v. Topco Associates, supra*, 405 U.S. at 608; *Northern Pacific Ry. Co. v. United States*, 356 U.S. 1, 5 (1958).

B. "Nexus"

Proof of a situation inconsistent with antitrust law or policy is only one of the basic prerequisites for relief under Section 105c. The second is a showing that "the activities under the [NRC] license would create or maintain" the anticompetitive situation. The Commission has characterized the latter as "the overriding requirement that there be a reasonable *nexus* between the alleged anticompetitive practices and the activities under the particular nuclear license." *Waterford II, supra*, 6 AEC at 621 (emphasis supplied).

The Licensing Board devoted a considerable portion of its opinion to analyzing the meaning of "nexus" and to discussing its application in Section 105c cases. After reasoning by analogy to patent and labor law decisions (among other authorities), the Board concluded in essence that (1) nuclear activities licensed by the Commission are "immunized" from the antitrust laws; (2) therefore, any "nexus" between licensed activities and an anticompetitive situation must entail some "misuse" of the license; (3) accordingly, such a connection would exist "if, and only if," the licensed activities were "misused" so as to be a material element and a substantial factor in a scheme or conspiracy the purpose or effect of which [was] to cause the creation or maintenance" of a situation inconsistent with the antitrust laws. 2 NRC at 60-61. The staff, intervenors and Justice challenge this analysis and Consumers Power Company does not defend it.⁵⁹ We agree that it is mistaken.

To begin with, "nexus" is not a term of art; the Atomic Energy Act and Commission regulations assign it no special meaning. Similarly, neither of the Commission's *Waterford* decisions—whence use of the term stems—suggests that the word was employed in some sense other than that ordinarily ascribed to it.⁶⁰ On the contrary, *Waterford II*, for example, uses "nexus" interchangeably with and as the equivalent of phrases such as "meaningful tie," "substantial connection," and "relationship," essentially the word's dictionary definitions.⁶⁰ See 6 AEC at 620-621.

It appears that the motivating force behind the Board's analysis was an axiomatic belief that activities authorized by a Federal license, so long as within the bounds of the grant, are beyond antitrust purview. We need not decide if that concept is valid for the purposes of the patent and labor law

⁵⁹See the *Staff's Opening Appeal Brief*, p. 43; *Intervenors' Opening Appeal Brief*, pp. 35-38; *Justice's Opening Appeal Brief*, pp. 172-73; and *Consumers' Appeal Brief*, pp. 342-52.

⁶⁰See *Waterford I, supra*, 6 AEC at 51; *Waterford II, supra*, 6 AEC at 620-21.

⁶⁰E.g., *The American College Dictionary* (Random House Ed. 1970) at 818 ("Nexus . . . 1. a tie or link; a means of connection. 2. a connected series . . .").

cases relied on by the Board below. Be that as it may, the proposition runs counter to generally accepted antitrust canons. The cases teach that legislative grants of antitrust immunity are to be strictly construed and that repeals of those statutes by implication are "strongly disfavored and have only been found in cases of plain repugnancy between the antitrust and regulatory provision." *Federal Maritime Commission v. Seatrain Lines, Inc.*, *supra*, 411 U.S. at 733, quoting from *United States v. Philadelphia National Bank*, 374 U.S. 321, 350-51 (1963); *accord*, *Silver v. New York Stock Exchange*, 373 U.S. 341 (1963); *Pan American World Airways, Inc. v. United States*, 371 U.S. 296 (1963); *California v. Federal Power Commission*, 369 U.S. 482 (1962); *United States v. Radio Corporation of America*, 358 U.S. 334, 350-52 (1959); *United States v. McKesson & Robbins, Inc.*, 351 U.S. 305, 316 (1956); *United States v. Borden Co.*, 308 U.S. 188 (1939). Certainly since *Otter Tail* was handed down by the Court four years ago, it has been settled that electric power utilities are normally subject to the antitrust laws. 410 U.S. 366; *accord*, *Cantor v. Detroit Edison Co.*, *supra*, 428 U.S. at 596 fn. 35. And Congress made plain that there is no "repugnance" between the Atomic Energy Act and the antitrust laws. It did so, of course, by inserting at the very outset of Section 105 the provision that "[n]othing contained in this Act shall relieve any person from the operation of the [antitrust laws]." 42 U.S.C. §2135(a).⁶¹

The Licensing Board's concept of license "misuse" falls with our rejection of its holding (on which that concept depends) that an NRC license

⁶¹The Licensing Board voiced the belief that it "stretches credulity to the breaking point" to argue "that activities under and within the scope of a license granted pursuant to Federal statute can, in and of themselves, create or maintain a situation inconsistent with the antitrust laws" 2 NRC at 79.

We would have thought that notion was dispelled by *Otter Tail*. The Supreme Court there reiterated that (410 U.S. at 372-73)

[a]ctivities which come under the jurisdiction of a regulatory agency nevertheless may be subject to scrutiny under the antitrust laws.

In *California v. FPC*, 369 U.S. 482, 498, the Court held that approval of an acquisition of the assets of a natural gas company by the Federal Power Commission pursuant to §7 of the Natural Gas Act "would be no bar to [an] antitrust suit." Under §7, the standard for approving such acquisitions is "public convenience and necessity." Although the impact on competition is relevant to the Commission's determination, the Court noted that there was "no 'pervasive regulatory scheme' including the antitrust laws that ha[d] been entrusted to the Commission." *Id.* at 485. Similarly, in *United States v. Radio Corp. of America*, 358 U.S. 334, the Court held that an exchange of radio stations that had been approved by the Federal Communications Commission as in the "public interest" was subject to attack in an antitrust proceeding.

See also *South Texas*, *supra*, CLI-77-13, 5 NRC at 1312, fn. 8.

conveys antitrust immunity of any sort. Honest industrial transactions as well as illegal maneuvers may serve to maintain monopoly power in violation of the antitrust laws. *Hanover Shoe v. United Shoe Machinery Corp.*, 392 U.S. 481, 496-99 (1968); *American Tobacco Co. v. United States*, *supra*, 328 U.S. at 809 (1946); *United States v. Aluminum Company of America*, *supra*, 148 F.2d at 431-32; see also *Poller v. Columbia Broadcasting System, Inc.*, 368 U.S. 464, 468-69 (1962).

In short, the Licensing Board misapprehended the application of the “nexus” requirement. For reasons elaborated in *Wolf Creek I*, the appropriate test is whether “anticompetitive situations [are] intertwined with or exacerbated by the award of [the] license to construct or operate a nuclear facility.”⁶² Accordingly, we must reexamine the anticompetitive situations alleged here to determine whether, properly evaluated, the requisite connection—nexus—is present. We do so in Part VIII, *infra*.

III. KEY ANTITRUST CONSIDERATIONS

The ultimate question here is whether, without appropriate remedial conditions in the company’s licenses, allowing Consumers Power Company to build and operate the Midland nuclear facility would maintain a “situation inconsistent with the antitrust laws” contrary to Section 105c of the Atomic Energy Act.⁶³ Those who urge that the question must be answered in the affirmative—and who therefore seek the addition of such remedial conditions—contend that Consumers has “monopolized” the generation and distribution of electricity in violation of Section 2 of the Sherman Act, Section 5 of the Federal Trade Commission Act, and policies underlying those two provisions. The opinion of the Board below offers little general guidance about the requirements of those laws. Evidently the Board assumed that (in contrast to Section 105c) those longstanding antitrust statutes are well understood. Perhaps so; nonetheless, a brief review may aid in appreciating their application to this case.

⁶²*Wolf Creek I*, *supra*, 1 NRC at 596; see also, 114 *Cong. Rec.* H.9446 (daily ed. September 30, 1970) (remarks of Rep. Hosmer).

⁶³We find no charge before us that the issuance of an unconditioned license would “create” rather than “maintain” an anticompetitive situation. The case has been tried on the theory that to award such a license would assist the company to continue or to expand its monopoly position. See *Justice’s Opening Appeal Brief*, pp. 6-8 and *Staff’s Opening Appeal Brief*, p. 25; and *Intervenors’ representations to the Licensing Board at Tr. 46-47* (July 12, 1972); but *cf. Intervenors’ Opening Appeal Brief*, pp. 185-86.

A. The Sherman Act

1. Section 2 of the Sherman Act, 15 U.S.C. §2, makes it a crime to “monopolize” any part of interstate trade or commerce. The elements of that offense were defined by the Supreme Court in *Grinnell*⁶⁴ as

- (1) the possession of monopoly power in the relevant market and
- (2) the willful acquisition or maintenance of that power as distinguished from growth or development as a consequence of a superior product, business acumen, or historic accident.

Defining monopolization is easier than recognizing it, each of its constituents having developed a gloss of its own. The meaning of “monopoly power” is relatively straightforward, having been characterized as the ability to control prices or exclude competition when it is desired to do so.⁶⁵ Stated another way, the “cases determine that a party has monopoly power if it has, over ‘any part of the trade or commerce among the several states,’ a power of controlling prices or unreasonably restricting competition.”⁶⁶ We have also been instructed “that the material consideration in determining whether a monopoly exists” for purposes of Section 2 of the Sherman Act “is not that prices are raised and that competition actually is excluded but that power exists to raise prices or to exclude competition when it is desired to do so.” *American Tobacco Co. v. United States*, *supra*, 328 U.S. at 811.

Where aspects of an industry’s operations are subject to government regulation, the determination whether a business enterprise has monopoly power requires assessment of the effects of the public controls. Even where (as in this case) the statutes do not exempt those subject to regulation from the antitrust laws, official action pursuant to that legislation may dictate prices, exclude competitors and restrict competition wholly apart from any instigation by the regulated entity itself.⁶⁷ That a regulated utility may “enjoy” (in all senses of the word) the protection thus afforded does not necessarily make it an illegal monopolist; monopoly power may have been “thrust upon it.”⁶⁸ Indeed, in the *United Shoe Machinery* case, *supra*,

⁶⁴*United States v. Grinnell Corp.*, 384 U.S. 563, 570-71 (1966).

⁶⁵*Id.* at 571.

⁶⁶*United States v. Dupont*, 351 U.S. 377, 389 (1956), quoting *Standard Oil Co. v. United States*, *supra*, 221 U.S. at 58.

⁶⁷See *Otter Tail Power Co. v. United States*, *supra*; *Cantor v. Detroit Edison Co.*, *supra*.

⁶⁸See *United States v. Aluminum Co. of America*, *supra*, 148 F.2d at 429. Possession of monopoly power is not automatically unlawful. *United States v. Standard Oil Co.*, 221 U.S. 1, 62 (1911). Assuming that Consumers does have monopoly power, the allegation that the power was acquired initially in violation of the antitrust laws was neither put in issue nor actually tried. See 2 NRC at 112-13; *Justice’s Opening Brief on Appeals*, pp. 6-7, 80; *Staff’s Opening Brief on Appeal*, pp. 21-23, 51; *Intervenors’ Opening Brief on Appeal*, pp. 73-85. See also, Tr. 60-61 and fn. 63, *supra*.

Judge Wyzanski included among possible examples of such circumstances the power conferred upon a utility in "franchises granted directly to the enterprise by a public authority." 110 F. Supp. at 342.

The extent of the protection afforded by government regulation is not self-evident; neither is it coincident with the scope of the regulatory agency's authority. To avail itself of this defense, a company charged with monopolization must demonstrate that the anticompetitive conduct which is sought to be laid at its doorstep was dictated in the first instance by "regulatory coercion" and not by private business judgments in which the regulators later acquiesced.⁶⁹ As the Ninth Circuit put it:

This is not to say that the nature and extent of regulation is, in the absence of an exemption, irrelevant from a factual perspective. The impact of regulation on pricing and other competitive factors is too obvious to be ignored. In the absence of an exemption claim, the fact of regulation is significant but not because it embodies a doctrinal scheme different from the antitrust law; the sole legal perspective is that afforded by the antitrust law. Rather, the impact of regulation must be assessed simply as another fact of market life.⁷⁰

Accordingly, we must also determine whether that assessment was made in this case and, if it was, whether made correctly.

2. The existence *vel non* of monopoly power is not an abstract question. Such power is by definition a measure of a company's control over the competitive arena, or the "relevant market." For antitrust purposes, therefore, the evaluation of a company's market power and the anticompetitive consequences of its conduct must be made against the backdrop of that market.⁷¹

It is now hornbook law that delineation of the boundaries of any relevant market is a "question of fact, heavily dependent upon the special

⁶⁹*Otter Tail, supra; Cantor, supra.* For recent applications of the rule that a regulator's leave to engage in given practices does not prevent those same practices from forming the basis of an antitrust violation, see *Wolfson v. Artisans Savings Bank*, No. 76-179 (D.Del., filed March 24, 1977) (slip opinion, pp. 16-17); *Litton Systems, Inc. v. Southwestern Bell Tel. Co.*, 539 F.2d 418 (5th Cir. 1976).

⁷⁰*International Tel. & Tel. Corp. v. General Tel. & Elec. Corp.*, *supra*, 518 F.2d at 935-36. See also, *United States v. Marine Bancorporation*, 418 U.S. 602 (1974). While these are cases under the Clayton Act, these considerations are also relevant in Sherman Act proceedings. See *United States v. Citizens National Bank*, 422 U.S. 86 (1975); *Mullis v. Arco Petroleum Corporation*, 502 F.2d 290, 298 n. 23 (7th Cir. 1974) (per Stevens, C.J.).

⁷¹*Walker Process Equip. v. Food Mach. & Chem. Corp.*, *supra*, 382 U.S. at 177-78; *Sulmeyer v. Coca Cola Company*, 515 F.2d 835, 849 (5th Cir. 1975); *Mullis v. Arco Petroleum Corp.*, *supra*, 502 F.2d at 295 and notes 14 and 15; *Kansas Gas and Electric Co. (Wolf Creek Generating Station, Unit No. 1)*, ALAB-299, 2 NRC 740, 747 (1975) ("Wolf Creek II").

characteristics of the industry involved,"⁷² that "turns on discovering patterns of trade which are followed in practice"⁷³ and "correspond[s] to the commercial realities."⁷⁴ In addition, the relevant market is a two dimensional concept: it requires consideration not only of the goods or services being provided—the "product market"—but also of the territory within which actual or potential competition exists to provide them—the "geographic market."⁷⁵ Each of these markets may in turn encompass "submarkets," the monopolization of any of which may also be an antitrust violation.⁷⁶

Finally, we have been cautioned not to expect bright lines separating the various markets. For example, the cluster of products and services generally denoted by the term "commerical banking," though by no means uniformly offered by all competing institutions, has been held to be a product market in terms of trade realities.⁷⁷ The geographic market similarly need not be precisely defined; literal "metes and bounds" are not required to be shown.⁷⁸ Such markets, we are told, probably cannot be outlined with scientific precision, but the complaining parties do have the burden of coming forward with a "rough approximation" of the localized market in question.⁷⁹

Not surprisingly, then, a number of different product and geographic markets have been found in the electric power generation and distribution industry. In *Otter Tail*, for example, the retail distribution of electric power and the utility's service area were respectively held to be the product and geographic markets. 410 U.S. at 368-69. In two other Section 105c cases

⁷²*Sulmeyer v. Coca Cola Company*, *supra*, 515 F.2d at 849. *Accord*, *Telex Corp. v. International Business Mach. Corp.*, 519 F.2d 894, 915 (10th Cir. 1975); *Acme Precision Products, Inc. v. American Alloys Corp.*, 484 F.2d 1237, 1241-42 (8th Cir. 1973).

⁷³*United States v. United Shoe Machinery Corp.*, *supra*, 110 F. Supp. at 303.

⁷⁴*Brown Shoe Co. v. United States*, *supra*, 370 U.S. at 336.

⁷⁵*Brown Shoe Co. v. United States*, 370 U.S. at 324; *Indiana Farmer's Guide Publishing Co. v. Prairie Farmer Publishing Co.*, 293 U.S. 268, 279 (1934); *United States v. Dupont*, 351 U.S. 377, 395 (1956); *Morton Bldgs. of Nebraska, Inc. v. Morton Bldgs. Inc.*, 531 F.2d 910, 918, (8th Cir. 1976); *Mullis v. Arco Petroleum Corp.*, *supra*, 502 F.2d at 295.

⁷⁶See *Brown Shoe Co. v. United States*, *supra*, 370 U.S. at 329; *United States v. Grinnell*, *supra*, 384 U.S. at 572; *Heattransfer Corp. v. Volkswagenwerk, A. G.*, ___ F.2d ___, Trade Reg. Rep. ¶ 61,473; *Cass Student Adv., Inc. v. National Adv. Ser. Inc.*, 516 F.2d 1092, 1099-1100 (7th Cir. 1975); *Whitten v. Paddock Pool Bldrs., Inc.*, 508 F.2d 547, 553-54 (1st Cir. 1974), *certiorari denied*, 421 U.S. 1004 (1975); *L. G. Balfour Co. v. FTC*, *supra*, 442 F.2d at 9-11.

⁷⁷*United States v. Philadelphia National Bank*, *supra*, 374 U.S. at 356; see also *Crown Zellerbach Corp. v. FTC*, 296 F.2d 800, 811 (9th Cir. 1961).

⁷⁸*United States v. Pabst Brewing Co.*, 384 U.S. 546, 549 (1966); *United States v. Philadelphia National Bank*, *supra*, 374 U.S. at 360-61.

⁷⁹*United States v. Connecticut National Bank*, 418 U.S. 656, 669-70 (1974).

before this agency, one licensing board found product markets in the industry to include the provision of "bulk power services [and] regional power exchange transactions,"¹⁰ and another, "wholesale bulk power" supplies.¹¹ The relevant market findings in those cases turned, of course, on the particular facts developed in the respective litigations.

In the instant case, however, the Licensing Board's relevant product market delineation does not rest on its analysis of the evidence. The Board's determination is based instead entirely on its understanding of the "relevant matters in controversy" set out in that Board's first prehearing conference order, which reads in pertinent part that¹²

The basic thrust of Justice's case is that (a) applicant has the power to grant or deny access to coordination; (b) applicant has used this power in an anticompetitive fashion against the smaller utility systems; (c) applicant's said use of its power has brought into existence a situation inconsistent with the antitrust laws, which situation would be maintained by activities under the licenses that applicant seeks. Neither the intervening parties nor the Atomic Energy Commission's regulatory staff enlarge this scope. Hence, the scope of the relevant matters in controversy is as herein outlined.

During the course of the trial the Board admitted documentary evidence, heard witnesses and accepted trial briefs about the wholesale bulk power and retail power markets (as well as about various submarkets).¹³ Nonetheless, when deciding the case, the Board held that the parties' acquiescence in the prehearing order was the equivalent of a stipulation to the effect that the only relevant product market in the case was that for "coordination services."¹⁴ 2 NRC at 40 and 45.

With respect to the relevant geographic market, the Board below said it had perused "the entire record" in finding it to be the area of Michigan's lower peninsula where Consumers "is now franchised to [serve]" and where it "could reasonably and feasibly extend service." 2 NRC at 45. The

¹⁰*Toledo Edison Co.* (Davis Besse Nuclear Power Station), LBP-77-1, 5 NRC 133, 160 (1977) (appeal pending).

¹¹*Alabama Power Company* (Joseph M. Farley Nuclear Plant), LBP-77-24, 5 NRC 804, 890 (April 8, 1977) (appeal pending). See also, Meeks, *Concentration in the Electric Power Industry; the Impact of Antitrust Policy*, 72 Colum. L. Rev. 64, 81-100 (1972). Meeks suggests the existence of four submarkets in the wholesale product market: "baseload power, peaking power, reserve power and economy power." *Id.* at 83. See pp. 902-903, *supra*, for definitions of these terms.

¹²Prehearing Conference Order of August 7, 1972, p. 3.

¹³See, e.g., Wein, fol. Tr. 3979, and Pace, fol. Tr. 7239.

¹⁴The nature of such services are discussed *infra*, pp. 952-957.

Board's opinion, however, offers no elucidation of either the reasoning or the facts underlying that determination.

The correctness of the relevant market determinations made by the Board below is challenged by Justice and Consumers Power Company. We review those determinations in Part V of this opinion, *infra*.⁴⁵

3. "Mere monopoly power in a relevant market, however, is not sufficient in itself to constitute a violation of section 2 [of the Sherman Act]."⁴⁶ We are concerned here with "monopolization"—the use of monopoly power to preserve or extend an existing monopoly, to foreclose actual or potential competition, to gain competitive advantage, or to destroy competitors.⁴⁷ This is illustrated by *Otter Tail Power Co. v. United States, supra*, where the Supreme Court found that Otter Tail had violated Section 2 of the Sherman Act through "anticompetitive uses of its dominant economic power" over retail electric power distribution in a number of municipalities, rather than simply through possession of that power.⁴⁸

⁴⁵Some of the cases cited for relevant market principles are decisions under the Clayton Act, 15 U.S.C. §18, rather than the Sherman Act. For most purposes, however, the considerations under both statutes are similar. *United States v. Grinnell, supra*, 384 U.S. at 572-73; *United States v. Empire Gas Corp., supra*, 537 F.2d at 303-04; *Cass Student Adv. Inc. v. National Ed. Adv. Serv., Inc., supra*, 516 F.2d 1092; *Twin City Sportservice, Inc. v. Charles O. Finley*, 512 F.2d 1264, 1270-71 (9th Cir. 1975); *L.G. Balfour Co. v. FTC, supra*, 442 F.2d at 11; *Woods Exploration & Producing Co. v. Aluminum Co. of America*, 438 F.2d 1286, 1304-07 (5th Cir. 1971), *certiorari denied*, 404 U.S. 1041 (1972).

⁴⁶*Woods Exploration & Producing Co. v. Aluminum Co. of America*, 438 F.2d 1286, 1307 (5th Cir. 1971); see fn. 68, *supra*, and *Wolf Creek II, supra*, ALAB-299, 2 NRC at 749 and cases there cited.

⁴⁷*United States v. Griffith, supra*, 334 U.S. at 107.

⁴⁸410 U.S. at 380 (emphasis added). Specifically, the Court concluded that Otter Tail had endeavored to prevent some of the communities from forming independent competing retail power distribution systems.

Consumers contends that the Supreme Court did not find the Otter Tail Power Company guilty of "monopolization" but of an "attempt to monopolize." *Consumers' Appeal Brief*, p. 66; App. Tr. 120-28. Section 2 of the Sherman Act makes an attempt to monopolize a separate offense, discrete from that of monopolization. To prove the former, a "specific intent to monopolize" (*i.e.*, "an intent which goes beyond the mere intent to do the act," *United States v. Aluminum Co. of America, supra*, 148 F.2d at 431-32) and a "dangerous probability of success" must be shown. *Swift & Co. v. United States*, 196 U.S. 375, 396 (1905) (Holmes, J.); *American Tobacco Co. v. United States, supra*, 328 U.S. at 785. Monopolization, on the other hand, requires proof of only monopoly power and a general intent to do the act charged. See fns. 91-92, *infra*, and the accompanying text.

Consumers concedes that Otter Tail possessed monopoly power (as both courts held). See App. Tr. 127-28. Its point is that the Supreme Court found Otter Tail's conduct sufficiently predatory to constitute evidence of the specific intent required to prove an attempt to monopolize and did not reach the question of monopolization.

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Otter Tail's actions exhibited a willful maintenance of monopoly power—an intent to monopolize. Intent is the second requisite element of “monopolization,” but only a general intent need be shown. Further, because a monopolist is chargeable with the probable and natural consequences of its actions,⁸⁹ the requisite intent may be inferred if the probable result of the firm's actions is the furtherance or maintenance of its dominant position in the relevant market.⁹⁰ As we have indicated, the actions need not be illegal⁹¹ or predatory⁹² in themselves; rather, their anticompetitive effects are tied to the firm's monopoly position.⁹³

The Licensing Board divided this case into eight “situations” and determined that Consumers' conduct in each was not inconsistent with the antitrust laws. Appellants attack that approach, contending that the Board failed to judge Consumers' conduct in the light of its dominant market position and neglected to consider the monopolistic effects of Consumers' overall course of conduct. In Justice's view, the Board below judged Consumers' conduct under an “*illegal per se*” standard, *i.e.*, one “requiring

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We do not agree. In *Otter Tail*, the Court was reviewing a decision resting almost entirely on findings that the utility had “monopolized” the retail power market. See 331 F. Supp. at 58-59. The trial court had discussed the company's attempt to monopolize only in passing, and then merely to find the company guilty of that offense too. *Id.* at 63 and 65. Before the Supreme Court, the Government successfully defended the lower court's decision as correct on both grounds (see 35 L.Ed. 2d at 810). With respect to the “monopolization” charge, the Court specifically stated that (410 U.S. at 377) “the record makes abundantly clear that Otter Tail used its monopoly power in the cities in its service area to foreclose competition or gain a competitive advantage, or destroy a competitor, all in violation of the antitrust laws. See *United States v. Griffith*, 333 U.S. 100, 107.” This is, of course, the offense of “monopolization,” and as Consumers' counsel acknowledged to us (App. Tr. 124), *Griffith* is a “monopolization” case.

⁸⁹*United States v. Griffith*, *supra*, 334 U.S. at 105.

⁹⁰“In order to fall within §2, the monopolist must have both the power to monopolize, and the intent to monopolize. To read this passage as demanding any ‘specific intent’ makes nonsense of it, for no monopolist monopolizes unconscious of what he is doing.” *American Tobacco Co. v. United States*, *supra*, 328 U.S. at 814, quoting from *United States v. Aluminum Co. of America*, *supra*, 148 F.2d at 432.

⁹¹See pp. 913 and 916-917, *supra*, and cases there cited.

⁹²*Hanover Shoe v. United Shoe Mach. Corp.*, *supra*, 392 U.S. at 498-99 and fn. 14. Consumers argues that in a “natural monopoly” setting—such as the electric utility industry—proof of predatory intent is required. See *Consumers' Appeal Brief* at 186-96. We deal with this argument below at pp. 1020 *ff.*

⁹³*United States v. Aluminum Co. of America*, *supra*, 148 F.2d at 431-32; *United States v. United Shoe Machinery Corp.*, *supra*, 110 F. Supp. at 344-45; *Cass Student Adv. v. National Ed. Adv. Service*, 407 F. Supp. 520, 522-24 (N.D. Ill.), *affirmed*, 537 F. 2d 282 (7th Cir. 1976); *Mullis v. Arco Petroleum*, *supra*, 502 F.2d at 296 fn. 19.

each element of [Consumers'] monopolization to be a *per se* violation of the antitrust laws."⁹⁴ We consider those criticisms in Part VII below.

B. The Federal Trade Commission Act

The staff reminds us that Section 5 of the FTC Act authorizes the invalidation of trade practices that conflict with Sherman Act *policies*,⁹⁵ and points to instances where the FTC has branded illegal under Section 5 conduct that would have passed muster under the Sherman Act standing alone.⁹⁶ Building on these, the staff argues that Section 5 authorizes us to hold a situation inconsistent with Sherman Act policies without the need to decide whether Consumers has monopoly power in the relevant market, a finding necessary to sustain monopolization charges brought directly under Section 2 of the Act.⁹⁷

In essence, the staff reasons that even if the evidence does not establish that Consumers has monopoly power, it does show (1) that the company controls the bulk of the electric power generation and transmission facilities in its service area, giving it "dominance" over the market, and (2) that the company used its dominant economic power to maintain its market position. Accepting *arguendo* this reading of the evidence, according to the staff it follows that a situation inconsistent with the antitrust laws has been established. The rationale is that (1) such use of dominant market power contravenes the policies underlying Section 2 of the Sherman Act, (2) Consumers' actions are therefore tantamount to an unfair method of competition in violation of Section 5 of the FTC Act, and (3) as such, they constitute an "inconsistent situation" under Section 105c to be remedied by the insertion of appropriate antitrust conditions in Consumers' licenses.⁹⁸

In response, Consumers asserts that

In assessing monopolization charges brought against a single entity under Section 5, the Federal Trade Commission has required the same substantive showing that is necessary to sustain monopolization com-

⁹⁴*Justice's Opening Brief on Appeal*, page 21.

⁹⁵*FTC v. Brown Shoe Co.*, *supra*, 384 U.S. at 321, and see pp. 911-912, *supra*.

⁹⁶Compare *FTC v. Cement Institute*, 333 U.S. 683 (1947), with *Cement Manufacturers Ass'n. v. United States*, 268 U.S. 588 (1925) (absence of combination or conspiracy needed for violation of Sherman Act §1 does not foreclose finding of violation of FTC Act §5); *Atlantic Refining Co. v. FTC*, 381 U.S. 357 (1965), and *FTC v. Texaco*, 393 U.S. 223 (1968) (actual tying arrangement needed to establish Sherman Act §1 violation unnecessary under FTC Act §5 where the central competitive characteristics of the agreement in question are similar to those of a tying arrangement).

⁹⁷See pp. 918-921, *supra*.

⁹⁸See *Staff's Opening Brief on Appeal*, pp. 14-19 and 25 (summary of argument).

plaints brought under Section 2 of the Sherman Act, *i.e.*, the showing set forth in the *Grinnell* case . . . relating to relevant markets, monopoly power, and the willful maintenance of that power.”⁹⁹

In other words, for purposes of the monopolization charges being pressed in this proceeding, the company argues that the same antitrust analysis “is applicable whether reliance is placed on Section 2 of the Sherman Act or Section 5 of the Federal Trade Commission Act.”¹⁰⁰

The staff disagrees; in its judgment, we may find violations of Section 5 in circumstances which the Trade Commission has not yet addressed. Neither in its reply brief nor in its oral argument, however, does the staff challenge Consumers’ characterization of actual FTC practice in monopolization cases.¹⁰¹

We are in agreement with Consumers on this point. True, as the staff says, in enacting Section 5 Congress gave the Federal Trade Commission wide authority to proscribe business practices as “unfair” whether or not they violate other antitrust laws. And the FTC has done so, rendering illegal practices otherwise permissible under the Sherman Act. Nevertheless, we have found no case (and have been cited to none) where the FTC has held conduct to be “monopolization” under Section 5 without first having shown that the respondent possessed monopoly power in a relevant market. *Golden Grain Macaroni Co.*, 78 FTC 157 (1971), *affirmed sub nom. Golden Grain Macaroni Co. v. FTC*, 472 F.2d 882 (9th Cir. 1972), *certiorari denied*, 412 U.S. 918 (1973); *L. G. Balfour Co.*, 74 FTC 494, 497-506 (1968), *affirmed sub nom. L. G. Balfour Co. v. FTC*, 442 F.2d 1, 12-14 (7th Cir. 1971).

Congress gave the task of defining unfair methods of competition within the meaning of Section 5 to the Federal Trade Commission. That body—not the NRC—is charged with the duty in the first instance of applying “the rule enacted by Congress to particular business situations, so as to eradicate evils, with the least risk of interfering with legitimate business operations.” *FTC v. Texaco*, *supra*, 343 U.S. at 225-26. Just as the Federal courts defer to the expertise developed by the FTC precisely because it is charged with (and experienced in) the practical administration of the statute (*id.* at 226), so too it is appropriate that we respect that agency’s decisions on matters in its primary jurisdiction.¹⁰²

⁹⁹Consumers’ *Appeal Brief* at 71, fn. 2 (citations omitted).

¹⁰⁰*Ibid.*

¹⁰¹See *Staff’s Reply Brief on Appeal*, pp. 1-5, and App. Tr. 105-107.

¹⁰²See, e.g., *Safir v. Gibson*, 432 F.2d 137, 143 (2nd Cir.), *certiorari denied*, 400 U.S. 942 (1970).

We need not decide whether we must always defer to our "sister agency" when charges cognizable under the FTC Act are in issue. Neither must we wait for an FTC decision involving electric utility practices before Section 5 may be invoked in our proceedings. But the Trade Commission has been administering the FTC Act since the days of President Wilson. And it is settled FTC jurisprudence in Section 5 cases that, under a charge of monopolization, one element to be proven is the respondent's possession of monopoly power.¹⁰³ In the circumstances, the appropriate (and wiser) course calls for us to take the same approach.

One further point remains for clarification. It concerns the degree of proof of monopoly power needed to sustain monopolization charges in a Section 5 proceeding. At least one court of appeals has indicated that a lesser level of evidence will uphold monopolization charges under Section 5 than might be needed to sustain similar charges in a court proceeding under Section 2 of the Sherman Act. *L. G. Balfour Co. v. FTC, supra*, 442 F.2d at 13-14.¹⁰⁴

Be that as it may, the quantum of proof needed to prevail in proceedings under Section 105c was specifically fixed by the framers of that section themselves. The *Joint Committee Report* (at p. 15) states explicitly that in determining whether a situation inconsistent with the antitrust laws exists, we are to apply the standard of "reasonable probability" applicable in cases under the Clayton Act.¹⁰⁵ Accordingly (*id.* at 14):

¹⁰³It may also be possible to attack such conduct under Section 5 in terms of Clayton Act or Robinson-Patman Act violations. See *Golden Grain Macaroni Co., supra*, and *L. G. Balfour Co., supra*. But no such charges are levied here.

¹⁰⁴The Seventh Circuit there commented:

While we believe that it was error for the Commission to conclude that the petitioners controlled 86.9% of the market, without evidence of the sales of all the firms in the market, we hold that petitioners' exclusive dealing contracts with over 90% of the fraternities supports a finding of monopoly power. The most effective proof, we admit, would be a total sales figure which included *all* competitors in the market. Absent this, however, the other evidence which revealed that the petitioners were under exclusive dealing contracts with nearly all of the national fraternities, satisfies us that petitioners possessed illegal monopoly power. The case before us, we repeat, is not a Section 2 monopolization case, but one under Section 5, a flexible and remedial law. See *Bader v. Balfour*, 440 F.2d 469 (7th Cir., March 22, 1971).

¹⁰⁵"The committee is well aware of the phrases 'may be' and 'tend to' in the Clayton Act, and of the meaning they have been given by virtue of decisions of the Supreme Court and the will of Congress—namely, reasonable probability. The committee has—very deliberately—also chosen the touchstone of reasonable probability for the standard to be considered by the Commission under the revised subsection 105c of the bill." *Joint Committee Report* at 15. See *Brown Shoe Co. v. United States, supra*, 370 U.S. at 323, fn. 39, for a discussion of proof under the Clayton Act.

The concept of certainty of contravention of the antitrust laws or the policies clearly underlying these laws is not intended to be implicit in this standard; nor is mere possibility of inconsistency. It is intended that the finding be based on reasonable probability of contravention of the antitrust laws or the policies clearly underlying these laws. It is intended that, in effect, the Commission will conclude whether, in its judgment, it is reasonably probable that the activities under the license would, when the license is issued or thereafter, be inconsistent with any of the antitrust laws or the policies clearly underlying these laws.

Whether (as may well be true) this “reasonable probability” test is also the standard of proof applied by the FTC generally, or corresponds to the one approved by the *Balfour* court, is immaterial. In antitrust cases before this agency, the Commission and its boards are governed by Section 105c and must apply the evidentiary standards incorporated by that provision.¹⁰⁶

IV. BACKGROUND

A. The setting

Consumers Power Company serves Michigan’s lower peninsula together with four other investor-owned electric utilities, 29 municipally owned electric systems, 2 generation and transmission (“G and T”) rural electric cooperatives and 10 distribution rural electric cooperatives. Consumers has common service area boundaries with the investor-owned utilities and with all 12 cooperatives. Of the 29 municipal systems, 23 are also located within or adjacent to Consumers’ service area.¹⁰⁷

¹⁰⁶See also, *Wolf Creek I*, *supra*, 1 NRC at 570.

¹⁰⁷Justice Department’s Exhibit No. 19. Also see Steinbrecher, Tr. 1110; Keen, Tr. 4463-8; and Paul, Tr. 7805-06.

Hereinafter Justice’s exhibits will be cited as “D.J. Exh. No. ____,” Consumers’ as “C.P. Exh. No. ____,” and intervenors’ as “Int. Exh. No. ____.” The staff introduced no exhibits.

Throughout the opinion transcript references will include the names of the witness whose testimony is being cited. We list here alphabetically the principal witnesses along with a brief background description. More complete descriptions appear where deemed necessary to the opinion.

Alphonse Aymond, Chairman of the Board and President of Consumers Power Company; *Earl Brush*, General Manager of the Lansing Municipal Electric System; *Janjai Chayavadhanangkur*, Electric Engineer with Southern Engineering Company of Georgia (Intervenors’ expert witness on bulk power supply); *Kenneth Croy*, employed by the Michigan Public Service Commission; *Stephen Fletcher*, President of Alpena Power Company; *Peter Gutman*, Professor of Economics at the Bernard M. Baruch College of the City University of

(Continued on next page)

1. **Consumers' service area.** Consumers distributes electric power in 61 of the 68 counties in Michigan's lower peninsula.¹⁰⁸ The company does not serve the Detroit metropolitan area, however. That city and all or part of the thirteen counties in the "eastern thumb" of the lower peninsula are served by the Detroit Edison Company. In terms of electrical load, Detroit Edison is fifty percent larger than Consumers.¹⁰⁹ Two American Electric Power subsidiaries, Indiana & Michigan Electric Company and the Michigan Power Company, serve all or part of five counties in the lower peninsula's southwest corner.¹¹⁰ Consumers' general service area spreads

(Continued from previous page)

New York (Intervenor's expert economic witness); *Samuel Helfman*, consulting engineer (Justice's expert witness on bulk power planning); *William Jefferson*, Consumers' Executive Director in charge of wholesale and retail electric rates; *John Keen*, General Manager of Wolverine Electric Cooperative; *Robert Kline*, Vice Chairman and Chief Executive Officer of Edison Sault Electric Company; *Jack Lundberg*, Principal Engineer with the analytical and consulting engineering firm of R. W. Beck and Associates (Justice's expert witness on power pooling principles); *William Mayben*, partner in the firm of R. W. Beck & Associates, analytical consulting engineers (Justice's expert witness on power pooling principles); *Jack Mosley*, Vice President of Consumers in charge of electric planning; *Dr. Frederick W. Muller*, former Chief for Power Marketing for one of the Bureau of Reclamation's Regional Offices (Staff's expert witness); *Harold Munn*, President of the Board for the Coldwater Municipal Electric System; *Joe Pace*, Economist and Vice President of National Economic Research Associates (Consumers' expert economic witness); *Robert Paul*, Consumers' General Supervisor of commercial electric sales; *Ronald Rainson*, General Manager of the Holland Municipal Electric System; *O. Franklin Rogers*, member of the Southern Engineering Company of Georgia (Intervenor's expert witness on wholesale power and power pooling); *Wilbur Slemmer*, consulting engineer (Consumers' expert witness on power pooling principles); *David Lapinski*, Senior Supervisor and General Engineer of Consumers' Power Resources Planning Section; *Arthur Steinbrecher*, General Manager of the Northern Michigan Electric Cooperative; *Irwin Stelzer*, Economist and President of National Economic Research Associates (Consumers' expert economic witness); *Warren Sundstrand*, attorney associated with the Village of Paw Paw's Municipal Electric System; *Harold Wein*, Professor of Economics at Michigan State University (Justice's expert economic witness); *Roger Westenbroek*, General Manager of the Top O'Michigan Rural Electric Company; *Joseph Wolfe*, former General Manager of Traverse City Municipal Electric System, 1966-1972, currently with the Lansing Municipal Electric System.

¹⁰⁸D.J. Exh. No. 21A, page 12 (Consumers Power Company 1973 Annual Report to its shareholders). The company's 1973 annual report to the Federal Power Commission and its 1973 Uniform Statistical Report (filed with Edison Electric Institute, among others) were filed with the Licensing Board pursuant to its June 12, 1974, order with the understanding of all the parties that the Board would take official notice of these documents. Tr. 9278-81. (Also see order of June 20, 1974, acknowledging receipt.) The parties and the Licensing Board have referred to these documents respectively as D. J. Exh. No. 21A, C.P. Exh. No. 12,022, and D. J. Exh. No. 228A. We will do likewise.

¹⁰⁹D. J. Exh. No. 19; Mosley, Tr. 8493.

¹¹⁰D. J. Exh. No. 19; Westenbroek, Tr. 928. The major portion of Indiana & Michigan Electric Company's service area is in Indiana. See Westenbroek, Tr. 931; D. J. Exh. No. 1.

over the remainder, the bulk of the lower peninsula. It extends from Lake Erie and the Michigan-Ohio/Indiana border in the east and south, to Lake Michigan in the west and north and Lake Huron in the north and east.¹¹¹ Consumers does not serve every square mile of this territory. There are rural areas in the north and west central part of the peninsula where the company is not franchised that are served exclusively by electric cooperatives.¹¹² The company also is not franchised in most of those municipalities lying within Consumers' overall service area that operate their own independent power systems.¹¹³ Nor does the company serve the City of Alpena and its rural surroundings; these are covered by a small investor-owned system, Alpena Power Company.¹¹⁴ In 1973, Consumers served some 27,846 square miles or approximately 70 percent of lower Michigan.¹¹⁵

2. **Municipal systems.** Twenty-three cities within or adjacent to Consumers' general service area operate their own electric systems, 19 of which (including the intervening cities of Grand Haven, Traverse City, Holland, Zeeland and Coldwater) are entirely inside that area.¹¹⁶ Each of the 23 municipal systems serves its particular city and immediately adjacent areas. The typical municipal system extends only one mile beyond its city limits; the maximum is approximately ten miles.¹¹⁷ In twelve of these 23 cities, retail customers are also served by Consumers Power Company.¹¹⁸ However, in only two—Bay City and Traverse City—is there vigorous, citywide, door-to-door competition between Consumers and the municipal system.¹¹⁹ In the other ten, Consumers serves a restricted number of retail

¹¹¹D. J. Exh. No. 19; D. J. Exh. Nos. 204 A and B. There is some minimal overlap of Consumers' service area with that of other investor-owned utilities. For example, in 1968 there were only 8 townships in which both Consumers and Detroit Edison were franchised to serve. D. J. Exh. No. 110. Also see Paul, Tr. 7862-66; Aymond, Tr. 6558.

¹¹²D. J. Exh. No. 19; Paul, Tr. 7844-45.

¹¹³D. J. Exh. No. 19; Paul, Tr. 7818-19.

¹¹⁴D. J. Exh. No. 19; Fletcher, Tr. 4255. Alpena is on the shores of Lake Huron in the north-eastern part of the lower peninsula.

¹¹⁵D. J. Exh. No. 228A, page 3.

¹¹⁶D. J. Exh. No. 19. The other 14 municipal systems operating *within* Consumers' general service area are Harbor Springs, Petosky, Charlevoix, Bay City, Hart, St. Louis, Lowell, Portland, Lansing, Eaton Rapids, Chelsea, Marshall, Union City, and Hillsdale. Those *adjacent* to Consumers' general service area are Clinton, Paw Paw, South Haven and Sturgis. See D. J. Exh. No. 19; C. P. Exh. No. 11,302.

¹¹⁷Paul, Tr. 7813; also see D. J. Exh. No. 19; C. P. Exh. No. 11,302.

¹¹⁸C. P. Exh. No. 11,302.

¹¹⁹Paul, Tr. 7806, 7874-75. Consumers in 1972 served 7,400 customers in Bay City and 1,578 in Traverse City. The municipal systems served respectively 11,343 (Bay City) and 4,993 (Traverse City) customers within the city limits. C. P. Exh. No. 11,302.

customers within the city limits.¹²⁰ In addition, both Consumers and the municipals serve the areas bordering the 19 municipalities with their own power systems that lie within Consumers' service area.¹²¹

3. Cooperatives. The two G and T rural electric cooperatives operating in the lower peninsula are intervenors Northern Michigan and Wolverine Electric.¹²² These sell wholesale firm bulk power to distribution cooperatives for retail distribution. Northern Michigan supplies wholesale power to three distribution cooperatives which operate in 19 northern counties of the lower peninsula; Wolverine Electric supplies four that operate in 23 west-central counties.¹²³ Except in a few areas, these distribution cooperatives are not the sole available suppliers of retail electrical power where they operate. Consumers Power Company is also franchised to serve roughly 80 percent of the cooperatives' service territory.¹²⁴

Three additional distribution cooperatives (beyond those described above as associated with Northern Michigan and Wolverine Electric) operate in lower Michigan. Their service areas also partly overlap Con-

¹²⁰Consumers served 186, 115, and 56, respectively, in the intervening cities of Holland, Zeeland, and Coldwater. In the remaining seven, it served sixty customers. C. P. Exh. No. 11,302.

Consumers, with one exception, does not have a general right to serve in these 10 cities. Paul, Tr. 7818. For example, in Holland and Coldwater Consumers is restricted to serving annexed areas in which it had been franchised before annexation. The municipal systems, however, can extend service into these areas in competition with Consumers. In Zeeland, where Consumers was at one time the sole supplier of electric energy, Consumers may continue to serve existing customers only. Paul, Tr. 7812-18.

¹²¹Paul, Tr. 7821, 8011-12; C. P. Exh. No. 11,302.

¹²²Steinbrecher, Tr. 1110; Keen, Tr. 4468.

¹²³Westenbroek, Tr. 958-59; D. J. Exh. No. 19. The distribution cooperatives served by Northern Michigan are Cherryland Rural, Top O'Michigan Rural and Presque Isle Electric; the four served by Wolverine Electric are Western Michigan, Oceana, O&A and Tri County. *Ibid.*

¹²⁴D. J. Exh. No. 19. Approximately one-third of Presque Isle Electric Cooperative's service area, the greater portion (more than 50%) of Top O'Michigan, Western Michigan and Oceana electric cooperatives service areas, the substantial part (greater than 90 percent) of Cherryland and O&A electrical cooperatives and all of Tri-County electric cooperative's service area, overlap areas where Consumers is also franchised to serve. Paul, Tr. 7844-45; also see D. J. Exh. No. 19.

Consumers does not actually distribute retail power in all the rural areas where it is franchised. Westenbroek, Tr. 948-51; Paul, Tr. 7845. Areas definitely exist, however, where there is duplication of service by the cooperatives and Consumers. *Ibid.*

sumers'.¹²⁵ In total, distribution cooperatives operate in somewhere between one-quarter and one-third of Consumers' franchised territories.¹²⁶

4. **Interconnections.** a. Consumers' transmission network consists of nearly nine thousand (9,000) miles of transmission lines. These carry current at voltages varying from 46 to 345 kilovolts (kV).¹²⁷ See p. 937, *infra*. Consumers has interconnected its transmission grid with those of the major nearby utilities. The company's most extensive physical tie is with Detroit Edison; there are six 345 kV connections and several 138 kV connections between these two utilities.¹²⁸ Consumers also has 345 kV ties with the Indiana & Michigan Electric Company and the Toledo Edison Company, which

¹²⁵These three distribution cooperatives are Fruit Belt, South Eastern Michigan and Thumb Electric. Thumb Electric operates in four counties between Saginaw Bay and Lake Huron; its service area, except for a minute overlap with Consumers, coincides with areas where Detroit Edison also operates. Fruit Belt Electric operates in seven southwestern counties; about one-third of its service area overlaps portions of Consumers' franchised area; the remaining two-thirds overlaps areas where Indiana & Michigan Company and Michigan Power Company operate. Southeastern Michigan Electric operates in Lenawee County, Michigan, and in northern Ohio; all of its service area in Michigan overlaps areas where Consumers is franchised to serve, but it is at several points adjacent to Detroit Edison's service area. D. J. Exh. No. 19; Paul, Tr. 7844-45.

¹²⁶See D. J. Exh. No. 19.

¹²⁷The amount of power that a transmission line can carry efficiently depends on a combination of factors. One major limiting factor on that efficiency is the power loss caused by the line's resistance. Essentially such power losses vary inversely as the square of the operating voltage. In other words, for a given amount of power to be transmitted, the power loss caused by line resistance decreases significantly as the operating voltage increases. See FPC, *1964 National Power Survey*, p. 151; *1970 National Power Survey*, pp. I-13-5 to 8.

Thus high voltage lines transmit power with substantially less power loss per mile than low voltage lines. Accordingly, it is much more economical to use high voltage transmission lines when transporting large blocks of power over long distances. For example, it is not economical to use 69 kV transmission lines to carry "20 megawatts more than 25 miles, or 30 miles." Wolfe Tr. 1712, 1727-29. Also see Mayben Tr. 2566.

Another advantage of high voltage lines is that the additional cost of construction compared to lines of lower voltages does not eat up the economic gains available by reason of the greater efficiency of the former. Thus, for example, "a 230 kV line with a wire size of 795 MCM can carry approximately 235,000 kilowatts of load and its construction cost is approximately \$55,000 per mile. A 115 kV line with a wire size of 477 MCM can carry approximately 95,000 kilowatts of load and its construction cost is approximately \$34,200 per mile. The 230 kV line can carry approximately 2.5 times more than the 115 kV line; however, the construction cost of the 230 kV line is only approximately 1.6 times the construction cost of the 115 kV line." Chayavadhanangkur, Tr. fol. 5090 at 26.

¹²⁸See D. J. Exh. No. 21A, p. 2.

serves Toledo and surrounding environs.¹²⁹ Detroit Edison in turn has 345 kV ties with the Hydro-Electric Power Commission of Ontario; Indiana and Michigan Electric Company has 345 kV ties with Commonwealth Edison Company (which serves Chicago and surrounding environs), Northern Indiana Public Service Company and Ohio Power Company (another subsidiary of American Electric Power); and Toledo Edison Company is also connected to Ohio Power Company and Ohio Edison Company.¹³⁰ These utilities are further interconnected with other major utilities operating in the east-central region of the United States.¹³¹ As a consequence of these interconnections, Consumers is able to—and does—undertake coordination transactions with its large neighbors and, as well, with large utilities beyond them to which it is not directly connected. See pp. 942-943, *infra*.

In addition to its ties with these major utilities, Consumers is directly connected with most of the small utilities operating within or adjacent to its general service area. The company has electrical ties to 14 of the 23 municipal systems (including the intervenors Coldwater and Holland),¹³² with three of the cooperatives (intervenors Northern Michigan and Wolverine Electric plus South Eastern Michigan Cooperative)¹³³ and with two small investor-owned systems, Alpena Power Company¹³⁴ and Edison Sault Electric Co. (which operates in Michigan's upper peninsula just across the Mackinac Straits).¹³⁵ These interconnections are currently used for the most part to transmit wholesale power sold by Consumers to the small utilities.¹³⁶

b. In contrast, the small utilities' transmission facilities are limited in size and scope. The only ones of consequence are 1,182 miles of 69 kV and 46 kV transmission lines operated by intervenors Northern Michigan and Wolverine Electric cooperatives. See p. 940, *infra*.

In addition to the distribution cooperatives which they serve, the G and T cooperatives are also interconnected with the municipal systems of Traverse City, Grand Haven, Zeeland, Hart, Lowell and Portland.¹³⁷ The

¹²⁹See D. J. Exh. No. 74, No. 75 and No. 21A, p. 2.

¹³⁰See D. J. Exh. No. 1, No. 20, No. 73, No. 75, No. 76 and No. 237.

¹³¹See D. J. Exh. No. 1, No. 77 and No. 237.

¹³²Other municipal systems to which Consumers is directly connected are Harbor Springs, Petosky, Charlevoix, Bay City, St. Louis, Lansing, Eaton Rapids, Chelsea, Marshall, Union City, Portland and Hillsdale. See D. J. Exh. No. 91, No. 92, and No. 100; C. P. Exh. No. 11,307; Mosley, Tr. 8458.

¹³³Keen, Tr. 4499-4500; Paul, Tr. 7897; Mosley, Tr. 8458.

¹³⁴Fletcher, Tr. 4285.

¹³⁵Kline, Tr. 4377.

¹³⁶See C. P. Exh. No. 11,307.

¹³⁷Steinbrecher, Tr. 1138, 1289-90; also see D. J. Exh. No. 18, No. 109, No. 181 and No. 240.

only major utility to which the network is tied, however, is Consumers Power Company. Other major utilities in the area are reachable only via Consumers' lines. Consequently, all the foregoing utilities are isolated from any major outside source of electric power other than that company.¹³⁸ And, as the Board below found, it is not economically feasible for those small utilities (or for the others similarly isolated within Consumers' general service area) to interconnect with other large nearby utilities by building or extending their own transmission networks. 2 NRC at 108.

B. The electric utilities

1. **Consumers Power Company.** Consumers is a combined gas and electric utility,¹³⁹ the seventh or eighth largest in the United States.¹⁴⁰ In 1972, Consumers had outstanding 26,233,838 shares of common stock and 2,179,338 shares of preferred stock with a total capitalization (including long-term debt) of more than two billion dollars.¹⁴¹ The company in that year had more than 1.6 billion dollars invested in electrical plants (original cost) to serve over one million retail customers.¹⁴² These customers bought 21,352,570 megawatt hours (MWh) of electric energy. This, combined with 725,904 MWh of electric energy sold at wholesale, gave the company a total electric sales revenue of \$416,994,066 and a 1972 net income for electrical operations of \$69,405,227. The peak load demand on Consumers system for 1972 was 4,080 MW.¹⁴³

a. **Consumers' franchises.** Before Consumers may distribute electric power at retail in a city or township, under Michigan law it must have a franchise either from the state under the "Foote Act"¹⁴⁴ or one granted by the municipality or township served. The company serves 45 percent of its retail customers under 53 Foote Act franchises.¹⁴⁵ This Act, on the Michigan Statute books only from 1905 to 1909, granted utilities the right to

¹³⁸This is not the case with those small utilities located adjacent to but south of Consumers' general service area. Most of these are connected to Detroit Edison (Clinton, Thumb Electric and Southeastern cooperatives) or to Indiana & Michigan Electric Company or Michigan Power Company (Fruit Belt Electric Cooperatives, Sturgis, Paw Paw, and South Haven). See Paul, Tr. 7897; D. J. Exh. No. 14, No. 18 and No. 109.

¹³⁹D.J. Exh. No. 21.

¹⁴⁰Tr. 94.

¹⁴¹D.J. Exh. No. 21.

¹⁴²*Ibid.*

¹⁴³D. J. Exh. No. 21. Peak load is the maximum demand for power that a utility experiences within a specified period of time.

¹⁴⁴Michigan Public Acts 1905, No. 264. See D. J. Exh. No. 6.

¹⁴⁵Pace, Tr. fol. 7239 at 10; Paul, Tr. 7866-67; C. P. Exh. No. 11,306.

construct distribution lines and to sell power at retail without first obtaining permission from the local government.¹⁴⁶ Foote Act franchises are of indefinite duration but confer no exclusive rights.¹⁴⁷ Another utility may be franchised in such areas by the local government. And if that government is a municipality,¹⁴⁸ it may establish its own competing power system.¹⁴⁹

Where Consumers' right to serve does not stem from the Foote Act it holds franchises from the local governments.¹⁵⁰ These are limited by the Michigan State Constitution to a maximum period of 30 years¹⁵¹ and are not exclusive.¹⁵² A city or township is not legally precluded from granting a franchise to a second utility or, in the case of a city, from establishing its own electric system before the 30-year period expires.

Consumers has 965 current franchise agreements with cities and townships. Under them it serves the remaining 55 percent of its customers. All but four are for the maximum 30-year period and may not be revoked within that period.¹⁵³ Of these, however, 215 will expire by the end of 1985.¹⁵⁴ Consumers must then have them renewed if it wishes to continue to serve those municipalities.

b. State and Federal regulation of Consumers. Consumers is subject to the jurisdiction of the Michigan Public Service Commission (PSC), which regulates the retail rates of private utilities operating in the state.¹⁵⁵ A private utility must file its retail rates with the PSC. Those rates are effective only when approved by that body,¹⁵⁶ which after review may adjust them to a level it deems reasonable.¹⁵⁷ Rates thus approved may not be altered or amended without the PSC's leave.¹⁵⁸

¹⁴⁶Pace, Tr. fol. 7239 at 14.

¹⁴⁷See *City of Lansing v. Michigan Power Co.*, 183 Mich. 400, 150 N.W. 250 (1914); *Michigan Public Service Co. v. City of Cheboygan*, 324 Mich. 309, 37 N.W. 2d 116, 122 (1949).

¹⁴⁸The Michigan Constitution, Article VII, Section 24, allows municipalities to establish their own electric systems; no similar constitutional grant exists for townships.

¹⁴⁹Consumers has Foote Act franchises in Bay City and Traverse City where it is in vigorous door-to-door competition with municipal electric systems. Aymond, Tr. 6542; Paul Tr. 7808, 7866.

¹⁵⁰Michigan Constitution, Article VII, Section 29.

¹⁵¹Michigan Constitution, Article VII, Section 30.

¹⁵²Paul, Tr. 7872. The Michigan Attorney General has ruled that municipalities lack authority to grant exclusive franchises. See Opinion, Attorney General, 62 (1928) (D.J. Exh. No. 2).

¹⁵³Pace, Tr. fol. 7239 at 10; Paul, Tr. 7868; C.P. Exh. No. 11,306. For a franchise granted by a municipality to be irrevocable, it must be approved by 60 percent of the electors voting on such a proposal. Michigan Constitution, Article VIII, Section 25. For a franchise granted by a township to be irrevocable, it must be approved by a majority. Michigan Constitution, Article VII, Section 19.

¹⁵⁴C.P. Exh. No. 11,306.

¹⁵⁵Michigan Statute Annotated, Section 22.13(6) [cited as M.S.A. §22.13(6)].

¹⁵⁶M.S.A. §22.152.

¹⁵⁷M.S.A. §22.4; Jefferson, Tr. 8297-98.

¹⁵⁸M.S.A. §22.13(6a).

The Michigan PSC also limits retail competition among private utilities. Under Michigan law, a private utility must obtain a certificate of public convenience and necessity from the PSC before it can extend service to an area already served by another private utility.¹⁵⁹ Moreover, where two or more private utilities operate in the same general area, PSC regulations restrict aspects of retail competition among them.¹⁶⁰ In particular, the PSC prohibits competition for existing single-phase (residential and small commercial) customers and limits competition for new ones.¹⁶¹ At the close of the record the PSC had under consideration similar restrictions for application to three-phase (industrial and large commercial) customers with loads under 75 kW.¹⁶²

In 1970, Consumers interconnected with Toledo Edison Company and Indiana & Michigan Electric Company. By doing so, it came under the jurisdiction of the Federal Power Commission, now the Federal Energy Regulatory Commission. See P.L. 95-91, 91 Stat. 565, 42 U.S.C. §§7101*ff.* For convenience, in this opinion we continue to refer to that agency as the FPC.¹⁶³

The Federal Power Act, 16 U.S.C. §824 *et seq.*, requires utilities to file with the Power Commission all "rates and charges" for the "transmission of electric energy in interstate commerce" and "the sale of electric energy at

¹⁵⁹M.S.A. §22.142.

¹⁶⁰See *Adoption of Rules Governing Extension of Single-Phase Electric Service in Areas Served by Two or More Utilities*, M.P.S.C. case U-2291 (1966) (D.J. Exh. No. 9). Also see Westebroek, Tr. 964 *ff.*

¹⁶¹The restrictions placed on competition for new single-phase customers are the following:

Prospective customers for single-phase service located within 300 feet of the distribution facilities of two or more utilities shall have the service of their choice.

Prospective customers for single-phase service located at a distance greater than 300 feet and within 2,640 feet from the distribution facilities of two or more utilities shall be served by the closest utility.

Prospective customers for single-phase service located more than 2,640 feet from the distribution facilities of any utility shall have the service of their choice

D. J. Exh. No. 9 at Exhibit "A," page 1.

¹⁶²D.J. Exh. No. 11; Westebroek, Tr. 970.

¹⁶³FPC jurisdiction extends over the transmission and sale of electric energy at wholesale in interstate commerce. 16 U.S.C. §824. See *Federal Power Commission v. Southern California Edison Co.*, 376 U.S. 205 (1964). In 1965 the Commission began an investigation of possible jurisdiction over Consumers Power and Detroit Edison. Starting in 1966, Consumers filed its wholesale and coordination contracts with the FPC without conceding its jurisdiction. After interconnecting with Indiana & Michigan Electric and Toledo Edison in 1970, however, Consumers acquiesced in the Commission's jurisdiction. See D.J. Exh. No. 172.

wholesale in interstate commerce."¹⁶⁴ On an initial filing rates are immediately effective, but where the filing would change existing rates, the new rates are not effective for 30 days.¹⁶⁵ In either situation the FPC may hold a hearing to determine whether the rates filed are "just and reasonable."¹⁶⁶ If the FPC decides they are not, it may adjust them to that level.¹⁶⁷ Consumers' coordination contracts and its wholesale service tariffs are on file with the FPC.¹⁶⁸

c. Consumers' bulk power facilities. Bulk power in the electric utility lexicon denotes large blocks of power generated and then transmitted at high voltages to distribution points where it is transformed to lower voltages for distribution and delivery to the ultimate user. Beyond the distribution point the power is no longer considered bulk power by the industry.¹⁶⁹ A utility's bulk power facilities are thus comprised of the generating units which produce that power and the high voltage transmission lines which carry it to the distribution points. Transmission lines can thus be distinguished from distribution (or "subtransmission") lines. The former connect the utility's generating plants with distribution points; the latter carry the power at lower voltages to the ultimate retail users. Transmission lines are designed for operation from 34.5 kV to 765 kV; distribution lines are usually designed to operate at 13.2 kV or less.¹⁷⁰

Consumers operates a mix of generating units located throughout its service area.¹⁷¹ In 1972, the company had on line seven fossil-fueled steam stations capable of generating 2,974 MW, two nuclear power plants with a 656 MW capacity, seven gas turbine stations with a 522 MW capacity, and 14 hydroelectric plants with a 133.6 MW capacity, for a total generating

¹⁶⁴16 U.S.C. §§824d(c) and 824.

¹⁶⁵16 U.S.C. §824d(d).

¹⁶⁶16 U.S.C. §§824d(e), 824e(a).

¹⁶⁷16 U.S.C. §824e(a).

¹⁶⁸Jefferson, Tr. 8410, 8439-40. A utility may file with the FPC either individual contracts with attached rate schedules or a general tariff. The latter is a compilation of the utility's rate schedules and terms of service under which it is willing to contract to supply wholesale or transmission service. See 18 CFR §35.2(b); *Municipal Electric Utility Ass'n of Alabama v. Federal Power Commission*, 485 F.2d 967, 969 (D.C. Cir. 1973).

¹⁶⁹Wolfe, Tr. 1708-09; Brush, Tr. 2326-28.

¹⁷⁰Steinbrecher, Tr. 1273-74; Brush Tr. 2326. Also see FPC, *1970 National Power Survey*, pp. I-13-1 to 4. Based upon usage, the industry further divides transmission lines into two categories: bulk power supply lines and subtransmission lines. Normally bulk power supply lines carry power from generating sources to load centers from which the subtransmission lines carry it to the various distribution points. Subtransmission voltages are usually 69 kV or less. Bulk power supply lines usually employ above 69 kV. Steinbrecher, Tr. 1272-76. See *United States v. Otter Tail Power Company*, *supra*, 331 F. Supp. at 59, *affirmed*, 410 U.S. 366 (1973).

¹⁷¹See fn. 272, *infra*, for a description of the different types of generating units.

capacity of 4,285.6 MW.¹⁷² In addition, in 1973 Consumers and Detroit Edison jointly brought on line the Ludington pump storage station which is to supply peaking power.¹⁷³ Consumers' share of generating capacity from this plant is 983 MW.¹⁷⁴

At the close of the record in June 1974, Consumers' largest operating generating unit was the Palisades Nuclear Power Plant, Unit No. 1. Palisades has a nameplate capacity¹⁷⁵ of 812 MW but the maximum generation available from it in mid-1974 was 700 MW.¹⁷⁶ The next largest generating unit operated by Consumers at that time was a conventional fossil-fueled steam unit of 375 MW.¹⁷⁷ Units 1 and 2 of the Midland facility, which were expected to be on line by 1980, will have generating capabilities of 485 MW and 815 MW, respectively.¹⁷⁸ In addition, according to the company's 1973 annual report, Consumers planned to have in operation by 1974, 1975 and 1977, respectively, three additional fossil fuel units of 644 MW, 663 MW, and 800 MW.¹⁷⁹

As we mentioned earlier, Consumers in 1973 operated 8,985 miles of transmission lines, comprised of 1,422 miles of 345 kV lines, 3,339 miles of 138 kV lines, 24 miles of 120 kV lines, 4,205 miles of 46 kV lines and 89 miles of lines of 41.6 kV or less.¹⁸⁰

As the foregoing reveals, Consumers power operates an extensive, vertically integrated power system.¹⁸¹ The company generates and transmits firm bulk power to distribution points; from there, Consumers, or a utility that has bought the power at wholesale, distributes the power to the ultimate retail user.

2. The small utilities. Intervenors are some of the small electric utilities operating within Consumers' service area together with the Michigan

¹⁷²D. J. Exh. No. 228, page E-18. A generating station or plant may be comprised of more than one generating unit. Generating capacity is either stated in terms of its nameplate capacity, *i.e.*, the expected generating capacity of the plant or the plant's "demonstrated capability," *i.e.*, the generating capacity the plant is actually capable of delivering. Mosley, Tr. 8706. The figures given here are the latter. Normally, variations between the two are slight and we will not specify which standard is being used.

¹⁷³Mosley, Tr. 8708.

¹⁷⁴D. J. Exh. No. 228A.

¹⁷⁵See fn. 172, *supra*.

¹⁷⁶Mosley, Tr. 8531.

¹⁷⁷Mosley, Tr. 8590; C.P. Exh. 12,022.

¹⁷⁸The generating capacity of the two units differ because Consumers has sold part of the energy produced by Unit 1 as processed steam to the Dow Company rather than use it to generate electricity. See Mosley, Tr. 8507.

¹⁷⁹D. J. Exh. No. 21A, p. 11.

¹⁸⁰D. J. Exh. No. 228A, p. E-21. These statistics include underground lines; also they are in circuit miles, not pole miles. (Consumers in 1973 operated 47,039 miles of distribution lines. *Ibid.*)

¹⁸¹See Wein, Tr. fol. 3979 at 45; also fn. 352, *infra*.

Municipal Electric Association, an organization comprised of officials of the municipal electric systems.¹¹² Understanding of the full situation before us requires a general awareness of the small utilities' operations, with a focus on the operations of those who have intervened.

a. **The cooperatives.** The electric cooperatives operating in lower Michigan have financed construction of their electrical plants in part with low interest loans under the Rural Electrification Act of 1936, 7 U.S.C. §901 *et seq.*¹¹³ This means that they are precluded from extending service to towns of more than 1,500 population.¹¹⁴ The ten distribution cooperatives in lower Michigan accordingly operate only in rural areas. In 1972 they served more than 110,000 customers whose total demand for electric energy was 938,576 MWh, somewhat less than 5 percent of Consumers' retail sales in the same period.¹¹⁵

Like investor-owned utilities, cooperatives must be franchised by communities they serve.¹¹⁶ The record does not, however, reveal the total number of franchises they hold. Cooperatives are also subject to the jurisdiction of the Michigan PSC. That body did not elect to exercise its jurisdiction over them until 1965, when urged to do so by the cooperatives themselves.¹¹⁷ Since that time the cooperatives have filed and received PSC approval of their retail rates. The cooperatives are also subject to the PSC's regulations limiting retail competition among private utilities for single-phase customers.¹¹⁸ Competition between Consumers and the distribution

¹¹²"The Michigan Municipal Electric Association . . . is an organization comprised of officials of thirty-four (34) municipal electric departments or utility boards in the State of Michigan [whose objective is to assist] member utilities in the production, distribution and use of electricity for public service and [to resist] any pressures brought that are harmful to its members' mutual well being or that encourage the sale of municipal utility systems." *Intervenors' Joint Petition to Intervene*, page 2.

¹¹³Most currently REA loans are at five percent interest (originally they were 2 percent). Usually, REA finances about 50 percent of the cost of new electrical plant; the rest is financed by the Cooperative Financing Corporation, an organization of most of the cooperatives in the United States whose purpose is to obtain money from private markets. Steinbrecher, Tr. 1277-83.

¹¹⁴7 U.S.C. §§904, 913; Westebrook, Tr. 963.

¹¹⁵D. J. Exh. No. 106; C. P. Exh. No. 11,307; D. J. Exh. No. 21.

¹¹⁶Michigan Constitution, Article III, Section 29; Westebrook, Tr. 951.

¹¹⁷D. J. Exh. No. 8.

¹¹⁸The Commission's issuance of the single-phase rules (see fn. 161) governing competition among private utilities was within four months of the Commission's exercise of jurisdiction over the cooperatives. Before these two events there was competition in certain areas between Consumers and the distribution cooperatives for existing single-phase customers, competition which the cooperatives apparently were losing because their retail rates were higher than Consumers'. Westebrook, Tr. 982-83. It was to avoid this loss of customers that several of the cooperatives sought Commission jurisdiction and its subsequent protection in the form of the single-phase rules. Westebrook, Tr. 988-91; Keen, Tr. 4507-08; Paul, Tr. 8117-21.

cooperatives in areas served by both is therefore governed by those PSC rules.¹⁸⁹

Each individual distribution cooperative may install generating and transmission facilities to supply its bulk power needs or it may elect to band with others and form a joint G and T cooperative. The Rural Electrification Administration, however, will approve loans for the initial construction of a bulk power plant only if there is no adequate or dependable source of bulk power available to the distribution cooperatives, or if such power is significantly more expensive than power that could be generated and transmitted by the proposed REA financed facilities. The REA criteria for approving loans for *expansion* of existing bulk power facilities, however, are less restrictive. All that need be shown in such instances is that the proposed additional facilities constitute "the most effective and economical arrangement" for meeting increased power demand.¹⁹⁰

As we mentioned earlier, seven distribution cooperatives in lower Michigan formed the two G and T cooperatives which have intervened here: Northern Michigan and Wolverine Electric.¹⁹¹ The member distribution cooperatives are bound by long-term contracts to obtain all their bulk power requirements from these two generation and transmission cooperatives.¹⁹² The three remaining distribution cooperatives in the lower peninsula buy bulk power at wholesale from investor-owned utilities.¹⁹³

The 1970 peak load for Northern Michigan and Wolverine was 55 MW each.¹⁹⁴ To meet that load these cooperatives had facilities capable of generating 61 MW and 57 MW, respectively, comprised in the main of diesel-fueled, gas turbine and steam turbine units.¹⁹⁵ At the close of this record, Northern Michigan's largest unit was a 23.5 MW steam turbine;¹⁹⁶ Wolverine's a 23 MW "combined cycle" gas and steam-powered generator.¹⁹⁷

¹⁸⁹Cooperatives are not subject to the Federal Power Commission's jurisdiction. *Salt River Project Agr. Dist. v. FPC*, 391 F.2d 470 (D.C. Cir.), *certiorari denied*, 393 U.S. 857 (1968).

¹⁹⁰D. J. Exh. No. 7, revised Bulletin 20-6 of the Rural Electrification Administration issued May 7, 1969.

¹⁹¹See fn. 123, *supra*, and accompanying text.

¹⁹²Westenbroek, Tr. 958-59, 1060. The boards of directors of Northern Michigan and Wolverine Electric are composed of two representatives from each of their member distribution cooperatives. Keen, Tr. 4637; Westenbroek, Tr. 958.

¹⁹³Thumb Electric, except for the 10% which it generates itself, buys its bulk power requirements at wholesale from Detroit Edison; Fruit Belt Electric buys all its bulk power at wholesale from Indiana & Michigan Electric; Southeastern Michigan buys wholesale from both Consumers and Detroit Edison. Steinbrecher, Tr. 1259-61.

¹⁹⁴D. J. Exh. No. 109.

¹⁹⁵D. J. Exh. No. 106 and No. 109; Steinbrecher, Tr. 1114-1117; Keen, Tr. 4494-95. (These are 1971 statistics.)

¹⁹⁶C. P. Exh. No. 12,001; D. J. Exh. No. 106 and No. 109.

¹⁹⁷Keen, Tr. 4495.

To supply power from their generating plants to the distribution cooperatives they serve, both Northern Michigan and Wolverine Electric operate transmission networks. The two networks are interconnected and, combined, total 1,182 miles of 69 kV and 46 kV transmission lines. Of the 1,182, Wolverine Electric operates 696 miles and Northern Michigan 486.¹⁹⁹ These cooperatives are contemplating reinforcing their existing transmission network with approximately 525 miles of 138 kV transmission lines.¹⁹⁹

b. **The municipalities.** As noted, under the Michigan Constitution a municipality may own and operate an electric power system, and such municipal systems are explicitly exempted by statute from the Michigan PSC's jurisdiction.²⁰⁰ The municipals' retail rates are therefore not subject to PSC scrutiny, and its regulations governing retail competition do not apply to competition between municipal and private systems.²⁰¹

State law, however, does restrict a municipal system's sale of electric energy outside the limits of the city which owns it. Before 1974, Michigan limited such sales to 25 percent of the municipal's urban sales.²⁰² The law was amended in 1974, and now allows a municipal system to sell an unlimited amount of energy at retail in "any city, village or township which is contiguous" to its boundaries, providing, however, the consent of any preexisting power supplier is obtained first.²⁰³

The municipal systems actually now serve only their respective cities and small areas beyond.²⁰⁴ In 1972, the municipals had 146,744 retail customers

¹⁹⁹Steinbrecher, Tr. 1285-86; D. J. Exh. No. 18 and No. 20.

¹⁹⁹Steinbrecher, Tr. 1135; D. J. Exh. No. 20 (map scale was used). About 40 miles of the cooperatives' present transmission network is designed for 138 kV voltages but currently it is being operated at only 69 kV. *Ibid.*

²⁰⁰M.S.A. §22.13(6). Municipal electric systems are also excluded by Section 201(f) of the Federal Power Act, 16 U.S.C. §824(f), from the jurisdiction of the Federal Power Commission.

²⁰¹Brush, Tr. 2361; Westenbroek, Tr. 993.

²⁰²Michigan Constitution, Article VII, Section 24.

²⁰³Michigan Public Acts 1974, Acts No. 174 and 157 amending M.S.A. §§5.1534 and 5.4083. (The Constitution allowed change of the 25% limitation by statute.) A municipal system may continue to serve any cities or townships in which it was distributing retail power at the time of this statutory change even though they are not contiguous to its boundaries. *Ibid.*

The effective dates of the above statutes were respectively June 20 and June 23, 1974, *Ibid.*; the record was closed June 20, 1974. The parties are in dispute as to whether these statutes should be considered by the Board.

²⁰⁴Michigan franchise law is apparently applicable to municipal systems when they serve areas beyond their city limits. See *Bay City Plumbing & Heating Co. v. Lind*, 235 Mich. 455 (1926). The record indicates, however, that only Lansing has franchises for areas in which it operates beyond its boundaries. Brush, Tr. 2248. The record suggests, however, that there are instances where both Consumers and the cooperatives operate in areas where they are not franchised. Croy, Tr. 1547; Paul, Tr. 7864; D. J. Exh. No. 110. In such situations, the local government could, if it so desired, require the nonfranchised utility to remove its electrical facilities. See *City of Detroit v. Detroit United Railway*, 172 Mich. 136, 137 N.W. 645, *affirmed*, 229 U.S. 39 (1936).

who bought 3,031,364 MWh of electric energy, the equivalent of 14 percent of Consumers' retail sales that year.²⁰⁵ The largest municipal system is the City of Lansing's. Lansing sold 1,758,422 MWh of electric energy to 70,000 retail customers in 1972; its peak load (for 1973) was 373 MW;²⁰⁶ and its total generating capacity, 628 MW. The system's facilities were then comprised almost entirely of fossil-fueled steam units, the largest having a 160 MW generating capacity.²⁰⁷

The next largest municipal system is that of intervenor Holland. Its system, about one-eighth the size of Lansing's, sold 220,182 MWh of energy at retail in 1972;²⁰⁸ its peak load that year was 44.5 MW.²⁰⁹ Holland operated five generating units with a total generating capacity of 81.5 MW, the largest having a capacity of 31 MW.²¹⁰

The remaining intervening cities, Grand Haven, Traverse City, Coldwater and Zeeland, had retail sales in 1972 of 119,944 MWh, 106,588 MWh, 81,549 MWh and 42,503 MWh, respectively.²¹¹ Their peak loads that year were 23 MW, 17.2 MW, 12.5 MW and 8 MW,²¹² and their generating capacities 38.6 MW, 35.6 MW, 16.6 MW and 14 MW.²¹³ Only the City of Coldwater needed to supplement its generating capacity with wholesale power, which it purchased from Consumers Power Company.²¹⁴

The remaining 17 municipal systems' 1972 retail sales ranged from Union City's 10,897 MWh to Bay City's 141,280 MWh. Of these 17, only 3 systems generated their entire firm bulk power requirements; seven others bought all their firm bulk power requirements; and the remaining eight satisfied their needs partly by self-generation and partly through wholesale power purchases.²¹⁵

Because municipal systems serve compact areas, their need for transmission facilities for intrasystem bulk power transfers is minimal. Only Lansing, which operates 27 miles of 138 kV lines, has transmission lines greater than 69 kV.²¹⁶ Among the intervening municipalities, only Traverse City operates any transmission facilities, and these are limited to two miles of 69

²⁰⁵C. P. Exh. No. 11,302 and No. 11,307; D. J. Exh. No. 21.

²⁰⁶C. P. Exh. No. 11,307; Brush, Tr. 2299, 2327.

²⁰⁷C. P. Exh. No. 12,008, page E-2.

²⁰⁸C. P. Exh. No. 11,307.

²⁰⁹C. P. Exh. No. 11,111, Supplemental Agreement No. 4, Exhibit A.

²¹⁰*Ibid.*

²¹¹C. P. Exh. No. 11,307.

²¹²D. J. Exh. No. 108 (1971 statistics).

²¹³D. J. Exh. No. 109 (1970 statistics).

²¹⁴C. P. Exh. No. 11,307.

²¹⁵C. P. Exh. No. 11,307.

²¹⁶Brush, Tr. 2325; D. J. Exh. No. 109.

kV lines.²¹⁷ Several of the other municipal electric systems do operate transmission lines but all are 69 kV or less.²¹⁸

c. **Investor-owned systems.** Alpena Power Company and Edison Sault Company (the latter serves Michigan's upper peninsula) are the only small investor-owned utilities located within or adjacent to Consumers' general service area. The two are of course subject to the same state franchise and PSC regulations as Consumers. Alpena Power Company serves about 12,000 retail customers who purchased 245,117 MWh of electric energy in 1972.²¹⁹ Its peak load that year was 57 MW, which it met by generating 7 MW itself and buying the remainder at wholesale from Consumers.²²⁰ Alpena operates 38 miles of power lines with voltages of 40 kV or less and 11 miles of 138 kV transmission lines.²²¹

Edison Sault Company serves about 14,000 retail customers who in 1972 bought 314,225 MWh of electric energy.²²² This demand, coupled with bulk power supplied to a distribution cooperative operating in the upper peninsula, gave it a peak load that year of 73 MW.²²³ Edison Sault either owns or has the right to draw upon 73 MW of generation, 47 MW of which is produced by hydroelectric units.²²⁴ It supplements this generated power with wholesale purchases from Consumers.²²⁵

d. **Summary.** The total 1972 retail sales for the small utilities as a group was approximately 4,500,000 MWh, roughly 20 percent of Consumers' retail sales that year.²²⁶ Their total generating capacity was approximately 800 MW, which supplied approximately 70 percent of their own firm bulk power requirements; the remaining 30 percent they obtained by buying firm bulk power at wholesale. Consumers Power sold slightly more than half of the wholesale power bought by the small utilities, roughly 16 or 17 percent of the small systems' total firm bulk power requirements.²²⁷ Except for limited transactions between some of the smaller systems themselves, Consumers supplied the total wholesale power requirements of small utilities located inside its geographic service area.

3. The parties' coordination arrangements. Consumers' coordination practices with the small utilities form the primary focus of this proceeding.

²¹⁷Wolfe, Tr. 1706; D. J. Exh. No. 109.

²¹⁸See D. J. Exh. No. 109.

²¹⁹Fletcher, Tr. 4255; C. P. Exh. No. 11,307.

²²⁰Fletcher, Tr. 4256 (1973 statistics).

²²¹D. J. Exh. No. 108; Fletcher, Tr. 4285.

²²²Kline, Tr. 4376; C. P. Exh. No. 11,307.

²²³Kline, Tr. 4376-78 (1973 statistics).

²²⁴D. J. Exh. No. 89.

²²⁵D. J. Exh. No. 80; C. P. Exh. No. 11,307.

²²⁶C. P. Exh. No. 11,307; Pace, Tr. fol. 7239 at Attachment JDP-2, D.J. Exh. No. 109.

²²⁷*Ibid.* Most of the small systems located near another large utility bought their wholesale requirement from that utility rather than Consumers. *Ibid.* Also see D. J. Exh. No. 19.

Coordination and Consumers' coordinating policies are therefore discussed at length elsewhere in this opinion. For reference, however, we briefly enumerate here the existing coordination arrangements to which Consumers and the small utilities are parties.²²⁸

a. **Consumers' coordinating arrangements.** Consumers has entered into coordinating arrangements with its large neighboring utilities. The first such agreement, the Michigan Pool Agreement,²²⁹ was entered into by Consumers Power Company and Detroit Edison Company in 1962.²³⁰ In 1972 the combined peak load for Consumers and Detroit Edison was 10,475 MW; their combined generating capacity was 12,239 MW.²³¹ (In 1973, the 1962 Michigan Pool agreement was superseded by a new coordination agreement between the two utilities.)²³²

In 1966, Consumers and Detroit Edison jointly entered into coordination agreements with Toledo Edison Company,²³³ Indiana & Michigan Electric Company,²³⁴ Commonwealth Edison Company²³⁵ and Northern Indiana Public Service Company²³⁶ to the south and west. The physical interconnections to implement these agreements, however, were not completed until 1970. See fn. 163, *supra*. Also in 1966, Consumers and Detroit Edison entered into a coordinating arrangement with the Hydro-Electric Power Commission of Ontario.²³⁷

²²⁸Detailed discussions of their terms appear in Parts V and VI, *infra*.

²²⁹A pooling agreement is simply a comprehensive coordination arrangement. See fn. 297, *infra*.

²³⁰D. J. Exh. No. 71 (Electric Power Pooling Agreement Between Consumers Power Company and the Detroit Edison Company). Some coordination had been taking place between Consumers and Detroit Edison since 1928. See D. J. Exh. No. 66, page 1.

²³¹Mosley, Tr. 8469; C. P. Exh. No. 11,104.

²³²D. J. Exh. No. 67 (Electric Coordination Agreement Between Consumers Power Company and the Detroit Edison Company).

²³³C. P. Exh. No. 11,108 (Operating Agreement Among Consumers Power Company, the Detroit Edison Company and the Toledo Edison Company).

²³⁴C. P. Exh. No. 11,109 and D. J. Exh. No. 78 (Operating Agreement Among Consumers Power Company, the Detroit Edison Company and Indiana & Michigan Electric Company).

²³⁵D. J. Exh. No. 76 (Area Coordination Agreement Among Consumers Power Company, the Detroit Edison Company, Commonwealth Edison Company, Northern Indiana Public Service Company, the Toledo Edison Company and Indiana & Michigan Electric Company).

²³⁶*Ibid*.

²³⁷C. P. Exh. No. 11,106 and D. J. Exh. Nos. 73 and 23A (Interconnection Agreement Between Consumers Power Company and Detroit Edison Company and the Hydro-Electric Power Commission of Ontario). The agreement in evidence was executed in 1969 and superseded an earlier agreement entered into in 1966. *Id.* at page 1.

In addition the two Michigan utilities in 1967 joined the East Central Area Reliability Group (ECAR). This is not an actual coordination arrangement; rather, the purpose of this organization is to develop criteria and procedures for bulk power coordination among the signatory utilities which come from an eight-state region. D. J. Exh. No. 77; Mosley, Tr. 8522.

In addition to the coordinating arrangements with its larger neighbors, Consumers has entered coordination agreements with some of the small utilities within its general service area: Lansing (1964),²³⁸ Holland (1967)²³⁹ and the "M-C Pool," comprised of Northern Michigan, Wolverine Electric, Traverse City and Grand Haven (1973).²⁴⁰ Consumers' agreements with Lansing and Holland were superseded by broader agreements executed respectively in 1970²⁴¹ and 1974.²⁴²

b. **Coordination among the small utilities.** Only Northern Michigan, Wolverine Electric, Traverse City and Grand Haven among the smaller utilities in question have coordination agreements with one another. In 1968 these four formed the Michigan Municipals and Cooperatives Power Pool (MMCPP), the "M-C Pool" mentioned in the preceding paragraph.²⁴³ In 1971 the combined peak load for the four member utilities was 160 MW; their combined generating capacity was 192 MW.²⁴⁴ The record discloses no other coordination agreements among the smaller utilities located inside Consumers' service area. Neither does it reflect any coordination agreements between these small utilities and any large utility aside from the ones mentioned with Consumers itself.

²³⁸D. J. Exh. No. 91 (Agreement for Electric Service Between Consumers Power Company and the City of Lansing). Some coordination had been occurring between Lansing and Consumers since 1941. See D. J. Exh. No. 66, p. G-6.

²³⁹C. P. Exh. No. 11,111 and D. J. Exh. No. 100 (Agreement for Electric Service Between Consumers Power Company and the City of Holland). Some coordination between Holland and Consumers had been taking place since 1955. See D.J. Exh. No. 99 and D. J. Exh. No. 66, p. G-7.

²⁴⁰D. J. Exh. No. 105 (Interconnection Agreement between the Consumers Power Co. and Wolverine Electric Cooperative Inc., Northern Michigan Electric Cooperative, Inc., the City of Grand Haven, the City of Traverse (Members of the Michigan Municipals and Cooperative Pool)).

²⁴¹C. P. Exh. No. 11,112 and D. J. Exh. Nos. 92 and 92A (Interconnection Agreement Between Consumers Power Company and the City of Lansing, Michigan).

²⁴²C. P. Exh. No. 12,024 (Interconnection Agreement Between Consumers Power Company and the City of Holland, Michigan). This agreement was executed subsequent to the close of the record. The agreement is essentially identical to the interconnection agreement between Consumers and the M-C Pool and accordingly we will take official notice of it, as Consumers has requested, under Section 2.743(i) of the Commission's Rules of Practice. 10 CFR §2.743(i).

²⁴³D. J. Exh. No. 104A (Michigan Municipals and Cooperatives Power Pool Arrangement between Wolverine Electric Cooperative, Inc., Northern Michigan Electric Cooperative, Inc., Grand Haven Board of Light and Power, and the City of Traverse). Previously, Northern Michigan and Traverse City had a coordination agreement dating back to 1958. D. J. Exh. No. 240.

²⁴⁴Steinbrecher, Tr. 1287, 1115-17.

V. THE RELEVANT MARKETS

A. Geographic market

For reasons previously set forth, the relevant market must be analyzed in terms of its geographic and product dimensions both.²⁴⁵ With respect to the former there is little controversy. The parties have essentially accepted the Licensing Board's determination that it embraces the territory currently served by Consumers Power Company plus those areas which the company could reasonably serve, *viz.*, "all of the lower peninsula of Michigan except the eastern section served by the Detroit Edison Company and the southwest section served by the Indiana and Michigan Electric Company and the Michigan Gas and Electric Company" 2 NRC at 45. In light of the characteristics of electric power generation and distribution in the lower peninsula (described in Part IV, above), we agree that this adequately delineates the "area in which the seller operates and to which the purchaser[s] can practicably turn for supplies," and therefore corresponds to the relevant geographic market.²⁴⁶

Consumers further contends that this overall geographic market must be divided into retail and wholesale bulk power submarkets, each with different boundaries. The Licensing Board, however, rejected those two product markets as not in the case. In its judgment, only a product market for "coordination services" was before it for consideration. The Board based that conclusion on its reading of an agreement among all the litigants, Consumers Power Company included. See p. 902, *supra*. Consequently, before we undertake to determine whether the company is correct in its view that the actualities of competition require the geographic market to be broken down into appropriate wholesale and retail power submarkets, we must first decide what product markets are in this case. We turn now to that preliminary question.

B. Product markets

1. The coordination services market

a. The "agreement" that the only relevant product market is for coordination services. In determining the product market, the Board eschewed the traditional market analysis. It concluded instead that the only relevant product market was one for "coordination services"²⁴⁷ because the parties

²⁴⁵See pp. 919-920, *supra*.

²⁴⁶*United States v. Philadelphia National Bank*, *supra*, 374 U.S. at 359, quoting from *Tampa Electric Co. v. Nashville Coal Co.*, 365 U.S. 320, 327 (1961).

²⁴⁷The nature of these services is described briefly at pp. 902-903 above, and discussed more extensively below at pp. 952-957.

had agreed that the matters in controversy had focused on these. As a direct consequence the Board below refused to consider as relevant markets those for retail power or wholesale bulk power. 2 NRC at 40, 45. Justice and Consumers take sharp issue with the Board's action in this regard and challenge the premise on which it rests. Both parties contend that wholesale bulk power and retail power are relevant product markets for this proceeding. (They disagree, however, about whether those markets are *in addition* to or *in lieu of* the coordination services market, Justice taking the former and Consumers the latter position.)

Justice maintains that the basic thrust of its case "is and always has been that [Consumers] has the power to grant or deny meaningful access to coordination and has exercised this power with the purpose and anticipated effect of monopolizing the wholesale for resale firm power market."²⁴⁸ According to Justice, by "agreeing to the relevant matters in controversy, the parties only intended to limit the scope of evidence concerning [Consumers'] efforts to preserve its alleged monopoly position in the relevant markets," and did not intend to stipulate the product market to be solely one for coordination services.²⁴⁹

Consumers sides with Justice on this point. It, too, stresses that the "Board's holding [concerning the relevant matters in controversy] referred only to a limitation as to the evidence which would be adduced concerning the Company's conduct, not to the parameters of the relevant product market."²⁵⁰ A review of the record convinces us that Consumers and Justice are correct; there was in fact no interparty agreement about the relevant product markets.²⁵¹

(i) The Board dealt with the relevant matters in controversy in its first prehearing conference order. This in itself was not improper because an express purpose of that conference was the establishment of issues to be con-

²⁴⁸*Justice's Reply Brief on Appeal*, p. 9; see also *Justice's Prehearing Brief*, p. 38.

²⁴⁹*Justice's Opening Brief on Appeal*, pp. 39-40.

²⁵⁰*Consumers' Appeal Brief*, pp. 154-55.

²⁵¹The staff supports the Board's product market delineation. Its support rests not on the "agreement" of the parties, but on the staff's analysis of the electric utility industry in lower Michigan and on its understanding that the Board's "coordination services" market is equivalent to its own proposed "bulk power services" market.

In their appellate briefs, Joint Intervenors *assume* the existence of relevant product markets for coordination services and for supplies of wholesale and retail power. But their briefs lack any analysis of the record supporting the correctness of those assumptions. Because relevant market delineation is essentially a factual question, the absence of that analysis renders intervenors' relevant market arguments of little use for our purposes.

sidered in the forthcoming hearing. 10 CFR §§2.751a(a)(1) and (d).²³² Justice—which took the lead among the proponents of license conditions—accordingly set out for consideration at that conference its theory of the case.²³³ In the course of doing so the Department represented, *inter alia*, that it saw the situation in violation of antitrust principles as Consumers’ “maintenance of the power to grant or deny [the small utilities] access to coordination” and its use of that power “in an anticompetitive fashion against [them].” Justice described this as “[forming] the basic thrust of [its] case”; it made no reference to relevant markets.²³⁴ When questioned explicitly, Department counsel announced his intention to base Justice’s case on relevant markets and submarkets in both “bulk power supply and retail distribution.”²³⁵ In short, in representing that Consumers’ coordination practices formed the basic thrust of its case, Justice was describing *the means* by which it intended to show how Consumers had monopolized, not *the market* in which it had done so.

The terms of the Licensing Board’s prehearing order, which purport to adhere to Justice’s representations, portend no more. (See page 921, *supra*, for the order.) The first two matters paraphrase Justice’s charges against Consumers; the third questions whether that conduct is sufficient to show the existence of a situation inconsistent with the antitrust laws that licensing Midland would maintain. None of the three defines the relevant markets to be considered in making that determination. We find nothing on the face of that prehearing order that should have alerted counsel that the Board meant it to serve that purpose.

Even accepting that all the material issues in controversy were related to coordination practices, the Licensing Board’s reasoning that the relevant product market was thereby limited to that for coordination services is

²³²Indeed, in ordering an antitrust hearing in *Midland*, the Commission expressly instructed the Licensing Board

to establish on as timely a basis as possible, a clear and particularized identification of those matters related to the issue in this proceeding which are in controversy. As a first step in this prehearing process, the Board shall obtain from the parties a detailed specification of the matters which they seek to have considered in the ensuing hearing.

37 Fed. Reg. 7726, 7727 (April 19, 1972).

²³³See Tr. 47-66.

²³⁴Tr. 59-60. Also see 2 NRC at 41-42.

²³⁵Tr. 80. Also see Tr. 50-51 where, in reply to a question concerning the legality of Consumers’ acquisition of its present market position, Justice represented that

. . . the greater part of our case will consider whether or not even if the dominance and the market structure was lawfully obtained, whether it is unlawfully using that monopoly power to obtain and extend its monopoly both in bulk power supply and in retail distribution market.

faulty.²⁵⁶ As we indicated, monopolization consists of two elements requiring separate analyses. The first involves identification of the relevant market and a determination whether the respondent possesses monopoly power in it. See pp. 918-922, *supra*. The second looks to whether the respondent has willfully acquired or maintained that monopoly position. See pp. 922-923, *supra*. Proof of the second element, monopolistic intent, is frequently established by showing that the accused party has engaged in anticompetitive conduct.²⁵⁷ The link between the two is whether that conduct affected a relevant market.

Because conduct may have a detrimental impact in more than one marketplace, the same actions may have monopolized a number of markets.²⁵⁸ Consequently, where monopolization is charged, proof of anticompetitive conduct alone does not automatically define the relevant market and therefore the fact that Justice's charges all involved Consumers' coordination practice did not perforce limit the relevant market to that for coordination services. Rather, the relevant market or markets might be any in which Consumers' practices facilitated the company's acquisition, maintenance, or extension of monopoly power—including (of course) the coordination services market.

A review of the evidence confirms our judgment. The record makes clear that, by accepting the Board's definition of the relevant matters in controversy, the parties neither stipulated the existence of a relevant product market for coordination services nor agreed that it was the only relevant market. As described, throughout this proceeding Justice consistently proposed two relevant product markets—retail power and wholesale power—in addition to one for coordination services.²⁵⁹ On its part, Consumers just as uniformly argued against a separate market for coordination services and contended that these belong in the bulk power market.²⁶⁰ Both parties introduced considerable evidence, including expert testimony,²⁶¹ to

²⁵⁶See 2 NRC at 45. Also see 2 NRC at 40 (emphasis supplied) where the Board stated:

In the areas of the southern peninsula of Michigan in which [Consumers] is franchised [Consumers] is by far the largest utility whether measured by generation capacity or by sales of firm power, or any other reasonable yardstick. *Impressed with these facts, the parties have attempted to define the relevant market in terms of electric power as a relevant product. Such attempts ignore the material issues in controversy which are all concerned with coordination.*

²⁵⁷See pp. 1029, *infra*.

²⁵⁸See, e.g., *United States v. United Shoe*, *supra*, 110 F. Supp. at 302 (dictum); *Luria Brothers and Co.*, 62 FTC 597 (1962), *affirmed sub nom. Luria Brothers v. FTC*, 399 F.2d 847 (3rd Cir. 1968); cf., *Brown Shoe Co. v. United States*, *supra*, 370 U.S. 294.

²⁵⁹*Justice's Prehearing Brief*, pp. 29-31.

²⁶⁰*Consumers' Prehearing Brief*, pp. 98-109.

²⁶¹See, e.g., Mayben, Tr. 2538-2805; Wein, Tr. fol. 3979; and Pace, Tr. fol. 7239.

support their respective views. And each elaborated its position in proposed findings of fact and conclusions of law, and bolstered them with extensive briefs.²⁶² Manifestly, neither would have followed that course had it believed that acceptance of the Board's definition of the matters in controversy was acquiescence in one relevant product market limited to "coordination services."

(ii) Thus the question of the relevant product market or markets was not settled by the Licensing Board's order defining the relevant matters in controversy; its contrary conclusion is simply mistaken. Of course, that the Board below erred about the parties' agreement that coordination services was a relevant product market does not eliminate that market from the case. Justice and intervenors contend that it is a proper market; whether they are right or not is a question of fact. Fortunately, the issue was the subject of extensive litigation at each stage of the proceeding below with the result that a sufficient record was developed to enable us to resolve the matter.²⁶³ Accordingly, we undertake the required analysis.

The four parties propose essentially three different relevant product markets: (1) coordination services; (2) retail firm power; and (3) wholesale bulk power. There was no unanimity, however, about whether all three are appropriate or indeed exist. And among those who agree to their existence, there is neither consensus about what is properly includable within each nor concurrence about whether some further division into submarkets is called for. We consider each proposed market in turn.

b. Coordination services as a relevant market. It is accepted antitrust law that product markets are not limited to goods or commodities transactions in a traditional mercantile sense. Relevant markets and submarkets may also be comprised of services or even "clusters of products and services."²⁶⁴ Whether "power coordination services" (to use Justice's term)

²⁶²See, *Consumers' Proposed Findings of Fact and Conclusion of Law*, pp. 29-40, 85-97; *Consumers' Opening Brief Below*, pp. 79-145; *Justice's Opening Brief Below*, pp. 36-86; and *Justice's Proposed Findings of Fact and Conclusions of Law* at pages 258-67 of its *Opening Brief Below*.

²⁶³*Niagara Mohawk Power Corp.* (Nine Mile Point, Unit 2), ALAB-264, 1 NRC 347, 354 (1975); *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-422, 6 NRC 33, 42 (1977).

²⁶⁴*United States v. Philadelphia National Bank*, *supra*, 374 U.S. at 356 (commercial banking services); *accord*, *United States v. Grinnell*, *supra*, 384 U.S. at 572 (central station alarm services); *Cass Student Adv., Inc. v. National Ed. Adv. Service, Inc.*, *supra*, 516 F.2d at 1092 (solicitation of advertising); *Credit Bureau Reports, Inc. v. Retail Credit Co.*, 358 F. Supp. 780, 789-90 (S.D. Tex. 1971), *affirmed on the opinion below on this point*, 476 F.2d 989 (5th Cir. 1973) (insurance reports and credit reports); *United States v. Tidewater Marine Service, Inc.*, 284 F. Supp. 324, 328-31 (E.D. La. 1968) (waterborne transportation of supplies and equipment).

qualify as a separate product market under those tests is a factual question, the answer to which calls for an appreciation of the function and nature of those services in the electric power industry. We begin by sketching these briefly.

(i) **Benefits of coordination arrangements.** The usefulness of coordination is traceable directly to the nature of electricity and the preferences of consumers. For utilities that generate and distribute electric power, both factors cause difficult, costly problems. The Board below observed and no one disputes that “[m]ost customers of electric energy need or desire firm power.” 2 NRC at 36.²⁶⁵ “Firm” power is essentially a utility commitment to supply electric energy to a customer on demand for as long as needed. One contracting for firm power (whether at retail or wholesale) is buying not merely energy, but assurance that (barring some extraordinary unforeseen occurrence) the utility will make that power available without interruption when called for.²⁶⁶

It is an acknowledged fact of life in the industry that the demand for firm power “fluctuates significantly from hour to hour, day to day, and season to season.”²⁶⁷ Unfortunately, it is not practicable to generate electricity in slack periods and store it for use in times of peak demand. Utilities in the business of distributing electric power must therefore have access to generating facilities capable of satisfying firm power demands on their systems during those relatively few peak hours. And this means they need to have at hand a margin of “reserves.” Reserves are, as we noted,²⁶⁸ generating capacity above and beyond that needed at peak times to which resort may be had when generating units are down, whether in an emergency or simply for routine overhaul and maintenance.²⁶⁹ In short, the nature

²⁶⁵Applicant’s economic witness, Dr. Pace, confirmed that “The ultimate objective [of any utility] is to come out with something they can turn around and sell to a customer as firm power.” Tr. 7543-44. See also Tr. 7560.

²⁶⁶EEl Glossary, p. 63; See also Tr. 1132, 1741, 2076, and 2573-74; FPC, 1970 *Electric Power Survey*, Pt. 1, at I-24-3. Consumer’s witness testified that wholesale power is firm power in bulk. Mosley, Tr. 8459.

²⁶⁷*Gainesville Utilities v. Florida Power Corp.*, 402 U.S. 515, 517 (1971).

²⁶⁸See p. 902, *supra*, fn. 21.

²⁶⁹The industry distinguishes between various types of “reserve” requirements. Since time is required to start up equipment that is not operating, a certain amount of equipment must be maintained in such a state that it can begin generating power immediately. The industry calls these instantaneous or “spinning” reserves, and they must be available to meet load variations and breakdowns of equipment as they occur. A utility must always maintain “spinning” reserves equal to the size of the largest generator currently in service producing power, in order to protect against a breakdown of that unit. As “spinning” reserves are called upon a utility must start up more equipment in order to maintain “spinning” reserves at an adequate level. These reserves are called “quick-start” or “ready” reserves and must be available on short

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of the industry is such that to meet firm power demand, a utility must have available considerable amounts of surplus generating capacity, which capacity is by necessity often idle.

The amount of excess generating capacity that an isolated utility²⁷⁰ must maintain is directly related to the size of the generating units in use on its system. A rough rule of thumb is that such a utility must have reserves at least equal to its largest unit in operation to insure a continual flow of power to its customers if that unit fails.²⁷¹

Large generating units produce electricity at significantly lower costs than small ones. This is particularly true with respect to "baseload" units, generators operated steadily to supply the constant portion of the demand on a utility's system.²⁷² The cost per kilowatt hour of electricity generated

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notice — usually 10 minutes or less. Both spinning and quick-start reserves are collectively referred to as "operating" reserves, in contrast to "installed" reserves. "Installed" reserves refers to the remaining generating capacity of a utility, those generators that are not ready to be operated, or in operation. Accordingly, the expense associated with "reserve" requirements includes both capital expense—building the necessary "installed" reserve generating capacity—and operating expense—running the necessary "spinning" reserves and maintaining the readiness of "quick-start" reserves.

2 NRC at 37-38, quoting from *Gainesville, supra*, 402 U.S. at 518, fn. 2. Also see Mosley, Tr. 8465-67; Mayben, Tr. 3879-82, 87-88.

²⁷⁰An isolated utility is one that is not interconnected with any other utility and thus must depend entirely on its own resources to meet its customers demands. See *Gainesville Utilities v. Florida Power and Light Corp., supra*, 402 U.S. at 518.

²⁷¹See 2 NRC at 36. Also see Mayben, Tr. 2548-49, 2553-54; Mosely, Tr. 8530. The largest unit criterion for calculating reserves is valid only for small systems. As the number of generating units increase the utility would have to carry more reserves to cover the possibility that two units may fail at once. Mayben, Tr. 2577-78. Consumers calculates its reserves level by probabilistic methods. Mosley, Tr. 8272-73. Also see FPC, *1970 National Power Survey*, Part II, pp. II-1-41-46. The method of calculating reserves will be discussed more fully in Part VI, *infra*.

²⁷²Generating units are classified, depending on their function, either as baseload, intermediate or peaking. Chayavadhanangkur, Tr. fol. 5090 at 6-8. This division results from the fact that customer demand for electric power fluctuates significantly as a function of time. In approximate terms, only 50 percent of a utility's daily peakload is constantly experienced; demand for the remaining 50 percent is intermittent. FPC, *1964 National Power Survey*, Part I, pages 119-20; FPC, *1970 National Power Survey*, Part I, pages 1-3-1 to 3-3. Mosley, Tr. 8617. "Baseload" units are designed to run continuously (except for maintenance) to meet that constant portion of the utility's load. Intermediate and peaking units are utilized to meet the intermittent demand, with intermediate units generally being used to meet demand that is continuous for 12 or more hours and peaking units being used to meet demand that is less than 12 hours in duration. Wolfe, Tr. 1676; Mayben Tr. 2556; FPC, *1964 National Power Survey*, Part I, pp. 119-20; FPC, *1970 National Power Survey*, Part I, pp. 3-1, to 3; Int. Exh. No. 1,005, pp. 22-24; Chayavadhanangkur, Tr. fol. 5090 at 6-8.

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by such units is inversely proportional to the size of the unit.²⁷³

Thus, in planning its system, a utility must balance the economies of scale attainable with larger generating units against the increased amount of reserve capacity that their use necessitates.²⁷⁴ Not unexpectedly, then, all electric utilities strive to plan and to use their generating capacity as efficiently as possible. Each seeks to reduce its need to maintain surplus capacity and each also tries to meet growth on its system by building new facilities that attain economies of scale without requiring unreasonably large reserve margins. For reasons which will become apparent, no utility system can accomplish these things in isolation as effectively as it can in conjunction with others. As the Board below recognized, "coordination," "coordinating services," or "coordination arrangements" are shorthand terms in the electric power industry for contractual arrangements among utility companies to achieve economies in their overall power supply operations.²⁷⁵

(ii) **Coordination transactions.** Coordination may be broken down into two broad classifications: operational and developmental.²⁷⁶ The former is essentially a contractual arrangement among two or more utilities to exchange surplus power and associated energy; the contract terms vary depending on the operating conditions of their respective systems. These arrangements generally provide for a host of differing types of surplus power transactions which serve to increase the efficiency and often the reliability

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Because baseload units are operated continuously, they are designed to produce electricity as economically as possible. Wolfe, Tr. 1676; Mayben, Tr. 2556; Keen, Tr. 4483. Such units usually are nuclear and fossil-fueled steam generating units designed for efficient operation. Mayben Tr. 2558. With peaking units other considerations, such as capital cost and ease of startup and shutdown, are more important. Keen, Tr. 4483; FPC, 1970 *National Power Survey*, Part I, p. I-8-1. Typical peaking plants are gas turbines, conventional and pump storage hydroelectric units, specially designed oil or gas-fired steam units and diesel-fired units. (Intermediate units are often former baseload units which have been replaced by newer, more efficient facilities.) FPC, 1964 *National Power Survey*, Part I, pp. 119-129; FPC, 1970 *National Power Survey*, Part I, pp. 5-8, 7-4 to 6, and 8-1 to 7, Also see D.J. Exh. No. 236, pp. 5.2-2 to 7.

²⁷³Wolfe, Tr. 1677; Mayben, Tr. 2558. Economies of scale in baseload generation are attainable up to the 800 to 1,300 MW range. Mosley, Tr. 8697-98. Corresponding economies are ordinarily not achievable in peaking units. Wolfe, Tr. 1677; Mayben, Tr. 2557-58. However, pump storage hydroelectric units are one exception. *Ibid.*

²⁷⁴The size generating unit that any system can economically build is also related to that system's load growth. Mr. Mosley testified that "[i]t is not uncommon, and it's generally good economics, that you can put a unit in a system that is not greater than two years' anticipated load growth." Tr. 8531. Also see *Id.* at 8616-19; Mayben, Tr. 2649-50, 3694; Wein, Tr. fol. 3979 at 64-65.

²⁷⁵2 NRC at 34-35; see also FPC, 1970 *National Power Survey*, Part I, at I-24-2.

²⁷⁶Wolfe, Tr. 1599-1604; D. J. Exh. No. 167 (Edison Electric Institute, *Principles of a Coordination Agreement*). Also see FPC, 1970 *National Power Survey*, Part I, Ch. 17.

of the respective utility's bulk power supply operations.²⁷⁷ Developmental coordination, on the other hand, is understood in the industry to embrace the joint planning and construction of new bulk power facilities, in particular new baseload generating units, in an endeavor to achieve economies of scale.²⁷⁸ There is, however, no magic formula after which coordination agreements are patterned. Rather, each reflects the needs, resources, and managerial views of the particular contracting utilities.²⁷⁹

Normally a key step in operational coordination is a contract to share reserves.²⁸⁰ We need not draw up our own hypothetical to illustrate how reserve sharing permits lowered operating costs by allowing more efficient use of generating capacity. Rather, we follow the lead of the Board below and use for this purpose the Supreme Court's example in *Gainesville, supra*, 402 U.S. at 519, fn. 3:

Assume that four electric systems operate in isolation and that each has an annual peak load of 500 MW served by several generating units the largest of which is 200 MW. At a minimum each system would have to provide 700 MW of installed generating capacity (500 MW to cover the annual peak load plus 200 MW of installed reserves equal to the largest unit). If we assume further that each system operates its 200 MW unit near capacity throughout the year, spinning reserves equal to the output of that unit would constantly be required. If the four systems

²⁷⁷*Ibid.*

²⁷⁸There are usually two methods by which utilities coordinate construction of new generating plants: joint venture and staggered construction. See D. J. Exh. No. 167, pp. 15-18; D. J. Exh. No. 234 (Edison Electric Institute, *Methods of Owning and Selling Generating Capacity*). In a joint venture, as its name implies, the utilities jointly own and finance a facility large enough to meet the immediate power needs of all. In staggered construction, one utility will "be elected or will choose to build a generating unit that is larger than [it] immediately needs" and it "will sell the surplus [power in excess of its system's needs] to the other part[ies] until such time as [it] needs" that unit's total power output. "It is then implied and expected" that at a later time the buying parties will construct plants larger than their needs and supply a similar type of service to the original selling party. Mosley, Tr. 8499; also see Mayben, Tr. 2649-50; Brush, Tr. 2137. Power transferred under such arrangements is referred to as "unit power," the party being entitled to receive power only when that unit is in operation. Accordingly, the rates for such power are based solely on the capital and operating costs of the particular unit. And because the selling utility is under no contractual obligation to deliver power when the unit is down, either due to forced or scheduled outages, the buying utility must have available alternate sources of bulk power. See Mosley, Tr. 8505-06; Slemmer, Tr. fol. 8838 at 20; D. J. Exh. No. 234 at 25-29. By utilizing either joint ventures or staggered construction, utilities can build generating units with substantial economies of scale while at the same time avoiding capital investment in electric plants that would not otherwise be needed for a considerable time into the future. See fn. 274, *supra*.

²⁷⁹FPC, 1970 *National Power Survey* at I-17-1.

²⁸⁰See 2 NRC at 66. Also see Wolfe, Tr. 1609-10.

are to be interconnected pursuant to the Florida Operating Committee formula, total generating capacity need not exceed 2,300 MW (total annual peak load—plus operating reserves of 300 MW, *i.e.*, 1½ times the largest generating unit). This 2,300 MW capacity requirement would be met by requiring each system to maintain generating capacity equal to 115 percent of its annual peak load. Each system would thus have to maintain only 575 MW of generating capacity—125 MW less than would be required if operating in isolation. The interconnected system as a whole would require the constant maintenance of 200 MW of spinning reserves and 100 MW of quick-start reserves; each system's pro rata share of operating reserves would amount to only 75 MW. Thus, interconnection of the four systems would result in substantial capital savings by reducing installed generating capacity requirements and substantial operating savings by reducing operating reserve requirements.

The conclusion supported by the example is clear: "To the extent that the utility may rely upon the interconnection to supply this deficiency [in reserve generating capacity] the utility is freed of the necessity of constructing and maintaining its own equipment for the purpose." *Id.* at 520. It is also manifest that "[s]uch coordination results in substantial cost savings in furnishing reserves" ²¹¹

²¹¹Meeks, *Concentration in the Electric Power Industry*, *supra*, 72 Colum. L. Rev. at 102. Professor Meeks offers a similar example of the cost saving and other advantages of reserve sharing. *Id.* at 103:

To illustrate, consider a system with ten generators and a total capacity of 1,500 megawatts, the largest unit being 300 MW. The system, if operating alone, must have spinning reserves of at least 300 MW to cover the largest unit should it fail. If the 300 MW unit and another unit should go out at the same time, the system could not continue to serve all its customers if it had only 300 MW spinning reserve. On the other hand, the probability that several units will go out at the same time is less than that one will fail. If the system just described were to pool its spinning reserve with a neighboring system that also had a total capacity of 1,500 MW in ten units, the largest being 300 MW, the unlikelihood of both 300 MW units going out at the same time might lead the systems to decide that their reliability standard would be sufficient if together they provided 500 MW of spinning reserve. Thus, operating separately, each system would have to provide at least 300 MW reserve, whereas together they could attain the same degree of reliability with less idle capacity. Although this is a highly simplified illustration, the point to be emphasized is that the more units involved, the less spinning reserve as a percent of capacity will be needed to achieve the same degree of reliability. In addition, the more generating units that are interconnected, the greater will be the system's transient stability—its ability, due to the inertial effect of the combined generators, to absorb temporary instability in some of its component units. (Footnotes omitted.)

Consumers' witness agreed that interconnected operations lower the overall costs of its bulk power supply. See Mosley, Tr. 8516.

In short, under a reserve sharing agreement, the contracting utilities “pool” their respective reserve capacities, thereby reducing the overall level of reserves that must be maintained for emergency purposes.²⁴² Because each utility in the pool is thus relying partially on the reserve capacity of the others, the parties to the agreement may be called upon to supply power to a pool member that has a temporary generating deficiency because of an unexpected outage. Their obligation to supply that power, however, is not firm. These are “if and when available” arrangements. No utility is obliged to supply power where doing so would jeopardize “service to [its] own customers.”²⁴³

Power transferred among utilities pursuant to such arrangements is referred to in the industry as “emergency” power.²⁴⁴ Emergency power—like all power furnished under reserve sharing arrangements—is not provided free of charge. Rather, the supplying utility is paid for the energy transferred at a rate specified in the governing coordination contract or agreement.²⁴⁵ Most common (and illustrated by agreements in evidence here) is a charge that covers the “out-of-pocket cost” of the supplying utility plus 10 percent of that cost.²⁴⁶

Reserve sharing in emergencies is but one type of coordination service. There are literally thousands of such arrangements reflecting the need (or desires) of the particular utilities concerned.²⁴⁷ Examples involved in this case include agreements to purchase and sell “maintenance power,” “short-term power,” “seasonal power,” “economy energy,” “dump energy,” “diversity power,” “off-peak power” and “unit power.” All fall under the coordination service rubric. For purposes of this appeal we need

²⁴²Wolfe, Tr. 1635; Mosley, Tr. 8467.

²⁴³Mosley, Tr. 8462; Wolfe, Tr. 1554. Also see for example C.P. Exh. No. 11,109, Service Schedule A (Coordination Agreement Among Consumers Power Co., the Detroit Edison Co. and Indiana & Michigan Electric Co.).

²⁴⁴Wolfe, Tr. 1554; also see Mayben, Tr. 2697-98.

²⁴⁵Mosley, Tr. 8462-62A.

²⁴⁶See, e.g., C.P. Exh. No. 11,108, Service Schedule A, (Coordination Agreement Among Consumers' Power Co., the Detroit Edison Co. and the Toledo Edison Co.). Several of the contracts provide, at the option of the supplying utility, for return of equivalent energy in kind to that utility. *Ibid.* Also several of the contracts not only have a charge based on the out-of-pocket costs of the supplying utility but also include a capacity charge. See, e.g., D.J. Exh. No. 105, Supplement B (Coordination Agreement Between Consumers Power Co. and the M-C Pool); D.J. Exh. No. 67, Supplement D (Coordination Agreement Between Consumers Power Co. and the Detroit Edison Co.). Capacity charges are discussed at pp. 965-969, *infra*.

²⁴⁷“There are thousands of arrangements among systems from all segments of the industry providing for various degrees and methods of electrical coordination. These variations reflect differences in load density, characteristics of generating resources, geography, and climate. They are also a product of managerial views with respect to planning, marketing, competition, and retention of prerogatives.” FPC, 1970 *National Power Survey* at I-17-1.

describe them only summarily in the margin below.²³³ All are in essence variations on one leitmotif: the utilities' attempt to reduce their production cost by either purchasing or selling "surplus" power, or to put it more accurately, power from the surplus generating capacity inherent in the in-

²³³Maintenance power, short-term power and seasonal power all involve the sale, over a limited time period—be it a week, month or generating season—of power and energy by a utility with a temporary surplus of generation to one with a temporary generating deficiency. In such instances "the surplus party . . . will contract to deliver, for a given period of time, a given number of kilowatts of power with associated energy." Mosley, Tr. 8497-98 (Mr. Mosley referred to power exchanges of this general nature as "supplemental" power transactions). Maintenance power is specifically contracted for, usually in weekly periods, to cover (as its name implies) generating deficiencies created by scheduled maintenance outages. Utilities often jointly plan their scheduled maintenance outages and sometimes—but not always—arrange for power received by one to be repaid in kind when the other utility undergoes its scheduled maintenance; differences, however, in actual power and associated energy exchanged are compensated by cash payment. See Wolfe, Tr. 1617-18; C.P. Exh. No. 11,109, Service Schedule B; C.P. Exh. No. 11,108, Service Schedule B; C.P. Exh. No. 11,106, Supplement M (Coordination Agreement Between Consumers Power Co., the Detroit Edison Co. and the Hydro-Electric Power Commission of Ontario); D.J. Exh. No. 105, Supplement C. "Short-term" power and "seasonal power" may be contracted to cover temporary generating deficiencies due to any cause, be it unexpectedly high customer demand, delay in bringing a new generating plant on line or an extended emergency and corresponding maintenance needs. See Mosley, Tr. 8497; Wolfe, Tr. 2062; C.P. Exh. No. 11,106, Article V, Sections 2 and 3; C.P. Exh. No. 11,112, Article 4, Section 2, and Service Schedule B-1 (Coordination Agreement Between Consumers Power Co. and the City of Lansing). These are usually cash transactions. See, e.g., C.P. Exh. No. 11,109, Service Schedule D; D.J. Exh. No. 105, Supplement A. The rates for short-term and seasonal power both consist of a capacity charge and an energy charge. *Ibid.* Also see Mosley, Tr. 8498. The difference between the two is explained at pages 965-966, *infra*.

Economy energy transactions differ from those described above. They are not used to cover a temporary generating deficiency but are a means by which coordinating parties arrange to use their most efficient generating units. In such a transaction, a utility generating electricity with a unit whose operating costs are higher than one its neighbor temporarily has in reserve will shutdown the costly unit and receive power from its neighbor's economical unit. The receiving utility pays the supplier's operating costs plus half the difference of the operating costs of the two units, thus splitting the savings 50-50 between them. Economy energy, too, is supplied only on an "if available" basis and "the supplying utility can retract the service on an instant's notice." Mosley, Tr. 8495-97; Wolfe, Tr. 1590-92. See, e.g., C.P. Exh. No. 11,108, Service Schedule C; C.P. Exh. No. 11,106, Supplement E; D.J. Exh. No. 67, Supplement E.

"Diversity power," "dump energy" and "off-peak power" are surplus power transactions with particular characteristics. Diversity power is exchanged between utilities whose peak loads do not coincide. For example, a utility with a winter peak load may during that season obtain power and associated energy from a utility with a summer peak load; *vice versa* in the summer. Differences in actual power and energy exchanged are compensated in cash. See Slemmer, Tr. fol. 8838 at 16-17; C.P. Exh. No. 11,106, Supplement D; D.J. Exh. No. 76, Service Schedule C (Area Coordination Agreement Among Consumers Power Co., the Detroit Edison Co., Commonwealth Edison Co., Northern Indiana Public Service Co., the Toledo Edison Co. and Indiana & Michigan Electric Co.); D.J. Exh. No. 167, p.11. "Dump energy" refers to surplus
(Continued on next page)

dustry.²⁸⁹ This brings us directly to the question we must answer: whether these purchases and sales of surplus electric power and energy—transactions in coordination services—comprise a relevant market or submarket for antitrust purposes.

(iii) **Market analysis.** Consumers Power Company denies the existence of a discrete product market for electric power provided under coordination arrangements.²⁹⁰ It considers that power simply one part of an overall market for bulk power. The company's position rests on a line of cases beginning with the Supreme Court's *DuPont-Cellophane* decision.²⁹¹ It reads those cases to lay down the rule that products which have "reasonable interchangeability" are part of the same relevant product market for antitrust purposes. The company asserts that small utilities within its general service area can satisfy their bulk power needs three ways: (1) resort to self-generation; (2) wholesale power purchases from Consumers (or others); or (3) power available under coordination arrangements. The particular source (or sources) to which any individual utility will turn for its bulk power—according to Consumers—depends simply on the relative cost of power from the source available. This analysis implies that these three sources of electric power are functionally interchangeable and therefore in one and the same

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hydroelectric energy that must be produced because of the generating characteristic of the facility; it is priced below the operating costs of other generating facilities. Mayben, Tr. 2702-03; D.J. Exh. No. 167, p. 11. See D.J. Exh. No. 80, Section 11 (Contract for Electric Service Between Consumers Power Co. and the Edison Sault Electric Co.). "Off-peak" power is, obviously, power and associated energy sold in nonpeak hours, e.g. 10:00 p.m. to 7:00 a.m. See C.P. Exh. No. 11,109, Service Schedule E.

We have already described how unit power transactions are utilized by utilities who agree to stagger the construction of their new generating facilities. See fn. 278, *supra*. (The original Michigan Pool agreement, D.J. Exh. No. 71, provided in essence for unit power transactions in conjunction with a program of staggered construction. Mosley, Tr. 8499.) In addition, however, unit power transactions may occur outside a staggered construction program. See Mosley, 8505-06. An example of this in the record is Consumers' sale to Commonwealth Edison of a portion of its share of the Ludington pumped storage plant (a joint venture between Detroit Edison and Consumers). The sales agreement, which is 15 years in duration, provides that during the first 10 years Commonwealth Edison is to purchase one-third of Consumers' share; during the last five years of the agreement Commonwealth will buy one-sixth of Consumers' share. C.P. Exh. No. 11,118 (Agreement for Sale of Portion of Generating Capability of Ludington Pumped Storage Plant by Consumers Power Company to Commonwealth Edison Company). Also see Mosley, Tr. 8506-07.

"Certain aspects of coordination obviously serve to increase system "reliability," and these transactions are entered into for that purpose also. But it remains the case that an isolated system may be just as "reliable" as an interconnected one; however, "the cost would be astronomical." Meeks, *supra*, 72 Colum.L. Rev. at 102.

²⁸⁹See *Consumers' Appeal Brief*, pp. 154 *et seq.*

²⁹¹*United States v. E. I. duPont de Nemours & Co.*, 351 U.S. 377 (1956).

relevant product market under the *DuPont* rationale, a conclusion Consumers urges upon us.²⁹²

Justice takes issue with Consumers on this point. The Department seeks coordination services and wholesale power as forming quite separate markets. The wholesale power market, it asserts, is one "in which producers of firm electric power sell [firm] power in bulk . . . to electric distribution systems." Coordination power and associated services are, in Justice's view, but "factors of production or inputs" in producing firm bulk power.²⁹³ Because they are thus only an element of firm bulk power, they are not "reasonably interchangeable" with it and accordingly are not in its product market under the *DuPont* test, which requires "price, use and qualities" to be considered when characterizing the market.²⁹⁴

In support of its position, Justice relies principally on the testimony of Dr. Harold H. Wein, its economic expert and a university business school professor.²⁹⁵ Dr. Wein testified that, in addition to retail and wholesale markets for firm electric power, there is a third separate relevant market, a bulk power exchange market between [generation and transmission] utilities sometimes called the regional power exchange market. The "Michigan Pool" consisting of Consumers Power (CPCO) and Detroit Edison (DE) is an instance of this market. This pool is also connected with a larger grouping including large private utilities in Indiana, Illinois, and Ohio, and also Ontario-Hydro in Canada via connections of CPCO and DE.

Various kinds of purchases and exchanges of bulk power occur in this market such as short term firm power exchanges, emergency and scheduled maintenance exchanges resulting from outages of particular units, seasonal exchanges, economy energy and energy from shared

²⁹²*Consumers' Appeal Brief*, p. 164.

²⁹³*Justice's Opening Brief on Appeal*, p. 43; also see *Justice's Opening Brief Below*, p. 63.

²⁹⁴*United States v. E. I. du Pont, supra*, 351 U.S. at 404.

²⁹⁵Dr. Wein is a professor at the Graduate School of Business Administration at Michigan State University, a position he has held since 1959. From 1961 through 1963 he was on leave while serving as Chief Economist and Head of the Office of Economics of the Federal Power Commission. Thereafter, with the aid of Mr. Aymond, Chairman of the Board of Consumers, and others he established the Institute of Public Utilities at Michigan State University in 1965. Before becoming a professor at Michigan, he was Associate Professor of Economics and Industrial Administration at the Carnegie Institute of Technology, a consulting economist for industry, principal economist of the Antitrust Division of the Justice Department (where he also served as special advisor to the Attorney General on antitrust problems in the steel industry), principal economist in the Office of Price Administration, a senior statistician with the Army Air Forces, a principal economist in the War Production Board and a junior economist in the U.S. Commerce Department. He holds a masters degree in economics from Columbia University and a Ph.D. in economics from the University of Pittsburgh. Tr. fol. 3979 at 1-7.

pool units under the earlier Michigan Pool Agreement [D.J. Exh. No. 71] and wheeling services.²⁹⁶

After describing Consumers' coordination transactions within this market and in particular its contractual relationships with the Detroit Edison Company in the Michigan Pool,²⁹⁷ Dr. Wein explained that (Tr. fol. 3979 at 61):

A "pool" is, thus, a market because energy flows to and from the members are in fact paid for according to predetermined agreement between the members. It is the market which I have previously referred to as the bulk energy exchange market, or the regional power exchange market. This "market" is a very special market; it is not entered to sell electric power to the other members for the purposes of making a profit thereon, but rather for the purposes of reducing the costs of generation for each pool participant in order thereby to effectively compete in final electric power markets. It is a method of enabling each company to optimally combine the factors of production, which without this "market" would result in higher costs of operation and higher capacity costs.

Consumers rebuts Dr. Wein's position with the argument, succinctly presented by its own economic expert, Dr. Pace,²⁹⁸ that

The Department's attempt to differentiate between firm or wholesale power and nonfirm or coordinating power ignores the substitutability that actually exists in the market. By definition, firm power results from the electrical interconnection of a series of nonfirm sources of power. The mutual emergency support available from an interconnection with an adjacent system, for example, is identical in function to the emergency backup provided by the installation of a new gas turbine generating unit on one's own system and, to be acceptable, the terms of any interconnection arrangement must be competitive with the cost of installing additional generation. Similarly, firm wholesale purchases are

²⁹⁶Tr. fol. 3979 at 54-55.

²⁹⁷*Id.* at 57-60. A "pool" agreement is a comprehensive coordination arrangement between two or more utilities, usually encompassing both operational and developmental coordination, whereby the utilities essentially plan and operate their system as one. *Id.* at 60.

²⁹⁸Dr. Pace is an economist and Vice President of National Economic Research Associates, Incorporated (NERA), consulting economists. He joined NERA in 1970 after earning in that year a Ph.D. in economics (specializing in the areas of industrial organization and public utility economics) from the University of Michigan. Since joining NERA, Dr. Pace has directed or assisted in projects dealing with competition and regulation in the electric utility industry. Tr. fol. 7239 at 1-2.

substitutable and therefore must be competitive with the power that could be obtained from the combination of several nonfirm sources.²⁹⁹

For the reasons which follow we find the Department's position the one soundly based. We therefore conclude, as Justice would have us do, that electric power supplied under coordination agreements is distinct from firm bulk (*i.e.*, wholesale) power and comprises a discrete product market of its own.³⁰⁰

(a) **Functional differences.** We have no quarrel with the relevant product market tests that Consumers would have us apply. *DuPont, supra*, is, as the company says, the leading Supreme Court decision in the area. It holds in essence that after due consideration has been given to their "price, use and qualities," products belong in the same market where they have "reasonable interchangeability." 351 U.S. at 404. Put another way by the Court, the "[d]etermination of the competitive market for commodities depends on how different from one another are the offered commodities in character or use [and] how far buyers will go to substitute one commodity for another." *Id.* at 393. Our difficulty with Consumers' position centers not on the test but in its application.

No one disputes that electricity is fungible; a user cannot distinguish between electricity generated by a nuclear power plant and that generated by a facility which burns a fossil fuel. Nor does any party assert that the recipient of power delivered in bulk can tell by its physical characteristics whether it has been furnished under a coordination arrangement or a wholesale power

²⁹⁹Tr. fol. 7239 at 33.

³⁰⁰The staff pressed but one relevant product market on the Board below, that for "bulk power services" consisting of (but not necessarily limited to):

1. Bulk power or energy at wholesale for resale.
2. Bulk power or energy for coordination of expansion of generating capacity.
3. Coordinated planning.
4. Coordinated operations.
5. Interconnection and coordination of reserve capacity levels.
6. Transmission services including "wheeling."

The staff argues that it is appropriate to group these various transactions in one market because each "has one, and only one function, *i.e.*, to produce firm power" *Staff's Proposed Findings and Conclusions*, pp. 32-33.

Except for its inclusion of bulk power sold at wholesale, the staff's proposed market is essentially identical to the "coordination services" market urged by Justice. However, as we explain in the following pages, wholesale power and power obtained under coordination arrangements do not fall within the same product market. Accordingly, we reject the staff's proposed bulk power service market. Our main point of disagreement is that the *raison d'etre* for wholesale power transactions is not, as the staff suggests, "to produce firm power." Wholesale power is firm power in bulk. See fn.266, *supra*.

contract. What distinguishes the latter two are the terms under which power is supplied. This is the consideration that is significant for relevant market purposes.³⁰¹

The product marketed by electric utilities to their wholesale (and, for that matter, to their retail) customers is “firm power.” As Dr. Pace, Consumers’ principal economic expert, expressed it: “the product really being demanded by the electric utilit[ies] is firm power to turn around and sell to [their] customers.” Tr. 7543. We observed earlier that “firm power” has a specific meaning in the industry. It refers to a dependable, uninterrupted, long-term supply of electric power; “wholesale power” is firm power in bulk.³⁰² And Consumers’ Vice President for Electric Planning, Mr. Mosley, testified that a commitment to supply wholesale power “involves an obligation and responsibility to provide uninterrupted service to the extent that it is practicable, just as . . . to any retail customer.” Tr. 8452, 8459. A supplier of wholesale power consequently plans and operates its system to insure that a continuous flow of firm power in bulk is available to the buyer.³⁰³ For this reason a utility serving retail customers may rely entirely and confidently on purchases of wholesale power for its needs.³⁰⁴

Electric power furnished under coordination agreements, however, is supplied under conditions such that a utility may not rely on it exclusively—or even in large measure—to satisfy the power demands of its customers. This is inherent in the nature of coordination agreements. These generally oblige the supplying utility to deliver power if it has power surplus to its own needs but impose no duty on the supplier to insure the availability of such a surplus. For example, both emergency power and economy power (types of coordination services) are supplied solely on an “if and when available” basis; to the extent either is available a purchaser may have them—but there is no guarantee that either will be available at any specific time.³⁰⁵ Short-term power, maintenance power and seasonal power—also under the coordination services rubric—are contracted for on a relatively short-run basis. The selling utility will agree to make such power available only where, in its own judgment, it believes it will have surplus capacity

³⁰¹We note in passing that identity in physical characteristics does not preclude products from being in different antitrust markets depending on their price and use. See, e.g., *Bergjans Farm Dairy Co. v. Sanitary Milk Producers*, 241 F. Supp. 476, 478-79 (E.D. Mo. 1965), *affirmed*, 368 F.2d 679 (8th Cir. 1966) (raw milk for retail fluid purposes forms one market; the same milk wholesaled for manufacture into cheese or other dairy products forms another).

³⁰²See p. 936, *supra*.

³⁰³See Paul, Tr. 7940-41; Aymond, Tr. 6065; Brush, Tr. 2076.

³⁰⁴As we pointed out in Part IV, nine of the small utilities within the relevant geographic market rely entirely on purchases of wholesale power to meet the sum power demands of their retail customers. See p. 939 and fn. 193, *supra*.

³⁰⁵See p. 955 and fn. 288, *supra*.

temporarily available on its system and usually reserves the right to terminate the service where unforeseen events eliminate that surplus capacity.³⁰⁶ Mr. Mosley confirmed this important distinction. He agreed that coordination arrangements did not obligate utilities to supply power on a sustained basis.³⁰⁷

³⁰⁶See, e.g., C.P. Exh. No. 11,108, Service Schedule D; C.P. Exh. No. 11,112, Article IV, Sections 2 and 3; D.J. Exh. No. 105, Supplements A and C. Also see Mosley, Tr. 8497-98.

Short-term power is on occasion referred to as "short-term firm power." See, e.g., Mayben, Tr. 2698; Wein Tr. fol. 3979 at 55. It is firm power in the sense that a utility will not enter a contract to deliver short-term power unless it has at the outset the necessary surplus capacity beyond its system's needs to provide power on a continual basis during the contract period. See Mosley, Tr. 8497. It thus differs from emergency power and economy energy transactions; under these the supplying utility makes no such commitment and accordingly can essentially stop service on an instant's notice.

Most coordination contracts, however, allow the supplying utility to limit delivery of short-term power even after it has been contracted for, where conditions not reasonably foreseeable (such as an emergency), arise which would make it "burdensome" for the supplying utility to continue delivery. C.P. Exh. No. 11,108, Service Schedule D; C.P. Exh. No. 11,109, Service Schedule D; C.P. Exh. No. 11,106, Article V, Section 3; C.P. Exh. No. 11,112, Article IV, Sections 2 and 3; D.J. Exh. No. 105, Supplements B and C; C.P. Exh. No. 12,024, Supplements B and C. Thus short-term power is contracted for on a more limited and less reliable basis than wholesale power.

Seasonal power, as its name suggests, is contracted for a winter or summer generating season. Among the coordination agreements in evidence, seasonal power transactions are included only in those which impose a reserve responsibility for one or more of the parties. See pp. 1065-1066, *infra*.

These agreements provide that if a utility does not have generating capacity, or other sources of power sufficient to meet its reserve responsibility for the forthcoming season, that utility must either obtain power from outside sources or buy seasonal capacity, if available from the other party to the coordination agreement.

The supplier party then undertakes the responsibility for that generating season to deliver the power contracted for when called upon by the temporarily deficient party. D.J. Exh. No. 105, Sections 2 and 3; C.P. Exh. No. 12,024; D.J. Exh. No. 67, Article III, Section 2; D.J. Exh. No. 104A, Article 8, Service Schedule A. Thus, seasonal power transactions are in essence a means by which the contracting parties buy and sell reserve capacity on a seasonal basis, dividing the capacity costs for the group's reserves according to the reserve responsibility of each. Short-term power transactions are used in these agreements to divide capacity costs on a weekly basis. See, e.g., D.J. Exh. No. 67, Article III, Section 3; D.J. Exh. No. 105, Supplement C; C.P. Exh. No. 12,024.

³⁰⁷Mr. Mosley testified (Tr. 8461) that in operational coordination arrangements "there are three major kinds of power transfers . . . mutual emergency support, economy energy, and supplemental power." The amount of emergency power that a party to a coordination contract will deliver when requested depends on what "[it] can make available at the time without jeopardizing the service to [its] own customers." Tr. 8462. He also stated that (Tr. 8496) "[Economy energy] is not a firm transaction. The arrangements involve a privilege that the

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The point we are driving at is this. An obligation to supply power under coordination arrangements is of a substantially lesser magnitude than an undertaking to supply wholesale power. The latter is a firm commitment upon which the purchaser can rely to meet the demands of its customers; the former is no more than one factor of production in the makeup of firm power (pp. 972-973, *infra*), but is by no means the functional equivalent of that power.

There is no serious dispute about the fact that a utility without any generating capacity of its own—the situation of nine of the smaller utilities in this case—cannot rely on coordination power to meet its customers' first power demands. Indeed, with commendable candor Consumers' witness Dr. Pace, on cross-examination by counsel for the Department of Justice, acknowledged "there would be no point" for such a utility to contract for coordination power and associated services.³⁰⁸ That utility, until it acquires its own generating facilities, has no choice but to satisfy its bulk power requirements by purchasing wholesale power. Coordination power services are not useful to it and for its purposes are not functionally interchangeable with wholesale power.³⁰⁹ In short, given the nature of coordination power, such buyers literally cannot substitute coordination power for wholesale power as a long-term source of firm electric power. Consumers does not dispute the point.³¹⁰

Of course a utility with some generating capacity of its own can make use of coordination arrangements. This is because, as we describe shortly,

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supplying party can retract on an instant's notice." With respect to "supplemental power" transactions [e.g., short-term power, maintenance power and seasonal power], he explained that (Tr. 8497-98) "one party may find himself in a generally surplus condition for some period of time. That usually will be for a week, or a month or a few months, and another party, an interconnected party is temporarily deficient, possibly for such causes as new generation being delayed or by an extensive maintenance program. And the surplus party then will contract to deliver for a given period of time, a given number of kilowatts of power with associated energy."

³⁰¹(Tr. 7547):

- Q. [By Justice's counsel] . . . Now if I'm a full-requirements distribution system would I be interested in purchasing economy energy or emergency power?
- A. [By Dr. Pace]. Well, you're getting that through the wholesale purchase.
- Q. No sir. Would I go around looking for a contract for the supply of emergency power or economy energy?
- A. There would be no point.

³⁰⁹Mayben, Tr. 2679, 2697-98. Also see Pace, Tr. 7544, 7547.

³¹⁰"Of course, a system cannot rely upon coordination power exchanges independent of self-generation and/or wholesale [power] for the purpose of providing firm power to retail customers—the ultimate product in this industry." *Consumers' Appeal Brief*, p. 162, fn. 233.

power delivered under coordination arrangements is—or can be used as—an element in producing firm power. But it does not follow even in this situation that coordination power and wholesale power are “reasonably interchangeable” in the sense that the term was used by the Court in *DuPont*. The reason why not is cost.

Manifestly a long-term source of firm bulk power—*i.e.*, wholesale power—is physically substitutable for a relatively short-term, interruptible supply of bulk power—*i.e.* coordination power. From purely a *functional* standpoint, a utility could cover outages with a reserve of wholesale power in lieu of emergency power or some other suitable form of coordination arrangement. But while one could conceivably carry coal in Cadillacs, prudent businessmen normally do not do so. To be in the same market, products must not only be functionally interchangeable, they must be reasonably so.³¹¹ And case law (and common sense) teaches that the relative cost of the different products is a key factor in determining that reasonableness. *United States v. DuPont, supra*; also see *Brown Shoe Company v. United States, supra*, 320 U.S. at 325.³¹² We therefore examine what the record shows about the costs of wholesale versus coordination power.

(b) **Price differentials.** We have already described the differing terms on which wholesale power and coordination power are contracted. Because these differences have direct effect on their respective prices, we rehearse them briefly here.

In a wholesale arrangement the selling utility undertakes a contractual obligation, normally for a period of 3 to 5 years,³¹³ to meet some or all of

³¹¹Both Justice and Consumers cite *United States v. Charles Pfizer & Co.*, 246 F. Supp. 464 (E.D. N.Y. 1965), as a leading case. There the court pointed out that two questions must be answered in determining whether, under the *DuPont* test, two products are competing in the same market: first, whether the two are functionally interchangeable—*i.e.*, “whether they can be used for the same purpose” and, if so, whether they are reasonably interchangeable—*i.e.*, the “willingness or readiness [of purchasers] to substitute one for the other.” 246 F. Supp. at 468.

³¹²Even if there is some overlap, products with significant economic disparities belong in distinct submarkets. *United States v. Tidewater Marine Services, Inc.*, 284 F. Supp. at 330 (crew boats capable of carrying relatively small amounts of cargo form a different submarket than utility boats which can carry personnel, but are capable of transporting hundreds of times the amount of cargo). Also see *United States v. Grinnell, supra*, 384 U.S. at 574.

³¹³Mr. Paul who, among other duties, is Consumers’ General Supervisor for wholesale sales (Tr. 7805-06), testified that the majority of Consumers’ wholesale contracts run for an initial time period of three to five years. Tr. 7948. See, *e.g.*, C.P. Exh. No. 11,309, Section 10 (Contract for Electric Service Between Consumers Power Co. and the City of Charlevoix dated 1973); C. P. Exh. No. 11,310, Section 11 (Contract for Electric Service Between Consumers Power Co. and the City of Coldwater dated 1972). (Mr. Paul testified that these two contracts are representative of Consumers’ wholesale agreements. Tr. 7939.) After the initial term expires the agreements are automatically renewed on a yearly basis unless either party gives written notice to the other, normally 24 months prior to the date it desires termination of the contract. See C. P. Exh. No. 11,310, Section 11; C. P. Exh. No. 11,309, Section 10.

the firm bulk power requirements of its wholesale customer and the seller must plan and operate its bulk power system accordingly.³¹⁴ The seller thus must not only allocate a sufficient amount of its baseload, intermediate and peaking generating capacity to meet its wholesale customer's fluctuating power demands but, as described, must also have sufficient reserve capacity on hand to cover forced or scheduled outages of these plants. In short, as alluded to by Dr. Pace, a purchaser of wholesale power is buying a "package of services," of which coordination power is but a segment.³¹⁵

In a coordination agreement, on the other hand, the utilities are not contracting to buy and sell power on a long-term, firm basis. Rather it is an arrangement whereby the parties agree to buy (or to sell) energy from surplus generating capacity on terms designed to reduce the overall cost of production to both of them. The seller's production cost is reduced by its ability to make use of (and charge for) some of its surplus generating capacity; the buyer's by satisfying part of its power needs at surplus prices. In these arrangements there is obviously no duty on the seller to insure continual availability of surplus power.

These differences between the terms under which coordination power and wholesale power are marketed are reflected in the prices charged for each product. Wholesale power rates are generally based upon the supplying utility's systemwide average costs, each wholesale buyer paying a share of the selling utility's total cost of production and, accordingly, all the capital and operating costs associated with the selling utility's bulk power facilities (generation and transmission) are included in the wholesale rate calculation.³¹⁶ Coordination power rates, on the other hand, tend to reflect in large measure the supplying utility's out-of-pocket or incremental costs.³¹⁷

Typical of the industry, Consumers' wholesale rates are comprised of two components: A "capacity" or "demand" charge based on the maximum power demand (*i.e.*, kilowatts) that the buying utility places on Consumers' system, and an "energy" charge based on the actual amount of

³¹⁴Consumers' wholesale contracts specify the amount of power contracted for delivery. This is referred to as a "capacity reservation." Paul, Tr. 7940. See, *e.g.*, C. P. Exh. No. 11,309, Section 1. The company plans its system on the basis of this capacity reservation (Paul, Tr. 7940-41), but it will permit an increase in the capacity reservation if it has the power available. See *e.g.*, C. P. Exh. No. 11,309, Section 1.

³¹⁵Pace, Tr. 7543, 7547 (see fn. 308, *supra*).

³¹⁶See Jefferson, Tr. 8287-95. Mr. Jefferson is Consumers' Executive Director of Rates, Research and Data Control (Tr. 8274). The departments under his direction are generally responsible for formulating Consumers' wholesale and retail electric rates, Tr. 8275, but not the rates used in coordination agreements. Tr. 8333-34.

³¹⁷See p. 967, *infra*. Also see Brush, Tr. 2086.

electric energy (*i.e.*, kilowatt-hours) delivered.³¹⁸ The energy charge is designed to recover actual production costs, *e.g.*, fuel, labor and maintenance. It is calculated on the number of kilowatt hours of energy that Consumers delivers to the buying utility.³¹⁹ The capacity charge serves another purpose. It is designed to recover that portion of Consumers' capital investment in electric plant necessary to supply the buyer's power needs. Because Consumers must have generating capacity to meet the buyer's demands at all times, Consumers bases the monthly capacity charge on the maximum power demand (called the "billing demand")³²⁰ that the buying utility places on Consumers' system in that month. There is one important exception, however, known in the industry as the "ratchet clause." Under the ratchet clause, "a customer's billing demand [for any particular month] can never be less than 60 percent of the highest billing demand which [it] created in the previous [eleven] months."³²¹ The ratchet clause has a purpose; it serves to insure that the wholesale customer pays some portion of Consumers' continuing investment costs in the electric plant that the company must maintain to serve the purchaser's intermittent power needs on a firm power basis.³²² (Apparently similar in purpose is the "minimum charge" provision included in Consumers' wholesale contracts.)³²³ For a wholesale customer obtaining all its bulk power needs from Consumers, the ratchet clause is normally of little practical consequence. Such a system's power demand in any given month will most likely exceed 60 percent of its highest demand for the preceding eleven.³²⁴ The situation is

³¹⁸C. P. Exh. No. 11,003 (Consumers' wholesale rate schedule which became effective June 7, 1973, Jefferson, Tr. 8430). Also see Jefferson, Tr. 8311, and Wolfe, Tr. 1755-56. Consumers files with the Federal Power Commission a wholesale rate generally applicable to its wholesale customers. Jefferson, Tr. 8310-11.

³¹⁹See C. P. Exh. No. 11,003.

³²⁰The billing demand is the "30-minute period of maximum use in the billing month." C. P. Exh. No. 11,003.

³²¹Jefferson, Tr. 8309-12.

³²²*Ibid.* Ratchet clauses, though common in the industry, are not universal. *Id.* at 8407.

³²³See C. P. Exh. No. 11,310, Section 6 (a minimum monthly charge of \$10,000); D. J. Exh. No. 64, Section 6 (Contract for Electric Service Between Consumers Power Co. and Northern Michigan Electric Cooperative dated 1967; minimum monthly charge of \$5,000). The capacity reservation (see fn. 314, *supra*) in both contracts was 10 MW.

In Consumers wholesale rate schedule filed with the FPC which took effect in June 1973, C. P. Exh. No. 11,003, Consumers' PP-1 rate (the wholesale rate offered to utilities which buy only part of their firm bulk power requirements from Consumers) sets out a standard formula for calculating the minimum charge for partial requirements customers. This charge is computed by applying the capacity charge to the capacity reservation in effect. Thus if a utility contracted for 10 MW of power from Consumers, it would, using the 1973 rates, pay at least \$26,140 per month.

³²⁴Chayavadhanangkur, Tr. 5212-13.

likely to be otherwise, however, where less than all bulk power needs are purchased.³²⁵

Charges under coordination arrangements vary depending on the particular coordination contract and the type of transaction involved. Some power exchanges are normally compensated for solely on the basis of an energy charge. Examples of such exchanges are economy energy (see fn. 288, *supra*), dump energy (*ibid.*) and emergency power. (As indicated earlier, the charge for emergency power is often based on the supplying utility's out-of-pocket cost plus 10 percent. See p. 955, *supra*, and fn. 286.) Other coordination arrangements, maintenance power, short-term power and seasonal power, for example, usually carry both a capacity charge and an energy charge.³²⁶ Because these transactions are short-term, however, a utility may contract for generating capacity for the specific period in which it expects to be deficient, be it a week, a month or a generating season, thus avoiding the ratcheting effect of capacity charge for succeeding periods. See fns. 306 and 307, *supra*. Again, the energy charges for these transactions are most often calculated as cost plus 10 percent of the supplying utility's out-of-pocket costs.³²⁷

The cost difference between wholesale and coordination power stems principally from the wholesale "capacity charge" and the "ratchet clause" associated with it. Coordination agreements have either no capacity charge or one limited to the period when the excess capacity is actually needed. Not so under wholesale power agreements. Consumers' wholesale rate schedules, for example, include capacity charges based on the largest demand during a given month and 60% of that charge for the next eleven months. That capacity charge must be paid each month if no wholesale power were supplied by Consumers during those succeeding months. This "ratchet clause" imposes an enormous cost on a buyer who needs, let us say, only 10 MW of power for a limited time to cover an emergency outage and is restricted to using wholesale power for this purpose.

To illustrate this, assume for the moment that a utility's reserve capacity is 10 MW shy of that needed to cover the loss of its largest generating unit, that the unit is down for a week, and that the utility is so interconnected that

³²⁵It is possible for a utility to purchase wholesale power and coordination power simultaneously, the former in lieu of self-generation to meet a portion of its firm power requirement, the latter to supplement its own generation by which it meets the rest of its firm power demands. This possibility is explored below, pp. 1058-1061.

³²⁶Mosley, Tr. 8498. Also see fn. 288, *supra*. Unit power is also comprised of a capacity charge and an energy charge both of which are based on the cost of the particular unit. See fn. 278, *supra*.

³²⁷See, e.g., C. P. Exh. No. 11,108, Schedule D; C. P. Exh. No. 11,109, Schedule D; D. J. Exh. No. 105, Supplements A and C.

it may either (a) rely on a reserve sharing agreement with some other utility or (b) purchase wholesale power from Consumers. Whether it takes option (a) or (b), the cost of the energy delivered to it—the energy charge—would be roughly the same.³²⁸ With regard to the capacity charge, however, the picture changes dramatically. Under the reserve sharing arrangement (option (a)), the utility would incur a capacity charge at a rate of \$5,000 per week for one week, or \$5,000.³²⁹ But under option (b), the wholesale contract with Consumers, the buyer would have to pay a capacity charge for a full month figured on the highest power demanded, some \$26,140.³³⁰ Additionally, even if the receiving utility never demanded another kW under the wholesale power agreement with Consumers, the ratchet clause in the agreement would add a capacity charge of \$15,860 for each of the next 11

³²⁸Under Consumers' wholesale rate schedule (PP-1 rate) the energy charge would be \$12,600 if the 10 MW of power were utilized for the entire week. C.P. Exh. No. 11,003. Under most coordination arrangements the energy charge would be 110 percent of the supplying utility's out-of-pocket costs. Using the coordination agreement between Consumers and the M-C Pool (which has a minimum energy charge), the cost of energy would be at least \$13,440.

³²⁹Strictly speaking, most of the coordination agreements in evidence limit the supplying utility's obligation to provide emergency power to 48 hours, and for this period impose no capacity charge. Thus, under most of the coordination agreements in evidence, the utility would pay no capacity charge whatsoever if it were able to repair generation and thus quit drawing emergency power within 48 hours. It would pay only an energy charge for the energy actually delivered.

Under these coordination arrangements, if the emergency continues beyond 48 hours the utility with the emergency may contract for short-term power (or its equivalent) assuming the supplying utility has excess power available. Normally this power is contracted for on a weekly period, and involves a weekly capacity charge. See C. P. Exh. No. 11,112, Article IV, Sections 1 and 2 and Service Schedule B-1; D. J. Exh. No. 105, Supplement B; C. P. Exh. No. 11,109, Service Schedule A; C. P. Exh. No. 11,108, Service Schedule A; C. P. Exh. No. 11,106, Article V, Sections 2 and 3. Also see Wolfe, Tr. 2062; Gutmann, Tr. 4702-03.

In general terms the actual capacity per kWh per unit of time provided for in the coordination agreements in evidence appears to be roughly 15 to 25 percent less than that in Consumers' wholesale rates. Compare D. J. Exh. No. 105, Supplements A, B and C; C. P. Exh. No. 11,112, Service Schedules B and C; and C. P. Exh. No. 12,024 with C.P. Exh. No. 11,003 (PP-1 rates). Also compare C. P. Exh. No. 11,106, Supplement S; C. P. Exh. No. 11,108, Service Schedule D; C. P. Exh. No. 11,109, Service Schedule D; and D. J. Exh. No. 76, Service Schedule D, with D. J. Exh. No. 64, Section 6.

The capacity charge in the example above was calculated on the basis of the highest weekly capacity charge in these coordination agreements, which is \$0.50 per kilowatt of capacity per week. See D. J. Exh. No. 105, Supplement B; D. J. Exh. No. 92, Service Schedule B. Thus 10,000 kW of power bought at this rate would cost \$5,000.

³³⁰Under Consumers' wholesale rate schedule for those customers that buy only part of their firm bulk power from Consumers, the monthly capacity charge is \$2.77 per kW for the first 2,200 kW of the billing demand (see fn. 320, *supra*) and \$2.57 per kW for demand above 2,200 kW. Applying this rate to 10,000 kW demand gives a monthly capacity charge of \$26,140. C. P. Exh. No. 11,003 (PP-1 rate).

months, or some \$200,600 in total.³³¹ The cost disparity is, obviously, substantial. Our conclusions in this respect are confirmed in the testimony of Mr. Mayben, Justice's principal expert witness on bulk power supply practices. He used a different but analogous example to illustrate the cost difference between wholesale power and coordination power. He assumed a forced outage for one hour of a 25 MW unit. In an approximate calculation using earlier rates, under Consumers' wholesale contract the capacity charge would have been \$300,000; under a coordination arrangement, \$1,750.³³² No responsible utility would invoke option (b) (wholesale power from Consumers) to make up a temporary generating deficiency in circumstances where option (a) (the reserve sharing arrangement) was open to it; the former simply costs too much. And similar cost disparities exist between most other kinds of coordination power arrangements on one hand and wholesale power on the other.³³³

We do not mean to imply that the seller of wholesale power in our example, whether it be Consumers or any other utility, is necessarily overreaching or gouging the buyer. As we explained before, in terms of obliga-

³³¹As we noted above, the ratchet clause results in a wholesale customer's billing demand for any month never being less than 60 percent of the highest billing demand it created in the previous eleven months. See page 966, *supra*. Thus, given that the utility drew 10 MW during the month that the emergency occurred, its billing demand in each of the next 11 months would be at least 6 MW. Applying Consumers' wholesale rate to this amount (see fn. 330, *supra*) yields a capacity charge of \$15,860 per month for each of the eleven months following the emergency. C. P. Exh. No. 11,003 (PP-1 rate).

Moreover, if the utility in our example has entered a wholesale contract with Consumers for 10 MW as standby to cover the possible failure of its generation, it could not avoid that \$26,000 cost. Under Consumers' minimum charges it would have to pay \$26,140 per month regardless of whether it even drew upon the 10 MW of power. See fn. 323, *supra*. In our example, we utilized the ratchet provision because some of Consumers' wholesale customers generate part of their firm bulk power requirements and the witnesses' testimony from which this example is drawn utilized the ratchet clause by way of explanation. Mayben, Tr. 3838-43. Also see Wolfe Tr. 1564-73; Munn, Tr. 4071-72.

³³²Mayben, Tr. 3838-43.

³³³For example, both economy energy (which involves only an energy charge equal to half the incremental difference of the operating costs of the two units involved) and dump energy (which involves sale of surplus hydroelectric energy) are manifestly less expensive than wholesale power. See fn. 288, *supra*. One exception, however, may be unit power. As indicated in fn. 278, *supra*, the charge for unit power is based on the capital and operation costs of the particular unit. For a new unit this may be higher than the system's average cost which would include plants of older vintage. See Jefferson, Tr. 8293. However, assuming that the purchase were for the life of the unit, this would change. See Aymond, Tr. 6352-53. Moreover, with respect to purchases in a staggered construction arrangement, it must be kept in mind that the utility is also benefitting by deferring the costly construction of a generating facility of its own; see fns. 274 and 278, *supra*.

tion placed on the supplier, wholesale power is a vastly different animal than coordination power; the price differential is intended to reflect the cost of meeting that higher obligation. Our point is, rather, that wholesale power and coordination power are two different products. A buyer with needs that could be satisfied by power supplied under available coordination arrangements would scarcely be likely to contract for wholesale power for that purpose. It makes little sense to lease a furnished apartment for a year to accommodate an unexpected visitor where renting a motel room for a week would suffice.

In sum, this substantial price disparity is another indication—and we think a compelling one—that these products are not in the same market. “To ignore price in determining the relevant line of commerce [*i.e.*, product market] is to ignore the single most important, practical value in business.” *United States v. Aluminum Company of America*, 377 U.S. 271, 276 (1964).³¹⁴

(c) **Commercial practices.** Consumers cites two occasions on which the smaller utilities allegedly chose not to exchange coordination power but to rely exclusively on self-generation and wholesale power. The company would have us conclude from them that “the record clearly establishes that coordination power is also reasonably interchangeable with wholesale purchases and self-generation.” The instances to which Consumers points are not persuasive; none of the utilities involved turned to wholesale power where the option of engaging in coordination transactions was available.

The first involves “the municipal systems of Hart, Zeeland, Lowell and Portland” which, the company says, “desired to continue their existing

³¹⁴The Court in that case held a 50 percent price differential between aluminum conductors and copper conductors placed them in separate antitrust markets. It reasoned in full as follows (*ibid.*):

The choice between copper and aluminum for overhead distribution does not usually turn on quality of the respective products, for each does the job equally well. The vital factors are economic considerations. It is said, however, that we should put price aside and [*United States v. Brown Shoe, supra*] is cited as authority. There the contention of the industry was that the District Court had delineated too broadly the relevant submarkets—men’s shoes, women’s shoes, and children’s shoes—and should have subdivided them further. It was argued, for example, that men’s shoes selling below \$8.99 were in a different product market from those selling above \$9. We declined to make price, particularly such small price differentials, the determinative factor in that market. A purchaser of shoes buys with an eye to his budget, to style, and to quality as well as to price. But here, where insulated aluminum conductor pricewise stands so distinctly apart, to ignore price in determining the relevant line of commerce is to ignore the single most important, practical value in business.

Accord, Avnet, Inc. v. FTC, supra, 511 F.2d at 77; *Reynolds Metals Co. v. FTC*, 309 F.2d 223, 229 (D.C. Cir. 1962); *A. G. Spalding & Bros., Inc. v. FTC*, 301 F.2d 585 (3rd Cir. 1962).

purchase agreements with Wolverine rather than become ‘full-fledged participants’ in the [M-C] Pool.”³³⁵ But that is not the true picture. Article XII, Section 12.01, of the M-C Pool Agreement (D.J. Exh. No. 104A), indicates that the pool members do engage in coordination transactions with Lowell, Hart and Zeeland. The transactions, however, are accounted for under the agreement as transactions between the cities as “associates of Wolverine” and Wolverine.

The second instance is Traverse City’s 1967 search for a “stronger interconnection to support its own generation.”³³⁶ With this in mind, the city entered negotiations with the Northern Michigan and Wolverine cooperatives and the City of Grand Haven which led eventually to formation of the M-C Pool.³³⁷ When the discussions were fairly far advanced, Traverse City asked Consumers about an “interconnection agreement.” The company responded by offering its standard wholesale partial purpose (PP-1) rate and an interconnection arrangement based on the “Holland formula.” (See p. 1065, *infra*.) Traverse decided that the M-C “power pooling arrangement” and additional generation “. . . was the most economical and best alternative for the city,”³³⁸ and rejected wholesale power purchases from Consumers as an alternative. These examples thus confirm rather than undercut the lack of reasonable interchangeability between coordination services and wholesale power.³³⁹

Consumers’ own coordination practices afford further support for the view that power acquired under wholesale contracts is not considered a substitute for power under coordination agreements. During the years 1970-73, for example, Consumers was deficient in generating capacity because of delay in bringing new plants on line and because of extended outages at its Palisades plant.³⁴⁰ Consumers did not buy long-term wholesale power to cover that deficiency. Rather, it invoked the terms of its own coordination agreements to obtain seasonal capacity, short-term

³³⁵*Consumers’ Appeal Brief* at 162, fn. 234. The M-C Pool is described at p. 944, above.

³³⁶Wolfe, Tr. 1561.

³³⁷Tr. 1562.

³³⁸Tr. 1563-64.

³³⁹Indeed, the record shows that three years earlier Consumers’ divisional manager for the Traverse City area wrote Consumers’ vice president “that it is most useless to try and sell the City of Traverse City a wholesale contract while this condition exists,” the condition being a coordination agreement between Northern Michigan and Traverse City to exchange emergency energy. D. J. Exh. No. 175. Also see Wolfe, Tr. 1552; Steinbrecher, Tr. 1956-59; D. J. Exh. No. 240.

³⁴⁰Mosley, Tr. 8500-8503, 8692-94. Also see D.J. Exh. No. 21, pp. 8-9 and D.J. Exh. No. 21A, p. 4.

power, and other coordination services for itself to make up that generating shortage.³⁴¹ Indeed, in 1973 alone Consumers acquired nearly 20% of its power—at a cost of \$51,000,000—under coordination arrangements with other large utilities.³⁴² Consumers points out that this was a unique situation and that it does not plan and never has planned its system in contemplation of purchasing its bulk power requirements from other suppliers.³⁴³ But this is precisely our point. Coordination arrangements are not looked upon in the industry as a source of long-term firm bulk power, but rather as a low cost means of covering relatively short-term deficiencies of various types and for other temporary purposes. In short, because of its different “price, uses and quantities,” power supplied under coordination arrangements is a discrete product and in a different market than wholesale power.

(d) **Industry structure.** Consumers offers one additional argument for placing wholesale power supplies and power supplied under coordination arrangements in the same product market. Premised on the undisputed fact that “firm power results from the electrical interconnections of a series of non-firm sources of power,” Consumers argues that because differing combinations of nonfirm sources of bulk power are economically substitutable for wholesale power, all must be in the same product market. That product, in Consumers’ view, is “bulk power supplied to electric utilities for distribution and resale to ultimate customers.”³⁴⁴ Justice does not dispute that *self-generation* and *wholesale power* are reasonable substitutes for one another.³⁴⁵ But it does not agree that coordination power exchanged among utilities to supplement their self-generation and reduce their production costs is in that same market.

We think Justice is plainly correct not only for the reasons we have already set forth but for another as well: coordination transactions occur at a different level in the electric utility industry structure than wholesale power transactions.³⁴⁶ The final output of any utility operating generating and transmission facilities is firm power in bulk delivered to distribution points—their own or their wholesale customers’—where the power is transformed to lower voltages and subdivided for actual delivery to the retail customer. Exchanges of coordination power services are surplus power transactions among generating utilities which go into producing that

³⁴¹C.P. Exh. No. 12,022 at p. 424A-H (Consumers 1973 annual report to the Federal Power Commission). Also see citations in fn. 340, *supra*.

³⁴²*Consumers’ Appeal Brief*, p. 171 fn. 252; C. P. Exh. No. 12,022 at p. 424-A.

³⁴³*Consumers’ Appeal Brief*, p. 170.

³⁴⁴Pace, Tr. fol. 7239 at 33; see also *Consumers’ Appeal Brief*, pp. 152-64.

³⁴⁵See *Justice’s Reply Brief Below*, p. 56.

³⁴⁶*Cf., Avnet v. FTC, supra*, 511 F.2d at 78.

firm bulk power. In other words, as Justice's witness Dr. Wein testified,³⁴⁷ as Dr. Pace acknowledged,³⁴⁸ and as we stressed before, coordination power and associated services are factors of production, not the final product.

In most instances such a distinction, which relates to the structure of the industry, would automatically place the two in different markets (e.g., the market for sugar is different than that for candy). Nevertheless, Consumers' witness Dr. Pace had doubts whether a factor of production that functioned solely as one component in the final product could constitute a separate market.³⁴⁹ We harbor no such doubts for the cogent reasons expressed by the Ninth Circuit in *Case-Swayne Co. v. Sunkist Growers, Inc.*³⁵⁰ In that case involving "product oranges" (sold not as fresh produce but for making juice), the court of appeals explained:

While product oranges may have little, if any, value per se, the same is true of many raw products. The market for raw products is among the processors rather than the ultimate customer. We see no reason why the raw product may not be the relevant product market, even though it has little value in its raw state.

The fact that coordination power is used to augment a utility's self-generation in the production of firm bulk power, which is in turn economically substitutable for wholesale power, does not place all three in the same market. Consumers, by defining the product market to be all "bulk power supplied to utilities for distribution and resale to ultimate customer," has ignored the structure of the industry; it has collapsed two different functional aspects of electric utility operation—*i.e.*, generation and distribution—into one.

In the electric utility industry as in others, the manufactured product (here firm electric power) will eventually be sold to the retail customer. However, as is also true in most industries, there are on one side manufacturing and wholesale operations and on the other retail operations.

³⁴⁷Dr. Wein illustrated this point thus (Tr. 4000):

If you are a particular Company X and you enter a pool with Y or a set of agreements with Y in which you engage in reserve sharing and in which you are engaged in wheeling for each other and other practices of coordination of that sort, what you are dealing with then is a set of practices which allows you to combine the factors of production most optimally, so your output then is available for you at lower cost than a company absent these privileges would be engaged in

See also Mayben, Tr. 3702-03.

³⁴⁸Pace, Tr. 7562.

³⁴⁹Tr. 7562-65.

³⁵⁰369 F.2d 449, 457 (9th Cir. 1966), *reversed on other grounds*, 389 U.S. 384 (1967); also see *Union Carbide and Carbon Corp. v. Nisley*, 300 F.2d 561, 585 (10th Cir. 1961).

Operators on the retail level seek sources of wholesale supply—*i.e.*, firm power in bulk—from those at the manufacturing level. This defines the buyers and sellers of one product market: wholesale firm bulk power. See pp. 991-997, *infra*. Because of the peculiar characteristics of electricity (see pp. 950-962, *supra*), operators on the manufacturing level buy, sell and exchange surplus bulk power and associated services to improve the efficiency (*i.e.*, lower the cost) and reliability of their own operations. This delineates the buyers and sellers in another product market: coordination services.³¹

Of course, those at the retail level have an alternative to buying at wholesale—they can enter the manufacturing level themselves; *viz.*, become “vertically integrated” in the antitrust lexicon. And it is true that many if not most large utilities (including Consumers) are vertically integrated. But this does not detract from the fact that the electric utility industry is recognized as structured into discrete levels of operation—production and delivery of firm bulk power to distribution points, and retail distribution of power from those points³²—with separate relevant product markets at each level.

³¹In some instances a utility may utilize both self-generation and wholesale power to meet its retail load. To the extent that it depends on wholesale purchases, it is not a producer of firm bulk power but solely a buyer in the wholesale power market. However, such a utility would seek coordination services to supplement the generation it does have. Chayavadhanangkur, Tr. 5314. Also see Pace, Tr. 7558. Thus, a utility could simultaneously enter transactions in both the coordination services market and the wholesale power market. See pages 1058-1061, *infra*.

³²There are three distinct functions in supplying electricity to the ultimate consumer: generation, transmission and distribution. These functions correspond to the manufacture, transportation to market, and retail distribution of many products, except that electricity moves from the point of generation to the point of ultimate use in a continuous flow with the speed of light, 186,000 miles per second.

Generation takes place at hydroelectric plants which transform the energy of falling water into electricity or at steam-electric plants which generate electrical energy with heat derived from the fossil fuels and nuclear fission. Transmission is the transportation of electrical energy at high voltage from generating plants to bulk delivery points. Distribution completes the process of delivery to the individual consumer at lower voltage.

Generation and transmission facilities are as a general rule economically interdependent in that the choice of location, design, and scale of generating capacity must take into account the associated cost of transmission and vice versa. Responsibility for generation and transmission customarily go together. Distribution can be, and frequently is, conducted efficiently as a separate operation from generating and transmission.

FPC, 1964 *National Power Survey*, Part I at page 12. Also see Wein, Tr. fol. 3979 at 45-54.

That generation and transmission of firm bulk power is a function separate from that of retail distribution is evidenced by the fact that of the approximately 3,500 electric utilities in the United States slightly more than two-thirds operate solely at the retail distribution level. Wein, Tr. fol. 3979 at 27-8; FPC, 1970 *National Power Survey*, pp. I-1-19 to 12.

(e) **Coordination as a “bundle of services.”** As the Licensing Board recognized, coordination arrangements usually comprise several differing types of surplus power transactions and associated services. 2 NRC at 45. For the reasons detailed at length above, these various power transactions are not reasonably interchangeable with wholesale power. But neither are they necessarily interchangeable with one another. All, however, serve an essentially similar function. That function is facilitating production of firm bulk power at lower cost and with greater reliability by making profitable use of otherwise surplus generating capacity. These arrangements constitute a “bundle of services” which merits recognition as a distinct market similar to the way various services offered by commercial banks fall in one and the same product market. *United States v. Philadelphia National Bank, supra*, 374 U.S. at 356.

A similar conclusion was recently reached in closely analogous circumstances in *United States v. Hughes Tool Co.*, 415 F. Supp. 637 (C.D. Cal. 1976). The court there accepted as being in the same relevant product market a group of 36 different tools on the theory that they functioned together in the drilling, completion and working over of oil and gas wells. *Id.* at 640-41. Coordination services contracts serve similarly complementary functions. We find them fairly grouped together in one product market. *Accord, United States v. Grinnell, supra*, 384 U.S. at 572 (relevant market comprised of all central station alarm services); *Balfour v. FTC, supra*, 442 F.2d at 9-11 (relevant market comprised of all national college insignia-bearing goods even though members of each fraternity would only buy goods with their insignia); *British Oxygen Co., ___ FTC ___, 3 CCH Trade Reg. Rep. par. 21,063 at p. 20,910 (1975)* (relevant market comprised of all industrial gases), *reversed on other grounds, British Oxygen Co. v. FTC, ___ F.2d ___ (2d Cir. 1977)*.

Before we leave this area there are some loose ends to be tied up. One is the parties' disagreement over whether wheeling is properly considered a coordination transaction as Dr. Wein testified.³³³ Consumer agrees that transmission services are a necessary corollary service to coordination power exchanges, but contends that a wheeling arrangement as such—one utility facilitating a power exchange between two others—is usually not included in coordination agreements.³³⁴ The record is to the contrary. For example, two coordination agreements in evidence specifically provide for wheeling services.³³⁵ Moreover, the Edison Electric Institute (an association of large U. S. utilities) in its document, *Principles of a Coordination Agree-*

³³³Tr. 4000.

³³⁴See Slemmer, Tr. fol. 8838 at 21-22.

³³⁵D. J. Exh. No. 104A, Service Schedule E; C. P. Exh. No. 11,109, Schedule G.

ment, specifically includes “[t]ransmission capacity made available by one system for the interchange of power and energy between or among other systems”—in other words, wheeling—among the types of coordination services.³³⁶ We therefore find wheeling transactions properly classified as coordination services.

Finally, there is the question of “developmental coordination,” the construction of power plants on a staggered basis or as joint ventures by two or more utilities with the intention of sharing the power generated by them. We find it difficult to conceptualize how a joint venture project forms part of what Justice describes as a “market in which producers of firm electric power transact with one another for the necessary factors of bulk power production,” although the purchase and sale of “unit power” from such plants is within that market.³³⁷

(f) **Geographic market for coordination services.** Our finding that coordination services constitute a separate product market answers only half the problem; there remains the question of the relevant geographic market for that product. As we discussed earlier, it is in the context of that market that we must view the evidence bearing on the monopolization charges against Consumers.

The Board below noted that the Department of Justice did not attempt to establish exact metes and bounds for the “regional power exchange market” (as Justice terms the overall market for power supplied under coordination arrangements). 2 NRC at 107-08. Justice’s economic witness, Dr. Wein, did suggest that the “Michigan Pool” (*viz.*, Consumers Power and Detroit Edison) is an example of such a market. His testimony, however, went on to indicate that, through interconnections and agreements with other utilities and pools, the bounds of that market might also be viewed as going beyond the immediate service areas of the two utilities. Tr. fol. 3979 at 54-55.

The Department took the position that the “regional power exchange market by its very nature does not lend itself to precise geographic market definition. Electric utilities with access to this market range far and wide in search of useful power exchange transactions; they are not restricted to specific geographic limits or certain identified utilities with whom they may deal.”³³⁸ For these reasons, Justice argued that it need not establish the exact perimeter of this entire geographic market to show monopolization. In the Department’s view, it suffices to focus attention on Consumers’ actions in a smaller economic entity or “submarket” within that broader market.

³³⁶D. J. Exh. No. 167, p. 11. Also see Wolfe, Tr. 1603.

³³⁷See fn. 288, *supra*.

³³⁸The passage is quoted from pp. 85-86 of *Justice’s Opening Brief Below*. See also Mayben, Tr. 2767, 3703-05.

We agree with Justice's legal position. Where a discrete submarket exists within an overall geographic market, monopolization of the submarket is itself an antitrust violation. *Brown Shoe Co. v. United States*, *supra*, 370 U.S. at 336-37; *Case-Swayne Co. v. Sunkist Growers, Inc.*, *supra*, 360 F.2d at 455-59; *In re Luria Brothers and Co.*, *supra*, 62 FTC at 612-14. A submarket must correspond to commercial realities and be economically significant, *Brown Shoe*, *supra*, and its existence is a question of fact that must be "charted by a careful selection of the market area in which the seller operates and to which the purchaser can practicably turn for suppliers." *United States v. Philadelphia National Bank*, *supra*, 374 U.S. at 359.

The record discloses that the area to which the small utilities may turn for coordination services is limited to Consumers' service territory and nearby environs, as described above in Part IV. This is because where the smaller utilities are located, Consumers owns and operates the only transmission network interconnecting with larger neighboring utilities. As the Licensing Board found, "[m]ost of the small utilities in the relevant geographic market are too remote from" those larger utilities to build interconnecting transmission lines of their own at a reasonable cost. 2 NRC at 108. That Board was consequently led to find—correctly in our judgment—that the small utilities could enter bulk power transactions in the broader regional power exchange market only if Consumers would wheel power to them (*ibid*); a finding that Consumers does not dispute.

Manifestly, absent appropriate electrical interconnections between them, utilities cannot engage in coordination transactions. The smaller utilities are thus limited to (1) coordinating with one another, (2) coordinating with Consumers Power Company itself, or (3) using Consumers' lines to have coordination power wheeled to them from the regional power exchange market. The last option Consumers has so far foreclosed. These being the only choices open to them, there exists a geographic submarket for coordination services corresponding essentially to Consumers' general service area, for this is the area to which the smaller utilities, a significant group of purchasers, are confined by commercial realities.³⁹⁹

2. The Retail Market

a. Only Justice and Consumers analyzed the retail market in lower Michigan. They agree that the product involved is firm electric power sup-

³⁹⁹*Case-Swayne Co. v. Sunkist Growers, Inc.*, *supra*, 369 F.2d at 455-58; *Denver Petroleum Corp. v. Shell Oil Co.*, 306 F. Supp. 289, 304-06 (D.Colo. 1969); *Luria Bros. and Co.*, *supra*, 62 FTC at 612-13. See also *Brown Shoe Co. v. United States*, *supra*; *United States v. Pabst Brewing Co.*, 384 U.S. 546, 551-52 (1966); *United States v. Kimberly-Clark Corp.*, 264 F. Supp. 439, 455-56 (N.D. Cal. 1967).

plied by distribution systems to the ultimate retail user. Both parties also accept the Licensing Board's determination that the geographic market encompasses Consumers' present service area plus those additional areas which it could reasonably serve. The two disagree, however, about whether that market should be broken into submarkets reflecting the "commercial realities" of retail power distribution in lower Michigan as Consumers perceives them.³⁶⁰ The company proposed the existence of "two distinct relevant geographical markets": One "open," embracing those areas "where purchasers of retail power presently have a choice of electric supplier"; the other "closed," covering areas where "no present choice [of supplier] exists . . . and there is little likelihood that such a choice will exist in the foreseeable future."³⁶¹ This closed market Consumers would subdivide into (a) a "perpetual closed" submarket, consisting of those cities where the company is the sole supplier of electric power pursuant to a Foote Act franchise, and (b) a "long-run closed" submarket of cities and townships served by Consumers or some other private utility under 30-year franchises together with most cities served by municipal electric systems.³⁶²

Consumers justifies the division of the retail geographic market into "open" and "closed" areas on what it perceives as differing "legal and economic barriers" to competition in each.³⁶³ Consumers says that in lower

³⁶⁰Consumers developed this argument at length before the Licensing Board in its *Opening Brief Below* at 97-111 and in its *Reply Brief Below* at pp. 62-70. Consumers' appeal brief omits a retail market analysis as unnecessary "because retail sales are far removed from the question of bulk power supply and coordination with which this case is centrally concerned." *Consumers' Appeal Brief*, p. 179. We disagree. A utility's bulk power practices can have serious anticompetitive effects on the retail market as exemplified by the situation in *Otter Tail v. United States*, *supra*. Justice presses this issue on appeal. Accordingly, we will resolve it, the parties having fully litigated the question below.

³⁶¹*Consumers' Opening Brief Below*, pp. 97-111. In the open market Consumers includes "(1) the municipalities of Bay City and Traverse City, (2) the areas immediately surrounding the twenty-three neighboring municipalities which operate electric systems where the distribution facilities of these systems overlap or interface with those of Consumers Power Company, and (3) the areas where the distribution facilities of the Company and the cooperatives overlap"—to the extent the Michigan Public Service Commission's regulations, discussed above, see page 935, *supra*, permit retail customers a choice of electric suppliers. *Id.* at 100-101.

³⁶²*Id.* at 103-111. Consumers excludes Bay City and Traverse City from this submarket. See fn. 361, *supra*.

³⁶³Briefly, the "legal barriers" on which Consumers relies to support its position are (1) the statutory requirement that a private utility obtain a certificate of public convenience and necessity from the Michigan Public Service Commission before extending its service into an area already being served by a different private utility; (2) the MPSC's restrictions on door-to-door competition between private utilities; (3) Michigan law limiting retail service by a municipal electric system beyond its incorporated boundaries; (4) Federal law precluding rural

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Michigan, legal and economic restraints effectively preclude retail competition in the “closed” market and only in the “open” market is retail competition actually feasible. Reasoning from those premises, Consumers arrives at two related but distinct conclusions. The first is that the relevant geographic area in which to measure its retail market strength should be limited solely to those areas it denotes as “open” to competition. The second, as a corollary of the first, is that the legal and economic barriers to competition in the “closed market” preclude any inference that it possesses monopoly power in that market by virtue of its high market shares—77 percent of the “long-run closed” submarket and of course 100 percent of the “perpetual closed” submarket.³⁶⁴

Consumers made both these arguments below; in its appeal brief it presses only the latter.³⁶⁵ Both, however, hinge on what Consumers perceives as insurmountable barriers to competition. We discuss here the impact of these barriers and whether they justify subdividing the geographic market for retail power. Discussion of whether those barriers also preclude drawing any inferences about Consumers’ possession of monopoly power from the size of its market share we defer to Part VI, *infra*.

b. We have previously set out the judicial guidelines for fixing the boundaries of geographic markets and therefore need not rehearse them here. As we have noted, Justice and Consumers agree that the area where Consumers now distributes or reasonably could distribute electricity at retail defines the overall spread of the relevant geographic retail power market. As we see it, whether there are submarkets within that overall market depends on acceptance of the thesis that the relevant retail market should be limited to areas where the individual retail customers currently have a choice of electric supplier. There are few such areas in lower Michigan. That choice exists principally in Bay City and Traverse City, where there is door-to-door competi-

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electric cooperatives from initiating service in towns exceeding 1,500 in population; and (5) the current franchise laws in Michigan. (These legal constraints are described in detail in Part IV above.) The “economic barrier” on which Consumers relies is the large capital investment and attendant economic risks associated with entering the electric utility business, particularly in the perpetually closed submarket where a newcomer would be forced, according to Consumers, to compete at a door-to-door level. See *Consumers’ Opening Brief Below*, pp. 97-111; *Consumers’ Proposed Findings of Fact and Conclusions of Law*, pp. 12-18; *Consumers’ Appeal Brief*, pp. 144-50.

³⁶⁴Consumers further argues that state and Federal regulation in fact preclude it from having monopoly power in any market. We discuss this in Part VI, *infra*.

³⁶⁵Compare *Consumers’ Opening Brief Below*, pp. 97-111 and 136-45 with *Consumers’ Appeal Brief*, pp. 132-51 and 179-84.

tion between Consumers and the city-owned electric systems.³⁶⁶ The other areas where a choice of electric supplier may exist are the regions surrounding the 19 municipal systems located within Consumers' general service area and the rural areas where Consumers' distribution lines overlap the cooperatives'. The record confirms that door-to-door competition can, and to a certain extent does, exist in these areas³⁶⁷ and that in instances it may be

³⁶⁶Aymond, Tr. 6542; Paul, Tr. 7808. Also see D. J. Exh. Nos. 190-194. Consumers has Foote Act franchises for these cities.

³⁶⁷We have described in Part IV, *supra*, the potential for door-to-door competition between Consumers and the small utilities in lower Michigan. To recapitulate, the MPSC's single-phase rules, issued in 1966, preclude competition between the distribution cooperatives and Consumers for existing single-phase (residential and small commercial) customers and place restrictions on competition for new single-phase customers. See fn. 161, *supra*. No similar restrictions existed at the close of the record on competition for existing or new three-phase (industrial and large commercial) customers. The MPSC apparently does frown on competition for existing three-phase customers, Paul, Tr. 7846, and it does on occasion express its opinion as to which utility should serve a particular three-phase customer. See Paul, Tr. 7854-56.

The municipal systems do not fall under the jurisdiction of the MPSC and thus the MPSC's rules restricting door-to-door competition do not apply to possible competition between Consumers and municipal systems. However, the state laws enacted in 1974, which allow a municipal system to sell an unlimited amount of electric energy in areas contiguous to its boundaries, require the city to obtain the permission of the preexisting power supplier before extending service to its existing customers. Thus in practice competition in areas bordering the municipalities is limited to serving new customers.

We briefly list some of the actual and potential competition that is possible for individual retail loads in lower Michigan. For example: (1) Prior to the adoption of the MPSC's single-phase rules there was significant competition between the cooperatives and Consumers for both existing and new single-phase customers. Westenbroek, Tr. 982-87. The MPSC's single-phase rules "virtually" eliminated competition for existing single-phase customers. Westenbroek, Tr. 982; Paul, Tr. 7846.

There is, however, still some competition for new customers. Westenbroek Tr. 985, 1039; Paul, Tr. 8180. (2) In regard to three-phase loads, roughly speaking it is economical for a utility to extend a distribution line one mile to pick up a retail load of 1,000 kW. See Paul, Tr. 8085-90. Of Consumers' customers with loads over 3,000 kW, of which there are 129, 12 are within three miles of an existing cooperative's distribution line and located outside a community of 1,500, thus making it both economically and legally feasible for the cooperatives to serve them. Paul, Tr. 8085-90; C.P. Exh. No. 11, 305. (Mr. Westenbroek testified that larger industrial loads would help even out a cooperative's load demand, which is largely residential, and thus be beneficial to them. Tr. 952-53, 1034-35.) Also, there were some 4,500 to 5,000 new three-phase customers who from 1966 to 1971 located in the rural areas where both the cooperatives and Consumers are franchised to serve. See Pace, Tr. fol. 7239 at 29-30. (3) There may be door-to-door competition between Consumers and a municipal system in those areas the city has annexed. Paul, Tr. 7812-18. Further, there is actual competition outside corporate limits between Consumers and approximately half of the municipal systems within its general service area. See Paul, Tr. 7831-33. (4) In regard to possible competition between municipal systems and Consumers for new industrial loads, in 1972 for example, for the '68 industrial

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vigorous.³⁶⁸ The total amount of electric power sold in these areas, however, is small in terms of the total power sales in lower Michigan.³⁶⁹

Given the nature of electric power this is hardly surprising. Manifestly, a retail user cannot travel to different shopping malls in search of electric power. It is the supplier who must literally bring his product to the user's door. Moreover, to provide that retail service, a utility must build and operate a costly distribution network—towers, lines, transformers, *etc.* Duplicate systems would be inefficient, not to mention unaesthetic. Consequently, as the Supreme Court observed in *Otter Tail, supra*, it is recognized throughout the electric utility industry that “[e]ach town . . . generally can accommodate only one distribution system,” thus “making each town a natural monopoly market for the distribution and sale of electric power at retail.” 410 U.S. at 369. One would, therefore, generally expect little door-to-door competition for the sale of electric power at retail and that those areas where such competition did occur would be near the boundaries of the individual natural monopolies.

It is, however, precisely those limited areas between natural monopolies (in addition to Bay City and Traverse City) to which Consumers urges that we restrict our attention in determining the relevant retail market and in measuring its retail market strength. While we can certainly agree with Consumers that door-to-door competition in such areas deserves antitrust protection, at least equally deserving is competition for the right to be the sole distributor in these individual natural monopolies. We are ineluctably drawn to this conclusion by the Supreme Court's teachings in *Otter Tail v. United States, supra*, which Consumers apparently would have us ignore.

As detailed in the trial court's opinion in that case, the Otter Tail Power Company was a vertically integrated electric utility providing retail service to 465 municipalities in the States of North Dakota, South Dakota and Minnesota “pursuant to franchise agreements awarded to it by the city or town.

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plants constructed within [Consumers] general service area . . . 6 were located within or near municipalities that operated municipal electric systems.” Paul, Tr. 7836. Also Consumers serves industrial customers within several of the municipalities that operate electric systems and thus there is the possibility of competition between Consumers and municipal systems to serve these loads. See Paul, Tr. 7816, 7829-30, 8018. (5) Finally Mr. Paul testified that there is competition between Consumers and cooperatives or municipal systems to serve new housing subdivisions. Tr. 8225-26.

This list of actual and potential competition for individual retail customers is not intended to be exhaustive. To summarize, it would appear that the greatest potential for such competition is with respect to new commercial and industrial loads and for new housing subdivisions.

³⁶⁸For example, see D. J. Exh. Nos. 114-19.

³⁶⁹See Pace, Tr. fol. 7239 at 17-19.

By state law in each of the three states the franchises [were] nonexclusive and, depending upon the state, the franchise terms [were] limited to periods ranging from ten to twenty years." These "franchises customarily [granted] Otter Tail the right to construct and maintain electric distribution systems" within the municipality's boundaries. 331 F. Supp. at 57.

The events that led to the government's Sherman Act civil antitrust suit against Otter Tail were initiated when four municipalities decided not to renew that utility's franchises and to establish their own retail power distribution systems instead. In an effort to prevent its displacement as their sole retail supplier, Otter Tail refused either to sell wholesale power or to wheel power from outside sources to the four prospective municipal systems. The district court was thus called upon to determine (*inter alia*) the appropriate relevant geographic market in which to gauge the anticompetitive effect of the utility's refusals to deal. The court found that market to be the 465 towns that Otter Tail served at retail, together with the 45 towns in Otter Tail's service area served exclusively by municipal electric systems. 331 F. Supp. at 58-9. The Supreme Court upheld that relevant geographic market determination, observing that (410 U.S. at 369-70):

The aggregate of towns in Otter Tail's service area is the geographic market in which Otter Tail competes for the right to serve the towns at retail. That competition is generally for the right to serve the entire retail market within composite limits of a town and that competition is generally between Otter Tail and a prospective or existing municipal system.

In short, what the courts held entitled to protection from Otter Tail's anticompetitive practices was not door-to-door competition between retail distributors, but the potential competition that exists by virtue of each local government's right to replace its existing retail power supplier. As the district court in *Otter Tail* phrased the point (331 F. Supp. at 64):

Of course, it should be remembered that a public utility which operates without exclusive franchises from its customers does not have a right to be free of competition. *Rural Electrification Administration v. Central Louisiana Electric Company*, 354 F.2d 859 (5th Cir. 1966). This has long been the law and extends to competition from municipally owned facilities. *Alabama Power Co. v. Ickes*, 302 U.S. 464, 58 S.Ct. 300, 82 L.Ed. 374 (1938).

There is nothing startling about this idea. Consumers' own economic witness, Dr. Stelzer, candidly acknowledged in his testimony the existences of such "potential competition":

Although local distribution remains a monopoly service, however, the

identity of the monopolist is, in a number of instances, open to competition—which may become more extensive. This is really a form of potential competition in that the utility currently serving a locality may be supplanted if it fails to perform adequately.³⁷⁰

Thus, although most retail electric customers have no *individual* choice of electric supplier, they may (as in *Otter Tail*) have that opportunity *collectively* through their local governments. Because that possibility existed, the district court defined and the Supreme Court concurred in a relevant geographic market embracing all the municipalities which *Otter Tail* could or did serve, though no “door-to-door” competition existed or was likely to develop.

c. Consumers’ proposed “open” and “closed” market divisions would require us to disregard any potential competition to be the sole electric power distributor within each of the individual natural monopolies. Consumers’ position rests on its perception of legal and economic barriers in lower Michigan which it says make changes in electric suppliers in its proposed closed market remote and unlikely.

We decline to follow that course. In those areas in lower Michigan where utilities serve under limited-term franchises (*i.e.*, Consumers’ proposed “long-term closed” submarket), we perceive no legal barriers to competition significantly different from those faced in *Otter Tail*, and Consumers points to none.³⁷¹ As we have described (Part IV, above), the Michigan Constitution vests cities and townships with authority to grant, upon approval of their electors, franchises to public utilities to serve within their boundaries. As in *Otter Tail*, these franchises are nonexclusive and of limited duration; the maximum period for which a local government can grant a franchise is thirty years. True, this period is longer than the franchise periods involved in *Otter Tail*. This is a distinction without a difference. Its significance is confined to the fact that it limits the occasions when a private utility is vulnerable to displacement. Sooner or later, however, that utility must seek renewal of its franchises. When it does, a locale dissatisfied with the reliability, cost or other aspects of the utility’s service may refuse. And as Consumers acknowledges, no less than 215 of its franchises will expire by the end of 1985.³⁷²

³⁷⁰Tr. fol 7224 at 16, emphasis in original. Dr. Stelzer was testifying about the electricity utility industry in general, not the market situation in lower Michigan. Also see Paul, Tr. 7994.

³⁷¹Consumers stresses that the States of Minnesota and South Dakota did not regulate retail rates in the period leading up to the *Otter Tail* litigation. North Dakota, however, did regulate retail rates.

³⁷²C. P. Exh. No. 11,306.

It is undisputed that the Michigan Constitution empowers a city (with its electors' approval) to establish its own municipal electric system. Thus, as in *Otter Tail*, when Consumers' franchise expires, a city may elect to do just that. Alternatively, a city with a municipal electric system could at any time decide to discontinue its operation and substitute a private utility. In other words, the competitive choices of municipalities in Consumers' "long-run closed" submarket parallel those of the municipalities in *Otter Tail*.³⁷³

The situation is somewhat different respecting Consumers' Foote Act franchises.³⁷⁴ Under these, the local government may not displace a utility by refusing to renew its franchise. But Foote Act franchises are not exclusive and establishment of a retail distribution system in direct door-to-door competition with the Foote Act franchisee is permissible. (See p. 934, *supra*.) A municipality also possesses the right to condemn the private utility's distribution facilities. Consumers does not contend that either route is legally barred. Rather, the company premises its position on what it deems the sheer unlikelihood of those eventualities occurring.³⁷⁵

We can agree with Consumers that setting up a retail distribution system in a Foote Act franchise area in direct competition with the existing franchisee would be risky business.³⁷⁶ However, if Consumers should fail to give satisfactory service, or charge retail rates excessively above those which a prospective municipal system could offer, Consumers' own witnesses did not deny that the municipality might well consider entering the market itself.³⁷⁷ Stated differently, the legal right of the municipalities to elect to

³⁷³Townships may not substitute their own electric systems in lieu of the existing supplier, but might franchise a different private utility, e.g., a cooperative. (The Rural Electrification Act bars cooperatives from extending service to cities of more than 1,500 population but not to townships.) See p. 940, *supra*.

³⁷⁴Consumers asserts that Foote Act franchises are perpetual in duration. Justice contends that Michigan court rulings on the matter leave open the real possibility that some time limit will be placed on these franchises. We need not become embroiled in that controversy. For our purposes we assume that Foote Act franchises are perpetual.

³⁷⁵Consumers' contends that condemnation by a city is more difficult in Michigan than in most states because Michigan law does not vest "municipal governments with unrestrained powers of eminent domain; rather, before any property can be condemned a jury or independent commission must find that the condemnation is a 'necessity.' MSA 8.20, 8.78, 5.1858 (fourth class cities) and 5.1432(villages)." *Consumers' Appeal Brief*, p. 146 fn. 194. Consumers does not, however, point us to any Michigan case law describing what constitutes "necessity." Moreover, this does not mean that condemnation of its distribution system is impossible, only that the procedures and requirements for doing so are difficult.

³⁷⁶See *Consumers' Appeal Brief*, p. 149. Consumers cites testimony of Mr. Wolfe to this effect. Tr. 2039.

³⁷⁷Dr. Pace admitted that a significant disparity in retail rates "might be" sufficient to overcome what he perceived as barriers to entry in Foote Act franchise areas. Tr. 7270-71. Also see Paul, Tr. 8064.

compete with Consumers is a form of potential competition not without influence in the marketplace.³⁷⁸

Indeed, contrary assertions in Consumers' briefs notwithstanding, the chief executive of Consumers himself testified that his company was concerned about municipalities setting up their own power distribution systems in competition with his company and, eventually, forcing Consumers to sell out. Mr. Aymond went so far as to testify that "it is definitely a possibility, and it could happen in certainly all of the larger communities and the cities that [Consumers] serve[s]."³⁷⁹

In sum, though a Foote Act franchise is certainly a higher barrier to potential competition than a limited-term franchise, in neither case does

³⁷⁸See quotation from Dr. Stelzer, p. 982, *supra*.

³⁷⁹Tr. 6468. Mr. Aymond testified in full, *id.* at 6465-68:

Q. [By counsel for the Department of Justice] . . . In other words, my question really is: Why is it that you made this decision to sell out in Lansing (see fn. 380, *infra*) but haven't made the decision to sell out in Bay City and Traverse City?

A. [By Mr. Aymond, Chief Executive Office of Consumers Power Company] We have succeeded in Bay City in maintaining a good share of the business there despite the lower rates on the municipal system. Now in the case of Lansing, the differential in rates was greater, I believe, and our analysis of the situation was that we would not retain very much of the business and it would be a losing proposition for us to try to compete with the City.

If that had been our only business, for example, we would have gone broke at it. We couldn't afford to compete with them. They were underselling us in the marketplace and we couldn't recover our costs at our standard rates and, of course, if we lowered our rates we would still not be recovering our costs so we had no alternative.

Q. [Justice's Counsel] Well, if the gap had been greater, the disparity had been greater in Traverse City and Bay City, would that have affected your decision there as well?

A. [Mr. Aymond] It very well might, because then we would lose the business and we would have no return on our investment whatsoever, and the only thing we could do then would be to bail out and there would no longer be any competition in the municipality. They would have all the business.

Now one argument against our doing that is once we do that, that's an open invitation for every other municipality that we serve at retail to form their own municipal system.

Q. [Justice's Counsel] Are you concerned with this possibility?

A. [Mr. Aymond] Yes, sir.

* * *

Q. [Justice's Counsel] But are you concerned that this could happen if they had the ability to create a considerable gap between their rates and your rates? . . . meaning

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Michigan law bar a municipality from entering into door-to-door competition with Consumers or from displacing it through condemnation.

d. Even though Consumers does not consider its retail market position immutable, and despite the fact that in at least one instance business practicalities forced Consumers to sell out part of its system to a municipality,³⁸⁰ and notwithstanding that on at least two occasions since 1960 serious questions arose about whether the company's franchises would in fact be renewed,³⁸¹ it is nevertheless true that Consumers has not lost any of its retail distribution systems to other existing or emerging utilities since 1950.³⁸² The converse, however, is not true. In that same period (*i.e.*, post-1950), Consumers has gained control of 8 electric utilities, 7 municipal and one privately owned—three since 1960.³⁸³ Consumers has also bought outlying distribution lines from existing municipal systems and since 1960 the company has attempted, albeit unsuccessfully, to acquire three other small

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that your company would be forced to sell their facilities to them from the competitive pressures.

A. [Mr. Aymond] Well, there is a lag, of course. I mean, after all, between the time that a community organizes a municipal system and the time it gets started in the business and starts taking away customers, until the point when we see that we are going to have to sell out to them, that could take a period of a few years.

Q. [Justice's Counsel] Yes, sir.

A. [Mr. Aymond] But it is definitely a possibility it could happen in certainly all of the larger communities and the cities that we serve.

³⁸⁰Lansing annexed what is referred to as the North School District about 1960. At that time Consumers was the sole supplier of electric power therein. Immediately upon annexation the residents petitioned Lansing to furnish electric service. Rather than face door-to-door competition with Lansing, Consumers sold its distribution system to Lansing. (See fn. 379, *supra.*) As part of the bargain, Lansing sold some of its distribution lines in rural areas to Consumers and agreed to buy wholesale power from Consumers for 10 years to serve the retail demand in the North School District. Brush, Tr. 2073-74; Aymond, Tr. 6461-63; Wein, Tr. fol. 3979 at 73.

³⁸¹Mr. Paul testified that there have been two instances since 1960 where Consumers' franchises have not been routinely renewed. "In one case [the company] accepted an interim revocable franchise and in the other case [the company was at the time of the evidentiary proceeding] working with the municipality to resolve the franchise matter." Tr. 7867.

The record does reveal, however, that the City of Zeeland did in the 1930's, with the aid of PWA funds, establish a municipal system. Prior to that time Consumers had been the only system franchised to operate in the city. After the city established its system, it did not renew Consumers' general franchise to serve but did allow the company to continue serving those existing customers who desired not to switch to the city's system. Westenbroek, Tr. 938-39; Pace, Tr. 7257-58; Paul Tr. 7814-15.

³⁸²Wein, Tr. fol.3979 at 72; D.J. Exh. No. 12.

³⁸³Paul, Tr. 7992-93. Also see Westenbroek, Tr. 1025-27.

utilities.³⁴⁴ We therefore find the retail market situation nowhere near as stable a picture as Consumers would paint it. The record indicates that changes of electric supplier for groups of retail customers can and do occur—albeit mostly in Consumers' favor.

e. In sum, legal barriers do not preclude all retail competition in Consumers' proposed closed market.³⁴⁵ To the contrary, Mr. Aymond's own testimony confirms that Consumers is itself aware of both actual and potential retail competition in lower Michigan.³⁴⁶ Moreover, the presence of small

³⁴⁴Consumers formally offered to buy the municipal systems in Charlevoix (1962) and St. Louis (1965); and to lease Traverse City's system for 30 years (1965). D.J. Exh. No. 12; D.J. Exh. No. 188; C.P. Exh. No. 11,308.

³⁴⁵The cases that Consumers cites, *United States v. Marine Bancorporation, Inc.*, 418 U.S. 602 (1974) and *United States v. Connecticut National Bank*, 418 U.S. 656 (1974) (see *Consumers' Opening Brief Below*, p. 110-11), to support its division of the retail market into "closed" and "open" areas are inapposite to the factual situation in lower Michigan. In *Marine Bancorporation* state law forbade branch banking by a bank outside the city and unincorporated areas of the county in which the headquarters were located. 418 U.S. at 609-10. In *Connecticut National Bank* state law specifically barred branch banking by a commercial bank in those towns where the main office of another bank was located. 418 U.S. at 659, fn. 1. (Also both were potential competition cases brought under Section 7 of the Clayton Act, see fn. 465, *infra*.) As we have shown, no comparable legal bars exist with respect to prospective municipal power systems in lower Michigan.

³⁴⁶See fn. 379, *supra*. Also see Tr. 6059-62. There Mr. Aymond testified that granting the small utilities either joint venture access or unit power access to nuclear power or other large baseload units could provide them with "artificial and unfair competitive advantages." Tr. 6059. This testimony prompted the following colloquy between the initial Licensing Board Chairman and Mr. Aymond (Tr. 6060-62):

CHAIRMAN GARFINKEL: But, Mr. Aymond, let me ask you this question—and we have been hearing this term "competition," "competitive advantage," banded around in this proceeding, and the Board Chairman—I am not speaking for my colleague, Mr. Clark—is having some difficulties in terms of this question of competition.

How do you have competition, really, when the municipal which is franchised has a complete monopoly [in] its area? Each municipal has a monopoly and you have certain—I am not saying "improper," now, but certain monopolies.

So, therefore, does it really make any difference whether someone gets a better unit price—whether one municipal obtains a better unit price—whether one municipal obtains a better unit price as against a second municipal? The prices are passed on to the consumer, let's say.

But where is the competitive advantage? And the Board is interested in this area.

THE WITNESS: The competition comes in, Mr. Chairman, in the way the customer feels about our situation.

For example, Lansing, which is the largest municipal system, as I referred to, is really in the heart of our service area, sells power at a considerably lower rate than can Consumers. They can do that today without buying from us at below our system cost. They can do that today just with their tax and interest subsidies.

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independent systems in lower Michigan in general exerts a procompetitive influence at the retail level in the form of "yardstick competition." Dr. Stelzer (Consumers' economic witness) explained that the industry uses this term to describe comparisons of the cost and efficiency of operation of two electric utilities made by regulatory bodies in an endeavor to measure the adequacy of a utility's performance, and that the existence of such a "yardstick" generally serves "as a goad to dynamic efficiency." Tr. fol. 7729 at 7, 12-13. Dr. Stelzer further testified that "[t]his yardstick competition can and does exist on the distribution level" and acknowledged that "[i]t may be an important incentive to efficiency for regulated companies." *Id.* at 16.³⁷

This is not to suggest that competition to distribute electric power in lower Michigan is totally free and open, or even that major market changes are in the offing. But because this potential competition manifests itself only periodically and is more limited than that found in some unregulated markets, it is not for those reasons less deserving of antitrust protection. To accept Consumers' position on the relevant retail geographic market would

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Now, this makes our customers unhappy with us, and this is published in the newspapers: "Lansing has another great year; rates are 20 percent below Consumers Power Company"—or whatever the percentage is. And pretty soon you find that the people in the environs of Lansing want to leave Consumers Power Company and become a part of the Lansing system.

And the Lansing system at this very instant is seeking to have the law change[d] so that they can expand beyond Lansing without limit.

CHAIRMAN GARFINKEL: But right now they can't obtain—they can't take those customers away from you, is that correct?

THE WITNESS: Only if they—and they have done this on several occasions—only if they expand their corporate boundaries.

Under the law as it now exists, they are limited to selling only 25 percent of their sales within the community outside the community, and they are seeking to have that law changed so that they would have no limit on their expansion.

So this is one of the things we are concerned about.

³⁷Dr. Stelzer went on to point out that subsidies of the municipalities and cooperatives made a perfect comparison between private and public utilities impossible. *Id.* at 17-18. But he concluded nevertheless that "such subsidized firms do make a contribution, for example, in providing the dynamic pressure on privately owned utilities, such as Consumers Power, of yardstick competition and, in general serving as an alerting irritant." *Id.* at 18. Indeed, the Michigan Public Service Commission has asked Lansing for information about its retail rates. Brush, Tr. 2359-61. Also see Meeks, *Concentration in the Electric Power Industry: The Impact of Antitrust Policy*, 72 Colum. L. Rev. 64, 77-79 (1972).

The existence of the small utilities thus exerts a procompetitive influence in the overall retail market in lower Michigan. *Cf.*, *Municipal Electric Ass'n v. SEC*, 413 F.2d 1052, 1058 (D.C. Cir. 1969).

in effect nullify that protection. That result is simply out of line with the recent Supreme Court decisions in this area.³⁸⁸

It must also be kept in mind that Consumers was not born with a 77% or 100% portion of that retail market. Rather, it acquired its large share in no small part by the same slow competitive processes that it now suggests are too unlikely and remote for us to consider.³⁸⁹

We do recognize that, though not barring all competition as Consumers suggests, the barriers to potential retail competition in the electric power industry in lower Michigan are high and vary from area to area, depending on such factors as whether two or more electric suppliers serve the same or adjacent areas, and on whether a private utility is serving the area under a

³⁸⁸*Otter Tail v. United States, supra*. As Justice Blackmun wrote in *Gulf States Utilities Co. v. FPC*, 411 U.S. 747, 759 (1973): "Indeed, within the confines of a basic natural monopoly structure [of the electric power industry], limited competition of the sort protected by the antitrust laws seems to have been anticipated [by the drafters of the Federal Power Act]," (citing *Otter Tail* among other authorities).

³⁸⁹As Dr. Wein explained (Tr. fol. 3979 at 50-51, emphasis supplied), historically

[t]he early electric company (private or public) was a very small generating company distributing electricity via direct current at tiny voltages to its customers within a small town or to part of a larger city.

* * *

There followed a frenetic merger and acquisition program from the earlier years of the first decade through the twenties, and thirties [in an endeavor to achieve economies of scale made possible by technical improvement]. It has not yet ceased. *The existing large systems such as Consumers Power are the results of such mergers and acquisition, pursued by astute and farsighted men who not only recognized the inherent economies of large scale generation and transmission and attendant profits, but also knew how to develop and attain the financial connections which made these acquisitions possible.* They recognized, earlier than others, that the key element in obtaining these economies was the interconnection of many separate geographic markets selling retail power, *i.e.*, the interconnection of many separate distribution systems.

The Department's proposed exhibits D. J. Exh. Nos. 16 and 17 list the acquisitions and mergers that have resulted in Consumers' present market position. The Licensing Board rejected these exhibits because it believed an analysis of that market structure and Consumers' conduct therein from 1960 was sufficient to determine whether licensing the Midland facility would maintain a situation inconsistent with the antitrust laws. Tr. 4012-13. Although urged to do so by Justice (*Opening Brief on Appeal*, pp. 55-56), we do not overrule the Licensing Board's ruling. We merely take note of the accepted fact, as testified to by Dr. Wein, that large systems today, including Consumers, came about by merger and acquisitions of many small systems. Consumers does not deny that this is so and neither the legality of Consumers' acquisitions nor its market position as of 1960 is being litigated here.

The point we emphasize is simply that the so-called legal barriers to competition that Consumers now argues preclude a change of electric supplier in its proposed closed market existed throughout the period of Consumers' growth, see pp. 934-935, *supra*, and yet did not prevent the company from acquiring its present market position.

Footnote Act or limited-term franchise. In other circumstances, the differences between these market barriers might justify dividing the retail market into the various submarkets that Consumers proposes.³⁹⁰ But, as the Supreme Court has twice stated, “submarkets are not a basis for the disregard of a broader line of commerce that has economic significance.”³⁹¹ This is especially true where the charge is that a firm has monopolized that broader line of commerce. Consumers’ arguments in effect seek to focus our attention on those areas where door-to-door competition is now taking place and to have us ignore those areas where the company has already acquired dominance. To do so would be to manifest tacit acceptance of Consumers’ present market position as sacrosanct. This is simply not the case, legally or factually.³⁹²

We therefore reject Consumers’ proposed “open” and “closed” submarkets. We hold instead that the relevant retail market most appropriate for this case encompasses essentially the entire area delineated by the Licensing Board in its initial decision (2 NRC at 45): “all of the lower peninsula of Michigan except the eastern section served by Detroit Edison Company and the southwest served by the Indiana and Michigan Gas and Electric Company.”³⁹³ We do so because the record shows that it is in this area that Consumers is faced with both existing and prospective electric systems competing for the right to serve retail customers.

3. The wholesale power market

a. Consumers and Justice are in accord that wholesale electric power is one relevant product market in this case, but they dispute the makeup of

³⁹⁰For example, if a court were analyzing a merger of two electric utilities for Clayton Act purposes, conceivably it might focus on the existing door-to-door competition between the two. We note that the cases on which Consumers relies are all decisions of that quite different stripe. See fn. 385, *supra*.

³⁹¹*United States v. Greater Buffalo Press*, 402 U.S. 549, 553 (1971); *United States v. Phillipsburg National Bank*, 399 U.S. 350, 360 (1970).

³⁹²Moreover, accepting Consumers’ reasoning would lead to a paradoxical result: were Consumers to acquire all the small utilities in the relevant geographic area there would be (according to Consumers) no competition; therefore logically there would be no relevant market, and thus it would be impossible to find Consumers guilty of monopolization even if it had used predatory means to acquire the small systems. We think that a relevant market concept that leads to such a distorted result is of doubtful validity.

³⁹³Justice would include Edison Sault and Thumb Electric in the retail market; Consumers would not. (Both parties agree, however, that these two utilities are within the wholesale market.) Both lie at the market’s edge and there are arguments either way. We therefore elect to include them for purposes of geographic market unity. “Fuzziness at the boundaries [is] inherent in any attempt to delineate the relevant geographic market.” *United States v. Philadelphia Nat. Bank*, *supra*, 374 U.S. at 360 fn. 37. *Accord*, *United States v. Pabst Brewing Co.*, *supra*, 345 U.S. at 549; *United States v. Connecticut National Bank*, *supra*, 418 U.S. at 669-71.

that market. Their disagreement is over two basic points: *First*, whether that wholesale market includes bulk power supplied under coordination arrangements and, *second*, the extent to which a vertically integrated utility's own firm bulk power production is to be counted in that market.³⁹⁴ We disposed of the first controversy earlier in connection with our discussion of coordination services. For reasons explored at length, we held that a market for coordination power exists separate and distinct from that for wholesale power. See p. 945 *ff.*, *supra*. We turn here to the second issue, the proper allocation of "self-generation" used "in-house."

Some electric power utilities engage primarily in manufacturing and wholesale operations and some confine themselves to retail distribution. (Slightly more than two-thirds of all electric utilities within the United States operate only at the retail level. See fn. 352, *supra*.) As in other industries, however, some companies do both and these are described in the economic lexicon as "vertically integrated." Consumers Power Company and several of the smaller utilities in this case are vertically integrated entities. In other words, they generate firm electric power in bulk with their own facilities and then market that power either via their own "captive" retail distribution networks (*i.e.*, use "in-house") or sell the power at wholesale rates for resale over retail distribution networks of other utilities.

Justice takes the position that the wholesale market properly includes all firm bulk power production, whether retained for "in-house" retail purposes or wholesaled "outside" for independent retail distribution. It stresses that firm bulk power is the product every utility operating a retail distribution system must have, and whether purchased at wholesale or self-generated, the product is identical. The Department therefore contends that all bulk power production belongs in the relevant wholesale power market if a fair picture of the relative market strengths of the various competing utilities is to be obtained. Using Justice's market definition, in 1971 Consumers controlled an 85% share of the wholesale market in lower Michigan with sales of 21,123,360 MWh; all the remaining utilities accounted that year for only 3,655,861 MWh, less than 15%.³⁹⁵

Consumers does not deny that self-generation and wholesale power are, if not identical, certainly interchangeable products. And it agrees that bulk power produced by its competitors and used in their "in-house" retail

³⁹⁴Both Justice and Consumers concur on the geographic scope of the wholesale market as essentially that delineated by the Licensing Board. See p. 945, *supra*. (Compare D.J. Exh. No. 197 with Pace, Tr. fol. 7239 at Attachment JDP-2.) We agree, particularly as Consumers' Chief Executive testified that it is doubtful his company would seek to sell wholesale power outside this area. Tr. 6071.

³⁹⁵See p. 1010, *infra* (1971 statistics).

operations belongs in the wholesale power market because it competes to supply those needs by selling them wholesale power. Nevertheless, Consumers argues that its own “in-house” production must be omitted from the wholesale market. It reaches that result on what amounts to a theory of present competition. The company argues that while it competes to supply the firm bulk power needs of the small utilities, they do not and cannot compete to supply Consumers’ needs because the company plans its operations to satisfy all its “in-house” needs entirely on its own. This lack of present competition, Consumers says, places its own production of firm bulk power for “in-house” distribution outside the relevant wholesale market for purposes of determining its share of that market.³⁹⁶

Use of Consumers’ definition of the wholesale market reverses the picture painted by Justice. Instead of Consumers controlling 85% of the market, it would control only 15%, and of a much smaller market.³⁹⁷ Indeed, the largest competitor in the wholesale market as Consumers structures it would be the Lansing municipal system with a 40% market share, 2½ times larger than Consumers’ own.³⁹⁸

A market definition is supposed to reflect commercial realities. A definition which leads to the conclusion—as Consumers’ does—that the Board of Water and Light of the City of Lansing, Michigan, (with 5 power plants having a combined generating capacity of 639 MW) overshadows Consumers Power Company, the eighth largest in the nation (29 plants with a combined generating capacity of 4,285 MW), is manifestly askew.³⁹⁹

The antitrust law does not force acceptance of any such lopsided market picture. The proposition that the “in-house” production of the dominant firm must be excluded from the wholesale market is hardly new. The same arguments were raised and rejected more than 30 years ago by Learned Hand in *United States v. Aluminum Company of America*, 148 F.2d 417 (2d Cir. 1945), the only Sherman Act Section 2 monopolization case brought to our attention (or which we could find) that discusses the issue. In that case, as in this one, the company charged with monopolization sought

³⁹⁶*Consumers’ Appeal Brief*, pp. 170-73.

³⁹⁷See C.P. Exh. No. 11,307 (1972 statistics). In its appeal brief (p. 153) Consumers states that its market share as it defines the market is 17 percent. This, however, includes the bulk power requirement of the three small distribution systems, now part of its vertically integrated system, that it has acquired since 1960. See Pace, Tr. fol. 7939 at attachment JDP-2. Also see Paul, Tr. 7878-81.

³⁹⁸If Consumers’ production for “in-house” use is excluded and the smaller utilities included, the total wholesale market in 1972 would have been 4,529,282 MWh, of which Consumers’ share would be 718,424 MWh and Lansing’s share 1,758,422 MWh. See C.P. Exh. No. 11,307.

³⁹⁹Compare C.P. Exh. No. 12,008, p. S-2 with D.J. Exh. No. 228A, p. E-18.

to define the relevant wholesale market to exclude its “in-house” use of the wholesale product. In *Alcoa*, as here, the company argued that its own use of the raw product—there aluminum ingots—had no effect on the market for that product, and therefore, its “in-house” production was properly excluded from the relevant market. There, as here, acceptance of the company’s theory would have reduced its market share beneath the level from which monopoly power might be inferred.⁴⁰⁰ The company’s arguments were found wanting. In so concluding, Judge Hand wrote for the court that (148 F.2d at 424):

[T]he ingot fabricated by “Alcoa,” necessarily had a direct effect upon the ingot market. All ingot—with trifling exceptions—is used to fabricate intermediate, or end products; and therefore all intermediate, or end, products which “Alcoa” fabricates and sells, pro tanto reduce the demand for ingot itself. The situation is the same, though reversed, as in *Standard Oil Co. v. United States*, 221 U.S. 1, 77, where the court answered the defendants’ arguments that they had no control over the crude oil by saying that “as substantial power over the crude product was the inevitable result of the absolute control which existed over the refined product, the monopolization of the one carried with it the power to control the other.” We cannot therefore agree that the computation of the percentage of “Alcoa’s” control over the ingot market should not include the whole of its ingot production.

The court’s reasoning in *Alcoa* is applicable to the situation in this case. Indeed, *Consumers* cites the quoted passage from *Alcoa* as authority for including the small utilities’ “in-house” production.⁴⁰¹ Given that *Consumers* is unquestionably the dominant utility in the relevant geographic area, Judge Hand’s rationale would apply with greater force to *Consumers*’ “in-house” requirements than to the small utilities’. We also note that Judge Hand did not find it necessary (as *Consumers* would have us do) to focus on whether there was any competition to supply *Alcoa*’s “in-house” requirements. Obviously there was none.⁴⁰²

⁴⁰⁰The well known quotation from *Alcoa* is, of course, Judge Hand’s statement that “[t]he percentage we have already mentioned—over ninety—results only if we both include ‘Alcoa’s’ production and exclude ‘secondary.’ That percentage is enough to constitute a monopoly; it is doubtful whether sixty or sixty-five percent would be enough; and certainly thirty-three percent is not.” 148 F.2d at 424.

⁴⁰¹*Consumers’ Appeal Brief*, p. 160, fn. 228.

⁴⁰²In any event, there is no magic in the fact that *Consumers* plans to supply the firm bulk power demands of its retail distribution systems by self-generation; several of the small systems similarly have planned and structured their systems. For example, Grand Haven, Traverse City and Holland were self-sufficient in 1960-1972. Also Lansing, except for buying wholesale

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As we pointed out earlier, there are two distinct functional levels of operation in the electric utility industry, production and transmission of bulk firm power to distribution points on one hand and the distribution of retail power from those points on the other. Neither Consumers nor any other party offers any technical or economic reasons that require the two functions to be combined in one company. And, as we have already mentioned, slightly more than two-thirds of all electric utilities in the United States engage only in retail distribution. See fn. 352, *supra*. Thus, the situation at bar is analogous to that in *Alcoa*, and vertical integration, whether on Consumers' part or on that of the small utilities, reduces *pro tanto* the demand for wholesale bulk firm power by individual retail distribution systems that would otherwise exist in lower Michigan.⁴⁰³

b. The cases which Consumers cites as authority for excluding its "in-house" production from the wholesale market do not support its position. As

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power as part of the agreement in which it purchased the North School District, in that time frame met its firm bulk power requirements by self-generation. (Lansing's peak load in 1973 was 373 MW, its generating capacity was 628 MW.) See page 941, *supra*. Also see C. P. Exh. No. 11,307. Nor do most of the small utilities currently face legal restrictions that would preclude them from selling wholesale power to Consumers. It is true, as Consumers argues, that Northern Michigan and Wolverine Electric would be precluded under Federal law from selling wholesale power to Consumers. However, as Consumers acknowledges (*Appeal Brief*, p. 174, fn. 258), recent changes in the Michigan law would allow the municipalities to sell an unlimited amount of wholesale power for use beyond their incorporated boundaries. See p. 940, *supra*. Finally, Edison Sault Company and Alpena Power Corp. have never been legally barred from selling wholesale power to Consumers. Rather, Consumers is unlikely to turn to the small utilities for wholesale power simply because of the disparity in size between itself and them. As Dr. Wein testified, "given the economies of scale [that Consumers is able to achieve, the small utilities] can scarcely hope to do to [Consumers] what it does to them, *i.e.*, persuade [Consumers] to abandon generation or not increase it." Tr. fol. 3979 at 75. Also see Pace, Tr. fol. 7239 at 37.

⁴⁰³We note that the antitrust board in *Alabama Power Company* (Joseph M. Farley Nuclear Plant, Units 1 and 2), LBP-77-24, 5 NRC 804, 890-96 (1977) (appeal pending), has similarly concluded that a vertically integrated electric utility's "wholesale sales" to its captive distribution systems are properly includable in the wholesale market. As the *Farley* board explained (*id.* at 894):

... the supply of firm bulk power to any retail distribution system, even if not transacted at a money price within a vertically integrated business stratification, does encompass two different and widely recognized functions. The functional view of the electrical power industry is: generation, transmission and distribution. Consequently, the shadow price at which bulk firm power may be supplied to a captive or member distribution system is a wholly different animal from the shadow price at which say a toaster without a cord is supplied from one employee to the next one who attaches the cord to the appliance. This is a key distinction in defining the market this way. One must rise to the realm of abstraction and speculation to imagine a firm selling a toaster without a cord to another firm that

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we mentioned, the only monopolization case under the Sherman Act in point, *Alcoa*, is squarely against it. Consumers relies on a series of decisions under the antimerger provisions of the Clayton Act, Section 7. None of them, however, even purports to distinguish *Alcoa*. Moreover, the principal case Consumers cited to the Board below, *International Tel. & Tel. Corp. v. General Tel. and Electronics Corp.*, has in the interim been reversed on appeal on the very point.⁴⁰⁴ In doing so, the Ninth Circuit held “that vertical foreclosure in itself does not justify defining a customer market to exclude ‘captive’ sales” (518 F.2d at 931) and ruled that it was more appropriate to focus on the overall market for telephone equipment that included the Bell system’s “in-house” production rather than on the “submarket” the district court had chosen, which had excluded those “captive sales.”⁴⁰⁵

We have also reviewed the other lower court and agency cases cited by Consumers. We agree with the Justice Department that none of those

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attaches the cord. One need not rise to such a realm of abstraction or speculation to imagine two firms selling and buying wholesale power with each other. This happens. So, for one, there is a functional reason for viewing [Alabama Power’s] sales to seemingly “captive” entities as constituting wholesale sales (see J. Hirshleifer, “On the Economics of Transfer Pricing,” 29 *Journal of Business* 172 (1956)).

⁴⁰⁴351 F. Supp. 1153 (D. Haw. 1972), *reversed*, 518 F.2d 913 (9th Cir. 1975).

⁴⁰⁵In reversing, the Ninth Circuit reasoned (518 F.2d at 930-31):

Acknowledging that the Bell System was the “largest single purchaser of telephone equipment” in the United States, 351 F. Supp. at 1175, the district court refused to include Bell purchases in computing the market share foreclosed by GTE because it viewed the non-Bell—or “independent”—market for telephone equipment as constituting an “economically significant submarket” within the meaning of *Brown Shoe Co. v. United States*, 370 U.S. 294, 325, 82 S. Ct. 1502, 8 L.Ed. 2d 510 (1962). 351 Supp. at 1180. While the non-Bell market does display certain characteristics of a distinct submarket, it is clear that the Supreme Court did not intend the *Brown Shoe* concept to be used to exclude, in all cases, consideration of purchases by integrated “captive” customers of an appropriately defined line of products. In *Brown Shoe* itself, the Court computed market share by including manufacturers’ sales to captive customers, see 379 U.S. at 301-303, 82 S.Ct. 1502, despite the fact that opportunities for “independent” sales to such retailers were on the decline, *id.* at 301, 82 S. Ct. 1502. Similarly, in *Ford Motor Co. v. United States*, 405 U.S. 562, 92 S.Ct. 1142, 31 L.Ed. 2d 492 (1972), the court tacitly approved a market defined to include “captive” purchases. See *id.* at 566-569, 92 S.Ct. 1142.

From these cases it follows only that vertical foreclosure in itself does not justify defining a customer market to exclude “captive” sales.

The court went on to point out that a government/Bell antitrust consent decree did not immunize Bell from a private antitrust suit, and, therefore, concluded that “Bell’s purported foreclosure of a large fraction of the telephone equipment market [was] not an immutable fact of market life.” 518 F.2d at 931. The Court of Appeals did not find it necessary to discuss the import of the fact that Western Electric had supplied 99% of the Bell’s internal systems needs in the past.

merger cases justifies—much less compels—the exclusion of Consumers’ “in house” production from the relevant wholesale market in this case.⁴⁶

c. In sum, use of Consumers’ “present competition” theory to define the relevant wholesale market leads to anomalous results. To give another example, assume for the moment that Consumers, a large vertically integrated power company, acquires a smaller competitor in the wholesale market having its own generation facilities and then integrates the acquired company into its own operations. Under Consumers’ definition, the acquired company’s production is now excluded from the relevant wholesale market for the purposes of comparing the strength of the utilities still active in that market. Let us further assume that the acquisition left but one small competitor remaining independent. Under Consumers’ thesis, were that utility self-sufficient in generation, it would have a 100 percent share of the wholesale market and Consumers none. This result follows from the underlying assumption in Consumers’ theory that it competes to supply the firm bulk power needs of smaller utilities but not *vice versa*. And, finally, were Consumers to absorb that last competitor, then, under its definition, the relevant market would disappear entirely. Of course what really would have happened is just the opposite; the market would remain but the competition would be gone.

To state the result to which use of Consumers’ market definition would lead is to refute its validity. Manifestly, no law merits an application

⁴⁶In *Elco Corp. v. Microdot, Inc.*, 360 F. Supp. 741 (D. Del. 1973), and *British Oxygen Co.*, 3 CCH Trade Reg. Rep. par. 21,063 (FTC 1975), the court and the FTC analyzed submarkets after determining that the merger proposed was acceptable in more broadly defined markets; neither ignored statistically significant concentration in the broader markets. It bears repeating that “[s]ubmarkets are not a basis for the disregard of a broader line of commerce that has economic significance.” *United States v. Phillipsburg National Bank*, *supra*, 399 U.S. at 360. *United States v. Greater Buffalo Press*, 402 U.S. 549 (1971), involved a merger of two wholesale printers of newspaper comic supplements. The Court excluded certain newspapers’ “in-house” comic production from the relevant market because technological factors made their competition with the specialized printers impossible. In the case at bar, the applicant actively competes at both wholesale and retail levels with the smaller utilities. If anything, *Greater Buffalo Press* supports exclusion of the smaller companies’ “in-house” production, not Consumers’. A similar analysis applies to *Avnet, Inc.*, 82 FTC 391, 541-54, *affirmed, sub nom. Avnet, Inc. v. FTC*, *supra*. The lower court opinion in *U.S. v. Associated Press*, 52 F. Supp. 362 (S.D. N.Y. 1943), can be read to support Consumers’ arguments, but it antedates *Alcoa*. A one-line statement in *U.S. v. ITT*, 324 F. Supp. 19 (D. Conn. 1970), also favors Consumers’ position. If it be a “holding,” we are disinclined to follow it in the absence of any reasoned analysis and in light of the other authorities cited. *U.S. v. Blue Bell, Inc.*, 305 F. Supp. 538 (M.D. Tenn. 1975), involved the merger of two industrial laundries, neither of which were vertically integrated. If relevant to the case before us, its rationale calls for the exclusion of all “in-house” production, not just Consumers’.

antithetical to its purposes. For the reasons given earlier, we accept the Department of Justice's characterization of the wholesale power market as consistent with law, logic and common sense.⁴⁰⁷

Determination of the scope and dimension of the relevant markets sets the stage for the next important issue to be faced: whether in any of those markets Consumers possesses monopoly power. We turn to this in Part VI, which follows.

VI. MONOPOLY POWER

We discussed earlier why determining that an enterprise possesses monopoly power is not tantamount to finding it in violation of the antitrust laws. As we explained, the principal significance of the determination lies in the standard of conduct demanded of an enterprise with that degree of economic control. Firms dominant in the marketplace may be foreclosed from business practices acceptable when undertaken by others.⁴⁰⁸ Therefore we must decide whether Consumers Power Company possesses monopoly power in any or all of the relevant markets before we can gauge whether the charges leveled against it are valid.

Our task is not materially assisted by the decision of the Licensing Board. Although the question of Consumers' monopoly power was raised before it, that Board purposely refrained from resolving the question in the mistaken belief that it was not necessary to do so. See 2 NRC at 112-13. We therefore must undertake the analysis ourselves and begin by assessing the submarket for coordination services.

A. Coordination services submarket

Broadly speaking, monopoly power is the ability to control prices or exclude competition when it is desired to do so. Its existence can be—and

⁴⁰⁷We are aware that somewhat different relevant product markets were found by the antitrust licensing boards in *Alabama Power Company* (Joseph M. Farley Nuclear Power Plant, Units 1 and 2), LBP-77-24, 5 NRC 804, 885-92 (1977) (appeal pending), and *Toledo Edison Company* (Davis-Besse Nuclear Power Station, Units 1, 2, and 3), LBP-77-1, 5 NRC 133, 160-164 (1977) (appeal pending). It should not be inferred from our decision in this case, however, that either the *Farley* or the *Davis-Besse* Boards necessarily erred. As we have stressed, delineation of a relevant market is essentially a question of fact. We have not yet reviewed the basis of either the *Farley* or the *Davis-Besse* determinations.

⁴⁰⁸See fn. 92, *supra*, and pp. 1029-1031, *infra*.

often is—established indirectly, by inference from a firm’s predominate share of the market. *United States v. Grinnell, supra*, 384 U.S. at 571.

The nature of the coordination services market does not, however, lend itself to an easy calculation of market shares. A utility is both buyer and seller in this market. Whether in any given time period it is a *net* buyer or a *net* seller is in part fortuitous, depending on operating conditions in its own and its neighboring power supply systems. Justice therefore undertook to show Consumers’ possession of monopoly power in this market directly, by proving that its control of access to the market and its domination of power generation and transmission within it gives the company that power. This is a valid approach.⁴⁰⁹

1. As described in Part IV, Consumers operates a vertically integrated system. That system includes a 9,000-mile transmission network within the relevant geographic market that is in turn interconnected with the transmission network of all the major nearby utilities. We also previously noted our concurrence in the Licensing Board’s finding that, with few exceptions, the smaller utilities’ remoteness makes it uneconomical for them to build their own interconnections to major utilities outside the relevant market.⁴¹⁰ As the Licensing Board found and Consumers does not dispute, the practical result is that in order to engage in bulk power transactions with the utilities (other than Consumers) in the broader regional power exchange market, the small utilities must “obtain wheeling services from [Consumers].”⁴¹¹

Consumers’ control of high voltage transmission lines within the relevant geographic submarket thus enables it, by refusing to wheel power to them, to preclude the small utilities from coordinating with the other nearby large utilities outside that market. This does not mean that such a refusal to deal cuts off the smaller utilities entirely from all coordination services. But it does limit their choice of coordinating partners to (a) one another or (b) Consumers Power Company (or some combination of the two).⁴¹² In practical terms, whether Consumers has the power to control the “price and output” of coordination services to the small utilities turns on whether coordination among themselves is a reasonable substitute for coordinating with Consumers or with other utilities in the broader regional power ex-

⁴⁰⁹*Denver Petroleum Corp. v. Shell Oil Co.*, 306 F.2d 289, 304 (D. Col. 1969): “the existence of monopoly power” can be shown “by determining actual ability to exclude competition and control prices . . .”; accord, *Woods Exploration & Pro. Co. v. Aluminum Co. of America*, 438 F.2d 1286, 1305 (5th Cir. 1971), *certiorari denied*, 404 U.S. 1047 (1972).

⁴¹⁰See p. 977, *supra*.

⁴¹²NRC at 108 and *Consumers’ Appeal Brief*, pp. 105-114. The Licensing Board’s opinion refers only to wholesale power transactions. Obviously the same holds true for coordination transactions.

⁴¹³The M-C Pool, for example, has a coordination agreement with Consumers.

change market. If it is not a reasonable substitute, then the question is whether Consumers can dictate the economic terms under which the small utilities may enter this market. If it can, then it may be fairly said that Consumers has monopoly power in the relevant submarket for coordination services.⁴¹³

2. Whether coordination *inter sese* is a satisfactory alternative for the small utilities to coordination with a major utility—Consumers or another—is a question which can be viewed from several perspectives. The best approach is a practical one, to examine the issue in the light of a real problem the smaller companies face: their need to satisfy the steady growth in demand for power on their systems. The usual industry response is to add additional “baseload”⁴¹⁴ capacity. But how large a facility? The optimal answer is that size facility which will provide the necessary power at the lowest practicable cost per kWh. In this regard there is no dispute that the larger the baseload plant, the lower the kWh cost. But several factors constrain utilities in general and small ones in particular from building the plants that are most economical in those terms.

First, such plants are expensive. Years might pass before a small utility could use the entire generating capacity of a large plant on its own system. Until it could, that utility would have a substantial capital investment tied up in a generating facility greater than necessary to meet its load demands. One reason for coordination is, manifestly, to spread the cost of the large plants among several utilities, and by doing so, to reduce this problem to a manageable size for each. See fns. 274 and 278, *supra*.

Second, a large plant might necessitate a significant increase in the reserve capacity that must be maintained to insure reliability. A rough rule of thumb calls for an isolated system to have reserve capacity at least equal to its largest generating facility. See p. 951, *supra*. Another reason utilities engage in coordination is, therefore, to reduce the amount of reserves required to backstop the operation of large units.⁴¹⁵ The nub of the matter is that for most utilities to take advantage of the economies achievable by use of large baseload units, they must coordinate with their neighbors. And, as we shall see, Consumers is no exception.

⁴¹³A basic controversy in this case is over Consumers’ argument that valid business reasons require coordination between large and small utilities to be on different terms than coordination between two major utilities. This controversy, however, does not involve whether Consumers possesses monopoly power in the coordination submarket. Rather, it goes to a different question: *if* Consumers has monopoly power in the coordination submarket, *then* has Consumers used that power unreasonably, *i.e.*, “to monopolize”? We address this in Part VII, below.

⁴¹⁴See fn. 272, *supra*, for the definition of a baseload facility.

⁴¹⁵See pp. 953-955, *supra*, in particular the example given from the Supreme Court’s *Gainesville* decision.

3. As the foregoing observations suggest, the small utilities' size precludes them from obtaining by coordinating among themselves the benefits available by coordinating with larger systems. Even in combination, they are too small to achieve the maximum economies of scale now technologically possible in the industry. By themselves, they cannot afford generating facilities of the capacity of the typical modern nuclear power plants,⁴¹⁶ although these are among the most economical in terms of cost per kWh of electrical energy generated.

This can be illustrated by reference to the operations of the Michigan Municipals and Cooperatives Pool (the "M-C Pool"), which we have previously touched upon (see p. 944, *supra*).⁴¹⁷ This pool operates under the only coordination agreement currently in existence among the small utilities. In 1971 the combined load of the four M-C Pool members was 160 MW; their combined generating capacity was 192 MW; and their largest generating unit, 23 MW. See p. 944, *supra*. By coordinating their operations, the M-C Pool member can install larger generating units than they could on an isolated basis. Nevertheless, because of the small size of the pool, they still cannot obtain the significant economies of scale now available in the generation of electric power.

For illustrative purposes, assume that in an effort to take advantage of the economies of scale offered by larger generating units, the pool desired to add to its system in 1971 a 175 MW unit. While larger and more efficient than the pool's existing generating facilities, it is still small scale when compared to the 800 MW Midland Nuclear Unit No. 2. Putting to one side for the moment the pool's problem in making capital investment in a plant not needed until a considerable time into the future, adding a 175 MW unit to its system would automatically increase the pool's reserve requirements enormously. The pool would have had to maintain at least 175 MW in reserve to backup this plant, a reserve of more than 91 percent.⁴¹⁸ Thus,

⁴¹⁶See pp. 1002-1003, *infra*.

⁴¹⁷In addition to Wolverine Electric Corp., Northern Michigan Electric Corp., and the Grand Haven and the Traverse City municipal systems, the pool has three smaller associate members which participate for certain purposes. These have a combined peak load of 17.6 MW. We have omitted them from the example as too small to affect the point being illustrated in significant fashion. See Int. Exh. No. 1,001.

⁴¹⁸The 91 percent reserve figure assumes that the M-C Pool members sold as much power as possible while still maintaining adequate reserves under the single largest unit criterion to maintain system reliability. The percentage of reserves that a system is carrying is calculated by taking its on line generating capacity in excess of peak load requirements and dividing that figure by the peak load. For example, in 1971 (without installation of the hypothetical 175 MW unit) the M-C Pool's reserve was $(192-160) \div 160 = .20$ or 20 percent. Immediately upon installation of the hypothetical plant, the pool must hold 175 MW (the size of the largest plant) in reserve. Thus, the pool's peak load could grow only 32 MW (to 192 MW total) under the single largest unit criterion. At that point the pool would still be carrying a reserve in excess of 91 percent—*i.e.*, $(367-192 \div 192)$.

although the pool would have increased its overall generating capacity by 175 MW, the increase available to sell to their wholesale and retail customers would be limited to the output of only 32 MW of additional capacity; all the rest would be needed in reserve. If, however, the M-C Pool had been able to join a larger coordinated system in which each utility maintained reserves of 20 percent—a typical reserve level in the electric utility industry⁴¹⁹—the M-C Pool would have needed to maintain in reserve only 62 MW.⁴²⁰ In this situation, upon building the 175 MW plant the pool would have had available an additional 145 MW of firm power. This 145 MW would have been considerably more than that needed by the pool members to meet their immediate load growth for the next several years—at that time roughly 25 MW per year.⁴²¹ Thus, access to the regional power exchange market—*i.e.*, ability to engage in coordination services transactions outside the submarket to which they were confined—would have placed the M-C Pool in a position to market this excess capacity and associated energy, for example, on a unit power basis, as short-term power, or in some other type of economy energy transaction. As we have described, such transactions in the coordination service markets can and do reduce the cost of a utility's bulk power operations and are regularly entered into for that purpose. See pp. 952-957, *supra*.

Thus, coordination among the M-C Pool members is not equivalent to their becoming associated with a larger coordinated system. Moreover, even if the M-C Pool were to interconnect with the Holland and Lansing municipal systems—which the Licensing Board found to be economically feasible⁴²²—coordination among the three still would be on a plane below

⁴¹⁹See FPC, 1970 *National Power Survey*, Volume II, pp. 1-52, 53, 2-43. Also see fn. 634, *infra*.

⁴²⁰In arriving at the 62 MW reserve figure in the example, it was assumed that the M-C Pool members sold as much power as possible while still maintaining at least a 20 percent reserve level—*i.e.*, their peak load after building the plant could increase to 305 MW, an increase of 145 MW, and as their total generating capacity would be 367 MW, they would still have reserves of 62 MW, 20 percent of their peak load. Obviously, until their peak load actually reached 305 MW, they would be carrying reserves substantially in excess of 20 percent.

⁴²¹See D. J. Exh. No. 200, Schedule No. 6-c.

⁴²²On this issue, the Licensing Board found that (2 NRC at 98):

Lansing is only about 20 miles from the M-C Pool's projected 18 kV line and a less distance from the M-C Pool's existing 69 kV line. Holland is only about 10-12 miles from the M-C Pool's existing 69 kV line and less from the projected 138 kV line [Exhibits D.J. 18 and 20].

When we consider the 1,182 miles of transmission facilities projected for M-C Pool, these distances are very short. About all that can be said in favor of wheeling over [Consumers'] system is that it might possibly be cheaper.

Justice contends that the Board's finding on this matter is factually erroneous. Our own review of the record leads us to concur in the Licensing Board's conclusion concerning the City

(Continued on next page)

that attainable by access to the regional power exchange market. Moreover, even with such an interconnection, the evidence indicates that it still would not be economically feasible for Lansing, Holland, and M-C Pool and Coldwater⁴²³ to install a 500 MW unit without reserve sharing and other coordination arrangements with larger nearby utilities.⁴²⁴ Indeed, absent such a

(Continued from previous page)

of Holland as in accord with the weight of the evidence. See, e.g., Helfman, Tr. 3495, and D. J. Exh. No. 200. With regard to Lansing we are less sure. However, given the relatively short distance between the M-C Pool and Lansing and the relatively low cost of interconnection compared to their total operations, it would appear to be economical for Lansing and the M-C Pool to interconnect at either 69 kV (or 138 kV in the future) and to engage in at least small scale coordination. (We note that the M-C Pool and Lansing were at the time of the hearing having a formal study done to determine the feasibility of interconnecting the two systems. Brush, Tr. 2335.) Accordingly, while the question is a closer one, we accept the Licensing Board's finding on this point also.

⁴²³The Licensing Board did not consider whether it would be economical for the intervenor Coldwater to interconnect with the M-C Pool, or indeed whether it would be feasible for other small systems to connect to the M-C Pool because, in that Board's judgment, these systems were not "capable of coordination." 2 NRC at 98. We review the correctness of this conclusion at pp. 1056-1061, *infra*. Our own review of the record indicated that it would not be economical for Coldwater and the M-C Pool to interconnect. Coldwater is at least 50 miles from the M-C Pool transmission network and Mr. Helfman characterized an interconnection between the two as being "very expensive." He went on to testify that "[I]t would have been so expensive, in fact, that, by comparison, it would be far cheaper to rely upon [Consumers] to wheel power to Coldwater, which is sold by the M-C Pool to Coldwater It would be far cheaper." Tr. 3535. Also see Munn, Tr. 4075.

Several other of the small utilities, e.g., Hillsdale and Union City, are in situations similar to Coldwater. See D.J. Exh. No. 18.

⁴²⁴Mr. Mayben testified as follows (Tr. 3700-01):

Mr. Ross [counsel for Consumers], maybe I can answer your question with a certain qualification. I believe your question was what forms of coordination would be required for this intervenor group to be able to install [in 1980] a 500 [MW unit], and I won't pass any judgments with regard to whether or not 500 [MW] is an appropriate level or not.

But again, one of the forms would have to be reserve sharing and mutual support, not only among themselves but with the regional utilities to which they could effect interconnections.

Again, with a unit that large, coordinated maintenance scheduling and maintenance service would be important. I think when we get units that large, certainly economy energy transactions would be a form of coordinated operation that I would like to see because they may have some substantial low-cost energy-producing capability.

Finally, transmission service [wheeling] would be essential because of the way in which this particular group is strung out. It would be depending upon interconnections to the company of the various individual utilities in order to be able to transmit the power that would be produced from this 500-megawatt unit.

In regard to the need for "wheeling" from Consumers, Mr. Mayben was referring specifically to Coldwater. Tr. 3701. See fn. 423, *supra*.

reserve sharing agreement, the three utilities as a group would be required, upon installation, e.g., of a 500 MW unit in 1980, to maintain at least a 50 percent reserve level.⁴²⁵ (Had such a unit come on line in 1972, they would have needed reserves in the 80 percent range.)⁴²⁶ This compares to the approximately 20 percent reserve level that Consumers maintains, see fn. 634, *infra*, even though it currently has on line a 700 MW nuclear power unit.⁴²⁷

4. Consumers' ability to maintain a low level of reserves despite the large size of its generating units is attributable in no small part to its coordination arrangements in the regional power exchange market. The company's internal reviews confirm this. A 1962 "Preliminary Report on Pool Studies" by Consumers indicated that the company could lower its reserve level from 24 to 19 percent by coordinating with Detroit Edison, to 15 percent if Detroit Edison and Consumers coordinated with Ontario-Hydro, and to 12.5 percent if in addition they coordinated with the large systems to the south.⁴²⁸ Further, in 1964, those engaged in planning Consumers' bulk power supply system found that to install nuclear units in the 500 to 600 MW range that, "in order not to have an adverse impact on reserve requirements, large third-party interconnections [were] necessary at [Consumers' then present] load levels."⁴²⁹ (Consumers' peak load in 1964 was 2,375 MW.)⁴³⁰ And Mr. Wall, Consumers' former Vice Chairman, acknowledged that if Consumers were to disconnect itself from the utilities in the power exchange market and operate in isolation, it would have to increase its installed reserves to sup-

⁴²⁵The projected peak load, based on 1973 estimates for these utilities as a group in 1980, is 1,035 MW. See D.J. Exh. No. 254, Schedules 1, 2 and 3, and D.J. Exh. No. 255. Also see Tr. 3699.

Dr. Wein testified that "[a] system of 1,000 MW with a load growth of 80 MW per year could not build a 500 MW unit economically, both because of its lack of utilization and the severe reserve requirement." Tr. fol. 3979 at 64.

⁴²⁶The 1972 peak load of these utilities approached 600 MW. See pp. 939, 941, *supra*.

⁴²⁷Studies undertaken by Justice's bulk power planning expert, Mr. Helfman, suggest that it would be economical for the M-C Pool, Holland, Lansing and Coldwater to install in 1980 a 529 MW nuclear power plant in conjunction with Dow Chemical Company (Dow's share of the plant would be 180 MW) if these utilities had, in addition to wheeling, a reserve sharing agreement so that the percentage of reserves they maintain was equal to that carried by Consumers. D.J. Exh. No. 201. Also see Helfman, Tr. fol 3210 at 32-33.

We note also that the record indicates that the M-C Pool along with Alpena Power Co. and Edison Sault Co. is considering installation of coal units in the 250-350 MW range. See C.P. Exh. No. 12,017. However, Mr. Fletcher, President of Alpena, testified that the "primary problem" the group was experiencing in this regard was a lack of transmission. Tr. 4334.

⁴²⁸D. J. Exh. No. 65. Also see Wein, Tr. fol. 3979 at 65-66.

⁴²⁹Int. Exh. 1,005, pp. 36-37 (Consumers' internal memorandum quoted in the deposition of Mr. Harry Wall). See fn. 431, *infra*.

⁴³⁰C. P. Exh. No. 21A, p. 29 (Consumers' 1973 Annual Report to its Shareholders).

port the large-scale units projected for installation on its system.⁴³¹ Indeed, without its interconnections with these utilities, Consumers would have been in an extremely precarious situation from 1970 to 1973 because of the extended outage of its Palisades plant and other unexpected occurrences (see p. 971, *supra*), particularly so in 1971, when its generating capacity in actual operation was less than its peak load.⁴³²

Thus, even though Consumers' generating capacity is more than four times that of all the small utilities combined,⁴³³ is still finds coordination power transactions with the utilities in the regional power exchange market not merely helpful but necessary to produce reliable firm bulk power at low cost.⁴³⁴ As Consumers' own Vice President for Electric Planning, Mr. Mosley, candidly acknowledged in his direct testimony, "the bulk power supply of Consumers Power Co. is made available to its customers at a lower cost and with better reliability because of [its coordination arrangements] than could be done under any other alternative."⁴³⁵

5. In sum, we find that coordination among the small utilities alone is no substitute for their coordination as part of a larger interconnected system. This finding is not really surprising; the Federal Power Commission, for one, published a similar conclusion years ago. Its *1970 National Power Survey* stated that "[m]ost electric utilities are too small by themselves to construct and take full advantage of the largest modern fossil and nuclear fueled generating units, so they are able to obtain the economic benefits associated with large generating units only by joining with neighboring systems in coordinating arrangements."⁴³⁶ And, as the record makes plain, even Consumers finds it advantageous to do so despite its large size.

Consumers' strategic dominance over high voltage transmission gives the company control over the small utilities' access to other large nearby

⁴³¹Int. Exh. No. 1,005, p. 38. Also see *id.* at 33 (Deposition of Mr. Harry Wall, May 30, 1973). Prior to becoming Vice Chairman in 1972, Mr. Wall had been Vice President in charge of "production and transmission" (1954) and "senior Vice President of electric operations" (1969). *Id.* at 4. Mr. Wall was not able to testify in the proceeding because of his sudden death in December of 1973, prior to Consumers' presentation of its direct case. See C. P. Exh. No. 21A, p. 2.

⁴³²See D. J. Exh. No. 21A, p. 29.

⁴³³See Part IV, *supra*.

⁴³⁴Indeed, engineering studies suggest that the percentage of reserve capacity needed to meet a given reliability standard is "reduced significantly" until a coordinated system reaches 40,000 to 50,000 MW. See Breyer and McAvoy, *The Federal Power Commission and the Coordination Problem in the Electrical Power Industry*, 46 *S. Cal. L. Rev.* 661, 682-87 (1973).

⁴³⁵Tr. 8516. Later, on cross-examination, Mr. Mosley reiterated that "the reason we have [coordination agreements] are for two reasons: to enhance the stability and reliability of our system, and as an economic thing to do in the development of our power supply." Tr. 8652.

⁴³⁶FPC, *1970 National Power Survey*, p. 1-17-2. Also see Wein, Tr. fol. 3979 at 64.

utilities. The small utilities are thus forced to turn to Consumers for their needs, either directly in the form of coordination power and services, or indirectly to have these wheeled into them from "outside" utilities. Consequently, Consumers has monopoly power in the coordination services market submarket, for it can control the terms by which the small utilities can obtain these important coordination services. Stated in terms of the Licensing Board's order delineating the relevant matters in controversy (see p. 921, *supra*), Consumers "has the power to grant or deny [the small utilities] access to coordination" by virtue of undeniable dominance in the ownership and control in transmission facilities (85% of all transmission lines and 98% of lines 138 kV or higher) and in generating capacity (80%) in the relevant geographic market.⁴³⁷

6. one matter remains to be considered. This is Consumers' contention that regulation by the Federal Power Commission precludes it from exercising monopoly power in any bulk power market. Consumers bases its argument on Section 202(b) of the Federal Power Act, 16 U.S.C. §824a(b).⁴³⁸ This provision authorizes the Federal Power Commission in appropriate circumstances to order an interconnection established between two electric power utilities. Consumers' argument is unpersuasive.

⁴³⁷To be sure, the small utilities are able to derive limited benefits from their ability to coordinate operations with one another. But, as we described, these benefits are a far cry from those attainable through coordination with Consumers or with some "outside" utility. Be that as it may, "absolute success in excluding competition is [not] an essential element to proving monopoly power under Section 2 [of the Sherman Act]. It is enough that defendants' market position is such that they have substantial power to thwart competition." *Woods Exploration and Producing Co. v. Aluminum Co. of America*, 438 F.2d 1286, 1307 (5th Cir. 1971), *certiorari denied*, 404 U.S. 1047 (1972). See also, *United States v. Aluminum Company of America*, *supra*, 148 F.2d at 426.

⁴³⁸Section 202(b) provides:

Whenever the Commission, upon application of any State commission or of any person engaged in the transmission or sale of electric energy, and after notice to each State commission and public utility affected and after opportunity for hearing, finds such action necessary or appropriate in the public interest it may by order direct a public utility (if the Commission finds that no undue burden will be placed upon such public utility thereby) to establish physical connection of its transmission facilities with the facilities of one or more other persons engaged in the transmission or sale of electric energy, to sell energy to or exchange energy with such persons: *Provided*, That the Commission shall have no authority to compel the enlargement of generating facilities for such purposes, nor to compel such public utility to sell or exchange energy when to do so would impair its ability to render adequate service to its customers. The Commission may prescribe the terms and conditions of the arrangement to be made between the persons affected by any such order, including the apportionment of cost between them and the compensation or reimbursement reasonably due to any of them.

First, it is undisputed that the Federal Power Commission has no authority to force an electric utility company to wheel power.⁴³⁹ For reasons we have already described, unless Consumers will wheel power to them, the small utilities cannot engage in coordination transactions with the larger nearby utilities outside the coordination services submarket. They are literally landlocked in Consumers' service area. Their access to the outside depends on Consumers' willingness to wheel. The Federal Power Act does not change that picture.

Second, as Consumers acknowledges, the Federal Power Commission cannot order developmental coordination under Section 202(b).⁴⁴⁰ That section expressly withholds authority from the FPC "to compel the enlargement of generating facilities."⁴⁴¹ And, more generally, as the Federal Power Commission has itself conceded, its "jurisdiction does not extend to the 'facilities' used for the generation of electrical energy."⁴⁴² As we have just explained, to take advantage of the economies of scale inherent in large baseload units above 500 MW, the small utilities need either to be part of a joint venture with a nearby larger utility, or must buy unit power from such a plant built by a larger utility. Absent wheeling by Consumers, they can look only to that company for access to large scale baseload generating capacity. The Federal Power Commission cannot compel Consumers to grant that access; FPC decisions acknowledge that the agency has no right "to exercise jurisdiction over the size of nuclear generating unit [or] to allocate the bulk power generating therefrom, such unit being subject to the licensing provisions of the Atomic Energy Act"⁴⁴³

Third, it is true, as Consumers says, that the Federal Power Commission has power in certain circumstances under Section 202(b) to order utilities to enter into operational coordination arrangements such as reserve sharing and sales of economy energy.⁴⁴⁴ But as we have explained, these involve but one aspect of Consumers' monopoly power in the coordination services submarket. More significantly, however, in the *Otter Tail* decision, the

⁴³⁹*Otter Tail Power Co. v. United States*, *supra*, 410 U.S. at 376; *City of Paris, Kentucky v. Kentucky Utilities Co.*, 41 FPC 45 (1969).

⁴⁴⁰See *Consumers' Appeal Brief*, p. 90.

⁴⁴¹See fn. 438, *supra*.

⁴⁴²*Northern California Power Agency v. FPC*, 514 F.2d 184, 186-87 (D.C. Cir.), *certiorari denied*, 423 U.S. 863 (1975), quoting the FPC's decision in that case, 45 FPC at 1153 and 1155 (1971).

⁴⁴³*Ibid.* See 16 U.S.C. §824a(b), set out in fn. 438, *supra*.

⁴⁴⁴*Gainesville Utilities v. Florida Power Corp.*, 40 FPC 1227 (1968), 41 FPC 4 (1969), *reversed*, 425 F.2d 1196 (5th Cir. 1970), *reversed*, 402 U.S. 515 (1971).

Supreme Court squarely held that the existence of that FPC authority to order interconnections does not displace the operation of the antitrust laws. In that case, the Otter Tail Power Company argued—essentially as Consumers does here—“that its refusals to deal should be immune from antitrust prosecution because the Federal Power Commission [had] the authority to compel involuntary interconnections of power pursuant to §202(b) of the Federal Power Act.” 410 U.S. at 373. In rejecting the argument, the Court pointed out (*ibid.*, emphasis supplied):

The essential thrust of §202, however is to encourage voluntary interconnections of power. See S. Rep. No. 621, 74th Cong, 1st Sess. 19-20, 48-49; H.R. Rep. No. 1318, 74th Cong, 1st Sess. 8. Only if a power company refuses to interconnect voluntarily may the Federal Power Commission, subject to limitations unrelated to antitrust considerations, order the interconnection. The standard which governs its decision is whether such action is “necessary or appropriate in the public interest.” *Although antitrust considerations may be relevant, they are not determinative.*

After reviewing the Federal Power Act’s legislative history, the Court concluded (*id.* at 374-75, emphasis supplied):

It is clear, then, that Congress rejected a pervasive regulatory scheme for controlling the interstate distribution of power in favor of voluntary commercial relationships. When these relationships are governed in the first instance by business judgment and not regulatory coercion, courts must be hesitant to conclude that Congress intended to override the fundamental national policies embodied in the antitrust laws. See *United States v. Radio Corp. of America, supra*, at 351, 3 L. Ed. 2d 354. This is particularly true in this instance because Congress, in passing the Public Utility Holding Company Act, which included Part II of the Federal Power Act, was concerned with “restraint of free and independent competition” among public utility holding companies. See 15 U.S.C. §79a(b)(2).

Thus, there is no basis for concluding that the limited authority of the Federal Power Commission to order interconnections was intended to be a substitute for or immunize Otter Tail from antitrust regulation for refusing to deal with municipal corporations.

We think *Otter Tail* is dispositive. There is no doubt that the terms of coordination agreements are governed in the first instance by business judgment and not regulatory coercion. The FPC itself has stressed that there are literally thousands of different types of coordination arrangements and that their individual terms reflect the needs, resources and managerial views of

the different utilities.⁴⁴⁵ Apparently in recognition of the precedential force of *Otter Tail* and other Supreme Court decisions,⁴⁴⁶ Consumers does not make a bald assertion that its individual coordination transactions are exempt from antitrust scrutiny because of the Federal Power Act. Rather, it appears to be arguing that simply because the FPC might someday order it to interconnect with the smaller utilities, *ipso facto* the company lacks monopoly power. We fail to perceive how a regulatory scheme that admittedly grants no immunity from the antitrust laws, by its mere existence, alters the character of what is otherwise monopoly power. Consumers' argument is an attempt to slip in via the back door a proposition the courts have barred at the front, namely, that regulation for other purposes can attenuate the antitrust laws. That argument has been rejected. *Mt. Hood Stages, Inc. v. Greyhound Corp.*, 555 F.2d 687, 691-92 (9th Cir. 1977); *International T. & T. Corp. v. General T. & E. Corp.*, 518 F.2d 913, 935-36 (9th Cir. 1975), and cases cited. The best that can be said for it is that "the impact of regulation must be assessed simply as another fact of market life." *Id.* at 936. We find no evidence in this case—certainly Consumers cites none—that the responsibility for limiting the coordination between Consumers and the smaller utilities can be laid at the doorstep of the FPC.⁴⁴⁷

In sum, the regulatory authority vested in the FPC by Section 202(b) of the Federal Power Act does not preclude Consumers from having monopoly power in the coordination services market. The section gives the FPC no right to order wheeling or coordinated development and, for the reasons discussed, Consumers' attempt to minimize their importance as "two among many" viable bulk power supply alternatives is unconvincing. Nor does the FPC's power to order operational coordination blunt Consumers'

⁴⁴⁵See quotation in fn. 287, *supra*, from the FPC's 1970 National Power Survey.

⁴⁴⁶Other Supreme Court cases in addition to *Otter Tail* hold that where business judgment is not in the first instance supplanted by state or Federal regulatory coercion, a firm is held accountable under the anti-trust laws for its conduct, though its activities may be subject to the jurisdiction of a regulatory agency. *United States v. Radio Corp. of America*, 358 U.S. 334, 350-51 (1951); *Cantor v. Detroit Edison Co.*, 428 U.S. 579, 596-98 (1977). Also see *Goldfarb v. Virginia State Bar*, 421 U.S. 773, 788-90 (1976).

⁴⁴⁷Moreover, it is settled that even conduct formally approved by a regulatory agency may be the basis of an antitrust violation where agency approval conveys no exemption from the antitrust laws. *United States v. Radio Corp. of America*, *supra*, 358 U.S. at 350-51; *Cantor v. Detroit Edison Co.*, *supra*, 428 U.S. at 596-98; *California v. FPC*, 369 U.S. 482, 489 (1962); *United States v. Philadelphia Bank*, *supra*, 374 U.S. at 350-52; *Litton Systems, Inc. v. Southwestern Bell Tel. Co.*, 539 F.2d 418, 422-24 (5th Cir. 1976); *City of Mishawaka v. Indiana and Michigan Electric Co.*, *supra*; *Almeda Mall, Inc. v. Houston Power and Light Co.*, *supra*, Trade Reg. Rep. par. 61,485 (S.D. Tex. 1977).

monopoly power. The emphasis under Section 202(b) is on voluntary interconnection; business judgment, not regulatory coercion, governs in the first instance both whether and under what terms a utility will coordinate. The record before us confirms this: of the coordination agreements described in Part IV, none is attributable to FPC insistence. Moreover, when the Power Commission does elect to exercise its Section 202(b) authority, "antitrust considerations may be relevant, but they are not determinative." *Otter Tail Power Co. v. United States*, *supra*, 410 U.S. at 373. In the circumstances, Consumers' monopoly power over the coordination services submarket is not vitiated by the existence on the statute books of the Federal Power Act.

B. The wholesale and retail power markets

1. In contrast to the coordination services submarket, both the wholesale and retail product markets lend themselves to the traditional market share analysis. In the latter market the product is firm electric power supplied by electric distribution systems to the retail customer, the ultimate user of that power. We may determine the share of the utilities in this market with relative ease by calculating the amount of such electric energy in megawatt hours (MWh) that each sold. Using 1971 as an index,⁴⁴ Consumers that year distributed some 19,874,396 MWh of electric energy to customers in the retail market; the small utilities combined, some 3,751,242 MWh. On this basis Consumers held more than an 84 percent share of the relevant market for retail power.⁴⁵

For reasons described earlier (p. 990 *ff.*), the relevant wholesale product market embraces not only wholesale power sold to other utilities for

⁴⁴The market shares of the respective utilities do not vary significantly from year to year. See D. J. Exh. No. 197.

⁴⁵D. J. Exh. No. 197.

Were we to exclude Consumers' retail sales in its Foote Act franchise areas (except Bay City and Traverse City), Consumers' market share would not be drastically reduced. In 1971, Consumers sold 10,582,416 MWh in areas where it serves under limited term franchises. Pace, Tr. fol. 7239 at Attachment JDP-1. In addition, it sold 271,000 MWh in Bay City and Traverse City. This places Consumers' sales of power at the retail level (excluding those Foote Act Franchise areas where there is no current door-to-door competition) at 10,853,416 MWh. Comparing this to the 3,751,242 MWh that the small utilities sold at retail still leaves Consumers a 74.3 percent of the retail market.

This percentage differs slightly from the 77 percent market share that Consumers had calculated for itself in its proposed closed market (see Pace, Tr. fol. 7239 at Attachment JDP-1) because we included in our calculation both Consumers' retail sales in Bay City and Traverse City and those of the municipal systems. Also Consumers excluded Edison Sault and Thumb Electric from the relevant retail market systems, while we include them. (See fn. 393, *supra*.)

retail distribution, but also the firm bulk power that vertically integrated utilities furnish to their own “in-house” or captive distribution systems. In other words, this market includes the firm bulk power requirements of all the distribution systems in the relevant geographic market, whether or not a particular system is a component of a vertically integrated utility.

Because all power delivered to distribution systems is, except for distribution losses and certain minor exceptions, ultimately sold at retail, the wholesale power market is essentially equivalent in size to the retail market.⁴¹⁰ In calculating each utility’s wholesale market share, we look, as we did in the retail market, at the amount of electric energy it delivers to distribution systems in the form of firm bulk power. Before making this calculation, however, we reiterate a point we made in discussing the coordination services market. Wholesale power is “firm” power in bulk. While it can be generated by a single utility’s own facilities, more often than not it is now produced to some extent by combining bulk power from the coordination services market with bulk power generated internally. Accordingly, when calculating a utility’s share of the wholesale power market, one must add to (or subtract from) its in-house production of bulk power the utility’s net purchases (or sales) in the coordination services market. We have calculated the wholesale power market and Consumers’ share of it under that principle.

In 1971, Consumers generated 18,273,104 MWh of electric energy; it purchased (net) 2,850,256 MWh additional in the coordination services submarket, making a total of 21,123,360 MWh that it either supplied as firm bulk power to its captive distribution systems or sold at wholesale to other utilities serving the relevant geographic market. The total firm bulk power requirements for all distribution systems (including Consumers and the small utilities) for that year—the market—was 24,779,221 MWh. Thus Consumers’ portion of the wholesale firm bulk power market amounted to somewhat more than an 85 percent share.⁴¹¹

2. Consumers thus controls a high percentage of the market both at retail (84 percent) and at wholesale (85 percent). “Percentages of this magnitude,” the Justice Department contends, “‘leave no doubt’ that [Consumers] possesses monopoly power.”⁴¹² A review of monopolization cases confirms that the courts have indeed inferred the existence of monopoly power from market shares of comparable dimension. For example, in *United States v. Aluminum Co., supra*, 148 F.2d at 425, the court

⁴¹⁰See Wein, Tr. fol. 3979 at 73.

⁴¹¹D. J. Exh. No. 197.

⁴¹²*Justice’s Opening Brief on Appeal*, p. 55.

found monopoly power from defendant's control over 90 percent of the market; in *United States v. American Tobacco Co.*, *supra*, 221 U.S. at 162, from 86 percent; in *United States v. United Shoe Mach. Corp.*, *supra*, 110 F. Supp. at 343, from 75 percent; in *International Boxing Club of New York v. United States*, *supra*, 358 U.S. at 249, from 81 percent; and in *United States v. Grinnell*, *supra*, 384 U.S. at 567, from 87 percent of the relevant market. Seen in the light of those decisions, Consumers' percentages of sales in the relevant retail and wholesale markets are certainly well in the range that permits the inference that it possesses monopoly power in both markets.

Consumers urges, however, that peculiar characteristics of the electric utility industry preclude our drawing that inference. It prefaces its argument with the Supreme Court's "warn[ing] that '[o]bviously no magic inheres in numbers [reflecting market share because] the relative effect of percentage command of a market varies with the setting in which that factor is placed.'" ⁴⁴³ It contends that the Court's warning not to give talismanic effect to market shares "applies particularly where there are economic and legal restraints upon competition in the relevant market," such as those which Consumers says exist in the electric utility industry.⁴⁴⁴ In support of its position Consumers relies principally on three cases: *United States v. General Dynamics Corp.*, 415 U.S. 486 (1974); *United States v. Marine Bancorporation*, 418 U.S. 602 (1974); and *United States v. Citizens National Bank*, 422 U.S. 86 (1975). The company contends that in those cases the Court eschewed reliance on market shares because of legal and economic restraints on competition and urges us to follow suit for similar reasons. Consumers' position is, basically, that to the extent the electric utility industry in lower Michigan is not competitive, this is attributable to legal and economic facts of life in Michigan's electric utility industry. Consumers asserts that those factors negate the inference that it possesses monopoly power solely because it controls the lion's share of the relevant markets.⁴⁴⁵

a. We need not be long detained by the *legal* barriers to competition on which Consumers relies. Our analysis of the retail market sets out at length the reasons why that reliance is misplaced.⁴⁴⁶ To recapitulate briefly, those barriers do not cast the present market structure in concrete. Michigan law

⁴⁴³*Consumers' Appeal Brief*, p. 134, quoting from *Times Picayune Pub. Co. v. United States*, 345 U.S. 594, 612 (1953) and *United States v. Columbia Steel Co.*, 334 U.S. 495, 528 (1948). In both cases, the defendant's share of the relevant market was roughly 40%.

⁴⁴⁴*Consumers' Appeal Brief*, pp. 134-35.

⁴⁴⁵See *Consumers' Appeal Brief*, p. 151.

⁴⁴⁶See pp. 983-986, *supra*.

allows municipalities and townships to franchise other private utilities in lieu of Consumers. More importantly, those municipalities may establish their own electric systems within their respective jurisdictions in place of Consumers as the retail and even the wholesale supplier. And, as we also observed, these self-same legal barriers did not preclude Consumers from reaching its present market position by acquisition of other companies; indeed Consumers has acquired three more utilities since 1960. In short, there is nothing written into Michigan Law that guarantees the current market position of Consumers in Michigan. Rather, each utility's market share is subject to the ebb and flow of competitive market forces. Those forces are admittedly periodic and limited in strength, but nevertheless they exist and are protected by the antitrust laws. *Otter Tail Power Co. v. United States, supra*; *Cantor v. Detroit Edison Co., supra*; *City of Mishawaka v. Indiana & Michigan Electric Co., supra*.

b. It is true that the *economic* barriers to the entry of new competitors in the relevant markets (and in the electric utility industry generally) are high ones.⁴³⁷ For example, to start up its own retail electric system, a municipality would have to make a considerable capital investment in a distribution network.⁴³⁸ A similarly large capital investment would be required for any existing retail system to "integrate vertically," *i.e.*, become a bulk power supplier as well.⁴³⁹ Simply because of the expense involved, we accept that no municipality would undertake either step lightly. Before doing so it would have to satisfy itself that it would (at least eventually) be able to provide electric service to its citizens at rates significantly below those being offered by the private utility it would displace.⁴⁴⁰

But the existence of these high economic barriers to market entry hardly negates the idea that Consumers possesses monopoly power. The opposite is true: the presence of high entry barriers reinforces—if not confirms—the inference of monopoly power suggested by Consumers' high market shares.

⁴³⁷See Wein, Tr. 3993-99.

⁴³⁸According to the FPC, *1970 National Power Survey*, p. I-14-1, "distribution systems account for nearly 40 percent of the total investment in electric power facilities."

⁴³⁹For example, Holland's total electric utility plant (generation and distribution) in 1974 was valued at 21 million dollars. Holland's 1974 *Annual Report*, Form 1-19, p. 3, line 2 (quoted in *Consumers' Appeal Brief* at p. 111).

As we described in Part IV, Holland is vertically integrated and is the second largest municipal electric system in the relevant geographic market. In 1972 it served 12,048 customers whose peak power demand was 44.5 MW. Holland met this demand by operating five generating units with a total capacity of 81.5 MW. See p. 941, *supra*.

⁴⁴⁰Testimony with respect to Foote Act franchises suggests that a potential rate disparity in the neighborhood of 20 percent might be needed before a municipality would consider establishing a system in competition with Consumers. See fn. 377, *supra*.

The reason for this was cogently explained in the Federal Trade Commission's *Golden Grain Macaroni Co.* decision:⁴⁶¹

Under our analysis, it is necessary to consider the existence of other factors which may either confirm or rebut the presumption [of monopoly power] that arises from respondents' [high] market share. The most important such factor in this case in entry barriers. *If barriers to entry are low and unimportant, then the existence of numerous potential entrants on the edge of the market would effectively preclude respondents' control of price or exclusion of competition and thus would rebut the presumption of monopoly power. But in this case, the record reveals the existence of high and significant barriers to entry into the dry paste market in the Pacific Northwest, and this fact strengthens the monopoly power presumption based on market share.* [Emphasis supplied.]

To reiterate, *low barriers to entry rebut the inference of monopoly power* suggested by high market shares because the ease with which new firms may enter the market deters the dominant firm from increasing prices and demonstrates its incapability of excluding competition.⁴⁶² In contrast, *high entry barriers reinforce the inference of monopoly power* implied by large market shares because the difficulty of new firms entering the relevant market allows the dominant firm greater leeway in raising prices or excluding competition. *Golden Grain Macaroni Co., supra; United States v. United Shoe Machinery Corp., supra*, 110 F. Supp. at 343-44.

The three Supreme Court cases that Consumers cites to support its contrary argument are simply not on point. *Marine Bancorporation*, *General Dynamics*, and *Citizens National Bank* involved mergers attacked under Section 7 of the Clayton Act, not monopolization challenged under Section 2 of the Sherman Act.⁴⁶³ The pivotal factor in each was the factual deter-

⁴⁶¹78 FTC 63, 180 (1971) (concurring opinion). The majority agreed on this point:

Barriers to entry . . . would be relevant only if we found that respondents' market share was so large that they enjoyed monopoly power. For, if the barriers were not high, the potential entrants would operate as a deterrent to price increases and demonstrate respondents' incapacity to exclude competitors (the earmarks of a monopolist). In the same way, if we concluded that respondents' performance or conduct was that of a monopolist, we would measure entry barriers so as to gauge better the market power of respondents. But since we have found that under none of these tests (structure, performance or conduct) do respondents have the ability to exclude competitors or raise prices, it is not necessary for us to determine what the record shows respecting entry barriers. *Id.* at 163 fn. 9.

⁴⁶²See Judge Lacey's recent lucid discussion of the point in *Weber v. Wynne*, 431 F. Supp. 1048, 1054-56 (D.N.J. 1977).

⁴⁶³*United States v. Citizens National Bank* also involved a charge under Section 1 of the Sherman Act. Consumers does not rely on that portion of the Court's opinion.

mination that the merger between two existing companies did not substantially lessen competition, actual⁴⁴ or potential,⁴⁵ the statutory test for proscribing a merger under Section 7 of Clayton Act. None of these cases,

⁴⁴In both *United States v. General Dynamics* and *United States v. Citizens Bank*, the Court found that the merging companies' market shares were sufficiently high to support a finding of undue concentration. Clayton Act, Section 7, was held not to have been violated because of proof that the merger would in fact not substantially lessen competition.

In *General Dynamics*, the Court focused on the coal industry's practice of selling coal under long-term fixed price contracts. Because of this, the Court concluded that the best measure of a coal producer's competitive power was the size of its uncommitted reserves of recoverable coal. The Court found that the acquired company had relatively small amounts of coal reserves, most of which were already committed under long-term contracts, and that it did not have possibility of acquiring more reserves. Thus, the Court was led to conclude that though the acquired company was at the time a highly profitable and efficient producer of coal, it had dim long term prospects and therefore no substantial lessening of competition would result from the merger.

In *United States v. Citizens Southern Bank*, the Court found that the merger would not substantially lessen competition because, under a preexisting commercial relationship between the merging firms, "no real competition had developed or was likely to develop." 422 U.S. at 121. (The Court had expressly found that this previous commercial relationship did not violate Section 1 of the Sherman Act.)

These two cases stand for the proposition that factors other than market concentration are important when determining a violation of Section 7 of the Clayton Act. While that principle is applicable also under Section 2 of the Sherman Act, it is not material in determining the roles that barriers to market entry play in determining the existence *vel non* of monopoly power.

⁴⁵In *United States v. Marine Bancorporation*, the government's case rested on the potential competition doctrine. Its essence is that fear of the potential entry of the acquiring firm into the relevant market previously forced an otherwise oligopolistic market to function competitively to deter that entry. Upon merger of the potential competitor with a firm already in the market, the former procompetitive influence vanishes. Accordingly, the merger lessens competition within the relevant market. See *United States v. Marine Bancorporation*, *supra*, 418 U.S. at 623-41; *United States v. Falstaff Brewing Corp.*, 410 U.S. 526 (1973). See also *Kennicott Copper Corp.*, 78 FTC 744 (1971), *affirmed sub nom. Kennicott Copper Corp. v. FTC*, 467 F.2d 67 (10th Cir. 1972). Thus, as the Supreme Court observed in *Marine Bancorporation*, "ease of entry [into the relevant market] on the part of the acquiring firm is a central premise to the potential competition doctrine," 418 U.S. at 628. And in that case, the Court found that state regulatory restraints on branch banking made the acquiring firm "an insignificant potential entrant except by merger" and thus the "pro-competitive influence" the acquiring firm exerted in the relevant market "by standing 'in the wings'" was minimal. 418 U.S. at 639-40. The Court therefore concluded that because no potential competition existed, the merger could not have the effect of substantially lessening competition in the relevant market.

Manifestly, the rationale of *Marine Bancorporation* is not pertinent to deciding whether a firm already within the relevant market possesses monopoly power. In no way did the Court hold (as Consumers would have us do here) that the legal barriers to entry rebutted the presumption suggested by the market shares that the relevant market in that case was oligopolistic. Indeed, the Court recognized that these legal barriers reinforced the oligopolistic nature of the relevant market. 418 U.S. at 630-32 and 639-42.

however, suggests (much less holds) that high “barriers to entry” in a market negate the idea that the dominant firm in that market possesses monopoly power.⁴⁶⁶

Moreover, the testimony of both Consumers’ economic experts supports the validity of the proposition that high entry barriers enhance, not diminish the likelihood that an enterprise which dominates the market has monopoly power.⁴⁶⁷ Consumers’ contrary assertions are simply at war with accepted economic tenets.⁴⁶⁸

3. In the final analysis, our conclusion that Consumers possesses monopoly power in the retail and wholesale markets stands on three legs: the permissible inference to that end from the company’s predominant share of those markets; the high market barriers that face any new entrant to those markets (and serve to confirm the existence of Consumers’

⁴⁶⁶Consumers contends that the “basic natural monopoly” characteristics of the electric utility industry, with concomitant barriers to competition, make it “ ‘hardly surprising’ . . . that only one large firm will be present in a given market area.” *Consumers’ Appeal Brief*, p. 143. Consumers appears to be suggesting that because it is natural (at least from its viewpoint) for it to be the only large firm in its own general service area, it cannot have monopoly power. To the extent that Consumers is making such an argument it is in error. Because a firm’s monopoly is “natural” hardly suggests that it lacks monopoly power. It merely means that the antitrust law may not penalize acquisition of that power. See *United States v. Aluminum Co.*, *supra*, 148 F. 2d at 429-30.

⁴⁶⁷Dr. Pace, in response to hypothetical questions, testified that (Tr. 7300, 7302):

If one . . . had 80 percent of the market but there were substantial competitors standing on the edge of that market, obviously facing relatively little barriers to entry, the possession of 80 percent of the existing market by a single server could be, in fact, consistent with completely efficient performance.

* * *

[But] if he possesses 80 percent of the market, he is not regulated, and potential competition is barred from the market, I would tend to conclude he has monopoly power.

Similarly, Dr. Stelzer testified (Tr. fol. 7224 at 16):

[t]o the extent that [the possibility that a utility may be supplanted by entry of a new utility], exists, it reduces the economic meaningfulness of any market share competition since given the threat of entry, a firm has to behave as if his market share were under continuous threat.

⁴⁶⁸Even if an absolute legal barrier to new entry were to exist (not the situation in lower Michigan), Consumers’ proposition would be invalid. For example, a holder of a patent is protected by law from possible competitors manufacturing and selling its product—*i.e.*, an absolute legal barrier to competition in the selling of that product exists. If no reasonable substitutes existed for that product, the patentee would be totally free to set a monopoly price for its product. In short, he would have unmitigated albeit lawful monopoly power because of that barrier. Of course, as long as he does not misuse his patent, he is not subject to attack under the antitrust laws. But this does not detract from the fact that he possesses monopoly power.

monopoly power); and, lastly, Consumers' strategic dominance of generation facilities and, perhaps more importantly, the transmission network serving those markets. We have already described how this last factor enables Consumers to curtail the smaller utilities' access to the coordination services necessary to obtain economies in the production of firm bulk power—making them more likely to have to meet their bulk power needs by purchases of wholesale power from Consumers. But it is also manifest that Consumers' control of the transmission network enables it, simply by refusing to wheel, to block other utilities from entering the markets and competing to serve the smaller companies' bulk power needs.⁴⁶⁹ This in turn ultimately affects the smaller utilities' cost of producing retail power, again to Consumers' competitive advantage, and discourages potential new entrants in that market as well.⁴⁷⁰

4. Consumers insists, nevertheless, that it does not possess monopoly power in either market because of state and federal government regulation of its rates and other activities. We do not agree.

a. To begin with, as Dr. Wein explained, “the fact that [there is] regulatory review of [utility] companies' rates, whether it is on a federal or state level, is only because these companies do have monopoly power, *i.e.* . . . if they had no monopoly power to set the rates there would be no reason for regulation.”⁴⁷¹ The courts agree. “[P]ublic utility regulation typically assumes that the private firm is a natural monopoly and that public controls are necessary to protect the consumer from exploitation.” *Cantor v. Detroit Edison Co.*, *supra*, 428 U.S. at 595-96.

The effectiveness of rate regulation—whether it really precluded regulated enterprises from exercising monopoly control over prices—is debatable.⁴⁷² The two principal economists who testified in this case disputed the point.⁴⁷³ With respect to the retail market, however, we need not become embroiled in debate over the extent of the Michigan PSC's ability to control monopoly profits. As we have described at some length

⁴⁶⁹*Cf.*, *Alabama Power Company* (Joseph M. Farley Nuclear Plant, Units 1 and 2), 5 NRC 804, 899-901 (1977) (appeal pending).

⁴⁷⁰We stress again that the question addressed here is whether Consumers possesses monopoly power. Whether it has used that power to monopolize, an offense under the Sherman Act, is a separate question addressed in the next part of this opinion.

⁴⁷¹Tr. 3996.

⁴⁷²See for example, Hale and Hale, *The Otter Tail Power Case; Regulation by Commission or Antitrust Laws*, the Supreme Court Review, 99, 104-14 (1973); Turner, *The Scope of Antitrust and Other Economic Regulatory Policies*, 82 Harvard L. Rev. 1207, 1231-41 (1969); Posner, *Natural Monopoly and Its Regulation*, 21 Stanford L. Rev. 548, 592-606 (1969).

⁴⁷³Compare Wein, Tr. fol. 3979 at 31 and Tr. 3993-96, with Pace, Tr. fol. 7239 at 15-16, 24-25 and Tr. 7277-78.

(see Part V, *supra*), at the retail distribution level each locale may be thought of as a natural monopoly with only the identity of the monopolist open to competition. The critical question for purposes of this case is, therefore, whether state or Federal regulation precludes Consumers from using its dominant economic power to foreclose competition for the right to provide retail service to the individual communities. As we have already discussed, Consumers' control over transmission and generation facilities enables it to prevent potential retail competitors from looking elsewhere than to itself for wholesale power and coordination services. It was precisely the existence of this kind of power—and its use by an electric utility in analogous circumstances to foreclose its replacement as the sole supplier of retail power in several municipalities—which the *Otter Tail* Court characterized as “monopoly power” (410 U.S. at 377). And the Court did so notwithstanding the existence of FPC and local regulatory authority.⁴⁷⁴ Indeed, at oral argument, counsel for Consumers acknowledged that the Supreme Court had found that the Otter Tail Power Company possessed monopoly power (App. Tr. 127-28.)⁴⁷⁵ The *Otter Tail* decision is thus dispositive and compels our rejection of the argument that government regulation precludes Consumers' possession of monopoly power in the retail market.⁴⁷⁶

b. Consumers' argument that FPC regulation of bulk power transactions precludes its having monopoly power in the wholesale market is no

⁴⁷⁴The Supreme Court was well aware that the FPC had in 1968 ordered a temporary interconnection between Otter Tail and Elbow Lake (one of the cities involved) and made this interconnection permanent in 1971, four days after the district court had entered its decree. See 410 U.S. at 392 fn. 8, and 40 FPC 1262 (1968) and 46 FPC 675 (1971).

⁴⁷⁵In its appellate brief (p. 89, fn. 54), Consumers attempts to distinguish *Otter Tail* by arguing that it is not a “monopolization” case but rather (in the Supreme Court at least) involved charges of “attempting to monopolize” an unregulated retail market. We have previously rejected that reading of the case. See fn. 88, *supra*. (In any event, an element of an attempt to monopolize is a dangerous probability of success.) It is true that Minnesota and South Dakota did not regulate retail rates at the time, but North Dakota—also involved—did. This lack of rate regulation is of no significance. The Supreme Court found that Otter Tail had monopolized by anticompetitive uses of its dominant economic power—other than its rate structure—to exclude competition. See 410 U.S. at 377. Regulation of its rates would not block a utility company's exercise of monopoly power in this fashion in any event.

⁴⁷⁶Consumers also argues in its appellate brief (pp. 88-89) that because Michigan Law (MSA 22.156) provides that the state PSC may “order the Company to deliver power suitable ‘for distribution’ at any appropriate primary voltage in any ‘city, village or township’ through which its transmission lines run,” the company lacks the ability to exclude competition. Consumers does not press the point and makes no mention of any instance in which it was compelled to furnish power by virtue of this provision. This is merely another version of the argument that the existence of latent state regulatory power exempts business conduct from the antitrust laws. The point is not well taken. See p. 1005 *ff.*, *supra*.

stronger. Indeed, we have already considered and rejected that same line of reasoning when Consumers proffered that argument in connection with the coordination services submarket. See p. 1005 *ff.*, *supra*. Similar considerations call for its rejection here as well. In essence, these boil down to the fact that Consumers' power to exclude competition by virtue of its dominance over transmission and generation facilities is not effectively curtailed by the FPC's regulatory authority. We therefore find no occasion to discount Consumers' possession of monopoly power in the wholesale market on the basis of such FPC regulation.⁴⁷⁷

5. Finally, Consumers argues that the "competitive success and comparative financial strength of the Company's smaller neighbors" confirms its lack of monopoly power. The logic of this argument eludes us. Manifestly, every company that possesses less than 100 percent of the relevant market will have some viable competitors. That they continue in business—even successfully—does not mean that the dominant enterprise is without monopoly power. See, e.g., *United States v. United Shoe Machinery Corp.*, *supra*, 110 F. Supp. at 339, 345-46.⁴⁷⁸ "[W]e do not think that absolute suc-

⁴⁷⁷While we do not pursue the point, it is worth noting that the FPC's power to control wholesale rates apparently does not effectively bar a utility from exercising monopoly power in the wholesale market by means of "price squeeze" tactics. These tactics involve charging municipalities higher wholesale rates than the utility's own retail rates, thereby foreclosing the municipalities' competition for its customers or for new industrial users. See *City of Mishawaka v. Indiana & Michigan Electric Co.*, 560 F.2d 1314 (7th Cir. 1977). Indeed, even in straightforward cost-of-service situations, the efficacy of FPC procedures to preclude rate-gouging is problematical. Under the law, the Commission may only suspend a rate increase for 5 months while investigating whether it is just and reasonable. If the investigation is not then complete, the higher rate becomes effective. Thus, for example, after the *Otter Tail* litigation had been resolved in the Supreme Court, the utility agreed in 1973 to wheel wholesale power to the town of Elbow Lake, but only after filing a tariff which charged 500% more for that service than other towns were then called upon to bear. Elbow Lake promptly protested to the Commission, but the FPC proceedings on that rate filing are not yet close to completion. See *Alexandria v. FPC*, 555 F.2d 1020 (D.C. Cir. 1977). If the higher wheeling rate is held not "just and reasonable," the FPC might eventually be able to order a refund. But see, *Indiana & Michigan Electric Co. v. FPC*, 502 F.2d 336, 342-45 (D.C. Cir. 1974), *certiorari denied*, 420 U.S. 946 (1975) (FPC without power to order a refund of charges paid under an initial rate filing as distinguished from refunding an increase over a previously filed rate). Moreover, as the 7th Circuit dryly observed in *City of Mishawaka*, *supra*, "Delay, combined with the multiple rate increases, could mean that the customer has been put out of business by his supplier-competitor. You cannot give refunds to a corpse." 560 F.2d at 1325.

⁴⁷⁸The cases cited by Consumers do not hold to the contrary. *United States v. Columbia Steel Co.*, 334 U.S. 495 (1948); *United States v. General Dynamics Corp.*, *supra*, 415 U.S. at 502; and *Budd Co.*, 3 CCH Trade Reg. Rep. par. 20,998 (FTC 1975), concerned mergers attacked under Section 1 of the Sherman Act or Section 7 of the Clayton Act; the factual situations and legal questions involved in those cases are not analogous to those presented here. The Tenth

(Continued on next page)

cess in excluding competition is an essential element to proving monopoly power under Section 2. It is enough that defendants' market position is such that they have substantial power to thwart competition."⁴⁷⁹

Neither are we able to perceive how certain financing and tax advantages enjoyed by the municipalities and cooperatives negate Consumers' predominant market position and its control over the strategic transmission lines. Aside from the fact that anticompetitive conduct cannot be justified on the ground that a competitor has a tax advantage, see *American Federation of Tobacco Growers v. Neal*, 183 F.2d 869, 872 (4th Cir. 1950), those tax and financing advantages are a matter of federal policy. If Consumers finds them unpalatable, its remedy lies with the Congress; in the interim it must take its competitors as it finds them.

VII. MONOPOLIZATION

Our determination that Consumers Power Company possesses monopoly power in the relevant markets does not end the inquiry. It is not monopoly power but its willful use to preserve or extend a monopoly, to foreclose actual or potential competition, to gain competitive advantage or to destroy competitors—*i.e.*, "monopolization"—which Section 2 of the Sherman Act condemns. (See p. 921 *ff.*, *supra.*)

Where this a district court proceeding, the question would be whether Consumers has monopolized one or more of the relevant markets in violation of the Sherman Act. That question is indeed present. But Section 105c calls upon us to answer a further inquiry: Even if Consumers' conduct falls short of a full-fledged statutory violation, does it run counter to the policies underlying the Sherman Act so that remedial conditions on the company's nuclear licenses are called for nevertheless? Before we may reach those substantive questions, however, there are some preliminary matters which must be addressed.

(Continued from previous page)

Circuit declined, in *Cole v. Hughes Tool Co.*, 215 F.2d 924 (1954) *certiorari denied*, 348 U.S. 927 (1955), to accede to the trial court's inference of monopoly power from Hughes' 75 percent share of the drilling tool market. The court attributed that share to Hughes' legal monopolies under valid patents and expressed skepticism about the evidence to the contrary. The court's remark about the continued successful existence of certain competitors (who had been held infringing on Hughes' patents) was a makeweight at best.

⁴⁷⁹*Woods Exploration & Pro. Co. v. Aluminum Co. of America*, *supra*, 438 F.2d at 1307.

A. Preliminary questions

1. Matters "beyond" the scope of the controversy

On the basis of its assumption that the issues were limited to charges involving coordination (see Part V), the Licensing Board declined to consider charges that Consumers had monopolized the wholesale and retail markets. In so doing, it excluded charges that the company had monopolized those markets by (a) acquiring smaller utilities within them, (b) entering into agreements not to compete with neighboring large utilities, and (c) refusing to wheel bulk power from outside sources to the smaller utilities. See 2 NRC 40-45 and 104-109. In the Board's view, those charges were not concerned with coordination and hence were beyond the scope of this proceeding.

We have already held, as Consumers urged, that the Board erred in excluding consideration of the wholesale and retail markets. Consumers now insists, however, that it would be prejudiced by our consideration of the additional charges because it had no fair opportunity to defend against them below. Appellants disagree, contending that those allegations were fully litigated before the Licensing Board. If they are correct, we may consider those allegations. *Niagara Mohawk Power Corp.* (Nine Mile Point Nuclear Station, Unit 2), ALAB-264, 1 NRC 347, 354-55 (1975).

In resolving this question, whether the allegations have been formally charged in a complaint or specified at the outset in another manner is relevant but not decisive. In an administrative proceeding the "complaint"⁴⁰ need not "enumerate precisely every event to which [the agency] may finally attach significance."⁴¹ The crucial factor is whether the opposing party is given a reasonable opportunity to know and defend against the case as it unfolds. It is sufficient that such an opportunity has been provided and the matters have been fairly litigated and argued. In administrative pro-

⁴⁰The closest document to a formal complaint in this proceeding is the Attorney General's letter to the Commission recommending an antitrust hearing. See pages 897-898, *supra*. It was certainly his objections to Consumers' coordination practices with smaller utilities that formed the primary basis for his recommendation.

The primary agency document defining the scope of the proceeding is the Licensing Board's order delineating the relevant matters in controversy. See 2 NRC at 42. A fair reading of that order indicates that the "basic thrust" of Justice's charges of anticompetitive conduct levied against Consumers concern the company's coordination policies with respect to the small utilities, including their effect on the wholesale and retail markets. Wheeling is a form of coordination and thus certainly within the scope of the Board's order. At the hearing Consumers presented a general statement concerning its wheeling policies. It made no attempt to distinguish between wheeling for coordination and wheeling wholesale power.

⁴¹*L. G. Balfour Co. v. FTC*, 442 F.2d 1, 19 (7th Cir. 1971).

ceedings, claims of prejudicial error are not sustainable on technical deficiencies in formal statements of charges.⁴⁴²

Our review of the record satisfies us that the three allegations supposedly beyond the issues in controversy were fully litigated. (Indeed, we note that the Board below itself purported to resolve them "for the sake of completeness." 2 NRC at 102.) Each was addressed throughout the proceeding by all the parties, including Consumers. For example, the appellants sought discovery relating to these allegations⁴⁴³ and Consumers responded without objection.⁴⁴⁴ Moreover, in its prehearing brief Justice specifically made these allegations against Consumers, setting forth the particular factual situations that formed the basis for the charges.⁴⁴⁵ And, contrary to Consumers' contention, Justice and the NRC staff introduced testimonial evidence in support of their allegations.⁴⁴⁶ Consumers did not object and, again contrary to the representation in its appeal brief, actually conducted extensive cross-examination on these matters. See fn. 486, *supra*. Moreover, in making its direct case, Consumers itself offered witnesses who sought in their testimony to contradict evidence on these questions previously placed

⁴⁴²*L. G. Balfour Co. v. FTC*, *supra*, fn. 481. *Accord*, *Avnet v. FTC*, *supra*, 511 F.2d at 76; *Golden Grain Macaroni Co. v. FTC*, 472 F.2d 882 (9th Cir. 1972), *certiorari denied*, 412 U.S. 918 (1973). *Rea Trucking Co. v. NLRB*, 439 F.2d 1065, 1066 (9th Cir. 1971); *Rogers Mfg. Co. v. NLRB*, 486 F.2d 644 (6th Cir. 1973).

⁴⁴³For example, see *First Joint Request of [the Appellants] for Production of Documents from Consumers*, July 26, 1972, requests no. 3(a), 3(d), 5(c), 5f(1), 5f(2), 5f(2)(i), and 6(a); *Justice's Further Request for Admission and Interrogatories*, August 22, 1973, requests no. 9, 11, 12, 24, 25, 26; *Deposition of Mr. Aymond Consumers' Chief Executive Officer*, Intervenors' Exhibit No. 1,004, pages 183-190, 193-205.

⁴⁴⁴It should be noted that Consumers did raise numerous objections concerning the proper scope of discovery but none concerning the relevancy of requests concerning the three allegations in question. For example, see *Consumers' Objections to Document Requests and Motion for a Protective Order*. October 26, 1972.

⁴⁴⁵*Justice's Prehearing Brief*, 39-42, 47-48, 50-51. Also see *Intervenors' Trial Brief*, 17, 23, 41 and *Consumers' Prehearing Brief*, pages 158, 186-88.

⁴⁴⁶Testimony concerned with Consumers' acquisition of small utilities and related matters appears at Wolfe, Tr. 1585-89, cross-examination by Consumers, Tr. 1791-97; Steinbrecher, Tr. 1233-49, cross-examination by Consumers, Tr. 1882-92; Keen, Tr. 4487-88, cross-examination by Consumers, Tr. 4540-49.

Testimony related to general wheeling services from Consumers appears at Wolfe Tr. 1729, cross-examination by Consumers, Tr. 1829-32; Munn, Tr. 4073-77, 4136 cross-examination by Consumers, Tr. 4209-11; Keen Tr. 4510-15, cross-examination by Consumers, Tr. 4529-34; Fletcher, Tr. 4329, 4354.

Testimony related to wholesale territorial agreements appears at Sundstrand, Tr. 3890-3917. Mr. Sundstrand did not testify on any other topic. Consumers chose not to cross-examine. Tr. 3917.

in the record by the appellants.⁴³⁷ Finally, Consumers filed proposed findings of fact and conclusions of law with the Board below covering each of the allegations it now says were beyond the scope of the proceeding. Indeed, it did so without once urging the Licensing Board to find them beyond the relevant matters in controversy.⁴³⁸

These circumstances amply satisfy us that Consumers was afforded reasonable opportunity to defend itself against the allegations in question and that in fact it took advantage of the opportunity at each stage of the proceedings below. Notwithstanding its current assertions to the contrary (pressed for the first time on appeal), the company will not be prejudiced by our consideration of these allegations.⁴³⁹

2. Deference due the Licensing Board's findings

The remaining preliminary matter concerns the weight to be given the Licensing Board's findings. By way of background, we note that in general

⁴³⁷Direct testimony related to Consumers acquisition of the small utilities appears at Aymond, Tr. 6063-4; Paul, Tr. 7907-20. Moreover, Consumers' Exhibit No. 11, 308 lists both Consumers' acquisitions of small utilities and its offers to buy small systems.

Direct testimony related to general wheeling services appears at Aymond, Tr. 6046-52 and Paul, Tr. 7934-36. Direct testimony related to wholesale territorial agreements appears at Aymond, Tr. 6070-71 and Paul, Tr. 7950.

Consumers cannot contend that its direct testimony was entirely in response to evidence introduced by the appellants, for in summaries of testimony prepared prior to the evidentiary hearing Consumers included these topics as matters which its witnesses would address.

For example, in summarizing testimony to be given by Mr. Aymond, its chief executive officer, Consumers represented:

Specifically, he will discuss the applicant's past and current policies, where they exist, with respect to *wheeling power* for other utility systems, sales of power at wholesale, *mergers or acquisitions*, and sales of unit power and equity participation in nuclear plants: He also will discuss the *company's policies with respect to competition for wholesale and retail load*.

Consumers' Summary of Testimony of A.H. Aymond (emphasis supplied). See *Justice's Reply Brief on Appeal* p. 22.

⁴³⁸See *Consumers' Proposed Finding of Facts and Conclusions of Law*, pp. 61-68; *Consumers' Opening Brief Below*, pp. 185-86, 205-212; *Consumers' Reply Brief Below*, pp. 128-36, 152-169 and *Consumers' Supplemental Proposed Findings of Fact Attached to its Reply Brief Below*.

⁴³⁹*L. G. Balfour Co. v. FTC*, *supra*, fn. 482, and other cases cited in that footnote.

The case which Consumers primarily relies upon, *Rodale Press, Inc. v. FTC*, 407 F.2d 1252, 1256-57 (D.C. Cir. 1968), is simply inapposite. The FTC decided that case on a theory not advanced at trial and without allowing the parties "the opportunity to present argument under the new theory of the violation." We have no quarrel with the case or the result reached there. It simply is not what occurred here.

practice we accord licensing board decisions presumptive validity; we do not scan every line of testimony or examine each document in evidence *de novo*.⁴⁹⁰ But in conducting or review, we are not in the position of a federal appellate court. A court of appeals must accept the findings of the trier of fact (the district court) unless it can fairly say that they are “clearly erroneous.” Rule 52(a), *Federal Rules of Civil Procedure*. We do not owe that same degree of deference to the Licensing Board. For reasons elaborated in *Catawba*,⁴⁹¹ final responsibility for weighing evidence, making findings, drawing inferences and arriving at an appropriate decision is vested in the Commission itself, not in its subordinate hearing officers. Consequently, in our role as the Commission’s delegate in these cases, we may substitute our judgment of the facts as well as of the law for that of the Board below.

In this case, Justice and the staff urge that no weight at all be accorded those findings which exculpate Consumers from the charges of anticompetitive conduct. The claim is made that the Licensing Board improperly evaluated those charges by considering them individually rather than as components of a course of anticompetitive conduct (see p. 914 *ff.*) and by neglecting to include the factor of Consumers’ monopoly power when weighing those charges in the balance. Consumers disputes this. It points among other things to an express passage in the Board’s opinion which recited in so many words that, even “[a]ssuming without deciding that [Consumers] has or had monopoly power,” the eight anticompetitive situations “dealt with hereinabove” show no “misuse of such power.”⁴⁹²

⁴⁹⁰See *Northern Indiana Public Service Co.* (Bailly Generating Station, Nuclear-1), ALAB-303, 2 NRC 858, 866-67 (1975); *Niagara Mohawk Power Corporation* (Nine Mile Point Nuclear Station, Unit 2), ALAB-264, 1 NRC 347, 357 (1975).

⁴⁹¹*Duke Power Company* (Catawba Nuclear Station, Units 1 and 2), ALAB-355, 4 NRC 397, 403 (1976) and cases cited at 402-05.

⁴⁹²This portion of the Board’s opinion provides in its entirety (2 NRC at 112-13):

IV. APPLICANT’S MONOPOLY POWER

At the first prehearing conference, Justice took the position that Applicant has monopoly power and that such monopoly, insofar as was known at that time, was a lawful monopoly. Justice’s case was that said monopoly power had been used in such a way that it violated the principles of the antitrust laws [Tr. 60-61]. There is no evidence in the record that any monopoly possessed by Applicant on January 1, 1960, was other than lawful in and of itself. As agreed by Justice, we take the Applicant as we find Applicant on January 1, 1960 [Tr. 62]. The only evidence involving situations of possible unlawful use of or extension of monopoly power by Applicant in the wholesale and retail market were dealt with in Situations 1 to 3 and 5 to 7 hereinabove. The only evidence involving situations of possible use of monopoly power in the transmission field were dealt with in Situations 4 and 8 hereinabove. Assuming without deciding that Applicant has or had monopoly power in the relevant geographic market, situations involving misuse of such power have been dealt with hereinabove.

Justice acknowledges that passage but insists nonetheless that the Board improperly measured Consumers' culpability because it failed "to understand the legal significance of its own assumption."

We find some merit in appellants' contentions. For example, the only product market the Board considered relevant was that for coordination services. In discussing that market, however, the Board did not evaluate Consumers' conduct in light of its monopoly position in that market, much less in the retail and wholesale markets. The Board's treatment of the charges involving monopolization of those two markets ("situation six," 2 NRC 102-105) confirms this. Despite finding from Consumers' actions an intent "to monopolize the retail and wholesale power markets by destroying competition from a group of healthy, growing, effective and aggressive competitors" (2 NRC at 104), the Board saw no situation inconsistent with the antitrust laws "because the evidence totally fails to show the power to carry out the scheme" (*id.* at 105). But "dangerous probability of success" is material only in an "attempt to monopolize" case. See fn. 88, *supra*. In contrast, under the present charge of "monopolization"—use of *existing* monopoly power to preserve or enlarge market dominance—the Board's findings (if correct) could mean only that the Sherman Act had been violated. See p. 922 *ff.*, *supra*. The opposite determination makes sense only if the Board assumed that Consumers lacked monopoly power and was charged with attempting to achieve it. That the Board apparently so assumed indicates that it indeed considered each "situation" in isolation and neglected to evaluate them all in light of Consumers' monopoly status.

This is further confirmed by the Board's evaluation of Consumers' wheeling policy (situations "four" and "eight"). Although concluding that the company's conduct "amounted to a general refusal to wheel," the Board saw no adverse antitrust consequences "arising out of that refusal" because it found "no evidence" that it "was part of a larger scheme or conspiracy." Yet it also determined (situation "six") that "[Consumers'] goal [was] to acquire all of the small utilities within the relevant geographic market," that this was an "anticompetitive scheme to monopolize" the "wholesale and retail markets" as "forbidden by Section 2 of the Sherman Act."⁴³ Nowhere did the Board even question whether the refusal to wheel was part of the scheme to monopolize covered in situation "six." This incongruity, it seems to us, confirms that the Board passed on Consumers' conduct in each situation in isolation.

The passage in the opinion below relied on by Consumers—suggesting that even if the company possessed monopoly power it had not engaged in anticompetitive conduct—does not persuade us otherwise. As we have in-

⁴³Compare 2 NRC 99 with 104.

licated, the Board's own findings would demand the opposite conclusion under the correct standard."⁴⁴

These considerations do not lead us to conclude that the Licensing Board's basic findings of fact are worthless and merit no deference. But they do suggest that the Board somewhat misunderstood the applicable law. For that reason the inferences and determinations based on those findings may well be vulnerable. Accordingly, these will be given particular scrutiny.

B. Refusals to deal

A principal charge against Consumers is that it wheels power for and coordinates with large electric utility systems that do not compete with it but declines to do so on reasonable terms with competing small systems. Appellants contend that Consumers' selective refusals to deal take unjustified advantage of its small competitors and demonstrate the company's intent to monopolize.

The Licensing Board analyzed the charges in light of the parables of the Good Samaritan and of the Rich Man and Lazarus.⁴⁵ The Board concluded that Consumers had no obligation to coordinate with or wheel power for the small utilities because (a) no statutory duty required the company to do so and (b) the refusals to wheel and coordinate had not caused the small competitors economic distress (although provision of those services might alleviate it). On the basis of these holdings, the Board ruled that a monopolist's refusals to deal are not inconsistent with the antitrust laws unless proven to be substantial and material elements in a "scheme" to monopolize. See 2 NRC at 72-79.

The Department of Justice takes sharp issue with those rulings. It alleges that the company's refusals to coordinate, to share reserves and to sell transmission services raise artificial barriers to market entry and therefore constitute exclusionary conduct having the effect of maintaining Consumers' monopoly market positions. According to Justice, evidence of these refusals to deal is therefore sufficient by itself to establish "willfulness," the element of general intent needed to prove the offense of

⁴⁴Moreover, the structure of the opinion below suggests that the passage is at best an afterthought; it appears late in the decision, well after the substantive discussions and, in contrast to them, is devoid of any attempt at reasoned analysis.

⁴⁵Down through the ages, refusal to assist another who is in dire distress has been lawful in the absence of a specific statutory duty to act. Thus, in the parable of the Good Samaritan (Luke 10:29-37) and of the Rich Man and Lazarus (Luke 16:19-31), while those who failed to help the unfortunate met with divine disapprobation, there is no indication of the breach of a legal duty." 2 NRC at 71.

monopolization.⁴⁹⁶ The Department contends that the “scheme of monopolization,” repeatedly adverted to by the Board below, is a term unknown to the law of monopolization, but adds that the Board erred if it used the term to mean that a “specific intent” must be shown to prove monopolization.⁴⁹⁷

Consumers responds by insisting that the Board below correctly held it free of any obligation to deal with the small utilities. Citing *United States v. Colgate & Co.*, 250 U.S. 300 (1919), the company contends that “it is axiomatic that a firm has a right to exercise its business judgment in choosing those with which it wishes to deal, absent specific proof of monopolistic intent.”⁴⁹⁸ Discounting the Department’s authorities as no more than “several cases holding that a predatory discontinuance of vital prior dealings is sufficient to establish requisite specific intent in attempt-to-monopolize cases,” Consumers argues that “[t]hey have no application here where that motivation has not been established and where there is no allegation that Consumers Power refused to provide a previously-provided service.”⁴⁹⁹ In short, Consumers supports the Licensing Board’s ruling with the assertion that “even a firm with a monopoly share” is not required to deal “absent ‘bold’ predatory conduct which results in the destruction of competition.”⁵⁰⁰

For the reasons which follow, we hold that the Licensing Board has misconstrued the law and that Consumers’ attempts to buttress the Board’s decision in this area are unavailing.

To begin with, there are circumstances in which the antitrust laws impose an affirmative duty on business firms to deal with their competitors. As evidenced by decisions following *Colgate*, unilateral refusals to deal by a firm with a dominant market position have regularly been held to constitute either “monopolization” or an “attempt to monopolize” in violation of Section 2 of the Sherman Act.⁵⁰¹ In *Eastman Kodak Co. v. Southern Photo Co.*, *supra*, for example, Kodak violated Section 2 by refusing to sell except at retail prices to the plaintiff, a former retail distributor of Kodak pro-

⁴⁹⁶Citing principally *Eastman Kodak Co. v. Southern Photo Materials Co.*, 273 U.S. 359 (1927); *Packaged Programs, Inc. v. Westinghouse Broadcasting*, 255 F.2d 708 (3rd Cir. 1958); *Six Twenty Nine Productions v. Rollins Telecasting, Inc.*, 365 F.2d 478 (5th Cir. 1966); *Lorain Journal Co. v. United States*, 342 U.S. 143 (1951); and *Otter Tail Power Co. v. United States*, *supra*. see *Justice’s Opening Brief on Appeal*, pp. 27 ff., and *Reply Brief on Appeal*, pp. 37 ff.

⁴⁹⁷*Justice’s Opening Brief on Appeal*, p. 24 fn.

⁴⁹⁸*Consumers’ Appeal Brief*, p. 205.

⁴⁹⁹*Id.* at 205, fn. 34.

⁵⁰⁰*Id.* at 206-07.

⁵⁰¹Our discussion excludes cases arising under Sections 1 or 2 of the Sherman Act involving conspiracies or concerted refusals to deal.

ducts.³⁰² (Kodak, already holding a monopoly of production and at wholesale, was expanding into the retail market and had purchased other retail outlets in the area.)³⁰³ In *Lorain Journal Co. v. United States*, *supra*, the sole newspaper in a town was guilty of an attempt to monopolize by refusing to sell advertising space to those who advertised on the town's new radio station. In *Packaged Programs, Inc. v. Westinghouse Broadcasting*, *supra*, plaintiff, an advertising agency, averred that Westinghouse, owner of the only television station in Pittsburgh, was attempting to monopolize the advertising market by refusing to air commercials produced by the plaintiff. (Westinghouse also produced commercials.) The court held that this complaint stated a claim cognizable under Section 2 of the Sherman Act. In a factual situation paralleling *Packaged Programs*, the court in *Rollins Telecasting*, *supra*, reversed summary judgment for the defendant television station. and in *Otter Tail Power Co. v. United States*, *supra*, the Supreme Court held Otter Tail guilty of monopolization when that vertically integrated electric utility refused to wheel power for and to sell wholesale power to municipalities seeking to displace it as their retail distributor of electricity.

In a word, as the Second Circuit recently ruled, cases such as *Lorain Journal* and *Eastman Kodak*³⁰⁴ are Supreme Court decisions "which do

³⁰²The Court's decision is unclear on whether Kodak was guilty of monopolization or an attempt to monopolize. The Court was affirming a jury verdict and its discussion was brief. It stated:

although there was no direct evidence—as there could not well be—that the defendant's refusal to sell to the plaintiff was in pursuance of a purpose to monopolize, we think that the circumstances disclosed in the evidence sufficiently tended to indicate such purpose, as a matter of just and reasonable inference to warrant the submission of this question to the jury.

273 U.S. at 375.

³⁰³Two cases similar to *Kodak*, *i.e.*, a wholesale supplier-monopolist found guilty of monopolization by refusing to deal with independent retailers in favor of an integrated system, are *Poster Exchange, Inc. v. National Screen Serv.*, 431 F.2d 334 (5th Cir. 1970), *certiorari denied*, 401 U.S. 912 (1971) and *United States v. Klearflax Linen Looms*, 63 F. Supp. 32 (D. Minn. 1945). See also, *Woods Exploration & Pro. Co. v. Aluminum Co. of America*, 438 F.2d 1286, 1308 fn. 9 (5th Cir. 1971), *certiorari denied*, 404 U.S. 1047 (1972).

³⁰⁴The common thread running through these and similar cases is the possession of a monopoly or a near monopoly in a relevant market by the company refusing to deal. Thus, for example, Kodak possessed a monopoly at the wholesale level; the Journal was the sole newspaper in town and possessed a monopoly over advertising in Lorain until the radio station began broadcasting; Westinghouse Broadcasting and Rollins Telecasting possessed a monopoly—via FCC licensing—in local television broadcasting; and Otter Tail held a monopoly over retail distribution of electricity. In each case, through unilateral refusals to deal, the monopolist had used its dominant economic power in efforts either to maintain its current market position (*e.g.*, *Otter Tail*) or to extend its monopoly (*e.g.*, *Kodak*, *Westinghouse*)

(Continued on next page)

stand for the proposition that where a single trader refuses to deal in order to enhance its monopoly position, a [Sherman Act] Section 2 violation may be found." *International Railways v. United Brands*, 532 F.2d 231, 239, *certiorari denied*, 50 L.Ed.2d 100 (1967).³⁰⁵

The decisions relied on by Consumers are not to the contrary. They are cases where the court was persuaded that the respondent business enterprise lacked dominant market power. See, e.g., *Daily Press v. United Press International*, 412 F.2d 126 (6th Cir. 1969); *Mullis v. Arco Petroleum Corp.*, 502 F.2d 290 (7th Cir. 1974). As then Circuit Judge Stevens noted in *Mullis*:

Claims that refusals to deal were violative of §2 have often failed because the plaintiff incorrectly assumed that proof of the so-called monopoly which a manufacturer has over his own product is tantamount to proof of dominance in an economic market. See e.g., *Bushie v. Stenocord Corp.*, 460 F.2d 116, 120-21 (9th Cir. 1972); *Cal Distributing Co. v. Bay Distributors, Inc.*, 337 F.Supp. 1154, 1157-1159 (M.D. Fla. 1971); *South End Oil Co. v. Texaco, Inc.*, 237 F. Supp. 650, 655-656 (N.D. Ill. 1965). On the other hand, courts which have been persuaded that such dominance exists have held refusals to deal violative of §2. See, e.g., *Otter Tail Power Co. v. United States*, 410 U.S. 366, 93 S. Ct. 1022, 35 L.Ed. 2d 359; *Eastman Kodak Co. v. Southern Photo Materials Co.*, 273 U.S. 359, 47 S.Ct. 400, 71 L.Ed. 684; *Poster Exchange, Inc. v. National Screen Service Corp.*, 431 F.2d 334 (5th Cir. 1970), *cert. denied*, 401 U.S. 912, 91 S.Ct. 880, 27 L.Ed. 2d 811.³⁰⁶

Consumers' attempts to distinguish the authorities on which we rest are unpersuasive. It is not true, as the company contends, that all those cases rest on the "attempt to monopolize" rather than the "monopolization" clause of Section 2. *Otter Tail Power Co. v. United States*, for one, is a

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Broadcasting, Rollins Telecasting). In essence, these companies ran afoul of the Supreme Court's warning in *Griffith* that "use of monopoly power, however lawfully acquired, to foreclose competition, to gain a competitive advantage, or to destroy a competitor is unlawful." 334 U.S. at 107. As Judge Wyzanski cogently observed: "An enterprise that by monopolizing one field, secures dominant market power in another field, has monopolized the second field, in violation of §2 of the Sherman Act." *United States v. United Shoe Machinery Corp.*, *supra*, 110 F. Supp. at 346.

³⁰⁵Whether Consumers' refusal of access to its transmission lines presents a "bottleneck" situation is irrelevant in our analysis. Such denials may be treated as instances of refusals to deal. *Otter Tail Power Co. v. United States*, *supra*, 410 U.S. at 371; *Mullis v. Arco Petroleum Corp.*, 502 F.2d 290, 296 fn. 19 (7th Cir. 1974) (per Stevens, Cir. J.); see Note, *Refusals to Deal by Vertically Integrated Monopolists*, 87 Harv. L. Rev. 1720 (1974). The Licensing Board's assumption, supported by Consumers, that bottleneck cases must involve conspiracies (see 2 NRC at 78) is a misreading of *Otter Tail*.

³⁰⁶502 F.2d at 296 fn. 19.

monopolization case. See fn. 88, *supra*. Even if those cases all had involved “attempt” situations, Consumers’ position would not be advanced. If the specific intent needed to prove an *attempt* to monopolize may be inferred from a monopolist’s “predatory conduct,” then a general intent to monopolize—the lesser degree of proof needed where *actual monopolization* is charged—may also be inferred from that conduct *a fortiori*. As for Consumers’ assertion that all the cases cited involved some discontinuance of a previously provided service, the short answer again is that *Otter Tail* did not. The Otter Tail Power Company neither wheeled power for nor sold wholesale power to the municipalities prior to its refusals to deal with them. Nevertheless, the Supreme Court agreed that those refusals were anti-competitive.¹⁰⁷

Consumers’ reading of *Otter Tail* and the other refusal to deal cases reflects its general misconception of the Standard for determining monopolistic intent. The company asserts as a general proposition that it must be shown to have “acquired or maintained its position through unfair or predatory conduct” to be found guilty of monopolization and that “research reveals and opposing counsel have cited no case in which the requisite willfulness was found without a showing of predatory conduct” (Br. pp. 187 and 192). The company has confused the elements of an “attempt to monopolize” with those of “monopolization.” Both are offenses under Section 2 of the Sherman Act. Only where an “attempt” is charged, however, must a conscious desire or specific intent to monopolize be proven. Evidence of anticompetitive actions without legitimate business purpose, *i.e.*, “predatory conduct,” are often the source from which that specific intent is inferred.¹⁰⁸ But no predatory conduct (or any other proof of specific intent) is required to sustain “monopolization” charges. (See pp. 922-923, *supra*.) Indeed, a general intent to monopolize may even be inferred from business practices (sometimes called “exclusionary conduct”)¹⁰⁹ permissible to enterprises without monopoly power. As explained by Judge Wyzanski in *United States v. United Shoe Machinery Corp.*, *supra*, 110 F. Supp. at 344-45, with reference to United Shoe’s leasing practices:

They are the sort of activities which would be engaged in by other honorable firms. And, to a large extent, the leasing practices conform to long-

¹⁰⁷410 U.S. at 378.

¹⁰⁸See, *e.g.*, *Times-Picayune Publishing Co. v. United States*, 345 U.S. 594 (1953); *Chisholm Bros. Farm Equipment Co. v. International Harvester Co.*, 498 F.2d 1137, 1144-45 (9th Cir. 1974), *certiorari denied*, 419 U.S. 1023 (1974); *Hiland Dairy, Inc. v. Kroger Co.*, 402 F.2d 968, 975 (8th Cir. 1968), *certiorari denied*, 395 U.S. 961 (1969). See also E. H. Cooper, *Attempts and Monopolization: A Mildly Expansionary Answer to the Prophylactic Riddle of Section Two*, 72 Mich. L. Rev. 375, 392-400 (1974).

¹⁰⁹See Cooper, *op. cit. supra*, fn. 508, 72 Mich. L. Rev. at 389-92.

standing traditions in the shoe machinery business. Yet, they are not practices which can be properly described as the inevitable consequences of ability, natural forces, or law. They represent something more than the use of accessible resources, the process of invention and innovation, and the employment of those techniques of employment, financing, production, and distribution, which a competitive society must foster. They are contracts, arrangements, and policies which, instead of encouraging competition based on pure merit, further the dominance of a particular firm. In this sense, they are unnatural barriers; they unnecessarily exclude actual and potential competition; they restrict a free market. While the law allows many enterprises to use such practices, the Sherman Act is now construed by superior courts to forbid the continuance of effective market control based in part upon such practices.

Judge Wyzanski went on to point out that United Shoe's monopoly did "not rest on predatory practices." 110 F. Supp. at 345. Consumers' contention that the courts have never found monopolization without a showing of predatory conduct is simply wrong. We need not prolong our discussion, for the Supreme Court has settled that predatory practices need not be proven to establish that a firm has monopolized in violation of the Sherman Act. *Hanover Shoe v. United Shoe Mach. Corp.*, 392 U.S. 481, 495-500 (1968), and cases there cited.⁵¹⁰

We do not imply that a monopolist must continue (or enter into) a money-losing line of business to avoid a Sherman Act violation. The complaining party has the burden of persuading that the refusal to deal in light of all the circumstances is evidence of a purpose to exercise monopoly power. If the respondent "in fact had no reasonable business alternative but to abandon an unprofitable and uncomfortable operation," then its refusal to deal may be justified. *International Railways v. United Brands, supra*,

⁵¹⁰Consumers' brief points us to cases which have held that success in a natural monopoly situation cannot be unreasonable *per se*, *Lamb Enterprises, Inc. v. Toledo Blade Co.*, 461 F.2d 506, 515 (6th Cir.), *certiorari denied*, 409 U.S. 1001 (1972) (competition for the only cable TV franchise in the town); *Union Leader Corp. v. Newspaper of New Eng. Inc.*, 284 F.2d 582 (1st Cir. 1960), *certiorari denied*, 365 U.S. 833 (1961) (two newspapers competing in a town large enough to support only one); and to cases which hold that legal and ordinary marketing methods do not constitute monopolization. *Telex Corp. v. International Business Machines Corp.*, 510 F.2d 894, 919-28 (10th Cir. 1975), *certiorari denied*, 423 U.S. 802 (1975) (IBM had lowered its prices, but not below cost, and it had instituted a vigorous advertising and market campaign.); *Travelers Insurance Co. v. Blue Cross of Western Pennsylvania*, 481 F.2d 80, 85 (3rd Cir.), *certiorari denied*, 414 U.S. 1093 (1973) (Blue Cross because of its size was able to negotiate favorable contracts with hospitals). Accepting all those cases as correctly decided, they do not (and in light of *Hanover Shoe* obviously cannot) stand for the proposition that proof of "predatory conduct" is required to establish monopolization.

532 F.2d at 239. We have not overlooked this possibility in our evaluation of the charges against Consumers.

C. Consumers' acquisitions of other utilities

We begin our review of the activities assertedly inconsistent with anti-trust law and policy by looking at Consumers' actual and attempted acquisitions of smaller utilities in its locale. We start here because the Licensing Board expressly found that the company's conduct constituted an "anti-competitive scheme" intended "to monopolize the retail and wholesale power markets by destroying competition from a group of healthy, growing, effective and aggressive competitors." 2 NRC at 104. The Board's reasons for declining to hold the scheme inconsistent with the antitrust laws—that only markets not in controversy were involved and evidence of potential success was lacking (*id.* at 105)—are erroneous for reasons previously discussed.⁵¹¹ Consequently, if the Board's assessments are correct, they virtually compel a finding of a Sherman Act violation.

The Board's findings rest in large measure on facts that are undisputed: (1) Consumers' acquisitions since 1960 of the three small electric power systems, (2) Consumers' attempted acquisitions of other small systems, and (3) statements by Mr. Robert Paul, a Consumers official, to the effect that: The first goal of our [*i.e.*, Consumers'] marketing activity or program concerning utility systems in our service area is, of course, to acquire these systems. [D.J. Exh. No. 188, Tr. 8043].

It was principally⁵¹² these factors that led the Board to conclude that (2 NRC at 104):

we are not here concerned with individual acquisition or with a group of individual acquisitions. We are concerned with a goal or policy to acquire all of the smaller utilities in the relevant geographic market. The goal is not really to improve economy or reliability of service by retiring small utilities which are either nonviable or on the verge of becoming nonviable. The intent is to monopolize the retail and wholesale power markets by destroying competition from a group of healthy, growing, effective and aggressive competitors. We find as a fact that constitutes an anticompetitive scheme. Each acquisition or attempted acquisition whether or not innocent, in and of itself, is a material element and a sub-

⁵¹¹See pp. 945-949, 1024, *supra*.

⁵¹²In reaching its conclusion, the Licensing Board also referred to Consumers' attempt to block an REA loan and thereby forestall certain of the cooperatives from adding new generation. Consumers' actions regarding the loan bear on the character and purpose of Consumers' actual and attempted acquisitions. See pp. 1062-1064 and fn. 627, *infra*.

stantial factor in such scheme. [Consumers'] goal to acquire all of the smaller utilities in the relevant geographic market is an anticompetitive scheme to monopolize. Such schemes are forbidden by Section 2 of the Sherman Act. Mr. Aymond's [Consumers' Board Chairman and President] disavowal of the scheme is an assertion that it never existed. The testimony shows no intent to abandon an existing scheme. [Tr. 6063.] We find that as matters of fact that the scheme still exists and that the matter is not moot.

Consumers contends on appeal that it "has never been [company] policy" to seek acquisition of all the small utilities within the relevant geographic market.⁵¹³ The company argues, first, that because the three utilities it acquired accounted for only a *de minimis* share of the markets, the acquisitions were lawful under Section 7 of the Clayton Act.⁵¹⁴ The company argues from this that the acquisitions cannot be used to support an inference of monopolistic intent.⁵¹⁵ But "[i]ntent is not a necessary element of a violation of §7 of the Clayton Act," *United States v. Jerrold Electronics Corp.*, *supra*, 187 F. Supp. at 568 fn. 50, and a violation of the Sherman Act may be predicted on acquisitions that have not been challenged under Section 7.⁵¹⁶

Consumers also urges this Board to give "little substantive weight" to the goal espoused by Mr. Paul on the ground that it was made in an "informal talk" to company employees. In its appellate brief the company depicts

⁵¹³See Aymond, Tr. 6064; *Consumers Appeal Brief*, p. 327.

⁵¹⁴See *Consumers' Appeal Brief*, p. 322, quoting *Brown Shoe v. United States*, *supra*, 370 U.S. at 329.

⁵¹⁵"Even acquisitions which would be struck down under the incipency standard of [Clayton Act] Section 7 provide no support for charges of monopolization here where the standards of Section 2 of the Sherman Act are applicable." *Consumers Appeal Brief*, pp. 323-24, citing *United States v. Jerrold Electronics Corp.*, 187 F. Supp. 545, 566, 568 (E.D. Pa. 1960), *affirmed per curiam*, 365 U.S. 567 (1961).

⁵¹⁶*United States v. First National Bank & Trust Co. of Lexington*, 376 U.S. 665 (1964).

Further, as the district court pointed out in *Jerrold*, *supra*, fn. 515, the Supreme Court has held that the specific intent required for a finding of conspiracy or attempt to monopolize "need not be proven by direct evidence but can be inferred from practices of the defendants." 187 F. Supp. at 567, citing *Interstate Circuit, Inc. v. United States*, 306 U.S. 208 (1939). The *Jerrold* court held that Jerrold's acquisitions could not support such an inference because their primary purpose was investment. Consumers has misapplied this determination, which was a factual finding based on the particular circumstances in *Jerrold*. The court's legal analysis there indicates that acquisitions that are lawful under Section 7 (which can be violated even without specific intent, *United States v. E. I. du Pont de Nemours & Co.*, 353 U.S. 586, 589 (1957)) may, in appropriate circumstances, support a finding of a *specific* intent to monopolize. *A fortiori*, Consumers' acquisitions may support a finding that Consumers has a *general* intent to monopolize.

Mr. Paul as “a middle-level salesman” who is not charged with formulating company policy and whose remarks therefore neither represented company policy nor bound the company in this regard.³¹⁷ In support of its position, Consumers refers us to judicial decisions where the courts purportedly declined to find “monopolistic purpose” on the basis of “general statements of subordinate personnel unrelated to actual conduct.”³¹⁸

1. First, Consumers’ actual and attempted acquisitions have not, as the company would have us believe, occurred on an isolated basis. Rather, the record reflects a continual pattern of actual and attempted acquisitions that certainly suggest (if not compel) the conclusion that it is a company policy to acquire the remaining small systems in the relevant geographic market. As the Licensing Board pointed out, 2 NRC at 103, Consumers acquired municipal systems in Grayling and Allegan in 1961 and 1968, respectively, and in 1967 bought a small private utility that served the City of Rogers.³¹⁹ In addition, the company made formal offers to purchase the Charlevoix and St. Louis municipal electric systems in 1962 and 1965, respectively, and extended a formal offer in 1965 to lease Traverse City’s system for a period of 30 years.³²⁰ Moreover, the record indicates other instances short of

³¹⁷Consumers argues that Mr. Paul’s speech, as an intermural statement from one subordinate company employee to another, “would have been excluded from evidence in a conventional lawsuit.” *Consumers’ Appeal Brief*, pp. 327-28. In support of this conclusion it points to a quotation of Judge Wyzanski in *United States v. United Shoe Machinery Corp.*, 89 F. Supp. 349, 354 (D. Mass. 1950) and to *Restatement (Second) of Agency* §287 (1958). Although not arguing that this document is inadmissible in the context of an administrative antitrust hearing, it contends that its inadmissibility in a court proceeding is indicative of the lack of substantive weight inherent in such communications. In its reply brief Justice takes issue with Consumers on this point. It contends that although the quotation in *United Shoe* does indicate the general law, a different rule applies in antitrust proceedings. Indeed, Justice points out that Judge Wyzanski noted this difference and held that such documents “were, in fact, *admissible in a conventional antitrust lawsuit.*” *Justice’s Reply Brief on Appeal*, pp. 59-60. (Emphasis in original.) A review of Judge Wyzanski’s opinion reveals that Justice is correct in its characterization of the decision. As admissibility is not an issue here, this topic will not be explored further.

³¹⁸*Consumers’ Appeal Brief*, p. 329. Consumers refers us to *Dahl, Inc. v. Roy Copper Co.*, 448 F.2d 17, 19 (9th Cir. 1971); *Scott Publishing Co. v. Columbia Basin Publishers, Inc.*, 293 F.2d 15, 21 (9th Cir.), *certiorari denied*, 368 U.S. 940 (1961), and *South End Oil Co. v. Texaco, Inc.*, 237 F. Supp. 650, 655 (N.D. Ill. 1965).

³¹⁹C. P. Exh. No. 11,308. (The exhibit indicates Allegan was acquired in 1967.)

³²⁰C. P. Exh. No. 11,308; D. J. Exh. No. 12. Consumers says its attempt to lease the Traverse system is shielded from antitrust scrutiny by the “Noerr-Pennington Doctrine.” However, efforts to influence a government’s business decisions, such as this one was, are outside that doctrine’s protection. See fn. 627, *infra*, and *Hecht v. Pro-Football, Inc.*, 444 F.2d 931, 940-42 (D.C. Cir. 1971), *certiorari denied*, 404 U.S. 1047 (1972), and *Geo. R. Whitten, Jr., Inc. v. Paddock Pool Builders, Inc.*, 424 F.2d 25, 31-34 (1st Cir.), *certiorari denied*, 404 U.S. 850 (1970).

formal offers in which Consumers has suggested to a small utility the possibility of selling out its system to Consumers.³²¹ For example, in 1970, Consumers' initiated steps toward the acquisition of the Eaton Rapids electric system.³²² And Mr. Westenbroek testified that in approximately 1960, when he was manager of the Lowell municipal system, Consumers indicated a desire to purchase that system.³²³

Consumers has also attempted to purchase city street lighting systems from the cities of Wyoming, Grand Rapids and Saginaw.³²⁴ Municipalities that operate such systems are likely entrants in the electric utility business. Indeed, the system operated by the City of Zeeland, which displaced Consumers as the supplier of electricity within that municipality, evolved from a municipal street lighting system. See fn. 381, *supra*. The Consumers recognizes this threat is illustrated by the recommendation to Mr. Aymond in 1966 by Mr. Campbell, Vice President in charge of marketing, that Consumers acquire the Wyoming street lighting system because "[t]his purchase will eliminate another potential municipal electric system."³²⁵ Consumers thereafter made a formal offer to buy that system.³²⁶

2. Second, we find Customers' attempt to minimize the import of Mr. Paul's speech unpersuasive. Mr. Paul is admittedly not a company officer. His duties and responsibilities, however, encompass far more than those of a "middle-level salesman." His responsibilities as "General Supervisor of Commercial Electric and Governmental Service"³²⁷ include giving "functional supervision and direction to the company's programs and activities dealing with commercial electric sales, governmental gas and electric sales,

³²¹D. J. Exh. No. 141.

³²²Int. Exh. No. 2,155 and 2,172; the acquisition was not consummated, however. See D. J. Exh. No. 158; Paul, Tr. 7913-14. Also, as the Licensing Board noted, the company in 1969 sought to acquire Southeastern Michigan Cooperative. 2 NRC at 104. See also D. J. Exh. No. 125.

³²³Westenbroek, Tr. 1025-29. The City had initially approached Consumers in order to sell several rural lines to Consumers. The Company responded that it was not interested in purchasing the rural lines but did desire to purchase Lowell's entire system. However, once Tri-County Electric Cooperative expressed an interest in purchasing the rural lines, Consumers changed its position and subsequently did purchase the rural lines from Lowell. *Ibid*.

³²⁴Int. Exh. No. 2,040; D. J. Exh. 111, No. 158 and No. 188.

³²⁵D. J. Exh. No. 111.

³²⁶D. J. Exh. No. 158, p. 2.

³²⁷Paul, Tr. 7805. Mr. Paul, who holds a B.S. in electrical engineering, joined Consumers Power in 1949. In 1951 he was assigned to the company's Kalamazoo Division as a power sales engineer. In 1964 he was brought to the company's general office as a general power sales engineer; in 1967 he became General Supervisor of Governmental Sales and in 1970 he acceded to his current position. *Id.* at 7804-05. Mr. Paul reports directly to Mr. Condon, "who is the Manager of the Energy Consulting Services Department" and in turn reports to Consumers' Vice President in charge of operations. Tr. 7950.

steam sales, and wholesale to other utilities, and related matters” such as “competition [and] administration of service area policies.”³²⁸ It is also his duty to keep the Consumers marketing personnel abreast of company policy in these areas.³²⁹ In short, although Mr. Paul does not make company policy, it is his job in the company to be aware of current policy and “to transmit [the] policy of the company to others in the company.”³³⁰

Further, evidence confirms that Mr. Paul played an important and highly visible role in Consumers’ dealings with the small utilities. Thus it was Mr. Paul who (1) informed Northern Michigan in 1967 that it did not meet Consumers’ “established criteria” for entering a coordination arrangement,³³¹ (2) similarly advised Edison Sault in 1972 that Consumers would not enter a coordination agreement with it,³³² (3) was principal spokesman for Consumers, at least initially in the negotiation of the current coordination agreement between the company and the M-C Pool,³³³ and (4) was the person to whom several of the intervenors in this proceeding directed their requests for access to the Midland nuclear facility.³³⁴ Indeed, in this proceeding Mr. Paul was Consumers’ principal witness concerning the company’s competitive relationship with the small utilities,³³⁵ and has been a person proffered by Consumers to testify about the acquisitions that the company has made or considered making since 1960.

We perceive no reason to doubt that, in delivering the speech on which the Licensing Board relied, Mr. Paul was carrying out his obligation to inform other employees of company policy. The speech, according to the outline of it that was introduced into evidence,³³⁶ dealt entirely with Consumers’ competitive relationship with the small utilities. Personal knowledge of this area was part of Mr. Paul’s job, as we have just seen.

³²⁸Paul, Tr. 7805, 7959.

³²⁹Paul, Tr. 7959.

³³⁰Tr. 8267-68.

³³¹D. J. Exh. No. 49.

³³²D. J. Exh. No. 85.

³³³D. J. Exh. No. 54, 55, 56, 57, 59 and 60. These documents are letters exchanged by Mr. Paul and Mr. Keen concerning the various draft proposals leading to the current coordination agreement between the M-C Pool and Consumers. These communications cover a two-year span, from 1970 to 1972.

³³⁴D. J. Exh. No. 22, No. 23 and No. 58. Also see D. J. Exh. No. 28.

³³⁵Counsel for Consumers represented to the Board that Mr. Paul would discuss (Tr. 7803): competition within the municipal limits of municipal electric systems; service and competition of municipals outside of their permissible limits; competition for new industrial customers; competition with rural electric cooperatives—REA’s; competition with other investor-owned utilities—IOU’s; bulk power supply competition; retail franchises; acquisitions; interconnections with other systems; wholesale contracts—and the company’s division and general office organization.

³³⁶D. J. Exh. No. 188.

Further, Mr. Paul represented to the Board below that he made statements on company policy only when he believed that Consumers' management had "enunciated" and "approved" the policy.³³⁷

The cases Consumers cites as authority for ignoring Mr. Paul's remarks deal with statements of monopolistic intent that are either contradicted by other evidence or unsupported by actions implementing that intent.³³⁸ They are inapposite in the face of numerous actual and attempted acquisitions contemporaneous with Mr. Paul's statements of policy.³³⁹ In context, therefore, Mr. Paul's assessment of Consumers' acquisition policy appears a responsible statement of corporate position and intent. The Licensing Board was entitled to rely on it and we agree that it was justified in doing so.

3. We therefore conclude that there is ample evidence in the record to support the Licensing Board's finding that it is "[Consumers] goal to acquire all of the small utilities in the relevant geographic market." We agree with the Board that this goal certainly suggests that Consumers' "intent is to monopolize the retail and wholesale power markets." 2 NRC at 104. Before determining whether Consumers has actually monopolized or engaged in conduct inconsistent with the antitrust laws, however, we turn to the other allegations against it, the next being the company's wheeling policy and practices.

D. Consumers' refusal to wheel for the smaller utilities

Consumers wheels electric power for its neighboring large utilities. As a direct result of its arrangements to that end, the company can and does engage in coordination power transactions with utilities not directly linked

³³⁷Tr. 8268; see also 2 NRC at 102. Consumers now insists that the Licensing Board merely "felt itself constrained to 'conclude as a matter of law' that the company is bound by Mr. Paul's remarks," a conclusion the company characterizes as "purely formalistic" and "contrary to the law of agency." *Consumers' Appeal Brief*, p. 331. In our opinion, however, the Board's holding here rests on a reasoned analysis in accord with the record. In addition, it is not apparent, as Consumers urges it is, that the Board accepted Mr. Aymond's disavowal of the acquisition scheme. See 2 NRC at 102, 104. In any event, considering Consumers' actual and attempted acquisitions, Mr. Aymond's testimony is after-the-fact and self-serving and thus merits little, if any, weight.

³³⁸See fn. 518, *supra*.

³³⁹The Supreme Court observed in two related antitrust contexts that "knowledge of actual intent is an aid in the interpretation of facts and prediction of consequences." *Utah Pie Co. v. Continental Baking Co.*, 386 U.S. 685, 696, fn. 12 (1967); *Appalachian Coals, Inc. v. United States*, 288 U.S. 344, 372 (1933). In other words, an expression of actual intent helps determine the anticompetitive purpose or effect of related conduct.

to it. 2 NRC at 97.⁴⁰ Consumers has had a markedly different attitude, however, toward wheeling for the small utilities in its service area. In the succinctly stated finding of the Board below, Consumers' "conduct amounted to a general refusal to wheel." *Id.* at 99.⁴¹

As was the case with its evaluation of Consumers' acquisition policy, the Licensing Board's exoneration of these refusals to deal rests on invalid grounds.⁴² Consequently, given Consumers' monopoly power and the fact that it would be compensated for wheeling, the company's conduct is suspect under the antitrust laws.

⁴⁰Under the Michigan pool agreement, Consumers regularly transmits power across its transmission network for Detroit Edison and *vice versa*. Each is thereby able to engage in bulk power transactions with utilities with which it is not directly connected, *e.g.*, Consumers with Ontario-Hydro and Detroit Edison Co. and Indiana & Michigan Electric Company. See C. P. Exh. No. 12,022, p. 434 A-H. Consumers, although insisting that this is technically not a "wheeling arrangement," acknowledges that under the Michigan Pool it can "be said" that Detroit Edison and Consumers "exchange transmission services." *Consumers' Appeal Brief*, pp. 296-97. We agree. While the Michigan Pool transmission provisions differ somewhat from other arrangements, the point remains that it still is a means by which the two utilities in effect wheel power for each other and reap the benefits of such transactions.

Consumers also has a wheeling arrangement with Indiana & Michigan Electric Co. This enables the company to coordinate its operations with Commonwealth Edison Co. and Northern Indiana Public Service Co., though Consumers is directly connected to neither. See D. J. Exh. No. 76 and C. P. Exh. No. 11,109.

⁴¹Consumers refused to wheel power not only from outside sources to small utilities within its service area, but also among the small utilities themselves. *Ibid.*; see also 2 NRC at 107-08.

⁴²The Board below concluded that those smaller utilities with "adequate reserves to enter into a mutual benefit agreement" could coordinate without having power wheeled over Consumers' transmission system. 2 NRC at 98. Consequently, it held, Consumers "does not have the power to grant or deny operational or planning coordination between or among the smaller utility systems capable of coordination," *id.* at 99—such capability being, in the Licensing Board's view, a prerequisite to any obligation to coordinate. In our discussion of Consumers' coordination practices, we reject the Licensing Board's analysis of a "mutual benefit" requirement, see p. 1046 *ff. infra.*; we must similarly reject it here.

The Licensing Board also held that, assuming the aforementioned power existed, Consumers would have to misuse it as "part of a larger scheme or conspiracy to bring into being a situation inconsistent with the antitrust laws"; the Board declined to view Consumers' refusals to wheel in that light. As with the "mutual benefit" argument, earlier conclusions compel us to reject this analysis and determination.

Finally, the Board below dismissed as outside the relevant matters in controversy the issue of Consumers' refusal to wheel power to and from the "regional power exchange market." It suggested, however, that the small utilities have no right to such wheeling and that their contention otherwise "is another instance of assertion of a legal duty to be a good Samaritan." 2 NRC at 108. As we have already discussed the Licensing Board's analytical errors concerning the relevant matters in controversy and the duty to assist competitors, we may reject its determinations here without further comment.

Consumers attacks the Licensing Board's finding on several bases.³⁴³ Primarily, the company argues that to find a refusal to deal in an antitrust context there must first have been a "formal request" to the defendant for the services in question. We understand Consumers to mean that a formal request for wheeling services would be one asking for transmission services to facilitate a "particular" bulk power transaction, as opposed to a general inquiry about whether Consumers would be willing to wheel power.³⁴⁴ According to Consumers, such a request would have to specify, *inter alia*, the amount of power to be wheeled and "where the transmission across [Consumers] system would commence and where it would terminate."³⁴⁵ In other words, the utility seeking the transmission services must spell out in detail the contractual terms for the proposed wheeling transaction before Consumers need consider it.³⁴⁶

Consumers contends that none of the small utilities ever lodged an appropriate request with it "for the purchase of transmission services." The instances referred to by the Licensing Board, the company argues, were merely "preliminary and generalized inquiries, not concrete demands," and, therefore, do not support the conclusion that it had a general policy of refusing to wheel for those utilities.

1. We find Consumers' insistence on the necessity of such formalities unpersuasive; to say that an anticompetitive refusal to deal can be found only if "a formal request" was rejected exalts form over substance. That is particularly true here, where the basic issue is whether Consumers has had a general policy against wheeling power for the small utilities. If Consumers operated under such a policy—and the Licensing Board determined that it did—one would expect the smaller utilities to be aware of it and not waste time on useless negotiations for power from outside sources.

Antitrust jurisprudence does not require us to accept Consumers' position. The cases on which Consumers relies involve private antitrust suits for treble damages brought under Section 4 of the Clayton Act.³⁴⁷ The plaintiff in this kind of antitrust action must prove not only a violation of the an-

³⁴³*Consumers' Appeal Brief*, pp. 298-304.

³⁴⁴Aymond, Tr. 6163.

³⁴⁵*Consumers' Appeal Brief*, p. 304; Aymond, Tr. 6166.

³⁴⁶Aymond, Tr. 6167-68. Mr. Aymond acknowledged there that by a specific proposal for wheeling he was "talking in terms of contractual relationships where the terms and conditions [of the proposed transaction] are spelled out."

³⁴⁷*Dahl, Inc. v. Roy Cooper Co.*, 448 F. 2d 17 (9th Cir. 1971); *Royster Drive-In Theatre, Inc. v. American Broadcasting Paramount Theatres, Inc.*, 268 F. 2d 246 (2nd Cir.), *certiorari denied*, 361 U. S. 885 (1959); *Milwaukee Towne Corp. v. Loew's, Inc.*, 190 F. 2d 561 (7th Cir. 1951), *certiorari denied*, 342 U.S. 909 (1952); *Hamilton Street Corp. v. Columbia Pictures Corp.*, 244 F. Supp. 193 (E.D. Pa. 1965).

itrust laws but also injury to his business or property “by reason of” that violation.⁵⁴⁸ Absent an allegation of such injury, the private party lacks standing to sue.⁵⁴⁹ The “specific demand” requirement elucidated in those cases relates to whether a private plaintiff has in fact suffered cognizable injury and not to whether an antitrust violation exists itself.⁵⁵⁰ This distinction is a crucial one. For example, in *United States v. Loew’s, Inc.*,⁵⁵¹ the very arguments put forward by Consumers here were expressly rejected as a defense to an antitrust suit brought by the government. The court explained that (189 F. Supp. at 381) a “demand” as a prerequisite to a finding of refusal to deal -

may well be a rule of law applicable as to the allowance of damages in an action in a private antitrust action, but it can hardly be laid down as a rule of law in an action in which the Government is seeking an injunction. . . . The Court does not believe that a specific “demand” is a necessary prerequisite of a finding of refusal if there is a sufficient other evidence to justify a finding that there was a refusal on the part of the [defendant] to deal

Moreover, the Supreme Court has rejected the notion that a “formal request” must always be established even in a private antitrust action. *Continental Ore Co. v. Union Carbide & Carbon Corp.*, *supra*, 370 U.S. at 699. In overturning a Ninth Circuit decision⁵⁵² that had relied on the line of cases cited to us by Consumers in ruling that the private plaintiff had failed to show causation of damages, the Court held that (370 U.S. at 699, emphasis supplied):

. . . we do not believe that respondents’ liability under the antitrust laws can be measured by any rigid or mechanical formula requiring Continental both to demand materials from respondents and to exhaust all other sources of supply. . . . The cases relied upon by the Court of Appeals clearly do not support any such formula

The core of the matter is that there is no requirement in antitrust law that a finding of an anticompetitive refusal to deal be tied to the making of

⁵⁴⁸See *Brunswick Corp. v. Pueblo Bowl-O-Mat, Inc.*, 429 U. S. 477 (1971).

⁵⁴⁹See e.g., *In Re Multidistrict Vehicle Air Pollution M.D.L. No. 31*, 481 F. 2d 122 (9th Cir.), *certiorari denied*, 414 U.S. 1045 (1973); *SCM Corporation v. RCA*, 407 F.2d 166 (2nd Cir. 1968), *certiorari denied*, 395 U.S. 943 (1969).

⁵⁵⁰For example, in *Milwaukee Towne Corp. v. Loew’s, Inc.*, *supra*, fn. 547, there was no serious dispute that the antitrust laws had been violated. 190 F.2d at 565. Rather the sole question was whether the plaintiff was entitled to damages. The court disallowed damages prior to the date of the plaintiff’s demand and allowed damages for the period after the demand.

⁵⁵¹189 F. Supp. 373 (S.D. N.Y. 1960), *modified on other grounds*, 371 U.S. 38 (1962).

⁵⁵²289 F.2d 86.

a "formal request." Perforce in a Section 105c proceeding, where actual violation of antitrust law need not be established, such a concrete demand is also unnecessary. With this understanding we review the support for the Licensing Board's finding that Consumers had a general policy against wheeling.

2. It is common in the electric power industry for one utility to transmit electricity across its lines to facilitate bulk power transactions between two other utilities not directly connected. As we mentioned earlier, Consumers' own dealings with its larger neighbors reflect this. However, it is undisputed that, prior to the close of the record, Consumers had never granted the small utilities access to its transmission networks. As we pointed out in our discussion of monopoly power, without such access the small utilities are foreclosed from making bulk power transactions with other large nearby utilities. The testimony of the managers for the small utilities evidences a prevalent desire to enter into such transactions.⁵⁵³ The record reflects that they have not sought to do so because of the general understanding that Consumers would not provide the necessary wheeling services. For example, although at one point Traverse City considered buying wholesale power from Lansing, Indiana-Michigan Electric Company or Detroit Edison, it did not actively pursue the matter because Mr. Wolfe, the City Manager, "felt it was futile" to ask Consumers for transmission services.⁵⁵⁴ Similarly, Mr. Fletcher, President of Alpena Power Company, testified that although he had never heard directly from Consumers that wheeling was not available, it was understood that such was the case.⁵⁵⁵ He indicated that if such services were available, Alpena would consider alternatives to buying at wholesale from Consumers.⁵⁵⁶ And Mr. Keen, in explaining why

⁵⁵³See Munn, Tr. 4073-74; Steinbrecher, Tr. 1217-19; Keen, Tr. 4511-12; Fletcher, Tr. 4333-34; and Wolfe, Tr. 1726-28.

⁵⁵⁴Wolfe, Tr. 1727-29, 1989-91.

⁵⁵⁵Q. [By Mr. Verdisco, counsel for NRC staff] Have [Consumers' personnel] ever advised you that wheeling would be out for your system?

A. [Mr. Fletcher] Well, I don't believe we have ever heard it directly from any of Consumers' people what wheeling would be out. However, inasmuch as we have, in the two men who are working as superintendent and assistant general superintendent, some 32 years experience with Consumers, they have advised us that Consumers has never wheeled for small utilities.

Fletcher, Tr. 4329. (Alpena's general superintendent had previously been employed by Consumers for 12 years; the assistant for 20 years. Fletcher, Tr. 4328.)

⁵⁵⁶Mr. Fletcher testified (Tr. 4334):

. . . [T]he primary problem of [smaller utilities located in Northern Michigan] is: "if we do get together and plan load growth in Northern Michigan, how do we get the power to the ultimate consumer, not having any transmission service at this time."

(Continued on next page)

Wolverine failed to ask Consumers for wheeling in its 1964 negotiations with the Company (see pp. 1051-1053, *infra*), stated:

[A]s far as wheeling is concerned, I had my ears chopped off by a Consumers Power representative prior to that date and I—in regards to wheeling—and I never asked them again for the reason of the reaction I had at that time from the Consumers Power representative.⁵⁷

In short, the small utilities were uniformly of the impression that it would be a useless gesture to request wheeling from Consumers and thus refrained from proposing transactions dependent on access to Consumers' transmission network.

The instances in the record in which Consumers was approached about wheeling confirm that the small utility managers were not mistaken in their judgment. When in 1969 Southern Cooperative broached the topic of

(Continued from previous page)

So if we did have access, we would have the alternative of going in with a group of smaller utilities or, I suppose, if we actually had true honest-to-gosh wheeling services, that we could go to Detroit Edison, I&M, anybody, and ask them for wholesale power.

⁵⁷The quotation is from Mr. Keen's deposition. Consumers introduced it into evidence to show that Mr. Keen had not requested wheeling in Wolverine's 1964 negotiations with Consumers. See Tr. 4531-33. In its initial decision, the Licensing Board relied on this evidence in concluding that Consumers' conduct amounted to a refusal to wheel. On appeal, Consumers contends that the background of the incident referred to—brought out in other parts of Mr. Keen's deposition not in evidence—"involved . . . the company's rejection" of an offer by Mr. Keen "to wheel over Wolverine's transmission system *for the Company and not vice versa*." Consumers argues that but for the Licensing Board's understandable misinterpretation of this as "a prior refusal to wheel" by Consumers, it would not have found a general refusal to wheel. *Consumers' Appeal Brief*, pp. 302-03.

In oral argument the point was raised whether we should look at the portion of Mr. Keen's deposition not in evidence. Intervenors, although not voicing an objection, pointed out that they and Consumers had stipulated what portions of the depositions would be entered into evidence (see Tr. 5200) and represented that certain excluded portions of the depositions dealt with refusals to wheel. Thus, intervenors asked us to look at other deposition material allegedly concerned with the topic of refusals to wheel if we were to refer to Mr. Keen's deposition. In the circumstances, we declined to ask for submission of the remainder of the Keen deposition. App. Tr. 80; also see 109-15.

In any event, we believe that Consumers misreads the Board's opinion. The Board did not reply on Mr. Keen's testimony as a "prior refusal to wheel" by Consumers, for at the beginning of its discussion the Board pointed out that there was no evidence in the record that a small utility had ever formally requested wheeling from Consumers. Rather, the Board relied on this material to show the belief of the small utilities that it was futile to request *any* wheeling from Consumers. Regardless of the factual background, Mr. Keen's testimony definitely shows that he believed it to be a waste of time to ask Consumers for transmission services. It is only for this purpose that we refer to Mr. Keen's testimony.

wheeling, Consumers simply informed it that the Company “[had] no provisions for wheeling power”—and that ended the matter.”⁵⁸ As Mr. Paul acknowledged, the company intended its response to discourage Southeastern from taking further action in regard to wheeling.⁵⁹ And in 1971 Consumers declined to discuss wheeling when Coldwater requested it to do so.⁶⁰ In short, the record substantiates the Licensing Boards’ finding that whenever the small utilities approached Consumers about wheeling, the company brushed them aside.

“D. J. Exh. No. 125. In its appeal brief Consumers attempts to discount this incident as an “isolated, preliminary and generalized verbal inquiry” and contends that its “response was truthful if not especially enthusiastic.” According to Consumers, the burden was on Southeastern to follow up its initial inquiry with a “formal request” for wheeling. We cannot agree with Consumers, however, particularly in light of Mr. Paul’s testimony (referred to in the text above) that Consumers expected its “unenthusiastic” response to kill any further inquiry into wheeling. Further inquiry manifestly would have been futile in these circumstances.

“CHAIRMAN GARFINKEL: And what was the response [to Southeastern’s inquiry]?

MR. PAUL : Our response was that at that time—our response was we didn’t have a policy or rate on wheeling, but that also such wheeling would involve other systems over which we had no control.

CHAIRMAN GARFINKEL: Well, let’s put it this way. Could I make an assumption now that you did not intend further pursuit with respect to wheeling?

MR. PAUL : That’s right. We just—That was our response.

Tr. 7936.

“D. J. Exh. No. 26; C. P. Exh. No. 12, 014; Munn, Tr. 4076-77.

In its appeal brief, in addition to arguing that Coldwater’s inquiry is not a “formal request,” Consumers urges that we give no weight to this incident because it was a “litigation letter.” (The reason that Consumers gave for not discussing wheeling with Coldwater was that its wheeling policy had “been raised” as an issue in the instant proceeding. C. P. Exh. No. 12,014.) However, Coldwater’s request to discuss wheeling was only one of four topics which Coldwater raised in its “litigation letter”; Consumers agreed to discuss the other three. Moreover, several of the highly contested matters in this proceeding focus on events that have occurred subsequent to the initiation of these proceedings, e.g., the provisions of Consumers’ coordination agreement with the M-C Pool executed in 1973 and Consumers’ refusals to grant access to the Midland nuclear facility. Thus we believe it is proper to take Consumers’ response to Coldwater’s request as indicative of the fact that Consumers—prior to this proceeding—had a policy not to wheel for the small utilities.

At this point we note that Justice and the staff refer us to letters from Traverse City (D. J. Exh. No. 24) and from the M-C Pool (D. J. Exh. No. 58) requesting wheeling services from Consumers. However, these letters were requests for joint venture or unit power access to Midland and the wheeling services referred to therein were ancillary to that request—*i.e.*, the small utilities were only asking for transmission services to carry power from Midland to their systems. We discuss access to the Midland facility later in this opinion.

We note in this connection, however, that the Coldwater letter to Consumers did not seek access to Midland.

3. Although Consumers argues that it has never refused to wheel, it has never represented to us (or to the Board below for that matter) that it would have wheeled power had it been presented with what it deemed a satisfactory “formal request.” Rather, Consumers stated that it had no formal provision for wheeling because it had no need to draw one up in the absence of a specific request. This line of argument is disingenuous. It may well be that Consumers had no wheeling policy in the sense that its Board of Directors had never put it down in a written resolution. But there are obvious reasons why they would not do so. We are convinced—as was the Board below—that Consumers in fact has operated under a policy not to wheel for the small utilities.

It should be kept in mind that we are not called upon to rule on this question in a vacuum. As the Licensing Board correctly determined, Consumers has sought to acquire all the small utilities in the relevant geographic market. Refusing to wheel power would certainly aid Consumers in this quest. Mr. Aymond (Consumers’ chief executive) himself testified that Consumers would probably not wheel power where doing so would affect “the ability of Consumers Power Company to maintain its present markets.”⁵⁶¹ Given the Supreme Court’s *Otter Tail* decision, it is simply no longer open to dispute that a utility’s refusal to wheel in order to protect its monopolistic market position is anticompetitive conduct. See 410 U.S. at 378.

⁵⁶¹Int. Exh. No. 1,004, pp. 183-84 (Mr. Aymond’s deposition). There, in response to an inquiry whether Consumers would be willing to wheel power from Ontario Hydro or some other entity willing to sell power, Mr. Aymond replied that before doing so he would want to know for one thing, whether or not our lawyers felt we were obligated to do so. For another . . . for what purpose the power was being sold and at what rate . . . what the receiving utility intended to do with it, what impact it would have in the long run on the ability of Consumers Power Company to maintain its present markets.

Q. [Intervenor’s Counsel]: Is it fair to say that your judgment would be based at least in part on your judgment of the extent to which the purchase of this power by the municipality or cooperative within your service territory enabled it to reduce its rates in competition with Consumers Power?

A. [Mr. Aymond]: I think that would be a factor.

Q. A large factor?

A. [Mr. Aymond]: I think so.

Q. Apart from the question of your legal obligation, are there any other major factors?

A. [Mr. Aymond]: Well, I think the size of the transaction would be a factor.

Q. Why is that?

A. [Mr. Aymond]: Well, it might be a matter that all things considered wasn’t too significant. *I think whether the receiving utility actually was going to use it to invade our present market area would be a factor.* (Emphasis added.)

4. Thus, our assessment of the evidence leaves us in agreement with the Licensing Board that Consumers' "conduct amounted to a general refusal to wheel." There is also no doubt that Consumers' refusal to wheel has an anticompetitive effect. Without access to the company's transmission network, the small utilities cannot coordinate with or buy wholesale power from large nearby utilities other than Consumers. The obvious consequence of the refusal, as we detail below, is to retain those utilities as Consumers' customers.

5. Consumers' changed wheeling policy "posthearing"

In the presentation of its direct case, Consumers introduced a new official company policy on wheeling which the company had just formulated. The Licensing Board refused to consider that policy because it "deemed [the change] to be timed to influence the Board" thus offering "little assurance of a permanent change in policy." 2 NRC at 92. The Board's conclusion was the proper one in the circumstances.⁶² We deem it appropriate, however—particularly in light of our disposition of this case—to comment briefly on Consumers' "new" wheeling policy.

In essence, under that new policy Consumers will wheel power for other utility systems if four conditions are satisfied. The first two concern the technical capacity of Consumers' transmission network and appropriate compensation. On their face we perceive no antitrust difficulties with either.⁶³ Conditions 3 and 4, however, are quite another matter. Condition 3 provides that Consumers will wheel only if

provision of bulk power wheeling service will not result in a significant

⁶²Consumers presented its wheeling policy to the Board and other parties through the testimony of Mr. Aymond on February 12, 1974. See Tr. 6048-58. Mr. Aymond acknowledged that formulation of the policy had begun two weeks earlier and that it was not completed until the day before his testimony. Aymond, Tr. 6156-61. Further, at that time the Board of Directors had not seen the policy, much less approved it. *Ibid.* Moreover, the policy actually adopted by the Board of Directors included an additional condition not part of Mr. Aymond's original presentation. Compare Tr. 6049-50 with Tr. 8106-07, and see Aymond, Tr. 6093-97. Against this background, the Board was entitled to conclude that the policy was timed to influence this litigation.

⁶³The first two conditions are (*Consumers' Appeal Brief*, p. 305):

(1) that we have the physical capability on our existing or projected transmission grid to provide the desired service, without impairing service to our existing and projected loads or commitments or endangering our system reliability;

(2) that we be properly compensated for the service. Proper compensation means that we recover our costs, measured by proper allocation of average system transmission costs, so that our other customers do not subsidize the wheeling customer.

loss to Consumers Power Company, directly or indirectly, of existing load or services areas, with resulting idle facilities and social wastes.⁶⁴

In its appellate brief, Consumers defends this condition on the ground that the company is "clearly justified" in preventing wasteful transactions such as "creamskimming." In the electric utility industry that term "refers to the practice of one utility, with no general obligation to serve [an area], competing away only the most profitable customers," thereby leaving the original supplier with "the obligation to serve a decreasingly profitable group of customers" and the need to "charge higher prices in order to earn a reasonable return."⁶⁵ "Creamskimming" usually occurs at the retail level,⁶⁶ and whether competition of this kind is socially desirable has been questioned by authorities who cannot be charged with bias for large utilities.⁶⁷

However, even assuming that Consumers is justified in refusing to wheel for that reason, it does not follow that Condition 3 is permissible policy for an enterprise with monopoly power. As Mr. Aymond acknowledged, Condition 3 in terms encompasses more than just avoidance of creamskimming. Indeed, he went so far as to indicate that the company would probably invoke this condition and refuse to wheel where a competing utility was seeking to acquire an entire portion of Consumers' retail service area.⁶⁸ Moreover, by adhering to the terms of this condition, Consumers could also refuse to wheel wholesale power to a prospective system seeking to displace it at retail. As we have stressed before, however, the Supreme Court has held that the Otter Tail Power Company's refusal to wheel for precisely that reason violated the Sherman Act. See 410 U.S. at 380. Moreover, under Condition 3, Consumers could refuse to wheel wholesale power from outside sources to one of its existing wholesale customers. In short, Condition 3 offers no assurance whatsoever that Consumers will refrain from *anticompetitive* refusals to wheel. On the contrary, adherence to its terms if anything invites refusals to wheel for reasons unacceptable under the antitrust laws.⁶⁹

⁶⁴*Ibid.*

⁶⁵Pace, Tr. fol. 7239 at 76. Also see Stelzer, Tr. fol. 7224 at 21.

⁶⁶See Aymond, Tr. 6099.

⁶⁷See Meeks, *Concentration in the Electric Power Industry: The Impact of Antitrust Policy*, 72 Colum. L. Rev. 64, 94-95 (1972).

⁶⁸Aymond, Tr. 6099-6102.

⁶⁹It should be noted that, since the close of the record, Consumers has agreed to wheel (presumably pursuant to its new wheeling policy) 20 MW of firm bulk power to the M-C Pool from Detroit Edison. See *Consumers' Appeal Brief*, pp. 105, 297, 299, 303, 409. However, that

(Continued on next page)

Condition 4 poses a similar problem. It provides that Consumers will wheel power only if

[p]rovision of bulk power wheeling services will not result in significant loss to Consumers Power of access to interchange power transactions with third parties.³⁷⁰

In contrast to the other three, Consumers does not defend this condition in its appellate brief. We do not find this surprising. In light of governing antitrust principles, we can perceive no rational defense for it. It amounts to a direct statement of policy approved by Consumers' Board of Directors that the company will exercise its monopoly power in the coordination services market to exclude the small utilities from that market when it is to its competitive advantage to do so. That course of action exemplifies misuse of monopoly power.

To conclude, we find firmly imbedded in Consumers' "posthearing" policy the principle that the company will not wheel power where doing so would erode its market position. Although formulated to influence this case, that policy is still inconsistent with the policies underlying the antitrust laws and quite possibly the laws themselves.³⁷¹

E. Consumers' coordination practices

Justice, intervenors and the staff argue that Consumers has exercised its monopoly power over coordination services in an anticompetitive fashion against the small utilities. They contend on three specific grounds that Con-

(Continued from previous page)

Consumers has wheeled in this one instance is no assurance that it has abandoned its previous anticompetitive wheeling policy.

We also note that Justice questions the terms and motive of Consumers' agreement to wheel in this instance. See *Justice's Reply Brief on Appeal*, pp. 86-88. Obviously, since it was entered into after the record closed, appellants have not had opportunity to present evidence or cross-examine witnesses concerning this agreement. We therefore only consider it in conjunction with Consumers' new statement on wheeling policy, a statement which, as we noted, was patently timed to influence the outcome of this litigation.

³⁷⁰*Consumers' Appeal Brief*, p. 305.

³⁷¹Because Consumers hold public franchises, possesses eminent domain authority and has a monopoly, intervenors press the further argument that it is a "common carrier" with a duty to wheel power for them to the extent of its capacity to do so. *Intervenors' Reply Brief on Appeal*, p. 9. By those lights, the Otter Tail Power Company would also have been a common carrier. A conclusion to that effect would have offered an easy solution to the wheeling aspects of that litigation, common carriers having the duty to serve all who ask. Nevertheless, neither the district court nor the Supreme Court adopted that *ratio decidendi*. We also decline to rest on that disputed ground (see *Consumers' Appeal Brief*, pp. 298ff.) and do not reach the question.

sumers has refused to coordinate with those utilities on fair and reasonable terms, thereby creating a competitive advantage for itself in the relevant wholesale and retail power markets. The first charge is that Consumers unjustifiably refused to enter operational coordination agreements with Northern Michigan and Wolverine Electric in 1964, with the City of Allegan in 1966, with Northern Michigan in 1967 and with Edison Sault in 1972. The second is that where Consumers agreed to coordinate with small utilities, it did so only on unreasonable terms, particularly in refusing to share reserves with them on an equal percentage basis. The third charge is that Consumers has unjustifiably refused to coordinate development of baseload generation with the small utilities. This final allegation is based primarily on Consumers' refusal to allow or even to consider participation by members of the M-C Pool in the Midland facility when that possibility was broached in 1971.

For the most part, Consumers does not challenge the facts underlying the appellants' assertions but, rather, seeks to justify its coordination dealings with the small utilities. A refusal to deal by one with monopoly power is not a violation of the antimonopolization clause of Section 2 of the Sherman Act if there are reasonable grounds for that refusal. We therefore look first at the standard for measuring the reasonableness of Consumers' coordination practices.

1. The applicable standard

a. **The Licensing Board's decision.** The Board below held that Consumers was bound by law to receive a "net benefit" in any coordination agreement, ones with the smaller utilities not excepted. The Board failed to explain, however, the precise nature and the magnitude of that benefit. Moreover, that Board's determination rested not on antitrust principles but on what it perceived as the duty of an investor-owned utility to include only legitimate expenses in its rate base and not to waste corporate assets.⁵⁷² We have no quarrel with the Board's analysis of these general principles. We simply do not believe that they are helpful in answering the question at hand. The antitrust laws do not generally require one company to enter into or maintain an unprofitable relationship with another, see pp. 1030-1031, *supra*. Consequently, measurement of Consumers' conduct under applicable antitrust standards will not result in holding that company at fault for actions compelled by its duties to shareholders or customers. The principles ex-

⁵⁷²Application of these two legal principles led the Board to "conclude as a matter of law, that the management of [Consumers] is forbidden from entering into alleged coordination agreements which said management believes will result in a net detriment to [the company]." 2 NRC at 66.

pounded by the Licensing Board are thus the starting point, not the conclusion, in determining the standard to be applied.

b. **The parties' proposed standards.** Consumers professes to have a "long-established" policy of entering into "coordination arrangements which offer the Company benefits significantly in excess of its costs, *i.e.*, meaningful net benefits."⁷⁷³ The company contends that its insistence on receiving a net benefit is a "reasonable and necessary aspect of its coordination policies"⁷⁷⁴ and is in accord with industry and FPC standards. It further contends, however, that net benefits can result only if each coordinating party possesses the "willingness and ability to engage in comparable coordinating transactions on a reciprocal basis"⁷⁷⁵—that is, transactions which, over time, will yield a roughly even energy flow between the parties.⁷⁷⁶ Consumers argues that such reciprocity is necessary both because the parties need "incentive" and because coordination power is generally based on incremental rather than average costs. A small system that disproportionately utilized its interconnection would thus allegedly be "leaning on" Consumers. This, the company argues, would unduly discriminate against Consumers' wholesale and retail customers.⁷⁷⁷

Justice acknowledges that Consumers "is not obligated to coordinate with small systems where the coordinating transactions would result in no net benefit or in a net detriment." It contends, however, that a "[n]et benefit (and no net detriment) necessarily results whenever the cost (including a reasonable return on investment, *i.e.*, profit) is recovered from any given coordination transaction." Moreover, it argues that

In determining whether a net benefit is obtainable from a proposed coordinating transaction, it is clearly inappropriate to weigh in the balance any potential loss of revenue to the Applicant (Consumers) that may result because the small system, once afforded coordination, would thereafter purchase less wholesale firm power, or because the small system obtain a lower cost power supply through coordination and then compete more vigorously for wholesale and retail customers of Consumers.⁷⁷⁸

Intervenors urge essentially the same standard.⁷⁷⁹

The NRC staff, on the other hand, would examine whether a coordina-

⁷⁷³*Consumers' Opening Brief Below*, p. 187.

⁷⁷⁴*Consumers' Appeal Brief*, p. 227.

⁷⁷⁵*Id.* at 212.

⁷⁷⁶See Slemmer, Tr. fol. 8838 at 8-16; Mosley, Tr. 8459-60.

⁷⁷⁷See, *Consumers' Opening Brief Below*, 190-91; *Consumers' Appeal Brief*, 219-222; Slemmer, Tr. fol. 8838 at 14.

⁷⁷⁸*Justice's Opening Brief on Appeal*, p. 82.

⁷⁷⁹*Intervenors' Reply Brief on Appeal*, p. 81, fn. 1.

tion arrangement would place “an undue burden” on Consumers and make it unable to render services to its customers. The staff argues that “the net benefits to be achieved from the transaction are irrelevant” where a refusal to deal is determined to have an anticompetitive effect.⁵⁰

c. **Analysis.** We agree generally with Justice’s and intervenors’ position. The relevant inquiry is whether coordination with the smaller utilities would enhance Consumers’ ability to produce firm power economically, the usual reason for coordination arrangements. Accordingly, it is irrelevant whether, as a byproduct of coordination, the smaller utilities would be able to reduce their dependence on Consumers for wholesale power or to improve their competitive stance *vis-à-vis* Consumers. Indeed, a contrary result would allow Consumers to exercise its monopoly power in the coordination services submarket to its competitive advantage in the wholesale and retail markets, at direct odds with judicial teaching. *United States v. Griffith, supra; United States v. United Shoe Machine Corp., supra*, 110 F. Supp. at 364.

Underlying the allegations discussed in this section is concern with the disparity between the respective benefits that a small and a large utility receive from coordinating with each other. There is no dispute that in this situation, the smaller utility receives relatively greater benefits. It will most likely be able to achieve a greater reduction in reserve capacity⁵¹ and be able to increase the comparative size of its generating units to a greater extent than the larger system.⁵² Any large utility, simply by virtue of size, has

⁵⁰*NRC Staff’s Opening Brief on Appeal*, pp. 6, 60-64.

⁵¹Mr. Mayben testified that (Tr. 3744-45):

the value of the benefits to the small utility can be expressed in, again, the savings in reserve requirements and that can be translated into annual cost of capacity, and it can be sizable.

Again, he may go from 100 percent reserve requirement to a 20 percent reserve requirement, and that does represent a sizeable benefit to that municipal, compared to not having coordination.

⁵²Mr. Slemmer testified as follows (Tr. 8939-40):

Witness Slemmer: Well, it enables the small system to increase the unit size to a greater extent than the larger system, and also the fact that the increase—or the decrease in cost as unit size goes up, is not a straight line, it’s a curve. So for the same increase, the benefit is more in the smaller area.

Chairman Garfinkel: So by coordinated agreement or by coming into the pool arrangement, it would enable the small company, the small utility, let’s say to build larger units; is that correct?

Witness Slemmer: Yes.

Chairman Garfinkel: And that’s the normal type—what normally happens when a small unit joins a pool?

Witness Slemmer: That’s what it’s all about.

typically achieved some of the economies of scale now attainable in the electric utility industry. And in this case, in addition to its own large size, Consumers' existing coordination arrangements with large neighboring utilities have opened to it the possibility of even greater economies. Consequently, the relative benefits available to Consumers from coordinating with small utilities may well be minimal from that company's perspective.

Accepting all this, it must be kept in mind that Consumers possesses monopoly power over coordination services within the relevant geographic market. In practical terms, this means that the small utilities can turn only to Consumers for such services and their attendant benefits.³³ In a competitive situation where the small utilities had other alternatives, Consumers might be entitled to concern itself solely with the benefits *it* might obtain through coordination. But we think the case is otherwise where Consumers' refusals to deal not only deny coordination benefits to its small competitors but also give Consumers an edge over them in other markets. In such circumstances—at least where it obtains some benefits from coordination—Consumers can neither justify its refusal to coordinate on the grounds that the small utilities will obtain relatively greater benefits than it will, nor seek to impose on those utilities terms that effectively transfer to Consumers a portion of the benefits they would otherwise gain.³⁴ In judging the reasonableness of Consumers' coordination policies, therefore, we need focus only on whether Consumers would have benefited at all from coordinating with the small utilities.

Finally, we note that "reciprocity" as Consumers defines it is not a prerequisite to the company receiving a benefit in a coordinating arrangement. The example in the margin involving economy energy transactions exposes the flaw in Consumers' proposed standard, for both parties to such transaction undeniably receive "net benefits," even though the energy flow

³³See Part VI, *supra*.

³⁴Our conclusion in this regard is buttressed by *Gainesville Utilities v. Florida Power Corp.*, 402 U.S. 515 (1971). There, in rejecting Florida Power's argument that the FPC should have required the City of Gainesville to pay half its interconnection benefit to the much larger private utility, the Supreme Court observed (402 U.S. at 528; emphasis supplied):

It is certainly true that the same service or commodity may be more valuable to some customers than to others, in terms of the price they are willing to pay for it. An airplane seat may bring greater profit to a passenger flying to California to close a million dollar business deal than to one flying west for a vacation; as a consequence, the former might be willing to pay more for his seat than the latter. *But focus on the willingness or ability of the purchaser to pay for a service is the concern of the monopolist, not of a governmental agency charged both with assuring the industry a fair return and with assuring the public reliable and efficient service, at a reasonable price.*

between them is not reciprocal.⁵⁵⁵ Moreover, Consumers' witness testified that Consumers' reciprocity standard is in essence a means of dividing equally the benefits that two utilities achieve under a coordinating arrangement.⁵⁵⁶ This was in effect confirmed by Mr. Aymond's testimony that Consumers could justifiably refuse to coordinate with a small utility that received "much larger benefits in proportion" to Consumers'.⁵⁵⁷ For reasons which we discuss below, the company's proposed standard for reasonableness is out of harmony with the governing antitrust principles when applied to transactions with the smaller utilities in its service area.⁵⁵⁸

2. Consumers' refusals to coordinate

a. **Facts.** We turn first to those instances where Consumers has refused to coordinate on any terms with the smaller utilities. Since Consumers gives the same justification for each refusal, we will describe the factual situations before discussing the parties' positions and the Licensing Board's determination.

(i) **Consumers' refusal to coordinate with Northern Michigan and Wolverine Electric.** In December 1963 Mr. Daverman, the cooperative's

⁵⁵⁵Utilities engage in economy energy transactions in order to utilize their most economical generating unit. See fn. 288, *supra*. Briefly, in such a transaction a utility generating electricity with a unit whose operating costs are higher than one its neighbor temporarily has in reserve, will cease operation of its more costly unit and receive power from its neighbor's more economical unit. The receiving utility pays the supplier's operating costs plus half the difference in operating costs between the two units, in effect splitting the savings on a 50-50 basis. A prerequisite to such a transaction is that the receiving utility have idle generating capacity —*i.e.*, it cannot utilize economy energy for emergency purposes or to meet a general deficiency in capacity. And as stated earlier, economy energy is supplied only on an "if available basis" —*i.e.*, the supplying utility can retract service on an instant's notice.

Under Consumer's reciprocity standard as explained by Mr. Slemmer, Consumers' expert witness, a reciprocal net benefit with respect to economy energy transaction can be achieved only if "over time . . . each participating system ha[s] lower generating costs than the other participants a reasonable amount of time," so that energy can "flow in both directions." Tr. fol. 8838 at 16. However, given the nature of economy energy transactions, benefits do not hinge on receiving similar service in the future for, by definition, the seller has profited on each individual transaction. And because the receiver has capacity available (albeit more expensive to operate), it cannot be said to be "leaning" on the seller. This is made even more evident because the supplying utility can stop delivery any time that it needs the particular generating capacity for its own use. In short, both the receiving and the supplying utilities benefit in economy energy exchanges even where the power always flows in one direction. See Wolfe, Tr. 1591.

⁵⁵⁶Slemmer, Tr. 8860-61, 8929-31.

⁵⁵⁷Int. Exh. No. 1,004, p. 266 (Mr. Aymond's deposition). Also see Aymond Tr. 6262-68.

⁵⁵⁸Whether that standard is objectionable when applied strictly to transactions between large utilities is a question we need not and do not reach.

power consultant, wrote Mr. Campbell, Consumers' Vice President in charge of marketing, requesting that Consumers make alternative proposals for supplying bulk power to the cooperatives.³⁸⁹ At that time the cooperatives were meeting their load requirements by both generation and wholesale power purchases. Northern Michigan had a generating capacity of 22.97 MW, which it supplemented with purchases of 18.75 MW of firm power from Consumers to meet its 30.19 MW peak load.³⁹⁰ Wolverine then supplemented its generating capacity of 32.96 MW with purchases of 2.5 MW of wholesale power from Consumers to meet its peak load of 29.65 MW.³⁹¹

Mr. Daverman's letter to Mr. Campbell initiated formal negotiations between the cooperatives and Consumers. These extended over the better part of a year.³⁹² Throughout the negotiations Consumers expressed a definite strong desire to assume all the future load growth of the cooperatives³⁹³ and to this end submitted a wholesale power proposal running for 15 years.³⁹⁴ The cooperatives, however, found the Consumers' offer unsatisfactory because they considered themselves "established power suppliers"; as a counter to Consumers' wholesale power offer, they suggested negotiation for "some form of an interchange agreement" between

³⁸⁹D. J. Exh. No. 32.

³⁹⁰Steinbrecher, Tr. 1411-16. These figures are from Northern Michigan's report to the Federal Power Commission for the year ending 1964. *Ibid.* At that time the largest units on Northern Michigan systems were two units with generating capacities of 8.5 MW each. Also, Northern Michigan then had a coordination agreement with Traverse City which provided for mutual emergency support of 4 MW. D. J. Exh. No. 240; Steinbrecher, Tr. 1949-59. As explained in our discussion on coordination, this would be nonfirm power.

³⁹¹Steinbrecher, Tr. 1417-21. These figures are from Wolverine Electric's report to the Federal Power Commission for the year ending 1964. *Ibid.* In addition to the sources mentioned, Wolverine also received electric energy from Hart and Lowell. The record does not reveal if these transactions were on a firm power basis. Steinbrecher, Tr. 1418-19.

³⁹²See D. J. Exh. No. 33, No. 34, No. 35, No. 36, No. 37, No. 38, No. 39, No. 40 and No. 41.

³⁹³D. J. Exh. No. 35, No. 36 and No. 37

Mr. Campbell opened the meeting with generalities to the effect that Consumers was not interested in short term standby arrangements (such as the present [wholesale] contract), that Consumers wanted to obtain all the Cooperatives' future load growth and that Consumers would like some sort of policy expression from the Cooperatives as to their intended future relations with Consumers.

D. J. Exh. No. 36 (Summary of a meeting held between representatives of the cooperatives and Consumers, prepared by Mr. Hodge, an associate of Mr. Daverman).

³⁹⁴D. J. Exh. No. 37.

themselves and Consumers.³⁵ In a meeting with the cooperatives, however, Mr. Campbell indicated that Consumers "was definitely not interested in entering such agreements with any small companies at [that] time" and that "the company was not disposed to pursue this approach further."³⁶

The cooperatives, however, persisted in their efforts to obtain a coordination agreement with Consumers.³⁷ Consumers again rejected the idea, explaining that

As indicated in [Mr. Steinbrecher's] letter to Mr. Lee, any interconnection and pooling arrangement should create similar benefits for both parties. After careful and considered review, we conclude there are insufficient benefits for Consumers Power Company through such an arrangement to adequately protect the best interests of our stock-holders and existing regular customers.³⁸

Failing to obtain a coordination agreement with Consumers, the cooperatives continued as wholesale power customers of the company.

(ii) Consumers' refusal to coordinate with Northern Michigan. In January 1967, Northern Michigan wrote Consumers seeking to negotiate a coordination agreement to replace their existing wholesale power arrangement scheduled to terminate at the end of the year. Northern Michigan's system peak load at that time was 43.52 MW, its installed capacity 45.10 MW, and the size of its largest unit 23.5 MW. To supplement its generation, Northern was purchasing 11.5 MW of wholesale power from Consumers. In addition, Northern Michigan, Wolverine, Traverse City and Grand Haven were interconnected. Their projected generating capacity as a group by late 1967 was expected to be 160 MW while their projected load was but 100

³⁵When viewing your proposal in the light of the existing supply and transmission facilities of Northern Michigan and Wolverine, including their interconnections with other systems, your proposal is not responsive to their present needs. We have previously suggested in correspondence and in meetings with your people that there might be other avenues of approach to explore. Northern Michigan Electric Cooperative and Wolverine Electric Cooperative as established power suppliers feel strongly that an effort should be made to consider the possibility of some form of an interchange agreement based upon the general principles of power pooling, possibly along the lines of your present agreement with the Detroit Edison Company or following the pattern of pooling agreements which have been developed in recent years in other states.

D. J. Exh. No. 38 (Letter from Mr. Daverman to Mr. Campbell). Also see D. J. Exh. No. 39.

³⁶D. J. Exh. No. 39 (Summary of Meeting held May 27 between Consumers Power Company personnel and the cooperative's managers and power consultants, prepared by Mr. Daverman).

³⁷D. J. Exh. No. 40 (Letter from Mr. Daverman to Mr. Campbell dated June 30, 1964).

³⁸D. J. Exh. No. 41 (Letter dated November 16, 1964).

MW.⁵⁹⁹ (This included three new plants totalling 63 MW expected to come on line in late 1967.)⁶⁰⁰ Under the interconnection agreements then in existence among these utilities (this was prior to execution of the M-C Pool agreement), Northern Michigan could receive emergency power from both Traverse City and Wolverine.⁶⁰¹

After meeting with the cooperative's representative, Consumers requested, among other things, copies of the interconnection agreement between the cooperatives and the municipalities.⁶⁰² Northern did not send the copies but instead informed Consumers of the general characteristics of the interconnected systems, e.g., the generating capacity of each individual system, number of generating units, and the size of the largest unit. Apparently with no further communications, Mr. Paul of Consumers wrote Northern Michigan on July 14, 1967, that it would be unable to coordinate with the cooperative but that it would be glad to continue the present wholesale type of agreement. His letter stated in pertinent part:

Consumers Power Company has established criteria based on established utility practices for evaluating the relative costs and benefits to be derived from interconnected systems and makes available to other utilities interconnections based on such criteria. Applying this criteria to the preliminary load and generating data supplied by you, we find that Northern Michigan Rural Electric Cooperative has insufficient reserve capacity to benefit from or to comply with minimum provisions for this type of agreement.⁶⁰³

(iii). **Consumers' refusal to coordinate with Edison Sault.** In 1972 Consumers and Edison Sault were renegotiating their existing wholesale power arrangement.⁶⁰⁴ As indicated earlier (p. 942, *supra*), Edison Sault then had a peak load of about 73 MW. From a series of communications with Consumers' personnel, Edison Sault had received the definite impression that it had a choice between a standard wholesale impression that it had a choice between a standard wholesale contract and a coordination agreement.⁶⁰⁵

⁵⁹⁹D. J. Exh. No. 47 (Letter from Mr. Paul to Mr. Daverman).

⁶⁰⁰Steinbrecher, Tr. 1441-46. The 23.5 MW unit was planned to be in operation by November 1967. C.P. Exh. No. 12,001 (May 18, 1967).

⁶⁰¹D. J. Exh. No. 48.

⁶⁰²C. P. Exh. No. 12,001 (Letter dated April 21, 1967).

⁶⁰³D. J. Exh. No. 49.

⁶⁰⁴Kline, Tr. 4416.

⁶⁰⁵According to Edison Sault personnel, both Bob Conden and Gene Kaiser of Consumers had indicated that the decision on whether to enter "into an interconnection agreement or renegotiate our present wholesale contract" was Edison Sault's to make. D.J. Exh. No. 83 (Edison Sault memorandum of October 16, 1972, summarizing negotiations with Consumers personnel.) See also fn. 606, *infra*.

Under the latter, Edison would have been required to maintain reserves equal to 15 percent of its peak load. It was Edison Sault's understanding that, to the extent its generating capacity was less than 115 percent of peak load, it could make up the deficiency either by installing the necessary generating capacity itself or by purchasing the power from Consumers. At a subsequent meeting, Mr. Paul of Consumers attempted to convince Edison Sault that a wholesale power arrangement was more advantageous to it than the coordination agreement. Only after failing to do so did he advise Edison Sault's representatives that they had misunderstood comments of Consumers' personnel about the availability of the coordination arrangement and that, in fact, Consumers would not coordinate with Edison Sault.⁶⁰⁶ Edison Sault was left with no choice but to renew its wholesale power arrangement with Consumers.⁶⁰⁷

⁶⁰⁶D.J. Exh. No. 85 (summary of that meeting by Mr. Kline, president of Edison Sault):

At this point in the discussions, [*i.e.* after failing to convince Edison Sault that a wholesale power arrangement was more advantageous than coordination] Mr. Paul advised us that Edison had misunderstood the comments which had been made by Consumers Power Company representatives during the various conferences in which we concluded that either a wholesale agreement or an interconnection agreement was available to us. Mr. Paul stated that it was the Company's policy that if the utility was deficient in its base capacity, that they were not entitled to the benefits of an interconnection agreement.

It had been our understanding and without question throughout our discussions with Consumers Power Company that an interconnection agreement was available to us and that where our system was deficient, we would be required to install capacity or purchase the reserve capacity equal to fifteen (15%) percent.

In view of the fact that [Consumers] had announced that the interconnection agreement was not available to us, we terminated the conference and Mr. Paul stated that they would furnish us a proposed wholesale contract, that being the only contract available to Edison at [that] time.

⁶⁰⁷In addition to the instances just mentioned, Justice contends that Consumers refused to coordinate with the City of Allegan in 1966, an action that assertedly swung the balance in favor of Allegan selling its electric system to Consumers. Justice rests its allegation on Allegan's request in 1966 that Consumers supply it with either "standby or supplemental power." The only documentation of this request is an internal memorandum written by Mr. Paul. D.J. Exh. No. 178. In its appellate brief (p. 243) Consumers argues that Mr. Paul testified that "the 'standby power' referred to there was simply one variety of wholesale service" and thus Allegan's request was "not [related] at all to coordination." This is not entirely correct. See Paul, Tr. 7979-81. Nevertheless, Mr. Paul did testify that Allegan's request was one for wholesale power, to be used for standby or emergency purposes, which the company subsequently offered. Paul, Tr. 7977-78. The weight of the evidence in our judgment does not confirm that Allegan's request was one for coordination.

Justice in its appellate brief (pp. 99-104) also refers to instances where Consumers refused to coordinate on reasonable terms with the M-C Pool (1969-1973), Lansing (1970) and Traverse City (1968). Whether the terms of Consumers' current coordination agreements are anticompetitive is considered at p. 1065 *ff.*, *infra*.

b. **Consumers' position.** Consumers acknowledges that it refused to coordinate in the instances described above. It contended to the Board below, however, that those refusals were justified because the small utilities were "deficient" in generating capacity—*i.e.*, they had insufficient generation to meet their peak load plus some reasonable reserve level⁶⁰⁸—and therefore could not give assurances of "reciprocal emergency power support" comparable to that which Consumers would be providing. Consumers argued that for this reason it would have received no "net benefit" had it coordinated with the small systems. The Licensing Board agreed with Consumers, concluding that "true coordination with benefits to both parties was not feasible" in those circumstances. 2 NRC at 94-95. The Board did not attempt to explain, however, just why a utility partly dependent on purchases of wholesale power—firm power in bulk—could not be a viable coordinating partner.

c. **Appellants' position.** Justice points out that the small utilities, although lacking sufficient generating capacity of their own to meet their peak load and reserve requirements, were buying wholesale power to make up that difference and therefore had sufficient "firm power" to meet those obligations. The Department argues that a coordinating partner could rely on the small utilities' purchased reserves. It supports its position by pointing out that Consumers itself was in precisely that situation—*i.e.*, the company for various reasons has been short of generating capacity in recent years (most notably in 1971)⁶⁰⁹ and therefore has been purchasing power under coordination arrangements to meet its required reserve level. The intervenors support Justice's argument and offer a theoretical analysis to demonstrate its soundness.⁶¹⁰

Both Justice and the intervenors argue that Consumers would have benefited by coordinating with the small utilities in the instances described. Consumers' refusals to coordinate, they contend, were motivated by that company's desire to preserve and extend its monopoly position at both the wholesale and the retail levels.

⁶⁰⁸*Consumers' Opening Brief Below*, pp. 192-94.

⁶⁰⁹In 1971 Consumers' installed generating capacity was 3,443 MW; its peak load was 3,667 MW. See D. J. Exh. No. 21, pp. 9, 28.

⁶¹⁰The intervenors suggest that a non-sufficient utility can be thought of as two separate systems, one self-sufficient and the other relying totally upon wholesale power. They give an example of a system with a 20 MW load, 11.5 MW of generation and a 15% reserve requirement, the conceptual analog of which is two separate systems each having a 10 MW load, one having 11.5 MW of generation and the second purchasing 10 MW of wholesale power. The former would meet Consumers' test for coordination because it would have a 15% reserve to serve the 10 MW load. The intervenors assert that the combined system with the 20 MW load "should be equally entitled to coordination for the 11.5 MW of generation." *Intervenors' Opening Brief on Appeal*, pp. 160-62; *Reply Brief*, pp. 83-86.

d. **Discussion.** One who contracts for wholesale power has the right to demand the amount contracted for at any time. The selling utility accordingly must have planned its system to deliver that amount; in other words, it must have reserves sufficient to back its wholesale sales.⁶¹¹ For this reason, a utility without sufficient generating capacity of its own to meet its peak load can contract for wholesale power to cover its deficiency and provide the necessary amount of reserves. This is precisely what the small utilities had done in each of the instances described above. For example, in 1964 Northern Michigan had 42 MW available from either self-generation or wholesale contracts to meet its 30 MW peak load. It therefore had at its disposal at least 12 MW of power which was available to a utility with an emergency. This is not theoretical. At the time in question, Traverse City and Northern Michigan were operating under a coordination agreement under which they were exchanging emergency power.⁶¹² An electric utility that obtains its firm bulk power partly by self-generation and partly by wholesale power purchase is, therefore, not inherently disqualified as a coordinating partner.

This conclusion is buttressed by statements of Consumers' counsel at oral argument. There, counsel represented to us that "[Consumers has] never taken the position that a coordinating partner could not go out and buy firm power from somebody else, as long as it isn't from [Consumers]."⁶¹³ In other words, according to counsel, a utility partly dependent on wholesale power purchases is an acceptable coordinating partner for any other utility except the one supplying the wholesale power. This limitation is necessary, counsel argued, because the utility buying at wholesale from Consumers would not be able to supply power to Consumers in the event of an outage on Consumers' own system.⁶¹⁴

⁶¹¹For example, a utility that operates under a 20 percent reserve margin must in effect allocate 12 MW of generating capacity to serve a customer to whom it sells 10 MW of wholesale power.

Thus, to the extent that Consumers contracted to sell wholesale power as reserve capacity to the small utilities, it had to maintain sufficient generating reserve capacity to meet that commitment. In case of a power outage on Consumers' own system, Consumers would be able to draw on this capacity absent an emergency on the buyer's system.

⁶¹²D.J. Exh. No. 240; Steinbrecher Tr. 1950-53.

⁶¹³App. Tr. 135.

⁶¹⁴App. Tr. 135-36. Nowhere in its briefs to this Board or the Board below did Consumers make the distinction urged by counsel at oral argument. Rather, as shown by the argument made to the Board below, Consumers has asserted that its refusals to coordinate with the small utilities were justified simply because these systems were deficient in generation, apparently regardless of where they obtained the additional power to make up for that deficiency. See *Consumers' Opening Brief Below*, pp. 192-94.

(Continued on next page)

Assuming *arguendo* that the reason advanced by counsel was in fact Consumers' rationale for refusing to coordinate, we find it self-serving and unpersuasive given the company's policy against wheeling power for the smaller utilities. Absent that wheeling, they could not obtain the wholesale power which Consumers insist is needed to make them viable coordinating partners. In other words, Consumers was telling the small utilities on the one hand that to coordinate with the company they needed to obtain wholesale power elsewhere than from Consumers, while on the other hand it was denying them the use of its transmission network, their only access to those outside sources. Thus, if we accept counsel's explanation, Consumers created the situation that made it impossible for the small utilities to become "viable coordinating partners" by Consumers' lights.

At all events, counsel's argument is plainly a *post hoc* rationalization. This becomes clear when the actual negotiations leading up to Consumers' current coordination agreement M-C Pool are examined, for there the company took the opposite position. The negotiations were opened in 1969 by Wolverine Electric's request to buy 10 to 20 MW of power from Consumers and also to coordinate with the company.⁶¹⁵ Consumers eventually responded with a "Preliminary Proposal Interchange and Wholesale Power Purchase" agreement. That proposal would have allowed Wolverine to buy wholesale power from Consumers and for the two utilities to undertake mutual emergency energy power transactions.⁶¹⁶ Indeed, it was the manager of Wolverine Electric, not the Consumers representative, who questioned how the mutual emergency support transactions could be undertaken and billed when the cooperative was drawing wholesale power from Consumers.⁶¹⁷ The company's response, give by Mr. Paul, was the following:

Simultaneous deliveries of firm wholesale power to Wolverine and emergency support to Consumers Power Company would be treated as though they were being handled through two separate connections. As example:

If Consumers Power Company were delivering 10 megawatts of wholesale power to Wolverine and then Consumers called for 20 megawatts of emergency support, the net delivery to Consumers would be 10

(Continued from previous page)

In its brief below as well as in its appeal brief Consumers refers to the accepted proposition that a utility must maintain a reserve of at least 10 to 20 percent of its peak load as support for its position. However, in light of counsel's representations at oral argument, Consumers can no longer rely on that proposition, for it does not support the distinction counsel now urges upon us.

⁶¹⁵D. J. Exh. No. 53.

⁶¹⁶C. P. Exh. No. 12,002 and No. 12,003.

⁶¹⁷D. J. Exh. No. 54.

megawatts. Consumers would pay six mills per kilowatt-hour for this energy at a rate of 10 megawatts per hour or return it in kind at Wolverine's option. Wolverine in turn would pay for that month the standard wholesale rate for 10 megawatts of firm power capacity and the appropriate energy charge for the net kilowatt-hour received. Assume again that Consumers is delivering 10 megawatts of wholesale power to Wolverine and calls for 5 megawatts of emergency support. Deliveries to Wolverine would be reduced to 5 megawatts during this period. Consumers would pay Wolverine six mills per kilowatt-hour for energy at the rate of 5 megawatts per hour or return it in kind. Wolverine would pay the standard wholesale charges that month for delivery of 10 megawatts of capacity and the appropriate energy charge for the net kilowatt-hour received.

If Wolverine were purchasing 10 megawatts of firm power and at the same time required 20 megawatts of emergency support, Consumers would deliver a total of 30 megawatts, of which all in excess of the 10 megawatts firm purchase would be treated and billed in accordance with the interchange provisions of the agreement.⁶¹⁸

Mr. Paul's explanation on behalf of Consumers confirms our judgment that there is no inherent physical or economic barrier to Consumers' engaging in simultaneous wholesale and coordination transactions with the same utility. Consumers itself initiated this proposal to Wolverine; it would hardly have done so were a wholesale-coordination agreement not beneficial to it.⁶¹⁹

Under a wholesale-coordination agreement of the type Consumers offered Wolverine, the small utility would be required to buy wholesale power both to supply the difference between its generating capacity and peak load and also to provide it with a reasonable reserve margin.⁶²⁰ Because reserve

⁶¹⁸D. J. Exh. No. 55.

⁶¹⁹Mr. Paul's illustrations, and the derivative conclusion that Consumers would benefit from the transaction, is true not only with respect to the circumstances exist in 1970. As we subsequently explain, Consumers could generally benefit from coordinating with a "deficient" utility. Moreover, in the instances where Consumers refused to coordinate, the small utilities had substantial generation and their reliance on wholesale power was minimal. See "a," *supra*, at p. 1051 *ff*.

⁶²⁰It goes without question that a utility buying wholesale power from, as well as coordinating with, Consumers must (assuming no other outside sources of power) buy sufficient wholesale power to provide it with a reasonable reserve margin above its peak load requirements. Not to require purchases of wholesale power for reserve purposes would be, to use Consumers' terminology, to allow the small system "to lean" on Consumers, for the buyer would not be paying for the maintenance of generating capacity necessary to cover emergency or scheduled outages of its generating facilities.

capacity is not used on a continued or even a daily basis but is tapped in case of an unexpected or scheduled outage of a generating unit, Consumers can count on that increment of power as a reserve for its own system. This is true whether the small utility draws the maximum amount of wholesale power contracted for from Consumers, utilizes its own generating capacity as much as possible and draws wholesale power only when needed, or follows some intermediate course.⁶²¹ Thus, while being paid on a firm power basis, Consumers can, in an emergency, generally utilize the power generated by this capacity as though it were being produced by the small utility's own generators. This is a clear benefit to Consumers, notwithstanding the absence of the reciprocal power flow that the company focuses on. Indeed, the "burden" on Consumers' generation and reserves is less under a wholesale-coordination arrangement than under a wholesale power contract.⁶²²

We need not reach here the question of the reserve level a small utility must maintain so as not to burden Consumers' system. Consumers has defended its refusals to coordinate on the ground that it could *never* benefit by coordinating with a deficient utility that was also purchasing wholesale

⁶²¹Under a wholesale-coordination agreement, if the small utility draws the maximum amount of wholesale power, Consumers could in an emergency reduce its flow of wholesale power to the small utility, thus forcing it to operate the generation it is holding in reserve. (See Mr. Paul's illustration in text above.) If the parties had strictly a wholesale arrangement (rather than a wholesale-coordination agreement) Consumers would not be entitled to reduce the flow of wholesale power to the small system but would be required to look elsewhere for power to meet its emergency.

Similarly, under a wholesale-coordination type of agreement, if the small utility as a matter of course used its generating capability to the maximum, Consumers could rely in an emergency upon that portion of wholesale power the small utility had contracted for as reserve capacity, because the utility would call for that power *only if* it experienced an emergency.

⁶²²For example, assume that Consumers is dealing with Utility A, a system of the size that Northern Michigan was in 1967: peak load of 43.5 MW, installed capacity of 45.1 MW, largest unit 23.5 MW in capacity. Assume further that Utility A's largest unit fails during peak load conditions. Under a strictly wholesale arrangement, Consumers will have to deliver 21.9 MW of power to make up for this outage ([peak load + largest unit capacity] — installed capacity). In contrast, under a hybrid wholesale-coordination agreement with a 20 percent reserve requirement, Consumers will have to deliver only 7.1 MW of power to Utility A (.20 [peak load] — [installed capacity — peak load]). The remaining 14.8 MW (21.9 MW — 7.1 MW) would be delivered only if Consumers had excess capacity available either on its own system or via short-term power purchases from other systems. Thus, by insisting on a strictly wholesale arrangement, Consumers assumes an unnecessarily large share of the reserve burden—a doubly unwise course in light of Consumers' own capacity shortfalls. Of course selling wholesale power is more profitable than selling coordination services. See p. 964 *ff.*, *supra*.

power from it. As we have seen, that position does not withstand analysis.⁶²³

e. **Effect of Consumers' refusals to coordinate.** Having determined that Consumers could have benefited by coordination with the small systems, we must now consider whether its refusals to do so were anticompetitive in purpose or effect.

(i) The extent of competition in the wholesale power market depends in large measure on the small utilities' ability to obtain firm bulk power at reasonable cost. As the Licensing Board recognized (2 NRC at 108), their options in this case are limited to installing new generating facilities of their own or purchasing wholesale power from Consumers.⁶²⁴ We have explained, however, that the small utilities can construct and operate large,

⁶²³Coordination between a utility deficient in generation and one which is self-sufficient can also lower the reserve levels each must carry. Assume, for example, that Utility A has a 200 MW peak load and a 200 MW generating capacity, its largest unit being 50 MW. Assuming that the "largest unit criterion" for calculating reserves is valid, Utility A's reserve requirement before coordination would be 50 MW, which it purchases from Utility B under a wholesale power arrangement. Assume that Utility B has a peak load of 850 MW (including the 50 MW wholesale purchase by Utility A) and generating capacity of 1,050 MW, its largest unit being 200 MW. Utility B's reserve requirement before coordination would be 200 MW.

Upon coordination the combined peak load of the two systems would be 1,000 MW (viewing the two systems as one, the 50 MW wholesale purchased by A would not be part of the combined system's load). Again assuming that the largest unit criterion is valid, the reserve requirement for the combined system is 200 MW, or 20 percent of their combined peak load. If the utilities were to share reserves on an equalized basis, see fn. 631, *infra*, Utility A's reserve requirement would be 20% of 200 or 40 MW; Utility B's reserve requirement would be 20% of 800 or 160 MW. Thus, both could reduce their reserve requirements upon coordination: Utility A need buy only 40 MW of power from Utility B, and B need maintain only 160 MW of reserves.

Of course, if Utility B could not market elsewhere the extra power that it would have available through coordination with Utility A, B would naturally prefer to continue selling wholesale power to that utility rather than coordinate.

⁶²⁴Consumers does not dispute this; indeed, its proposed wholesale market definition was built around this competition. Mr. Aymond testified that Consumers has "actively solicited wholesale business from other utility systems in [its general] service area." Tr. 6064. This is borne out by the record. For example, in 1962 Consumers was actively seeking to sell wholesale power to Zeeland, Allegan and St. Louis. D. J. Exh. No. 15; in 1964 to Northern Michigan and Wolverine Electric, D. J. Exhs. No. 36, 37; in 1966 to Petosky and Holland, D. J. Exh. No. 188; in 1968 to Traverse City, D. J. Exh. No. 31; in 1969-70 to Wolverine Electric, C. P. Exh. No. 12,002, 12,003; and in 1971 to Portland. Int. Exh. No. 2,032. Moreover, Consumers has been at least partially successful in its efforts. For example, in 1962 St. Louis, Charlevoix and Hillsdale were self-sufficient; by 1972, however, St. Louis and Charlevoix were obtaining over 90 percent of their requirements at wholesale from Consumers and Hillsdale over 50 percent. C. P. Exh. No. 11,307; also see D. J. Exh. 15. During that period the cities of Petosky, Union City and Marshall similarly increased their wholesale purchases from Consumers instead of building new power plants of their own.

economically efficient plants without experiencing an unmanageable rise in required reserve levels only if they have suitable coordination arrangements. Consumers' refusals to coordinate with them thus have a two-pronged anticompetitive effect: they prevent the small utilities from building the most efficient (*i.e.*, at least costly per kWh produced) new facilities and, as a result, tend to ensure those systems' ever-increasing reliance on wholesale power purchases from Consumers.

(ii) We also find that Consumers' refusals to coordinate were purposefully anticompetitive. In 1964, Wolverine Electric and Northern Michigan had been studying several options for meeting the new load growth of their member distribution cooperatives.⁶²⁵ They considered expansion of old facilities, construction of a new plant, wholesale power purchases from Consumers, and a combination of expanded generation and purchases from Consumers.⁶²⁶ As pointed out above, Consumers itself was interested in supplying the future increased power needs of those cooperatives for the next 15 years but through sales of wholesale power. When the company failed to convince the G. & T. cooperatives to accept its offer, it sought to forestall the grant of REA loans to the cooperatives to finance that new generation.⁶²⁷ The company hoped thereby to force the cooperatives to turn to Consumers for wholesale power. In so doing, Consumers undertook an intensive public effort (using arguments based on cost comparison figures that were, at best, misleading), to show that the G. & T. cooperative was needlessly increasing the power costs of the distribution cooperatives and their retail customers by electing to build new generating

⁶²⁵Steinbrecher, Tr. 1423-28.

⁶²⁶*Ibid.*

⁶²⁷Consumers invokes the rule protecting the right to petition the government for the proposition that we may not take notice of its attempts to influence REA officials against making the loan. See *Eastern R.R. Presidents Conference v. Noerr Motor Freight, Inc.*, 365 U.S. 127 (1961), and *United Mine Workers v. Pennington*, 381 U.S. 557 (1965). To begin with, it is doubtful that the "Noerr-Pennington Doctrine" applies to actions of the kind involved here. It protects persons attempting to influence government policy, not those seeking to impede officials carrying out policies previously made. *Hecht v. Pro-Football, Inc.*, *supra*, 444 F.2d at 940-42; *Geo. R. Whitten, Jr., Inc. v. Paddock Pool Builders, Inc.*, *supra*, 424 F.2d at 31-34. But even were the doctrine applicable to the facts before us, it would only serve to insulate the attempts to influence the government officials from forming the basis of antitrust liability. The fact that such attempts took place, however, need not be ignored where they shed light on the anticompetitive nature of other actions. The Supreme Court itself drew this distinction in *Pennington*, observing that evidence of such conduct may be introduced and considered "if it tends reasonably to show the purpose and character of the particular transaction under scrutiny." 381 U.S. at 670 fn. 3. It is for this purpose that we take the circumstances surrounding the loans into account.

plants in lieu of buying wholesale power from Consumers.⁶²⁸ The record further reveals that Consumers' goal in seeking to block the REA loans was not only to increase the company's wholesale sales,⁶²⁹ but also to prevent

⁶²⁸REA will lend money to finance construction of new generating plants only where the proposal constitutes "the most effective and economical arrangement" for meeting increased power demand. (See Part IV, above.) In an attempt to show that its own wholesale power would be more economical than the cooperatives' installation of new facilities, Consumers took several steps: (1) Mr. Campbell, Consumers' vice president in charge of marketing, registered the company's opposition to the REA loan with the REA administrator both by mail and, at least once (in September 1965), in person in Washington, D. C. (D.J. Exh. Nos. 143 and 188; see also Paul, Tr. 7900-05, 8067); (2) in December 1965, Mr. Campbell wrote to the manager of each distribution cooperative served by Wolverine Electric and Northern Michigan (which are generation and transmission cooperatives), setting forth calculations purporting to show the relative high cost of plant expansion over wholesale purchases (D.J. Exh. No. 143); (3) a few days later Consumers issued identical representations in a press release (D.J. Exh. No. 145). These were culled from a power-cost study by Mr. Paul that simply compared, for the period since 1950, the distribution cooperatives' average cost per kwh under their existing agreement with the G and T cooperatives to that paid by Consumers' wholesale customers. (Paul, Tr. 8068. See also D.J. Exh. Nos. 143, 145 and 224; the last is an extension of the study through 1967). The study's conclusions are misleading: First, according to uncontradicted testimony, that study omitted the costs of transmitting power from points on Consumers' system to the cooperatives' load centers (Steinbrecher, Tr. 1244-45; Keen, Tr. 4487-88, 4540-50), thereby significantly understating Consumers' actual costs. See D.J. Exh. No. 45. Second, by using only *past* costs in his comparison, Mr. Paul unfairly excluded the capital expenditures that the G and T cooperatives had already made on their existing bulk power facilities by 1964; the comparison should have been between the G. and T. cooperatives' *future* incremental generating costs and partial wholesale purchases.

⁶²⁹The following example shows how Consumers' sales of wholesale power could be favorably affected by a refusal to coordinate. Assume that Utility A's peak load is 43.5 MW, its installed capacity 45.1 MW, and its largest unit 23.5 MW in capacity. If Utility A relies on wholesale purchases from Consumers for all additional power necessary to cover possible outage of its largest unit, it will have to buy 21.9 MW of such power: Utility A's minimum power requirement equals the sum of its peak load plus a reserve equivalent to the capacity of its largest generating unit ($43.5 + 23.5 = 67$ MW); because the utility's installed capacity is only 45.1 MW, it will have to buy the difference ($67 - 45.1 = 21.9$ MW) from Consumers. Under a wholesale-coordination arrangement that required it to maintain reserves of 20 percent of peak load, however, Utility A would need only 7.1 MW of wholesale power. (20% of 43.5, less the difference between 45.1 and 43.5, or $8.7 - 1.6 = 7.1$ MW.) As a result of Consumers' refusal to coordinate, Utility A would have to buy an extra 14.8 MW of wholesale power at a substantial additional cost. See p. 964 *ff.*, *supra*.

These figures are taken from the statistics for Northern Michigan in 1967, when officials of that utility sought a coordination agreement with Consumers but were rebuffed. The example and result are hypothetical only because Northern Michigan fortuitously had been able to reduce *in part* its wholesale power needs by interconnecting with Grand Haven, Traverse City and Wolverine Electric. Even so, Northern Michigan had to contract with Consumers for 10 MW of wholesale power, 2.9 MW more than if it had been able to coordinate with Consumers at a 20 percent reserve margin. See D.J. Exh. No. 64.

further development of an independent bulk power system within its service area.⁶³⁰

Against this backdrop, there can be no doubt that Consumers was motivated by anticompetitive purposes in dealings with the G. and T. cooperatives in 1964. By refusing to coordinate, the company hoped to head off the development of an alternative power supply system within its service area while increasing its level of wholesale sales.

We find a similar anticompetitive purpose in Consumers' refusal to coordinate with Northern Michigan in 1967 even though that cooperative was interconnected with Grand Haven, Traverse City and Wolverine Electric and the four as a group shortly would have been virtually self-sufficient. We reject Consumers' defense that Northern Michigan failed to provide the company with the interconnection agreements it requested, thus precluding its assessment of their value. Northern Michigan provided the company with substantial information about the four systems and the agreements. See C. P. Exh. No. 12,001. If more was necessary, Consumers could have said so instead of flatly refusing to coordinate.

To sum up, Consumers' refusals to coordinate with the small utilities were both unreasonable and anticompetitive. That company would have benefited from coordination; by declining to do so, it sought to enhance its monopoly position in the wholesale power market and to impede the growth of an independent bulk power supply system within its general service area. Consumers was at least partially successful in both endeavors. The anticompetitive consequences of its unwillingness to coordinate were compounded by its simultaneous refusal to wheel power for the small systems. That refusal effectively cut off the small systems' chances of negotiating coordination agreements with some large utility, hampering their ability to serve their own customers and to compete against Consumers.

⁶³⁰That Consumers feared the growth of such a system is evidenced in Mr. Paul's speech, discussed at pp. 1034-1036. He dealt at length with the "real problem" of the cooperatives "attempting to achieve a completely independent power source," depicting them as obstacles to Consumers' acquisition of other small systems in its service area (D. J. Exh. No. 188).

There is further evidence that Consumers entered into several bulk power transactions with small utilities in order to prevent their interconnecting with the G. and T. cooperatives and strengthening of their overall bulk power supply. For example, Messrs. Paul, Mosley and Conden recommended to Mr. Aymond that Consumers negotiate a coordination agreement with the City of Holland, "[o]ur prime reason being that if Consumers did not maintain this interconnection undoubtedly the City and Wolverine Electric Coop. would enter into such an agreement." (D. J. Exh. No. 150. See also D. J. Exh. No. 178.)

3. Consumers' refusal to share reserves on an equalized percentage basis with the small utilities

Consumers has entered into coordination agreements with Holland, Lansing and the M-C Pool. None, however, calls for Consumers and the smaller system to share reserves on an "equalized percentage basis." Appellants challenge as unjustified and anticompetitive Consumers' refusal to agree to such a provision; Consumers defends its position as reasonable and in line with FPC and industry standards.

a. **Background.** Reserve sharing on an equalized percentage basis means simply that each coordinating party maintains in reserve an identical percentage of its peak load.⁶³¹ In its coordination agreements with Holland and the M-C Pool, however, Consumers insisted on following what we shall call the "Holland formula," under which the smaller utility must carry reserves equal to the sum of (1) one-half the generating capacity of its largest unit, (2) one-fourth the capacity of its second largest unit and (3) 10 percent of its annual peak load.⁶³² Using 1972 statistics for the City of Holland as an example, we find that the smaller utility would have a reserve requirement of approximately 26 MW under the Holland formula⁶³³ but only about 9 MW on an equalized percentage basis.⁶³⁴

⁶³¹Under this system, the amount of total reserve and the appropriate percentage of peak load are calculated in this manner: Assume that utilities with peak loads of 50 MW, 100 MW and 150 MW respectively agree to share reserves on an equalized percentage basis. They would first determine the amount of reserves that three systems combined must carry to meet their combined peak load of 300 MW. See Slemmer, Tr. 8901-02. Assume that this amount is found to be 60 MW, which is 20 percent of the combined peak load. Each system would then be required to maintain a reserve equal to that percentage of its peak load. The utility with 50 MW peak load would thus be responsible for 10 MW, the one with a 100 MW peak for 20 MW and the one with 150 MW for 30 MW of reserves. See fn. 418, *supra*.

⁶³²The coordination agreement between Consumers and the City of Lansing differs in that it requires the city to "utilize all reasonable efforts under normal nonemergency operating conditions to maintain a minimum spinning reserve" of 70 MW through November 30, 1977, and 35 MW thereafter (D.J. Exh. No. 92).

⁶³³In 1972 Holland's two largest units had generating capacity of 31 and 24.5 MW, respectively. The city's peak load for the year was 44.5 MW. See C.P. Exh. No. 11,111, Supplemental Agreement No. 4. Applying the "Holland formula," Holland was required to maintain reserves equal to $(1/2 \times 31 \text{ MW}) + (1/4 \times 24.5 \text{ MW}) + (1/10 \times 44.5 \text{ MW})$ or 26.075 MW.

In actuality, the reserves that Holland was required to maintain in 1972 amounted to 25 MW, not 26 MW. *Ibid*. The formula given in the text above is the one in Consumers current coordination agreement with Holland, executed in 1974, see fn. 242, *supra*, which is slightly different from the formula in Consumers' 1972 coordination agreements with Holland and the M-C Pool.

⁶³⁴The calculation in the text is based on a 20 percent reserve requirement for Consumers; for purposes of this portion of the opinion, we consider insignificant the difference between the 18

(Continued on next page)

Although all three aforementioned agreements specify reserve requirements for the small utilities, none does so for Consumers. Instead, they all merely provide that the company shall use "all reasonable efforts to provide and maintain sufficient electric generation reserves. . .including formally executed power purchase transactions. . .to at all times meet its load requirements including reserves."⁶³⁵

In contrast, under the Michigan Pool agreement⁶³⁶ Consumers shares reserves with Detroit Edison on an equalized basis. Consumers' coordination agreements with Toledo Edison Company, Commonwealth Edison Company, Indiana & Michigan Electric Company, Northern Indiana Public Service Company and the Hydro-Electric Power Commission of Ontario contain no rigid formula for calculating reserve requirements. Rather, in all these agreements the parties heed practical considerations in establishing those requirements. Indeed, four of the five contracts provide for a joint study to determine the adequacy of a system's generating reserves and transmission facilities if that system has been unable over time to supply emergency service as requested.⁶³⁷

(Continued from previous page)

percent reserve requirement that Consumers deemed desirable for the Michigan Pool (D. J. Exh. No. 236, p. 5.3-1) and the "22 to 24 percent" requirement that is evidently included in Consumers' current system plans (Mosley Tr. 8488).

We should note here that the M-C Pool's current reserve requirement, as calculated under the Holland formula, is 20 percent. As our discussion and findings below demonstrate, however, this is a coincidence tied directly to the size of the M-C Pool's current facilities.

⁶³⁵D. J. Exh. No. 105, Section 3; C. P. Exh. No. 12,024; D. J. Exh. No. 92, Article I, Section 2(d).

⁶³⁶D.J. Exh. No. 71, Article II; D.J. Exh. No. 67, Article III; Mosley, Tr. 8490-92. The 1973 agreement added a provision requiring each utility to maintain reserves equal to the capacity of its largest generating unit if its reserve responsibility as computed under the equal percentage basis were less than that amount. D.J. Exh. No. 67, Article III, Section 2(b)(2). As Consumers' peak load in 1972 was 4,080 MW and its largest unit planned to come on line in the near future is Midland, Unit No. 2 (815 MW to be installed in 1980), this provision does not immediately affect Consumers. See also our discussion in Section F, *infra*, p. 1085 *ff*.

⁶³⁷D.J. Exh. No. 76, Schedule A, Section 3.4; Schedule B, Section 3.5; C.P. No. 11,108, Schedule A, Section 2.4; C.P. No. 11,109, Schedule A, Section 2.5; Mosley Tr. 8480. Moreover, the agreements with Indiana & Michigan Electric Company and Northern Indiana Public Service Company provide for a joint system study if current information "indicates that during a subsequent period of four years" one system will not be able to supply emergency services. If the study shows that the system's provisions for future capacity will not be adequate to assure that emergency power "will be available 90 percent of the time" when requested, that system must take "immediate steps" to provide adequate capacity for the future or else enter into arrangements for "equitable compensation" with other utilities party to the agreement. C.P. Exh. No. 11,109, Schedule A, Section 2.4; D.J. Exh. No. 76, Schedule A, Section 3.4; D.J. Exh. No. 76, Schedule B, Section 3.4; Mosley Tr. 8480-81.

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b. **The Licensing Board's decision.** The Board below declined to decide whether Consumers' refusals to share reserves with the small utilities on an equalized percentage basis contravened antitrust law or policy. Instead, holding that *Gainesville* was not controlling and that reserve sharing on an equalized percentage basis might (at least theoretically) increase one party's reserve obligations, the Licensing Board ruled "as a matter of law" that it was the Federal Power Commission's task, not its own, to apply antitrust standards to Coordination agreements. 2 NRC at 68-71.

Appellants challenge that deferral to the FPC, and Consumers does not defend it. We agree that the Board erred. Congress has directed this Commission to explore the antitrust ramifications of granting nuclear power plant licenses. Fulfillment of that responsibility entails an evaluation of the relationships between a license applicant and its competitors. It is simply too late in the day to argue that an electric utility's dealings—or refusals to deal—with its competitors are exempt from antitrust scrutiny in the absence of prior FPC review. The courts have decided otherwise, rejecting the excuses proffered by the Board below. *Otter Tail Power Co. v. United States*, *supra*, 410 U.S. at 372-73; *City of Mishawaka v. Indiana & Michigan Electric Co.*, *supra*, 560 F.2d at 1318-24.

c. **Gainesville.** All the parties rely to some extent on the Federal Power Commission and Supreme Court decisions in *Gainesville Utilities v. Florida Power Corp.*,⁴³¹ litigation that followed the City of Gainesville's unsuccessful attempt to persuade the utility to share reserves with it.

The characteristics of Gainesville's electric system in 1965 were similar to Holland's in this case. At that time Gainesville operated an isolated system. It had a generating capacity of 108.4 MW, a peak load of 51.1 MW, and a largest unit of 50 MW capacity. The city's 1970 projections anticipated a 30 MW increase in its generating capacity to 138.4 MW and a 50 MW increase in peak load to 102 MW.⁴³² The projection indicated that in 1970 Gainesville's installed capacity would be inadequate to meet peak load with its largest generating unit out of operation. This left the city two options: to construct additional generating capacity or to reduce its need for reserves by coordinating with nearby utilities; it chose the latter.

After failing to negotiate a reserve sharing agreement with Florida

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The agreement with Ontario-Hydro reaches the same end without a contractual provision, because a planning committee periodically reviews the adequacy of each utility's reserves. Mosley, Tr. 8478. See also C.P. Exh. No. 11,106.

⁴³¹40 FPC 1227 (1968), *reversed sub nom. Florida Power Corp. v. F.P.C.*, 425 F.2d 1196 (5th Cir. 1970), *reversed and remanded for entry of a judgment enforcing the Commission's order sub nom. Gainesville Utilities v. Florida Power Corp.*, 402 U.S. 515 (1971).

⁴³²See 402 U.S. at 520-21.

Power,⁴⁴⁰ in 1965 the City petitioned the Federal Power Commission to order the two utility systems interconnected. (See Section 202(b) of the Federal Power Act, 16 U.S.C. §824a(b).) The matter was referred to an FPC hearing examiner, before whom Florida Power argued that the sole purpose of the interconnection agreement was “to supply instantaneous emergency backup service to Gainesville,” 40 FPC at 1256, and that it “neither need[ed] nor want[ed] emergency electric service from” the City. 40 FPC at 1252. The utility therefore urged that two conditions be made part of any coordination agreement between it and the City. The first was that Gainesville maintain a reserve capacity of 25 percent (as opposed to the 15 percent that Florida Power itself was carrying) to assure that the City would “materially contribute to its own support and not depend entirely on Florida Power for an extended period of time in the event of a sustained outage of Gainesville’s largest unit.” 40 FPC at 1257. Company witnesses justified this condition as “necessary because Gainesville’s largest unit constitute[d] such a high percentage of its summer long duration peak load.” *Ibid.*

The second condition demanded by Florida Power was a “standby charge” on Gainesville to compensate the company for providing emergency service.⁴⁴¹ Florida Power reasoned that this extra payment (above the charge for electric energy actually used) was proper because, in its view, the benefits of the interconnection agreement all flowed to the City.

The examiner rejected Florida Power’s proposed standby charge but did recommend that the parties divide equally the benefits arising from the interconnection.⁴⁴² However, he rebuffed Florida Power’s bid to have the City maintain a higher reserve margin than the company, ruling instead in effect that the City should maintain the same percentage of reserves that Florida Power did as a member of the Florida Operating Committee. 40 FPC at 1257-58.

The Federal Power Commission adopted the examiner’s conclusion regarding the City’s reserve responsibility, stating (40 FPC at 1234-35):

⁴⁴⁰Florida Power’s 1966 peak load was 1,232 MW and its generating capacity that year was 1,595 MW. Its 1970 projections were for a 1,826 MW load and a 2,114 MW generating capacity—its largest unit in 1970 being 525 MW. Florida Power at the time was interconnected with four other utilities. As a result of this interconnection it needed to maintain a reserve capacity of only 15% of its peak load. This amount for 1970 was 274 MW, less than the generating capacity of Florida Power’s largest unit. *Ibid.*

⁴⁴¹The standby charge proposed was an amount equal to \$3.08 kW per year, multiplied by the capacity of the city’s largest generating unit (40 FPC at 1256), which would yield estimated revenue to Florida Power from Gainesville of \$150,000 annually. See 402 U.S. at 522.

⁴⁴²40 FPC at 1257. There was no dispute that the interconnection would bring greater benefit to Gainesville by enabling it to defer installation of additional generation capacity. 40 FPC at 1252, 1256.

[W]e are satisfied that an appropriate basis has been shown for evaluating Gainesville's generating resources and for assigning to the City a reserve responsibility. Briefly, they are those requirements which apply to Florida Power as a member of the Florida Operating Committee, and those which the Corporation applies to itself by reason of its utility operating practices.

The FPC rejected, however, both Florida Power's argument for a standby charge and the examiner's ruling that the benefits of the interconnection be divided equally (40 FPC at 1237-38, emphasis supplied):

The reasoning of both Florida Power and the Examiner is inconsistent with what we have determined to be the appropriate analysis of the basic issues here presented: sharing the responsibilities of interconnected operations. As we have explained, *that sharing must be based upon, and follow the proportionate burdens each system places upon the interconnected system networks, not the benefits each expects to receive.* Benefits received in any given situation may approximate these responsibilities or they may not. In the course of negotiation of voluntary pooling arrangements, benefits received may, on occasion, serve to offset burdens imposed in determining the appropriate charge for particular services rendered or facilities supplied. But where, as here, the cost of providing such services and facilities and the appropriate charges therefor have equitably been determined after a careful analysis and apportionment of the burdens and responsibilities of each party, there is no basis for any further consideration of relative benefits as proposed by the Examiner.

The evidence before us shows that Gainesville will be contributing its proportionate share of instantaneous emergency service and installed generating capacity, including reserve capacity.⁶⁴³

⁶⁴³Earlier in the opinion the Commission had set forth the following as general criteria applicable to interconnection agreements (40 FPC at 1233):

As a general proposition we note that whenever two electric systems with generating capacity undertake to interconnect and operate in parallel it is necessary for them to consider the nature of their respective electrical resources and individual system utility responsibilities, both as a means of evaluating the particular services to be rendered between the connecting systems and in order to ensure that appropriate compensation is afforded, either through service exchanges or financial payments. Marked disparities between two (or more) systems in the reliance placed upon the network should be reflected in the terms and conditions of the interconnection arrangement through appropriate provisions. Each participant should bear its proportionate share of that responsibility. In our judgment, a prerequisite to viable and effective interconnected operations among all electric systems is equitable sharing of the responsibilities of interconnected operation. Each participant should bear its proportionate share of that responsibility. In doing so, each interconnecting system will meet its utility responsibilities and there will be no economic penalties for being the last one on the interconnected network.

The FPC stressed in particular that “the specific type of demand charge requested by Florida Power, namely, the imposition of a charge based upon the size of Gainesville’s largest generating unit, would discourage future coordinated planning and operation by reducing the economic incentive for Gainesville to install larger and more efficient generating units.” *Id.* at 1238. The Commission added that “[w]ithout such a demand charge, Gainesville could participate more fully in coordinated planning including staggered construction with Florida Power and other systems in Florida to the mutual benefit of all such systems.” 40 FPC 1238.

In short, the FPC held that, because Gainesville bore its equitable share of the responsibility for the interconnected operation, coordination between Gainesville and Florida Power upon an equalized reserve sharing basis was proper and the terms of the agreement should not be drawn to divide the benefits that the City might receive under it.⁶⁴⁴

The Fifth Circuit modified the agency’s decision on the company’s appeal.⁶⁴⁵ The court held that the interconnection order failed to “provide Florida Power with the ‘reimbursement reasonably due’ it” under Section 202(b) because in the court’s opinion only the City obtained substantial benefits and only Florida Power incurred a substantial burden. This burden, the court reasoned, would be reflected in Florida Power’s “cost-based rates” and thus eventually borne by Florida Power customers.⁶⁴⁶

⁶⁴⁴The Commission also pointed out that Florida Power itself received significant benefits from interconnecting with Gainesville on an equalized reserve sharing basis, observing that (40 FPC at 1238):

The financial benefits are those which could result from coordinated planning and more intensive utilization of existing generating resources. Savings from coordinated planning of new facilities might involve deferral of future generating units or revisions in power supply contracts with other systems. As to the electrical operating benefits, this record shows that the City will have an additional 60,000 kVA energy source continuously connected to the City’s distribution circuits. For the Company, the interconnection will add an additional energy source to its network in a geographic area where the Company has a substantial load (customer demands), but does not have generating plants of its own. Because of that, the expected benefit to Florida Power may be very substantial since the governors have a faster rate of response setting than Florida Power’s. Also of great importance to Florida Power is the improved system reliability which the Company will gain through the proposed intertie. That is shown in studies submitted by staff from engineering analyses of loss of load probabilities. They establish that the interconnection will have the effect of improving the reliability of Florida Power’s system.

Also see 41 FPC at 5-6 (quoted by the Supreme Court, 402 U.S. at 524 n. 5), where the FPC, in its denial of a rehearing in Gainesville, expanded its discussion of the benefits attained by Florida Power.

⁶⁴⁵425 F.2d 1196 (1970).

⁶⁴⁶The relevant part of the court of appeals’ opinion is as follows (425 F.2d at 1203):

But, although there is no direct cost, Florida Power, really its customers, will bear a substantial burden. They must bear the allocated fixed cost represented by the added obliga-

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The Supreme Court rejected the court of appeals' analysis and reinstated the FPC's order as amply supported by evidence in the administrative record. The Court deemed irrelevant that the benefits to Florida Power would be of less value than those to Gainesville, observing that (402 U.S. at 527-28, emphasis supplied):

Florida Power's emphasis on Gainesville's small size occurs only when discussing Gainesville's ability to provide Florida Power with energy. But Gainesville's small size has relevance in terms of the amount of power it may, even in emergencies, require from Florida Power. *What Florida Power chooses to emphasize is that the availability of a certain amount of power flowing from it to Gainesville is relatively more valuable to Gainesville's small system than the availability of the same amount of power flowing from Gainesville to Florida Power.* It is certainly true that the same service or commodity may be more valuable to some customers than to others, in terms of the price they are willing to pay for it. An airplane seat may bring greater profit to a passenger flying to California to close a million dollar business deal than to one flying west for a vacation; as a consequence, the former might be willing to pay more for his seat than the latter. *But focus on the willingness or ability of the purchaser to pay for a service is the concern of the monopolist, not of a governmental agency charged both with assuring the industry a fair return and with assuring the public reliable and efficient service, at a reasonable price.*⁶⁴⁷

d. **The parties' positions.** Justice acknowledges that neither the FPC nor Supreme Court decision in *Gainesville* mandates equalized reserve sharing in all situations. However, Justice, the NRC staff and the intervenors all argue that those two decisions are "benchmarks" in determining the reasonableness of a reserve sharing agreement. Justice further stresses that the factual setting in *Gainesville* is remarkably similar to that in lower Michigan. The appellants assert that, in light of *Gainesville*, Consumers' in-

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tion imposed under the terms of the ordered interconnection. And this burden will be reflected in their cost-based rates. They are entitled to not have to carry the entire responsibility for providing an extremely valuable service.

The Commission's policy of proportionate utility responsibility really works only one way. The small system receives high benefits and, because of its size, no real obligations. The large system, however, receives no benefit but does incur real, substantial responsibilities. Such imaginary equity is not reasonable compensation.

⁶⁴⁷Because substantial evidence supported the finding of a benefit accruing to Florida Power, the Court found it unnecessary to decide whether the FPC was correct in its conclusion that it could order interconnection even when one party received no benefits beyond compensation for services and power actually exchanged. 402 U.S. at 529.

sistence on the “Holland formula” in its coordination agreements with the intervenors is unreasonable.

Consumers differs sharply with the appellants about the implications of *Gainesville*. The company finds no suggestion in either the FPC or the Supreme Court opinion that the equalized reserves sharing formula approved in *Gainesville* had applicability in any other setting. Rather, Consumers emphasizes that, in determining Gainesville’s reserve level, the FPC took into account the attributes of the two systems involved, *i.e.*, the “load characteristics, capacity of generation, size of individual generating units, forced outage rates and scheduled maintenance requirements” of each (40 FPC at 1257-58). The company argues that it did no less when “establishing coordination terms” for the small utilities in order to assure that they would not lean on Consumers.⁶⁴ The FPC’s order was affirmed, Consumers contends, because the Court found substantial evidence in the administrative record that Florida Power would receive some benefits under the terms of the agency’s interconnection order.⁶⁵

The company next urges that rejection of appellants’ misconception of *Gainesville* leads to acceptance of its own reserve practices with the small utilities as being in accord with FPC standards and fundamental system planning principles. Consumers notes that both the M-C Pool and Lansing are currently maintaining reserves in the range of 20 percent, roughly equivalent to its own. Although acknowledging that the City of Holland must maintain such higher reserves—58 percent in 1972—the company contends that this “is the direct result of [Holland’s] decision to rely on a 31 MW generating unit to serve a system with a peak load less than twice that amount.” According to Consumers, this situation “affects Holland’s system reliability, and therefore its desirability as a coordinating partner, in two significant ways”: First, “Holland’s concentration of generation capacity in such a large unit means that. . .if the city’s single largest unit is for any reason out of service at or near peak load, Holland has insufficient capacity to carry its load and must look to the Company for assistance.” In contrast, Consumers points out that it “maintains reserves at least as large as its largest unit so, if that unit is out of service at the time of the Company’s peak, it need not look to Holland for help.” Second, Consumers argues that in terms of statistical probabilities, “Holland’s concentration of capacity in a relatively small number of units sharply increases the likelihood that Holland will need emergency support from the Company.” From these circumstances Consumers reasons that for the City of Holland “to provide

⁶⁴Consumers’ Appeal Brief, p. 251.

⁶⁵See fn. 647, *supra*.

reciprocity to its coordination partner, [it] must maintain a higher percentage of reserves in relation to peak load than does the Company.”⁶⁰

Stated another way, Consumers’ contention that the “Holland formula” is reasonable hinges on reliability problems that it perceives as inherent in small systems depending on generating units that are large in relation to their peak load. According to Consumers, a small utility system that decides to install larger, more economical units must maintain a higher reserve level in order to assure Consumers a net benefit from coordination between them.

e. The Holland formula measured against FPC standards elucidated in Gainesville. On the whole, we agree with the appellants’ reading of *Gainesville*. In light of the FPC’s opinion in that case, the “Holland formula” must fall as unreasonable. Several paths lead us to this conclusion.

First, as Consumers argues and Justice acknowledges, the FPC in *Gainesville* did not explicitly mandate equalized reserve sharing as the invariable standard for Section 202(b) proceedings. It did, however, establish as a general governing principle for interconnections the notion that each utility “should bear its proportionate share of [the] responsibility” of the interconnected operation. In other words, the terms of an interconnection agreement should be based on a proportionate sharing of the *burdens* and not of the *benefits*. Adherence to this general rule, the Commission observed, has the advantage of assuring “no economic penalties for being the last one on the interconnected network.” See fn. 643, *supra*.

As is made clear by the testimony of Mr. Slemmer (Consumers’ own expert, on whose testimony the company bases its argument on this issue), Consumers’ proposed standard conflicts directly with the FPC teachings in *Gainesville*. Mr. Slemmer testified that under the “reciprocity standard” espoused by Consumers, the last system to join a larger interconnected network would inevitably be penalized. This is the case simply because the others have already achieved many of the benefits attainable from coordination.⁶¹ Moreover, Mr. Slemmer acknowledged that he perceived the

⁶⁰*Consumers’ Appeal Brief*, pp. 258-59.

⁶¹See Slemmer, Tr. 8860-61, 8883-84, 8938-42. Throughout his testimony Mr. Slemmer stated his belief that the sharing of reserves should be done on an equal reliability basis as opposed to an equal percentage basis. Under the equal reliability concept, reserves are apportioned on the basis of the reserves that each party maintained prior to entering a coordination agreement. Mr. Slemmer’s testimony suggests that both the Holland formula and Consumers’ general theory of reciprocity are akin to the equal reliability concept. See generally Slemmer, Tr. fol. 8838 at 23-4, 26-9. Mr. Slemmer acknowledged, however, that no engineering reason dictates this method of sharing reserves. Slemmer, Tr. at 8929-31.

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reciprocity standard as one way of evenly dividing the *benefits* from an interconnection, which he deemed important for incentive purposes.⁶³² Again, this is at direct odds with the general principles laid out in *Gainesville*, where Florida Power's argument that it should share equally in the benefits was rejected explicitly, not only by the FPC but also by the Supreme Court.

Nor does *Gainesville* stand alone. The FPC has subsequently observed that the case embodies its views on the appropriate criteria for evaluating interconnection proposals.⁶³³ And the FPC staff has recently characterized the *Gainesville* decision (as well as a later one) as setting out "the well accepted interconnection principle of equalized reserves (the sharing of reserves must follow the proportionate *burdens* each system places upon the interconnection, not the benefits each system expects to receive)."⁶³⁴

In short, although in *Gainesville* the FPC did not lay down an iron-clad rule in favor of equalized sharing of reserves, it did establish the general

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That the equal reliability concept results in penalizing the last system joining a pool is clearly illustrated by D. J. Exh. No. 285, prepared by Mr. Lundberg, one of Justice's experts on coordination, Tr. 9112-16. One of the examples in that exhibit assumes that three identical utilities, A, B, and C, each operate two units 10 MW in size. Prior to any coordination among them each must maintain 10 MW in reserves, 100% of peak load. Assume next that A and B form a pool that sells as much power as possible while maintaining adequate reserves (see fn. 418, *supra*)—i.e., the peak load equals the combined capacity of three of the four pooled 10 MW units (30 MW), and the fourth unit provides reserves equal to the capacity of the pool's largest unit (10 MW). The reserve requirement, although still 10 MW, is thus reduced from 100% of peak load to 33-1/3% of peak load. Under both the equal reliability and equal percentage concepts, A and B would each maintain 5 MW in reserves. If C were to join the pool, the amount of reserves needed would still be 10 MW, (again assuming that the pool's peak load was as large as possible—five of the six pooled 10 MW units). By sharing reserves on an equal percentage basis, each utility would maintain reserves of 3-1/3 MW or about 19% of peak load. Under the "equal reliability" concept expounded by Mr. Slemmer, however, the reserves that each utility would maintain after C joined the pool would be apportioned on the basis of the reserves that each maintained prior to C's joining the pool. Before joining the AB pool, C maintained 10 MW reserves and AB together maintained 10 MW. Because C's reserves before joining the pool are equal to AB's after pooling, C would maintain half the reserves for the ABC pool or 5 MW and A and B together the other half or 5 MW. This results in C carrying a reserve of 33-1/3% and A and B 14.3% each.

Manifestly, under the equal reliability concept, the last system to join the pool would always be faced with a penalty. If nothing else, this result is at war with the general standards of the FPC laid down in *Gainesville*.

⁶³²Slemmer Tr. 8929-31, 8860-61.

⁶³³*Village of Elbow Lake v. Otter Tail Power Co.* 46 FPC 675, 678-79 (1971), affirmed as modified *sub nom.* *Otter Tail Power Co. v. FPC*, 473 F.2d 1253 (8th Cir. 1973).

⁶³⁴*New England Power Agreement (NEPOOL)*, Opinion No. 775, Docket No. E-7690 (FPC, September 10, 1976), slip op. at 17. For discussion of this opinion, see fn. 656, *infra*, and accompanying text.

principle that each utility should carry a proportionate burden under the agreement. And from FPC jurisprudence to date, this has resulted in sharing of reserves on an equalized basis.⁶⁵

Second, the "Holland formula" has the same failing as Florida Power's proposed standby charge in the *Gainesville* case. It fixes a small utility's reserve requirements according to the capacity of its largest plants, thereby tending to discourage the small system from building more economical facilities. The FPC in *Gainesville* found fault with Florida Power's proposed standby charge precisely because it had that effect, noting expressly that this prevented Gainesville from engaging in more sophisticated coordination with Florida Power to their mutual benefit. 40 FPC at 1238. In a similar vein, on reviewing the New England Power Pool agreement, the FPC again struck down a reserve formula that penalized a utility for depending in large part on one unit, explaining that provisions of this kind "discriminate against the smaller systems."⁶⁶ Thus there can be no doubt that Consumers' insistence on pegging the small utility's reserve requirement to its largest two units runs contrary to Federal Power Commission policy.

Finally, Consumers' seeks to defend the "Holland formula" by arguing that a small utility's reliance on comparatively large units in relationship to its peak load inherently affects its desirability as a coordinating partner. According to Consumers, such a system must invariably maintain a higher percentage of reserves than its larger coordinating partner to assure the larger system of receiving a net benefit. As we noted earlier, however, not only the hearing examiner but the FPC itself rejected that argument when the Florida Power Corporation made it in the *Gainesville* case. The Commission further pointed out that Florida Power would receive significant benefits by coordinating with Gainesville on an equalized reserve basis, notwithstanding the city's reliance on a comparatively larger unit.

⁶⁵We also note that the NEPOOL and Kentucky and Indiana Power Pools provide for reserve sharing on an equalized basis even though each includes small utilities as members. See *New England Power Pool Agreement (NEPOOL)*, *supra*, fn. 654, and Mayben, Tr. 3753-54.

⁶⁶*New England Power Pool Agreement (NEPOOL)*, *supra*, at p. 25. The provision that the Federal Power Commission struck down was one which provided that any system which obtained in excess of thirty percent of its annual peak load from one generating unit had to make a penalty payment to the NEPOOL fund. The provision was applicable only to generation coming on line subsequent to 1975, and the Executive Committee had argued that it was a "necessary incentive to lessen the possibility that a participant would abuse the equalized reserves established . . . by taking an unduly large entitlement in the most economic generating units." *Ibid.* The Commission was unimpressed. It noted that the larger members of the pool could avoid this provision "since 30% of their annual peak load" was greater than the largest units that NEPOOL planned. *Ibid.* Moreover the Commission noted "*pool reliability would be unimpaired by participants taking entitlements in individual units in excess of 30% of their annual peaks.*" *Id.* at 26; emphasis supplied.

In short, we harbor no doubts that Consumers' insistence on the "Holland formula" in its coordination agreements with the small utilities runs contrary to the principles laid down by the Federal Power Commission under Section 202(b) of the Federal Power Act. Although standards under that section are not necessarily controlling for antitrust purposes, they have been formulated by the agency charged with reviewing and regulating these aspects of electric utility operation. We therefore accept those standards as an appropriate guide for measuring the reasonableness of reserve sharing agreements.⁶³⁷

f. **Benefit to Consumers.** Consumers would benefit, albeit less than the small utilities, by sharing reserves on an equalized basis with them. By doing so, Consumers could draw on the small systems' reserves in the event of an emergency on its own system. Manifestly, this would be of some benefit to the company even if the coordination arrangement did not permit it to reduce the level of its own reserves.⁶³⁸ It must be kept in mind that, although a small system's reserves may be diminutive compared to Consumers', Consumers operates large baseload units, which are generally recognized as having a higher forced outage rate.⁶³⁹ Moreover, because Consumers has more generating units by far than a small system, it is more likely to have two or more units down simultaneously. Even with sufficient reserves to cover the outage of its largest unit, Consumers could well, through a series of failures, find itself without adequate backup to cover its forced or scheduled outages. In such circumstances, the ability to draw upon the reserves of a small system such as Holland would be beneficial to it. And, indeed, the record confirms that Consumers has in fact called upon the City of Holland in the past to supply it with a significant amount of emergency power.⁶⁴⁰

Consumers nevertheless argues that it will receive no benefit if its smaller coordinating partner is a greater user of the interconnection, which Consumers argues will be the case if reserves are shared on an equalized basis. As indicated above, Consumers urges in support of this argument that, because emergency power is priced on an incremental (rather than average cost) basis, its own customers will be unduly discriminated against.

Even assuming that a smaller utility would draw emergency power from

⁶³⁷The Supreme Court noted in *Otter Tail* that the district court could properly consider Federal Power Commission policies under Section 202(b) in fashioning prospective antitrust relief. 410 U.S. at 381-82. Indeed, *Consumers* argues that the Court in *Otter Tail* "expressly recognized the propriety of evaluating proposed interconnection arrangements for antitrust purposes under the 'policies embodied in the Federal Power Act.'" *Consumers' Appeal Brief*, p. 212, fn. 49.

⁶³⁸See discussion at pages 953-955, *supra*.

⁶³⁹Lundberg, Tr. fol. 8996 at 9.

⁶⁴⁰Rainson, Tr. 3189; Helfman, Tr. 3241.

Consumers more often than the reverse, we are unpersuaded.⁶⁶¹ The Fifth Circuit reversed the FPC in *Gainesville* on this ground only to be reversed in turn by the Supreme Court, for the argument is simply incorrect. Neither Consumers nor its customers will be discriminated against unless Consumers is forced to *increase* its reserve capacity as a result of the agreement, an unlikely situation given the disparity in size between Consumers and the small utilities and the relatively small size of the latter's generating units as compared to Consumers'.⁶⁶² Each utility must maintain reserves that are idle most of the time to assure delivery of firm power to its customers. Regardless of whether it coordinated with a small utility, Consumers would therefore have to maintain approximately the same reserve capacity and bear the capital costs of that capacity. Thus, coordination with a small utility on an equalized basis would force neither the company nor its customers to foot the bill for additional generating capacity.

The "no benefit" argument is similarly flawed with regard to Consumers' supplying emergency power to a smaller coordinating partner. Be-

⁶⁶¹In this regard we note that Consumers has in fact relied on its interconnection with the City of Holland substantially more than the city has. Rainson, Tr. 3189.

⁶⁶²Under the Michigan Pool agreement, Consumers and the other members jointly plan and operate their systems as one. Mosley, Tr. 8492-93. In 1972, their combined peak load was approximately 10,475 MW and their combined generating capacity about 12,239 MW. See page 943, *supra*. At that time or shortly thereafter, Detroit Edison had four 800 MW units (Mosley, Tr. 8494). Large units control system reliability. Lundberg, Tr. 9106. Indeed, this fact forms the basis for Consumers' justification of the "Holland formula." Thus, in general, interconnecting a small system (such as the M-C Pool) with small units to a large system with large units will have little or no effect on the reserves needed by the large system, see Lundberg, Tr. 9096, or may lessen that need slightly. See Mayben, Tr. 3744.

Nevertheless, in its appeal brief (p. 252) Consumers represents that "[i]n fact in 1972 had the Company agreed to enter into emergency power exchange arrangements under an equal percentage formula with systems of the size an generation capacity of the MMCPP members, and had these systems experienced the same generation outage record as the Company, the record demonstrates that the Company would have had to increase its reserves by 29 MW over its preagreement level." As support for this proposition, Consumers refers us to Mr. Mosley's testimony (Tr. 8469-72) and to one of its exhibits (C. P. Exh. No. 11,104).

We find Consumers' suggestion unpersuasive. First, larger units generally have a higher forced outage rate. See fn. 659, *supra*. Second, as indicated above, the Michigan Pool with its large units would dictate the reserve levels of any interconnection between it and the M-C pool. Third, the evidence that Consumers refers us to is a hypothetical example prepared by Mr. Mosley to show that, theoretically, sharing reserves on an equalized basis could result in increasing a utility's reserve requirement. To illustrate his point, Mr. Mosley picked two hypothetical systems with general characteristics similar to that of the Michigan Pool and that of the M-C Pool. He stressed, however, that his illustration was "intended entirely as an example." Tr. 8469. (Moreover, even in his example the percentage of increase that the large system experienced was statistically insignificant.) Finally, Justice introduced an extensive study showing that connecting the M-C Pool with Consumers in fact would not adversely affect Consumers' reserve levels. See Lundberg, Tr. fol. 8996.

cause the charge for such energy is normally at least 110 percent of Consumers' out-of-pocket costs (see pp. 955, 967, *supra*), providing this power could not burden Consumers or its customers; to the contrary, by supplying power from capacity otherwise idle, Consumers would in fact be engaging in a profitable transaction.

Indeed, Consumers has utilized its emergency tie with the City of Holland substantially more than Holland has—which Mr. Rainson, the city's manager, characterized as a "small source of income for [the city]" rather than an unfair situation.⁶⁶³ The profit to Holland is further confirmed by the testimony of Mr. Helfman, Justice's expert witness on bulk power supply planning, who testified that

at the present time, Holland is selling some 11 million kilowatt-hours a year net to [Consumers] at a price of ten mills, for a total revenue of over one hundred thousand dollars. And, over and above the cost of fuel, most of that is profit, because, as I say, it does not increase their operation and maintenance one whit.⁶⁶⁴

In our judgment, Consumers would benefit by sharing reserves on an equalized basis with the small utilities. Moreover, because the small utility is carrying its fair share of the burden in the interconnected system—*i.e.*, it (and its customers) are paying for the same percentage of the reserve capacity as Consumers in relation to peak load—neither Consumers nor its customers will be burdened or discriminated against.⁶⁶⁵ Indeed, requiring a smaller utility to maintain a higher level of reserves discriminates against the customers of that utility, for they must then absorb a greater proportion than Consumers' customers of the capital costs of the total pool reserve capacity.

g. Summary. On the basis of the foregoing, we have concluded that Consumers' insistence on requiring the small utilities to maintain reserves under the "Holland formula" is unreasonable.⁶⁶⁶ Moreover, because that policy

⁶⁶³Tr. 3189.

⁶⁶⁴Tr. 3241. We note that one of the benefits in Gainesville which the FPC foresaw Florida Power receiving was a "financial [benefit]" from "more intensive utilization of existing generating resources."

⁶⁶⁵Only if the smaller utility carries a lesser percentage of reserves than the company is Consumers' argument valid. See 40 FPC at 1233-39.

⁶⁶⁶We do not find Consumers' reserve sharing arrangement with Lansing to be unreasonable. That arrangement essentially requires that Lansing maintain 20 percent "spinning reserves" through November 1977 and only 10 percent thereafter. It should be noted that although Consumers carries reserves of roughly 20 percent, not all of those are necessarily "spinning reserves." A utility normally maintains only a certain percentage of its reserve requirement in that status. (*E.g.*, in *Gainesville*, Florida Power carried 15 percent installed reserves and 10 percent spinning reserves.) Thus 20 percent spinning reserves may be high. However, the 10 percent spinning reserves that Lansing is to maintain after 1977 does not appear unreasonable.

discourages the small utilities from installing larger, more economical generating units, it definitely has anticompetitive consequences. These affect the wholesale market directly, because they increase the probability that small utilities will turn to Consumers for wholesale power purchases rather than install their own additional generation. And it has direct adverse consequences in the retail market as well, in locations where there is door-to-door competition between Consumers and the small utilities (*i.e.*, Traverse City and other areas where Consumers' lines overlap those of its smaller Competitors). Of course, as the smaller competitors' production costs are forced up, they become correspondingly less useful as "yardsticks" for measuring Consumers' own efficiency.⁶⁶⁷

4. Consumers' refusal to grant the small utilities access to the Midland facilities

a. In 1971, after the congressional amendments creating the precicensing antitrust review scheme of Section 105c, several of the small utilities requested that Consumers discuss their possible participation in the Midland nuclear facility via either a joint venture or a unit power arrangement.⁶⁶⁸ At that time, Consumers refused to consider—much less allow—the small utilities access to Midland. (But see p. 1099, *infra*.) The appellants argue that Consumers' denial is an unreasonable refusal to engage in developmental coordination with the small utilities.

Consumers counters that its refusals were justified because the small utilities did not make their requests until 1971, four years after the size of the Midland units was established and planning for the facility was well along. The company argues that in 1971 the power from the Midland facilities was committed to meet future growth on its system and that its accession to those requests would have led to an increase in its own bulk power generation costs, which costs would in turn have been "borne by the Company's customers in the form of higher rates." Thus, according to Consumers, "[u]nder these circumstances, having been denied the prospect

⁶⁶⁷See *Municipal Elec. Assn' v. SEC*, 413 F.2d 1052, 1057-59 (D.C. Cir. 1969) (applying the yardstick competition test to the acquisition of stock of a nuclear power generating company under the Public Holding Company Act of 1935, 15 U.S.C. §79-79z); see also, Meeks, *Concentration in the Electric Power Industry*, *supra*, 72 Colum. L. Rev. at 77-79.

⁶⁶⁸Consumers received written formal requests for negotiations concerning participation in the Midland Nuclear Facility from Traverse City on May 24, 1971 (D. J. Exh. No. 24), from Northern Michigan on July 20, 1971 (D. J. Exh. No. 22), and from Grand Haven on July 29, 1971 (D. J. Exh. No. 27). In addition, Mr. Keen of Wolverine Electric raised the question of access to Midland in the negotiations leading up to current coordination agreement between Consumers and the M-C Pool (D. J. Exh. No. 58) and Consumers received oral inquiries from Alpena Power Company and the City of Coldwater. Fletcher, Tr. 4350; Munn, Tr. 4141-42.

of receiving net benefits from the proposed transaction, the Company was clearly justified in refusing to discuss participation in the Midland units.”⁶⁶⁹

Justice, on the other hand, points to Consumers’ refusals to coordinate with the smaller utilities prior to the sizing of the Midland units in 1967 and argues:

As long as Applicant denied even the most basic forms of coordination to the small systems, it is hardly surprising that requests for the more advanced and sophisticated kinds of coordination (unit power or joint development) were not forthcoming.⁶⁷⁰

Because Consumers’ own actions “chilled specific requests”⁶⁷¹ until Section 105c was amended, Justice continues, a determination that the 1971 requests were untimely would “[reward Consumers] for its persistent course of monopolistic conduct.”⁶⁷²

Asserting that it has always coordinated with small systems capable of doing so, Consumers argues in response that its coordination policies could not have chilled requests by the small utilities (particularly Holland and Lansing, with whom Consumers had coordination agreements in 1967).⁶⁷³

b. The Licensing Board found in Consumers’ favor, concluding that by 1971 the company had planned its system to utilize all the power from the Midland facilities to meet internal demands and that its refusal to consider the small utilities’ “belated inquiries concerning access to Midland” could therefore not be deemed “a refusal to enter developmental coordination.”² NRC at 100-101.

The Licensing Board’s conclusion does not square with the record. Rather, given the cooperatives’ unsuccessful earlier bids for a reserve sharing arrangement with Consumers, there was no reason to expect success from a request for more sophisticated pooling transactions involving access to Midland in 1967 and 1968.⁶⁷⁴ Moreover, because, as we previously noted, Consumers’ refusals were motivated by a desire to prevent the development of an independent bulk power supply within its general service area, we have no hesitation in concluding on this record that Consumers would have rejected out of hand any inquiries along that line.

⁶⁶⁹*Consumers’ Appeal Brief*, pp. 272-73.

⁶⁷⁰*Justice’s Opening Brief on Appeal*, p. 136. See generally *Justice’s Opening Brief on Appeal*, pp. 132-39; *Justice’s Reply Brief on Appeal*, pp. 94-101.

⁶⁷¹*Justice’s Opening Brief on Appeal*, p. 137.

⁶⁷²*Id.* at 136.

⁶⁷³*Consumers’ Appeal Brief*, pp. 275-79. The company also reiterates here its position that there can be no finding of refusal to deal without a prior specific demand. We have already refuted this contention.

⁶⁷⁴Consumers refused in 1964 to share reserves with Northern Michigan and Wolverine Electric and refused another Northern Michigan request in 1967.

Nor do Consumers' 1967 coordination agreement with Holland and its 1968 offer to coordinate with Traverse City suggest otherwise. Not only are the terms of the "Holland formula" unfairly discriminatory against small systems, in effect depriving them of many of the benefits of true coordination, but the "prime reason" (to use Consumers' own words) that the company coordinated with Holland in 1967 was to prevent the city from interconnecting with the G. and T. cooperatives.⁶⁷⁵ As for the 1968 negotiations with Traverse City, Consumers representative, Mr. Paul, urged that a wholesale power arrangement was "the only way the City could benefit from the economies of scale" inherent in larger generating units.⁶⁷⁶ In light of this, it is bootless to suggest that a year earlier Traverse City might have received a favorable response to a request for participation in Midland.⁶⁷⁷

As Justice argues, the small utilities' request for access to Midland was not untimely in view of Consumers' previous anticompetitive refusals to coordinate. When the amendments to section 105c gave them a "reasonable expectation" of obtaining participating in Midland, the small systems made their request with due dispatch. See fn. 668, *supra*.⁶⁷⁸

⁶⁷⁵See fn. 630, *supra*.

⁶⁷⁶D. J. Exh. No. 31.

⁶⁷⁷Consumers contends that "[i]n 1967, an officer of Consumers Power outlined for representatives of Northern Michigan cooperative, the [M-C Pool] engineering consultants, and the staff of the Michigan Public Service Commission the availability to other systems of unit power from [the Ludington pumped storage project]." *Consumers' Appeal Brief*, p. 269 This, according to Consumers, refutes the chilling effect argument expounded by Justice. *Id.* at 275-76. While it is true that Consumers mentioned the possibility of other systems buying unit power from Ludington (see C.P. Exh. No. 12,007, Steinbrecher Tr. 1897-1900, 1929-30; Paul, Tr. 8165-66), the company did not make a specific proposal to that effect. Rather, according to Mr. Paul's summary of the meeting, Mr. Campbell said "that at an appropriate time the Company would be willing to consider a sale of peaking power to the cooperatives from [Ludington]." C.P. Exh. No. 12,007. We are not persuaded that this amorphous statement overcame the effects of Consumers prior unreasonable refusals to coordinate with the cooperatives, particularly as the company had refused that year to coordinate with Northern Michigan. Indeed, the very purpose of the meeting was to negotiate a renewal of Consumers' wholesale contract with Northern Michigan, made necessary by the company's anticompetitive refusal to coordinate. *Ibid.*

⁶⁷⁸In this regard, Mr. Wolfe testified (Tr. 1625-26):

Well, I became aware of the change in the Federal law which required that applications for construction of nuclear plants would require a review by the Justice Department to consider any antitrust implications about the time that the law was changed.

But it was not clear at the time what the rights of the parties like Traverse City or small systems might be, except there was some speculation in the industry, I think, at the time. But it was not until later that—I think that change in the law was in 1970, and it was not until in 1971 when the Justice Department made an investigation of this application that we began to become increasingly aware of some of the possible rights that we might have under the law.

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Events subsequent to 1971 confirm that the company's policy at the time the record closed was to deny the small utilities access to nuclear power. First, in early 1971, just before the small utilities requested participation in Midland, Consumers' projected peak load for 1980 was 7,790 MW; by 1973 its estimated demand for 1980 had dropped to 7,020 MW; and by mid-1974 it dropped further to 5,870 MW.⁶⁷⁹ Although in 1971 Consumers may have required use of the entire output from Midland to meet projected load growth on its system, the outlook changed drastically in a short period of time. Rather than engage in negotiations with the small utilities for sale of some of the excess planned capacity, however, Consumers voluntarily delayed construction of other generating units originally planned to come on line in 1978 and 1982.⁶⁸⁰ In other words, the company has continued to plan its system as though it never received the requests from the small systems.⁶⁸¹

Second, Consumers did not represent to the Licensing Board or to this Board that it would seriously consider allowing the small utilities to participate in future nuclear generation. Indeed, the company entered into the record below a policy statement that gives every indication that it will not grant the small utilities access to future nuclear plants.⁶⁸² Moreover, in its argument concerning appropriate relief assuming an inconsistency is found,

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And it was at that time that we had considerable discussion among ourselves and with legal counsel regarding some of these provisions and rights and started to attempt to obtain them.

⁶⁷⁹Stafford, Tr. 9170-76.

⁶⁸⁰Stafford, Tr. 9187-91.

⁶⁸¹Consumers argues that the company would incur an additional cost of \$57 million over an eight year period if it sold 220 MW of Midland's output to the small systems and \$141 million if it sold 440 MW. *Consumers'Appeal Brief*, p. 272. Also see C. P. Exh. No. 12,018 and Stafford, Tr. 9161-65. This amount, according to Consumers, "represents the cost of replacing that portion of the Midland output which would . . . become the property of other systems." *Ibid.*

We find Consumers' argument irrelevant in light of its delay of additional generation. As we have recently observed in another antitrust context, "the need to readjust, on a regular basis, planned operations and power plant construction schedules is virtually endemic in the electric utility industry" (citations omitted). *Toledo Edison Company* (Davis-Besse Nuclear Power Station, Units 1, 2 and 3), ALAB-385, 5 NRC 621, 628 (1977).

⁶⁸²The policy statement, Tr. 8107-08, is as follows:

As to unit power sales:

Unit power transactions may be justified as a part of a program of coordinated development where there are truly reciprocal coordinated development benefits derived by each party. [The company does] not understand that those Intervenor which seek the right to make unit purchases from Midland are willing or able to enter into such programs on a basis that would genuinely reduce Consumers Power's costs and, thus, benefit its customers.

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Consumers contends that “wholesale purchases [are] the most reasonable and equitable form of participation” in Midland. It argues that joint venture or unit power access to Midland for the small utilities would “unduly burden the Company’s other customers.”⁶³ Given those actions and attitudes, Consumers can hardly expect us to credit the suggestion that it would have seriously considered the small utilities’ requests to participate in Midland had they only been received in 1967.

c. The next consideration is whether Consumers’ refusal was a justifiable action taken to avoid an unfair burden on its customers. Because, as the FPC has observed (see p. 1004, *supra*), most electric utilities cannot afford to construct and operate the larger, more economical units on their own, joint ventures and unit power arrangements are not uncommon in the electric utility industry; Consumers’ practices reflect this.⁶⁴ It is in this context that Consumers’ denial of access to Midland must be evaluated.

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As to equity participation:

Equity participation, apart from a genuine, mutually beneficial program of coordinated development, suffers from the same vice as unit power transactions—namely, discrimination against wholesale, as well as retail, customers which do not derive the same benefits of discriminatory access to the unit. In view of the investment subsidies possessed by the intervenors, such transactions could also provide *artificial and unfair competitive advantages to them*.

⁶³*Consumers’ Appeal Brief*, pp. 384-87. But see Part IX, *infra*.

⁶⁴Under the original 1962 Michigan Pool agreement, for example, Consumers and Detroit Edison engaged in staggered construction of new units, allowing them to achieve economies of scale beyond those justified by additional growth on their individual systems, D.J. Exh. No. 21; Mosley, Tr. 8499. Moreover, the two utilities constructed and currently operate the Ludington Pumped Storage Hydroelectric Generating Plant as a joint venture; D. J. Exh. No. 72; C.P. Exh. No. 11,114, No. 11,115, and No. 11,116; and Consumers sold a part of its share in Ludington to Commonwealth Edison for a period of 15 years on a unit power basis, C.P. Exh. No. 11,118; Mosley, Tr. 8506-07. Finally, Consumers had contracted to sell processed steam from the Midland, Unit No. 1, to the Dow Chemical Company for the life of the plant, Mosley, Tr. 8507. Although this technically is not a joint venture or unit power arrangement with another electric utility, the beneficial effect to Consumers is essentially identical to such an arrangement, Mr. Mosley testified that Consumers’ arrangement with Dow could be thought of as a “unit steam sale” to Dow, Tr. 8507. It allows Consumers to obtain the economic benefits associated with an 800 MW nuclear unit although system demand would justify only the construction of a 500 MW unit. As noted above, the electric power output of Units 1 and 2 is 485 and 845 MW, respectively. However, the ultimate power level of each is identical. *Consumers Power Company* (Midland Plant, Units 1 and 2), LBP-72-34, 5 AEC 214, 217 (1972). The sole difference is that rather than using it to generate electricity, a portion of the steam produced by one of the units is delivered to (and paid for by) Dow. Although this may result in some differences in the cost of electricity per kWh generated by each (see Stafford, Tr. 9240), given the units’ identical size, the capital costs of construction for each would be essentially the same. And it is capital costs that constitute the major expenditure for electricity generated by nuclear power.

Because of Consumers' past refusals to negotiate with the small utilities, the amount of power those utilities seek to obtain from Midland is not precisely established. However, figures in the range of 220 to 440 MW have been mentioned in this proceeding.⁶⁶⁵ Even the lower end of this range constitutes a sizable block of power; and Consumers could have benefited from allowing the small utilities to participate in Midland on a unit power or joint venture basis, just as it benefits from its arrangement with Dow Chemical Company.⁶⁶⁶

Indeed, Consumers' own expert witnesses, Dr. Pace and Mr. Slemmer, acknowledged that consumers would generally benefit by having the small utilities participate in a nuclear facility (at least on a joint venture basis) when a block of power of that size was involved.⁶⁶⁷ In light of the fact that Consumers can actually lower its generating costs by granting the small utilities access to nuclear power, we find it difficult to perceive how Consumers customers would be burdened. To the contrary, they would receive a slight benefit.⁶⁶⁸

d. The remaining question is whether Consumers' refusal to allow the small utilities participation in the Midland plant is anticompetitive. The facts compel an affirmative answer. Consumers has refused to wheel power for the small utilities. This effectively precludes them from making joint venture or unit power arrangements with other large nearby utilities that might give them other access to nuclear power. Consumers has also refused to enter into reasonable reserve sharing agreements with the small systems. This impairs (if not eliminates) their ability to construct large baseload units; coal or nuclear, on their own.⁶⁶⁹ In short, by its other anticompetitive practices, Consumers has blocked the small utilities from looking elsewhere to attain those economic benefits which can be derived from the generation of baseload power in large scale units.

⁶⁶⁵See Stafford, Tr. 9164.

⁶⁶⁶Consumers argues that unit power transactions can be undertaken only as part of a program of staggered construction. However, its sale of unit power from Ludington to Commonwealth Edison for a period of 15 years belies this contention. Indeed, Mr. Mosley testified that a unit power sale could "extend for a large number of years." Tr. 8506. Confirmation of this appears in the *Farley* proceeding, where Alabama Power Company offered Alabama Electric Cooperative long term unit power access, but not joint venture access, to the Farley nuclear plant. *Alabama Power Co.* (Joseph M. Farley Nuclear Plant, Units 1 and 2), LBP-77-41, 5 NRC 1482, 1491 (1977) (appeal pending).

⁶⁶⁷Pace, Tr. 8965; Slemmer, Tr. fol. 8838 at 25-26.

⁶⁶⁸Consumers' argument in this regard hinges on its perception of the small utilities simply as customers. Only from this viewpoint can it be argued that their joint venture or unit power access to Midland would constitute "preferential treatment." However, these utilities are not only Consumers' customers; they are also independent bulk power procedures in their own right and the antitrust law requires this to be taken into consideration.

⁶⁶⁹See discussion in Part VI, *supra*.

Consumers' denial of access to nuclear power from Midland completes the circle foreclosing the small systems from economical generation.⁶⁹ Their inability to obtain that access increases their power production costs, and this in turn enhances Consumers' competitive position at both the wholesale and retail levels. In the circumstances of this case, therefore, Consumers' refusal to allow participation by the small utilities in Midland will have an anticompetitive effect in the relevant retail and wholesale markets when Midland comes on line, and Consumers' monopoly position in those markets will be enhanced commensurately.

The nuclear industry originated as a government monopoly developed in great measure with public funds. Section 105c reflects "a basic Congressional concern over access to power produced by nuclear facilities" and legislative intent that nuclear power not be used as a tool to further the monopolization of electric generation. *Waterford, supra*, fn. 5. The record in this case reveals that Consumers' refusal to allow the small utilities access to Midland is part and parcel of its monopolization of electric generation within the relevant geographic market. That refusal thus falls within the proscriptions of Section 2 of the Sherman Act and is counter to antitrust law and policy.

F. Exclusion of the small utilities from the Michigan Pool

In addition to the particular refusals discussed above, Justice alleges that Consumers "has taken steps to eliminate the Michigan Pool as a potential avenue by which the small systems might obtain access to coordination." Specifically, Justice alleges that Consumers (1) purposely drafted a provision concerning third-party membership to avoid participation by small utilities in the pool, and (2), when a third party membership provision was included upon Justice's urging, purposefully changed key provisions of pool agreements in order to discourage "pool participation" by the small systems.

1. Consideration of third-party membership in 1968

In support of the first allegation, Justice refers us to internal communications among Consumers' personnel in 1968. The company was then considering revisions to the Michigan Pool agreement, including one draft provision concerning third-party admission to the pool. Mr. Paul reviewed this draft and criticized as overly general the proposed criteria for joining the Michigan Pool—*i.e.*, the requirement that new members "must provide

⁶⁹See Wein, Tr. fol. 3979 at 65-66.

facilities to permit a meaningful and mutually advantageous interchange of capacity and/or energy between itself and the Pool.” He told the drafters that the criteria “[would] not effectively limit future participation by [undesirable] third parties,” particularly “the group consisting of Northern Michigan and Wolverine Electric cooperatives and Traverse City and Grand Haven municipal systems,” which had “just entered into a so-called new pooling agreement.” He suggested the establishment of “definite minimum standards or levels of mutual benefits that must be available before third parties will be considered.” After an apparent redraft, Mr. Paul expressed satisfaction with the criteria.⁶⁹¹ Although a draft provision had been prepared, no new express policy concerning new members was actually added to the pool agreement at that time.

In response to this portion of Justice’s allegation, Consumers emphasizes that no action was taken on this proposal. Moreover, it defends Mr. Paul’s recommendation as fully reasonable.⁶⁹² The Licensing Board agreed with the Consumers, viewing self-sufficiency as a prerequisite to reciprocal benefits and therefore finding “nothing sinister” in Mr. Paul’s suggestion.

We cannot agree with either the Licensing Board or Consumers on this point. Mr. Paul made no reference to the requirement of self-sufficiency; his obvious concern was preclusion of the newly formed M-C Pool from seeking membership in the Michigan Pool. As Consumers itself acknowledges, however, the combined resources of the M-C Pool members met the self-sufficiency requirement. Indeed, negotiations began in 1969 for what eventually became the current coordination agreement between Consumers and the M-C Pool.

We also find unpersuasive Consumers’ defense that Mr. Paul’s suggestion prompted no action on the draft provision. The company cannot defend a draft provision designed to exclude the small utilities from the Michigan Pool on the ground that no provision allowing third party membership was formally adopted. The effect is identical, and we agree with Justice that Consumers’ actions are indicative of its anticompetitive intent to exclude the small utilities from coordination.⁶⁹³

2. The current provision for third-party membership

a. In 1971, the Department of Justice reviewed the opportunity for third-party participation in the Michigan Pool in connection with its anti-

⁶⁹¹D.J. Exh. Nos. 170 and 171.

⁶⁹²The company refers to its present policy of self-sufficiency and implies that this is what Mr. Paul intended. *Consumers’ Appeal Brief*, pp. 262-64.

⁶⁹³Consumers may have believed it was better to have no provision concerning third-party admission rather than one patently discriminatory on its face. Moreover, had there been a legitimate reason for not adopting any provision, Consumers could have offered testimony to that effect. It failed to do so.

trust review of Detroit Edison's Fermi 2 Nuclear Power Plant. In order "to obviate a Department recommendation of antitrust hearing, Detroit Edison" agreed "to exert its best efforts" to secure agreement with Consumers "to modify the third-party membership provisions of the pool agreement so that third parties who met reasonable objective criteria would be allowed to participate in the Pool."⁶⁹⁴ The new Michigan Pool agreement executed by the two utilities in May 1973 did include such a provision. However, the new agreement made important changes in two other provisions of the 1966 agreement by (1) completely eliminating the provision for pool units (*i.e.*, developmental coordination) and (2) requiring each member utility to maintain reserves equal to its largest single generating unit if the capacity of that unit is greater than the member's reserve responsibility calculated under an equal percentage basis. Justice asserts that these changes effectively eliminated the advantages the smaller utilities could have obtained from Pool membership and were but another manifestation of Consumers' intent to monopolize. Consumers argues that legitimate business reasons, as opposed to anticompetitive purposes, prompted these changes.⁶⁹⁵

The Licensing Board dealt with this allegation simply by stating its finding "as a fact that the requirements for membership approved by Justice and incorporated in the existing Pool agreement are fair and reasonable," and its conclusion as "a matter of law that they are not anticompetitive." 2 NRC at 97. It discussed neither the purpose nor the consequences of the major changes that were made in the pool agreement when the new third-party admission provision was adopted.

b. Contrary to both Consumers and the Licensing Board, no significance can be attached to Justice's role in the adoption of the current third-party admission rules. The heart of Justice's allegation in this proceeding is that Consumers Power and Detroit Edison have negated the impact of this provision by simultaneously taking more subtle steps to remove any incentive for the small utilities to join the pool. Thus, whether the third-party admission rules were approved or authorized by Justice—which in fact they were not⁶⁹⁶—is of no relevance, for Justice played no role whatsoever

⁶⁹⁴*Justice's Opening Brief on Appeal*, p. 110. Also see *Consumers' Appeal Brief*, pp. 260-61 and Tr. 1684-87 (statement by Detroit Edison officials to that effect incorporated into the record).

⁶⁹⁵According to Consumers, the two utilities had been discussing the need for these amendments since 1970 and 1967, respectively, long before the Justice Department review in 1971. The company also makes much of the fact that the provision for admitting third parties was adopted at Justice's behest. It characterizes "*Department* [as] the author of the Pool's admission standards" and contends that Justice found "no cause for complaint" with the new provision when it considered Detroit Edison's application for the Greenwood facility in 1974. *Consumers' Appeal Brief*, pp. 261, 264.

⁶⁹⁶See, Tr. 1684-87 and 36 Fed. Reg. 17883 (September 4, 1971).

in the other changes in the Pool agreement. The latter were solely the product of Consumers' and Detroit Edison's own business initiative, be it legitimate or anticompetitive in purpose.⁶⁹⁷ Being unable to accept the Licensing Board's conclusion, so summarily reached, we will look into the purpose and impact of the changes effectuated by the 1973 agreement.

There can be no serious doubt that these changes had the effect of discouraging the small utilities from seeking participation in the Pool.⁶⁹⁸ Elimination of the pool unit concept precluded the possibility that they could directly obtain the advantages of large baseload units by participating in the Pool. And the new requirement that a member maintain reserves at least equal to its largest unit eliminated the possibility that the small systems could, as pool members, build larger, more economical units and still maintain reasonable reserves.⁶⁹⁹ The 1973 changes in the Pool agreement thus undercut most of the benefits that the small utilities could receive by joining the Pool.⁷⁰⁰

We conclude, after reviewing the reasons given by Mr. Mosley,⁷⁰¹ that the deletion of the pool unit concept may well have been based on valid business reasons—we will not pursue that matter further—but its *effect* was plainly anticompetitive. In any event, we cannot excuse the provision concerning minimum reserves even to that extent.

Mr. Mosley testified in essence that this provision was adopted to insure that members would carry sufficient reserves on their own systems to back up unusually large units they might install. In fact, the provision had no such effect; the projected reserve levels and planned installations for both

⁶⁹⁷Nor is Consumers aided by the fact that Justice did not find fault with the new Michigan Pool agreement in its 1974 antitrust review of the Greenwood Energy Center. As a result of that review, Detroit Edison agreed to accept license conditions that required it, *inter alia*, to (1) grant small utilities within its general service area access to new generating capacity including the Greenwood nuclear facility, (2) share reserves with these utilities on reasonable terms and (3) wheel power for them on reasonable terms. See 39 Fed. Reg. 12373 (April 5, 1974). These conditions gave the small utilities certain access to the coordination even if they were not members of the Michigan Pool.

⁶⁹⁸Mr. Wolfe gave considerable testimony to this effect. Tr. 1684-93; 1697-1702.

⁶⁹⁹Mr. Wolfe explained the result of this provision as follows (Tr. 1691-92):

The second item requires that, regardless of the percentage reserve, that it must be equal to or greater than the largest unit on the system, which would tend to make it an undesirable feature as far as small systems are concerned.

In fact, it could be a penalty because it would tend to penalize the large unit.

⁷⁰⁰Wolfe, Tr. 1701-02.

⁷⁰¹Tr. 8500-05.

Consumers and Detroit Edison⁷⁰² demonstrates that the change had no immediate⁷⁰³ or prospective impact⁷⁰⁴ on either utility. In light of all the circumstances, only one fair conclusion is possible: the new provision was artfully designed to discourage small systems from seeking to join the Michigan Pool.

c. Even if its purpose were valid, the largest unit/minimum reserve requirement is intrinsically unreasonable under applicable legal precedent. The Michigan Pool situation parallels that in *Associated Press v. United States*, 326 U.S. 1 (1945). In that case, the publishers of 1200 newspapers formed a news gathering agency with bylaws that enabled current members to exclude their competitors. The Supreme Court held these restrictions violative of the antitrust laws because of the competitive advantage members enjoyed over nonmembers.

Membership in the Michigan Pool enables Consumers to obtain the advantages of coordination, advantages we have shown it withholds from the small utilities. A competitively advantageous arrangement like the Michigan Pool would be suspect under the antitrust laws absent the national policy, as expressed in the Federal Power Act, of encouraging coordination among electric utilities.⁷⁰⁵ That Act expresses no policy to keep small utilities from coordinating; Consumers therefore cannot rely on it as justifying, implicitly or explicitly, any policy to exclude the small utilities from the Michigan Pool. Rather, the Pool must be formulated and justified according to legitimate technical or business principles. *Associated Press v. United States*, *supra*. Also see *United States v. Terminal Railroad Ass'n*, 224 U.S. 383 (1912); *Silver v. New York Stock Exchange*, 373 U.S. 341 (1963); *Gamco, Inc. v. Providence Fruit & Produce Building*, 194 F.2d 484 (1st Cir.), *cer-*

⁷⁰²Tr. 8669-71. Mr. Mosley testified that Consumers' "present planning calls for reserve percentages in the range of 22 to 24%." Applying that percentage (23%) to Consumers' 1973 estimates for its projected 1980 peak load of 7,020 MW, see Stafford, Tr. 9173, establishes the 1980 reserve level at 1,614 MW. In 1973, however, the largest units planned for Consumers' system were two 1,150 MW nuclear units, the first of which would have come on line in 1982. Assuming the same percentage of increase in Detroit Edison's projected load growth in 1973, it would have been planning its systems to have reserve for 1980 in the range of 2,400 MW.

⁷⁰³Mr. Mosley's testimony suggests that there was an immediate impact from this change in Michigan Pool operations. Tr. 8669-71. However, in 1973 Consumers largest unit was Palisades, which was operating at a 700 MW level; Detroit Edison had four 800 MW units; with respective peakloads of approximately 4,000 and 6,000 MW. Thus, even with an 18% reserve in effect, see fn. 634, *supra*, the provision added in 1973 had no immediate effect on either Consumers or Detroit Edison.

⁷⁰⁴In his testimony, Mr. Mosley did refer to 2,500 MW units, but only in passing. His testimony stresses instead the fact that the industry was seriously considering going from units 1,100 MW in size only to units of 1,300 MW. Tr. 8669-71.

⁷⁰⁵See Meeks, *supra*, *Concentration in the Electric Power Industry*, 72 Colum. L. Rev. at 110-11.

tiorari denied, 344 U.S. 817 (1952). For reasons we have previously discussed at some length, a requirement that a small utility maintain reserves equal to its largest unit cannot be justified on legitimate business or technical grounds, and runs counter to the Federal Power Commission standards under Section 202(b) of the Federal Power Act.

3. Conclusion

In sum, we find that (1) Consumers has purposefully sought to exclude the small utilities from the Michigan Pool and (2) the terms of the present pool agreement are unreasonable as applied to the small utilities. If the smaller utilities were able to share reserves on an equalized percentage basis and engage in developmental coordination with Consumers, their participation in the Michigan Pool might well be unnecessary. Because Consumers has consistently refused to coordinate with the small utilities on reasonable terms, however, its efforts to prevent the small utilities' membership in the Michigan Pool constitute but another attempt to block the small utilities' reasonable access to coordination.

G. Other allegations of anticompetitive conduct

1. Contract provisions precluding interconnections

a. In a number of its coordination and wholesale power contracts with the small utilities, Consumers has included provisions limiting interconnections between the small utility and third parties. For example, the company's coordination agreement with the City of Lansing of May 15, 1964,⁷⁰⁶ provided:

9. CONNECTIONS WITH OTHERS INVOLVING INTERSTATE OR FOREIGN COMMERCE: Lansing agrees that without the written consent of Consumers it will make no interconnection with any person, firm, corporation, government agency or other entity which might result in either party hereto becoming engaged, directly or indirectly, in the transmission or sale at wholesale of electric energy in interstate or foreign commerce.

⁷⁰⁶D.J. Exh. 91. Similar provisions are contained in Consumers' contracts with Northern Michigan (1967 D.J. Exh. No. 64), Edison Sault Electric Company (1966 D.J. Exh. No. 80), City of Holland (1967 D.J. Exh. No. 100), Southeastern Michigan Rural Electric Cooperative (1967 D.J. Exh. No. 93), the City of Bay City (1967 D.J. Exh. No. 94), Alpena Power Company (D.J. Exh. No. 95) and the Village of Chelsea (1964 D.J. Exh. No. 98)

Justice argues in general that this provision was unreasonable and had an anticompetitive effect. It points to testimony of Mr. Brush, general manager of Lansing, which suggests that in 1968 the City eschewed negotiations for an interconnection with the M-C Pool because of that provision.⁷⁰⁷

Consumers denies that the provisions had an exclusionary purpose or effect, averring that they were inserted "to avoid inadvertently becoming subject to the jurisdiction of the FPC" and have since been removed from all contracts. Moreover, the company contends that no small utilities ever requested or were denied permission to interconnect with a third party.⁷⁰⁸

The Licensing Board agreed with Consumers. It also found "no evidence that an interconnection between any two smaller utilities in the relevant geographic market would result in the transmission or sale of wholesale electric energy in interstate or foreign commerce," concluding therefrom that "Provision 9" in Lansing's contract "is a nullity" and "Mr. Brush's interpretation. . . is completely unrealistic." 2 NRC at 92-93.

b. We cannot agree with the Licensing Board.⁷⁰⁹ Our review of the record leads us to conclude that Consumers' actions had an anticompetitive effect and were at least in part motivated by anticompetitive purpose.

First, Consumers unquestionably had the power to insist on the inclusion of this provision in its contracts with the small utilities; the Licensing Board made an express finding to this effect. 2 NRC at 92. Moreover, the record reveals that, in 1966, Bay City sought to have this provision eliminated from its contract with Consumers and the company refused.⁷¹⁰

Second, we do not believe that Consumers can avoid antitrust consequences of this clause by claiming that the small utilities paid too much at-

⁷⁰⁷Mr. Brush testified that Lansing "advised" the M-C Pool "that until [it] had consummated [current] negotiations [with Consumers it] didn't see where [it] could pursue the matter very far in that the existing contract that [Lansing was] working under, the 1964 agreement precluded third-party interconnections." Brush 2235; also see Tr. 2090.

⁷⁰⁸*Consumers' Appeal Brief*, p. 286.

⁷⁰⁹One must question why Consumers would take the trouble to include such a provision if it were a "nullity." Consumers contends that "the contracts in question were long-term and the company had a *bona fide* interest in protecting against future expansion which involved interstate commerce." *Consumers Appeal Brief*, p. 285, fn. 216. It is at least problematical that avoidance of federal regulation is a *bona fide* interest; our finding here obviates consideration of that question, however.

⁷¹⁰Mr. Paul stated:

it appears here that the city may want this eliminated so they could conceivably make an interconnection with the G. & T.'s for emergency or standby purposes.

Paul, Tr. 8076; D.J. Exh. No. 94.

See also D. J. Exh. No. 272. We recognize that Bay City buys all of its power at wholesale from Consumers. However, Mr. Paul still apparently perceived this clause as inhibiting interconnection with the cooperatives.

tention to it. As Consumers has sought to preclude interconnection among the small utilities, its conduct certainly was not likely to erase their purported false impressions of the clause; Mr. Brush's interpretation is therefore significant. Moreover, Mr. Paul's summary of Bay City's reasons for seeking deletion of the clause reveals that Consumers and the small utilities *both* perceived this clause as having an inhibiting effect. See fn. 710, *supra*.

Finally, in addition to limiting third party interconnections, most of the contract provisions in question limit resale of the electric energy that Consumers furnished thereunder. In particular, Consumers' 1967 coordination agreement with the City of Holland (D.J. Exh. No. 100) provides in part:

It is agreed that the electric energy to be supplied by Consumers Power to Holland hereunder shall be used solely to meet a part of the requirements of Holland in the Operation of its electrical system located in the State of Michigan.

In other words, Holland was precluded from reselling the energy it received from Consumers. This is especially noteworthy given that Consumers' professed "prime reason" for entering the 1967 agreement with Holland was to avert the city's possible interconnection with the G. and T. cooperatives. Consumers therefore not only took away the city's incentive to interconnect with the cooperatives but also contractually barred the city from doing so without accepting similar restrictions on its own use of the electric energy it received from Holland. Consumers cannot argue that the above restriction is in any way related to a desire to avoid FPC regulation.⁷¹¹

2. Reverter provisions in deeds disposing of Consumers' old hydroelectric facilities

Consumers has had a policy of including in deeds disposing of its obsolete hydroelectric facilities restrictive covenants prohibiting their future use for electrical generation.⁷¹² According to Mr. Aymond:

[W]e were disposing of these on the grounds that they were no longer economic for us to operate, and we were disposing of them for a very nominal consideration, perhaps \$1 in most instances.

And apparently our lawyers felt that it would be unfair for those to wind up in the hands of a competitor for that nominal a consideration.⁷¹³

⁷¹¹Other agreements containing similar limitations are Consumers' contracts with Northern Michigan, Edison Sault, Southeastern Michigan, Bay City, Alpena Power and Chelsea. See fn. 706, *supra*, and fn. 737, *infra*.

⁷¹²As noted earlier, the Licensing Board did not consider this matter.

⁷¹³Tr. 6433-34.

It suffices for us to agree with Justice that, although Consumers certainly need not give away old hydroelectric facilities to competitors, its insistence on a restrictive covenant of this nature is one more manifestation, if a minor one, of its monopolistic intent.⁷¹⁴

3. Wholesale territorial agreements

Justice charges that Consumers had informal “gentlemen’s agreements” with its major neighbors limiting wholesale competition, which in effect blocked the small utilities’ access to alternate sources of firm power. The Licensing Board found as a “matter of fact” that there was “no substance” to Justice’s evidence on this charge. 2 NRC at 105-07. Justice challenges that finding as erroneous.

There is some evidence of agreements not to compete among the larger utilities. For example, in a letter to Mr. Campbell in 1960 concerning the possibility of selling wholesale power to the Village of Constantine, an employee of Consumers stated:

We realize, of course, that we do not want to offend the Michigan Gas & Electric Company by serving customers in their area. However, since the Village of Constantine has always been unhappy with Michigan Gas & Electric, maybe there could be a mutual agreement worked out where-by we could serve Constantine.⁷¹⁵

And in late 1962 and early 1963, the Village of Paw Paw, which was being served by Michigan Gas & Electric, sought unsuccessfully to purchase wholesale power from the applicant. Mr. Sundstrand, attorney for the village, testified that he was advised by Mr. Paul that Consumers refused the city’s offer because of a “gentlemen’s agreement” between Consumers and Michigan Gas & Electric.⁷¹⁶ And as additional support for its position, Justice points to an internal company memorandum where Mr. Paul stated in part:

they [Paw Paw officials] are expecting to point out that the gentlemen’s

⁷¹⁴Consumers’ argument that Justice failed to show why these facilities would be economical for the small utilities—as Justice noted they had been for Alpena Power Co. and Edison Sault—misses the point that Consumers took no chances of these facilities being useful to actual or potential competitors.

⁷¹⁵D. J. Exh. No. 157.

⁷¹⁶Mr. Sundstrand testified to the existence of “more or less of a gentlemen’s agreement that so long as one company wanted to serve a municipality that the other company would not compete with it.” Tr. 3903.

agreement not to infringe on other power company's territory even when no franchise or contract exists, is an act of undue restraint of trade.⁷¹⁷

However, the record also contains evidence pointing the other way. For example, in 1966 Paw Paw again sought wholesale power service from Consumers, and in October of that year the company made an offer that would have saved Paw Paw \$50,000 per year. American Electric Power, which was in the process of acquiring Michigan Gas & Electric, made a counter offer that was substantially better than Consumers'. Paw Paw accepted the latter offer, and Consumers' accordingly withdrew its offer. Also in 1966 the Southeastern Electric Cooperative turned to Detroit Edison in lieu of Consumers as its major source of wholesale power.

This concrete evidence of competition is more persuasive than the testimony that secret gentlemen's agreements prompted Consumers to refuse service. In effect, therefore, we agree with the Licensing Board that the weight of the evidence in this case does not support Justice's allegation concerning restrictive agreements.

VIII. "NEXUS"

We have detailed our reasons for concluding that Consumers Power Company has monopolized the relevant markets for coordination services, wholesale electric power and retail electric power in violation both of the letter and the spirit of Section 2 of the Sherman Act. The Nuclear Regulatory Commission's antitrust responsibility, however, is not plenary; authority to remedy the anticompetitive situation is limited to the right to impose conditions on Consumers' license to build and operate the Midland plant.⁷¹⁸ And we may do so in the case now before us only if we find that "the activities under the [Commission] license would . . . maintain a situation inconsistent with the antitrust laws." 42 U.S.C. §2135(c) (5) and (6).

We have no difficulty in making the requisite connection on the basis of this record.⁷¹⁹ One reason we have written at length-perhaps prolixly-is precisely to demonstrate that nexus between the existing anticompetitive situation and the introduction of the Midland generating capacity. Without

⁷¹⁷D.J. Exh. No. 235. Consumers denies the existence of a gentlemen's agreement. The reason for its decision not to serve Paw Paw, it claims, was solely the fact that "service by the Company would have required a significant investment in transmission facilities," and that "there was some legal doubt as to the Company's right to serve without MPSC approval." *Consumers Appeal Brief*, p. 313.

⁷¹⁸See *Houston Lighting & Power Co.* (South Texas Project, Unit Nos. 1 and 2), CLI-77-13, 5 NRC 1303, 1312 fn. 8, 1316 (1977) (appeal pending).

⁷¹⁹See also p. 915 *ff.*, *supra*.

repeating our findings chapter and verse, fair access to efficient, dependable and economical baseload generation is at the heart of the competitive situation before us. In the modern era of generating technology, this means resort to power plants of a size only dreamed of a generation ago. These plants, because of the economies inherent in their large scale operations, are efficient to use but costly to build.

And there is the rub. The small utility systems isolated in Consumers' service area are not in a practical position to build such plants. In part this is undeniably a product of their limited financial resources-but not wholly so. The record amply demonstrates that Consumers' refusals to coordinate with them on reasonable terms insures their inability to construct a large plant economically, because building one would necessitate their building another to be held in reserve. And Consumers has compounded the smaller systems' problems by refusing to wheel power in to them, effectively eliminating their ability to coordinate with or even buy cheaper power from outside sources. Finally, Consumers has (thus far) refused to allow any of those smaller utilities to join with it in developing new large-scale baseload generating units.

These actions by Consumers have effectively prevented the small systems—Consumers' competitors in many instances—from turning to the most economical sources and making the most efficient uses of baseload power. The result is to give Consumers a competitive edge over the small utilities—an edge attributable not to that company's efficient operations but to its exercise of monopoly power.

Now Consumers wishes to increase its efficiency by installing large nuclear powered generating units. Manifestly, this will exacerbate the anti-competitive situation. What we said at the beginning of this opinion bears repeating at the end: the tremendous costs of developing the technology underlying nuclear plants was borne by the Treasury and, as the Commission emphasized in *Waterford*, Congress did not intend that public expenditure to benefit only the few; one of the reasons for its amending section 105c to its present form was the desire to prevent the foreclosing of the advantages of nuclear power to all but the very largest electric utilities.⁷²⁰ But unless we step in, that is precisely what will happen in this case: Consumers will have successfully used its monopoly power to retain the benefit of nuclear-powered baseload generation for itself, to the disadvantage of its "land-locked" smaller competitors.

We stress that we do not rest our conclusion that the necessary "nexus" exists solely on the fact that Consumers is large and its competitors small. But Consumers' size is a relevant consideration. The Supreme Court has warned in antitrust cases that ". . . size carries with it an opportunity for

⁷²⁰*Waterford I, supra*, 6 AEC at 48; *Waterford II, supra*, 6 AEC at 620.

abuse that is not to be ignored when the opportunity is proved to have been utilized in the past.”⁷²¹ Having held that Consumers has previously used the “opportunity for abuse” that its size affords, we cannot turn a blind eye to the further opportunity it will have to do so through its activities under the Midland licenses. That possibility is heightened by the fact that the Midland units represent substantial growth in Consumers’ size and overall capacity.⁷²²

We recognize also the applicability of certain timely truths about the electric utility industry. As we said, the record is replete with evidence of the impending unavailability of fossil fuels and the increasing expense of utilizing those that remain;⁷²³ it also contains repeated references to the unique status of nuclear power and to Congress’ intent that access to it not be limited to a small number of large utilities.⁷²⁴ Consumers criticizes its adversaries’ insistence on such factors as

simply another incarnation of the simplistic theme that nuclear generation is inherently the “wave of the future” and therefore must be made available to smaller systems whatever the economic realities of the market place and of nuclear generation and without regard to the requirements of law.⁷²⁵

⁷²¹*United States v. Swift & Co.*, 286 U.S. 106, 116 (1932) (Cardozo, J.).

⁷²²Statistics compiled by Justice indicated that the 1,300 MW of power to be generated by the Midland units will equal 16 percent of Consumers’ total generation capacity as of the time those units are installed and will increase to 36 percent the portion of Consumers’ power generated by nuclear facilities. The Midland units will operate almost full-time and are expected to provide the cheapest available power. *Justice’s Opening Brief on Appeal*, pp. 142, and Stafford, Tr. 9160, 9166, 9240. We acknowledge that the characterization of nuclear power as relatively low-cost was not universally accepted in this proceeding. Criticizing its adversaries’ evidence as “a potpourri of outdated and off-the-record date,” Consumers strenuously contends that current information (dealing with rising costs for financing, construction and fuels) provides no “economic support for the view that nuclear generation provides unique advantages to its owners.” *Consumers Appeal Brief*, pp. 114-120. In our judgment, however, the record—including testimony by some of Consumers’ own witnesses—bears out the assertion that nuclear generation is comparatively cost-effective. We conclude that, despite its irrefutable capital intensiveness, nuclear power will ultimately be the most economical available form of baseload power. See, e.g., Aymond, Tr. 6351-6353; Brush; Tr. 2480-2485, 2496-2502; Stafford, Tr. 9240. We should note particularly that, contrary to Consumers’ contention (*Consumers Appeal Brief*, pp.115-16), Mr. Brush (Lansing’s system manager) “in no way conceded that the nuclear and non-nuclear bulk power alternatives were comparable from a cost standpoint.” See *Justice’s Reply Brief on Appeal*, p. 127-30.

⁷²³See, e.g., Steinbrecher, Tr. 1225-27; Mayben, Tr. 2807; Brush, Tr. 2502-2504; Chayavadhanangkur, Tr, fol 5090 at 17.

⁷²⁴See, e.g., Joint Committee Hearings at 9-11, 128. See also *Justice’s Opening Brief on Appeal*, pp. 134-135; *Justice’s Reply Brief on Appeal*, pp. 113-114; *Staff’s Opening Brief on Appeal*, p. 66, n. 95. This point was also emphasized in our decision in *Wolf Creek I*, *supra*, 1 NRC at 565.

⁷²⁵*Consumers’ Appeal Brief*, p. 355.

We think Consumers' assessment is an inaccurate characterization of critical facts. Far from reciting simplistic themes, appellants are pinpointing essential issues. In the present setting of monopolization by Consumers, the already significant issues of fuel cost and availability take on even greater urgency. For if traditional fuels become scarce or prohibitively expensive, and if the Midland licenses do not require Consumers to grant the small utilities fair access to a new source of available energy, then this nuclear plant represents far more "than a routine addition of generation capacity." It represents a means of perpetuating a monopoly and a threat to the continued existence of competitors. That situation amply satisfies the needed link between the activities sought to be licensed and the situation inconsistent with the antitrust laws.

Consumers nevertheless denies the existence of a proper nexus on the basis of an assertion it makes repeatedly in other connections: that the benefits derived by the small utilities from access to wholesale power—whether from Consumers or other utilities or from nuclear or fossil fuel plants—are comparable to those they would derive from proper coordination and access to the Midland units. From this contention (among others) Consumers would have us conclude that "the smaller systems' failure to obtain unit power sales from, or ownership interest in, the Midland Units will not affect, or in any way jeopardize their continued financial and competitive viability" and that, therefore, the requisite nexus is non-existent.⁷²⁶

Consumers is simply wrong about this. We reiterate that "wholesale power" is an amalgam of all types of power generated by a utility's system, including peaking and reserve power, and its cost reflects all the costs on the system. The power to be generated by the Midland units, on the other hand, is baseload power. The evidence demonstrates that a substantial price differential normally exists between wholesale power and coordination power.⁷²⁷ Congress was aware of this cost disparity and, as we already noted, this knowledge contributed to the formulation of Section 105c.⁷²⁸ On the basis of the legislative history, the statutory provisions and the record before us, we hold that access to a nuclear facility's output via wholesale purchases alone does not constitute fair and adequate access and does not counteract the maintenance of a situation inconsistent with antitrust law or

⁷²⁶Sec. *Consumers' Appeal Brief*, p. 359.

⁷²⁷As we concluded in the course of analyzing the relevant markets, wholesale power and coordination power are not *reasonably* interchangeable, although they may be *physically* substitutable for one another. Wholesale power entails a greater obligation on the part of the seller than does coordination power, and the selling prices of the two types of power reflect this difference. The price gap is therefore a characteristic of the industry rather than, by itself, an indication of anticompetitive conduct or intent. See pp. 960-970, *supra*.

⁷²⁸Sec. *e.g.*, *Joint Committee Hearings* at 109-110, 128.

policy. On the contrary, keeping in mind our findings of monopolization, we agree with the Department of Justice that

The advantage accruing to Applicant from its ability to integrate low-cost nuclear generation with its system is manifest. Its average cost is reduced and to the extent Applicant is able to do this while denying its competitors the same advantage, its competitive position vis-a-vis these systems improves.⁷²⁹

Finally, that excerpt highlights an error of law which Consumers makes in its nexus argument. The company contends that the construction and operation of the Midland units will not “*change*, or have any impact whatever, upon its competitive or coordinating relationships with any other system.”⁷³⁰ Even assuming *arguendo* that this were so and that the wholesale/coordination cost disparity is irrelevant, Consumers is pressing the wrong point. As Justice notes,

If the small Michigan utilities could achieve power costs identical to those Applicant enjoys from the Midland Units, Midland would nevertheless contribute in a significant manner to the *maintenance* of the situation existing in Michigan . . . [T]his is all that Section 105(c) requires.⁷³¹

For all the reasons elucidated, we find it reasonably probable⁷³² that Consumers’ activities under the Midland licenses would maintain the present situation inconsistent with the antitrust laws.

IX. REMEDIES

The Joint Committee on Atomic Energy instructed, in its report on the bill enacted into Section 105c, that a finding of a nexus between an anti-competitive situation and a proposed nuclear plant calls for “Commission-imposed conditions [on the nuclear license] to eliminate the concerns entailed in [that] finding.”⁷³³ Significant developments following the close of the record below, however, make manifest that in this case the proper course is a remand to the trial Board for formulation of those conditions.⁷³⁴

⁷²⁹*Justice’s Reply Brief on Appeal*, p. 124.

⁷³⁰*Consumers’ Appeal Brief*, p. 357 (emphasis added).

⁷³¹*Justice’s Reply Brief on Appeal*, p. 127 (emphasis added).

⁷³²See pp. 898-899 and 926-927, *supra*.

⁷³³*Joint Committee Report*, *supra*. at 31. In subsection (6), Section 105c calls also for an evaluation of other factors, including “need for power in the affected area,” that may bear on the formulation of those conditions. The Joint Committee emphasized, however, that “except in an extraordinary situation,” the license conditions should normally be able to harmonize any such factors and the antitrust considerations. *Ibid*.

⁷³⁴*Cf., Alcoa, supra*, 148 F.2d at 445-48.

Specifically, Consumers' willingness to sell an ownership interest in the Midland plant to the intervening utilities has undergone a notable change.

As recently as 1976, Consumers was insisting that requiring it to convey such an interest "could unreasonably burden the Company," that the resultant cost to Consumers might be "as high as \$141 million," and that imposition of a license condition requiring such a conveyance would be "inappropriate and contrary to the public interest." See *Consumers' Appeal Brief* at 279 and 388-89. We were therefore surprised to learn, in the course of our review in another proceeding involving Consumers, that the company is now (and has been for some time) actively negotiating the sale to Northern Michigan and Wolverine electric cooperatives—intervenor in this case—of "An interest in the [Midland] plant is exceeding 12 percent."³³ Though that representation was not made by antitrust counsel, we have no reason to doubt its accuracy.

We are well aware that conditions can change rapidly even in the public utility industry. We do not find it hard to imagine legitimate reasons why Consumers would not care to sell an interest in Midland a few years ago but desires to do so now. Be that as it may, our point is simply that this change cautions against drawing up licensing conditions on a stale record. Accordingly, we will refer that task to the Board below with instructions that it allow the parties to supplement the record with evidence concerning the proposed sale and any other significant changes that have occurred since the record closed.³⁶

In fashioning a remedy, we offer the Licensing Board one further caution. We believe that no type of license condition—be it a requirement for wheeling, coordination, unit power access, or sale of an interest in the plant itself—is necessarily foreclosed as a possible form of relief. Section 105c imposes no limits in this respect; it gives the Commission "authority. . . to issue a license with such conditions as it deems appropriate."³⁷ But as broadly as it is framed, that discretion is not *carte blanche*. The authority to

³³See pp. 101-103 of the transcript of oral argument of November 17, 1977, in Docket Nos. 50-329 and 330, *Consumers Power Company* (Midland Nuclear Power Plant, Units 1 and 2) (on motion to suspend construction pending completion of judicially remanded proceedings).

³⁴On June 15, 1977, the Licensing Board hearing the remanded *Midland* construction permit proceeding forwarded three exhibits in that case to us. Two appear to be excerpts from contracts between Consumers and Dow Chemical for the sale of electricity and steam from the Midland plant. These contain clauses restricting Dow's resale rights. The other, dated 1976, is a copy of confidential minutes of a meeting between officials of Dow and Consumers confirming the existence of that restriction.

We have not relied on those exhibits and we draw no inferences from them now. However, the Licensing Board may consider them in drawing up appropriate license conditions after giving each party opportunity to demonstrate their relevances, if any.

³⁵See *Wolf Creek I, supra*, 1 NRC at 571.

act may not be divorced from the purposes of the legislation. The Congressional goals as we understand them are these: to insure the smaller utilities a fair access to nuclear power under conditions which permit them a reasonable opportunity to make effective use of its potential, and to see that activities undertaken pursuant to Consumers' licenses neither create nor maintain an anticompetitive situation.

Section 105c is one provision in a statute that regulates the use of nuclear power. Nothing on the face of the section or in its legislative history suggests that, except as reasonably necessary to achieve the goals just outlined, it may be employed as an implement to restructure the electric utility industry. In formulating "appropriate" license conditions, the Licensing Board should proceed accordingly.

Reversed and remanded.

It is so ORDERED.

**FOR THE ATOMIC SAFETY
AND LICENSING APPEAL BOARD**

**Romayne M. Skrutski
Secretary to the Appeal Board**

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Elizabeth S. Bowers, Chairman
Gustave Linenberger
Dr. Quentin J. Stober

In the Matter of

Docket Nos. STN 50-546
STN 50-547

**PUBLIC SERVICE COMPANY OF
INDIANA, INC.**

**(Marble Hill Nuclear Generating
Station, Units 1 and 2)**

December 9, 1977

Upon request for authorization of certain safety-related construction activities, the Licensing Board authorizes the Director of Nuclear Reactor Regulation, in his discretion, to issue, pursuant to 10 CFR §50.10(e)(3), and subject to six specific conditions concerning monitoring and notification, and expanded Limited Work Authorization (LWA-2) for such activities. In doing so, the Board finds that, with the exception of the matter of the financial qualifications of one co-applicant, the applicants have submitted all information required by the Commission's regulations for issuance of construction permits.

TECHNICAL QUALIFICATIONS: REQUIREMENTS

Lack of evidence that a co-applicant is technically qualified to design, construct or operate a proposed nuclear facility does not preclude issuance of appropriate authorizations or permits if proposed agreements give a qualified co-applicant transcendent authority and responsibility with respect to the health and safety of the public.

EMERGENCY PLAN: PROTECTION OF PERSONS OUTSIDE LPZ

In determining, as part of a licensing proceeding, the adequacy of an applicant's emergency plan, "consideration is not to be given . . . to the feasibility of devising an emergency plan for the protection (in the event of

an accident) of persons located outside the low population zone." *New England Power Company, et al.* (NEP Units 1 and 2) and *Public Service Company of New Hampshire, et al.* (Seabrook, Units 1 and 2), ALAB-390, 5 NRC 733, 747 (1977).

TECHNICAL ISSUES DISCUSSED: Financial qualifications (rural electric cooperative); quality assurance; emergency plans.

PARTIAL INITIAL DECISION LIMITED WORK AUTHORIZATION—2

Appearances

Harry H. Voigt, E. David Doane, and Michael F. McBride, Esqs., LeBoeuf, Lamb, Leiby and MacRae, 1757 N Street, N.W., Washington, D.C. 20036; **Charles W. Campbell, Esq.,** General Counsel, **Jim Pope, Esq.,** Associate Counsel, and **Greg Kimberlin, Esq.,** Assistant Counsel from Public Service Company of Indiana; on behalf of the Applicant, Public Service Company of Indiana.

Bill V. Seiller, Esq., 2100 Commonwealth Building, Louisville, Kentucky 40202; on behalf of the Joint Intervenors, Sassafras Audubon Society, Knob and Valley Audubon Society and Citizens' Coalition.

Thomas M. Dattilo, Esq., 404 East Main Street, Madison, Indiana 47250; on behalf of Save the Valley/Save Marble Hill.

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Walker C. Cunningham, Stuart L. Adams, Marvin R. O'Koon, Esqs., 1112 Kentucky Home Life Building, Louisville, Kentucky 40202; on behalf of Jefferson County, Kentucky. At the health and safety phase of the proceeding the county's counsel was **Charles Kaplan, Esq.,** who formerly appeared on behalf of the City of Louisville.

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Michael J. Walro, Esq., 427 East Main Street, Madison, Indiana 47250; on behalf of the Plan Commission and Board of Zoning Appeals of Jefferson County, Indiana.

John Ready O'Connor, Esq., Suite 15, K of P Building, Madison, Indiana 47250; on behalf of Saluda Township.

Lawrence Brenner, Harry H. Glasspiegel, Lawrence J. Chandler, Bernard M. Bordenick, and Richard J. Goddard, Esqs., Office of the Executive Legal Director, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555; on behalf of the NRC Staff. Mr. Jeffrey F. Lawrence was associated with counsel.

TABLE OF CONTENTS

	Page
I. PRELIMINARY STATEMENT	1104
II. UNCONTESTED RADIOLOGICAL HEALTH AND SAFETY MATTERS	1110
A. Description of Application and Staff Analysis	1110
B. Description and Safety Evaluation of the Proposed Facilities	1110
C. Independent Review of the Advisory Committee on Reactor Safeguards	1113
D. Common Defense and Security	1114
E. Development of Final Design	1114
F. Financial Qualifications	1115
G. Technical Qualifications, Quality Assurance and Management	1116
III. MATTERS IN CONTROVERSY: CONTENTION 13— Emergency Plan	1119
IV. LWA-2 REQUEST	1122
V. CONCLUSIONS OF LAW	1123
VI. ORDER	1125

I. PRELIMINARY STATEMENT

1. On July 1, 1975, Public Service of Indiana, Inc. (PSI or Applicant), filed an application to construct two pressurized water reactors to be known as the Marble Hill Nuclear Generating Station, Units 1 and 2. The proposed location is in Saluda Township, Jefferson County, Indiana, on the Ohio River, approximately 10 miles south and slightly west of Madison, Indiana.

2. On August 22, 1977, the Licensing Board issued a "Partial Initial Decision—Limited Work Authorization." The decision authorized the NRC Staff to issue a Limited Work Authorization (LWA-1) permitted by 10 CFR §50.10(e)(1). The NRC Staff issued the LWA-1 on August 24, 1977,

and amended it on October 14, 1977, to permit additional specified activities within the permissible scope of an LWA-1.

3. On September 16, 1977, the Applicants requested the NRC Staff to authorize specified safety-related construction activities, pursuant to 10 CFR §50.10(e)(3)—known as an LWA-2. This Limited Work Authorization would permit the installation of structural foundations, including any necessary subsurface preparation, for structures, systems, and components that are subject to the quality assurance provisions of Appendix B to 10 CFR Part 50. The Board must make certain prerequisite findings before the Staff can issue an LWA-2. The Staff informed the Board and the parties on October 12, 1977, that it had determined that the additional construction items requested by the Applicants are within the scope of an LWA-2 authorization. The Board concurs in this determination.

4. All remaining radiological health and safety issues, including an issue in controversy, are considered in this Partial Initial Decision—LWA-2 with the one exception.

This Board kept the record open on the matter of the Wabash Valley Power Association (WVPA) financing of its 17% share of the proposed facility. Public Service Company of Indiana (PSI) plans to own 83% of the proposed facilities. PSI urges the Board to authorize the issuance of construction permits subject to the Staff's approval of the REA loan guarantee to WVPA and the ensuing contract between PSI and WVPA. The Board rejects this suggestion since it has the responsibility to determine whether the Applicants are financially qualified to design and construct the proposed facility. (See paragraph 6 of the First Partial Initial Decision (PID), 6 NRC 294.)

5. On August 24, 1977, the Board issued a notice of hearing on health and safety issues. The notice stated that the hearing would commence at 1:00 p.m. (local time) on September 26, 1977. The notice also invited limited appearance statements at the commencement of the proceeding. The hearing room was very crowded with representatives of the parties and with many people who wished to make limited appearance statements. At 1:00 p.m. when the Board became concerned about the absence of a court reporter, a phone call was made and the Board learned the Ace Federal Reporters thought the hearing had been cancelled. With the help of the library staff and local counsel, contact was made with all court reporters in the county, all adjoining counties and four reporting firms in Louisville. No reporter was available. The Board informed the public in the hearing room that the proceeding for that afternoon was cancelled and that the hearing would commence at 9:00 a.m. on the following day. Many people stated they could not return the next day. People were told that if they couldn't return the next day, someone else could read their statements. We also an-

nounced that limited appearance statements would be called for at the beginning of each morning and afternoon session. The Louisville newspaper also carried this announcement. There were a total of twenty-four (24) statements from the audience in addition to a few written statements received by the Board. Some of the limited appearance statements raised issues within the jurisdiction of the Board. These issues either had been addressed by PSI in its ER and PSAR and the Staff in its FES and SER, or were responded to by oral testimony at the hearing (Tr. 5966-77).

6. Originally, there had been three radiological health and safety contentions in this proceeding. One of them, Contention 16, involved the monitoring system for onsite spent fuel storage facilities. The contention was dismissed as a matter in controversy after the Joint Intervenors were dismissed as parties. (See Board Order of July 13, 1977, and the first PID at paragraph 8.) In any event, the concern expressed by the dismissed contention has been fully responded to in the safety evaluation of this facility, as summarized by the Staff's supplemental testimony admitted into the record in response to former Contention 16. (Staff Testimony following Tr. 5965.) On page 4 of Save the Valley/Save Marble Hill (STV/SMH) Proposed Findings of Fact, it was stated that Contention 16 should have remained in issue and STV/SMH and other intervenors with a discernable interest should have been permitted cross-examination. Before the Board could rule on STV/SMH's right to cross-examine, STV/SMH waived its right to cross-examine and deferred to the Commonwealth of Kentucky. Kentucky proceeded with cross-examination (Tr. 5972-77).

7. Another contention removed as a matter in controversy was Contention 12 which had been advanced by the Louisville Water Company. This contention involved the monitoring and notification of unsafe radioactive liquid discharges into the Ohio River. The analysis of the postulated effect of such releases had been performed as a part of the site suitability findings, including those on Contention 15, in our LWA-1 decision. This analysis concluded that there would be no unacceptable discharges. The remaining aspects of concern to the Louisville Water Company were resolved pursuant to an agreement between the Water Company, the Applicants and the Staff. Pursuant to that agreement, which was approved by the Licensing Board, the Louisville Water Company withdrew as a party to the proceeding. (See Board Order dated August 22, 1977.) The agreement on this contention, which was executed and served on the Board and the parties on August 15, 1977, includes six requirements for monitoring and notification which go beyond the requirements of the regulations. Pursuant to the agreement those six requirements shall be included in the conditions and/or technical specifications of any NRC construction permits or operating licenses issued

for the proposed facility. The requirements are set forth in our Conclusions of Law near the end of this decision.

On page 4 of STV/SMH's Proposed Findings of Fact, the Intervenor states that the Louisville Water Company contention should have remained an issue and requests a new hearing at a future date on this matter. The Board approved the agreement after careful consideration and now finds no basis for the action proposed by STV/SMH.

8. Accordingly, the only issue remaining in controversy in this proceeding is Contention 13, involving two limited aspects of emergency planning. One aspect was advanced by the City of Madison and the other by the City of Louisville and Jefferson County, Kentucky.

9. During the hearing, the Staff brought to the Board's attention an ongoing dispute between the Region III office and PSI involving a request by Region III for copies of certain documents (Tr. 6309-6338, 6345-6402). By letter dated November 28, 1977, from the Staff Counsel, we have been advised that at a meeting in Plainfield, Indiana, on November 23, 1977, representatives of Public Service Company of Indiana, Inc. ("PSI") and the NRC Staff's Office of Inspection and Enforcement, Region III, reached agreement concerning the Staff's request that PSI supply Region III with copies of the Construction Management Manual and of the Design Criteria for Replication. These documents, and updates, will be loaned to the Region III office. The arrangement will be mutually reevaluated by Region III and PSI over the course of time to assure that it is assisting, rather than hindering, the ongoing inspection effort. In addition, during the most recent November 8-10, 1977, inspection at the Marble Hill site, copies of requested documents were provided to Staff inspectors and others were loaned for their use overnight. We are informed that the Staff can rely on the continued cooperation of PSI in this area. Based on the above, agreement has been reached on this matter and it is no longer an issue for Board consideration. The parties are to be commended for their independent resolution of this matter.

10. Pursuant to the notice of hearing, and in addition to the findings on the matter in controversy involving emergency planning, the Board must determine:

1. Whether in accordance with the provisions of 10 CFR Section 50.35(a):
 - (a) The Applicants have described the proposed design of the facility including, but not limited to, the principal architectural and engineering criteria for the design, and have identified the major features or components incorporated therein for the protection of the health and safety of the public.

- (b) Such further technical or design information as may be required to complete the safety analysis, and which can reasonably be left for later consideration, will be supplied in the final safety analysis report.
 - (c) Safety features or components, if any, which require research and development have been described by the Applicants and the Applicants have identified, and there will be conducted a research and development program reasonably designed to resolve any safety questions associated with such features or components.
 - (d) On the basis of the foregoing, there is reasonable assurance that (i) such safety questions will be satisfactorily resolved at or before the latest date stated in the application for completion of construction of the proposed facility, and (ii) taking into consideration the site criteria contained in 10 CFR Part 100, the proposed facility can be constructed and operated at the proposed location without undue risk to the health and safety of the public.
2. Whether PSI is technically qualified to design and construct the proposed facility.
 3. Whether the Applicants are financially qualified to design and construct the proposed facility.
 4. Whether the issuance of permits for construction of the facility will be inimical to the common defense and security or to the health and safety of the public.

11. The application for licenses has been reviewed by the Staff and the Advisory Committee on Reactor Safeguards ("ACRS"). Both the Staff and the ACRS have concluded that there is reasonable assurance that Marble Hill, Units 1 and 2, can be constructed and operated at the Marble Hill site without undue risk to the health and safety of the public. (Staff's Safety Evaluation Report ("SER"), June 1977 (Staff Ex. 3-A); ACRS letter of October 22, 1976.) A supplement to the SER was issued on July 22, 1977, in which the Staff concluded that PSI can obtain the necessary funds for 83% of the facility and is financially qualified to design and construct the Marble Hill facility (Staff Ex. 3-B). The SER supplement also concluded that, upon receipt of a loan commitment notice announcing that the proposed loan to WVPA will be guaranteed by the Rural Electrification Administration, WVPA will be financially qualified to own 17% of the Marble Hill facility.

12. At the evidentiary hearing held during September 27-30, 1977, the following exhibits were received in evidence:

Applicant

- 6—Application for Licenses, as amended (the application proper, consisting of one volume).
- 7—Preliminary Safety Analysis Report, as amended (“PSAR”).
- 8—Letter of intent dated December 15, 1975, regarding WVPA’s participation in the Marble Hill plant.
- 9—Letter agreement dated January 14, 1977, regarding WVPA’s participation in the Marble Hill plant.
- 10—Certification of resolutions adopted by the Board of Directors of WVPA, dated February 10, 1977.
- 11—Joint letter from Applicant and WVPA to the REA, dated July 11, 1977.
- 12—Certified copy of resolution adopted by the Board of Directors of WVPA on July 6, 1977.
- 13—Proposed Marble Hill Nuclear Plant Purchase and Ownership Participation Agreement, dated July 12, 1977.
- 14—Proposed Marble Hill Nuclear Plant Operation and Maintenance Agreement, dated July 12, 1977.
- 15—Proposed Interconnection Agreement between PSI and WVPA, dated July 12, 1977.
- 16—Letter from Dr. James Coughlin to Mr. Edson G. Case, dated September 16, 1977.
- 17—A set of four drawings by Sargent & Lundy Engineers, labeled M-11, M-15, M-17, M-18.
- 18—Letter (with nine-page attachment) from State of Indiana Stream Pollution Control Board to J. Coughlin, dated September 19, 1977.

Staff

- 3-A Safety Evaluation Report, NUREG-0115, dated June 1977.
- 3-B Safety Evaluation Report, Supplement No. 1, NUREG-0115 Suppl. No. 1, dated July 1977.

13. STV/SMH was the only Intervenor who submitted Proposed Findings of Fact and Proposed Conclusions of Law. This submittal as well as the submittals filed by PSI and the Staff have been carefully considered by the Board. Any Proposed Findings of Fact submitted by the parties hereto, which are not incorporated directly or inferentially into this Partial Initial Decision—LWA-2, are herewith rejected as being unsupportable in fact or law or as being unnecessary to the rendering of this partial decision.

II. UNCONTESTED RADIOLOGICAL HEALTH AND SAFETY MATTERS

A. Description of Application and Staff Analysis

14. The License Application (app. Exh. 6), and the Preliminary Safety Analysis Report (PSAR) (App. Exh. 7) contain in-depth technical information relative to radiological health and safety matters. This information includes a description of the plant design, including the general design criteria by which compliance with Appendix A of 10 CFR Part 50 would be achieved; an analysis of the safety-related structures, systems and components; an analysis of postulated accidents and the engineered safety features provided to limit their potential effect; a summary of PSI's quality assurance program; the technical qualifications of PSI; the financial qualifications of the Applicants; and considerations relating to the common defense and security of the United States. The Board finds that with the exception of the matter of financial qualifications of the co-applicant WVPA which will be discussed further under the heading of financial qualifications, the Applicants have submitted all information required by the Commission's regulations for issuance of construction permits.

15. The Staff extensively reviewed this material and in June 1977 issued its Safety Evaluation Report (Staff Exh. 3-A). The SER was supplemented by the Staff's Supplement No. 1 to the SER (Staff Exh. 3-B) and by an errata to the SER (following Tr. 6527). The SER, as supplemented, summarizes the results and delineates the scope of the technical evaluation relative to the radiological health and safety aspects of the proposed facility.

16. The Staff's analysis and evaluation includes, *inter alia*, site characteristics (SER Section 2); design criteria for the reactor, structures, components, equipment, and related systems (SER Sections 3 through 10); radioactive waste management and radiation protection (Sections 11 and 12); emergency planning and industrial security (SER Section 13); accident analysis (SER Section 15); quality assurance matters (SER Sections 13 and 17); matters concerning the common defense and security of the U.S. (SER Section 19); and the Applicants' financial qualifications (SER Section 20). Section 1.6 of the SER lists various modifications to the design of the facility as originally proposed which were required by the Staff as a result of its review. The Board has considered the PSAR and amendments thereto and the SER, as supplemented. The Board finds that the Staff's technical review and safety evaluation are comprehensive and adequate.

B. Description and Safety Evaluation of the Proposed Facilities

17. The Board has previously made detailed Findings of Fact describing

the Marble Hill site in its Partial Initial Decision—Limited Work Authorization dated August 22, 1977. We have now considered the additional material and Staff analysis presented in the SER, as supplemented, including the Staff's analysis of offsite radiation doses resulting from postulated accidents. In addition, we have made further inquiries with respect to control over the exclusion area (Tr. 6461-6468), and to assure that appropriate consideration has been given to the possibility of liquid natural gas or liquid petroleum gas accidents adversely affecting the safety of the plant (Tr. 5800, 5947-48, 5952). We find no reason to alter our previous Findings that the proposed site is a suitable location for two nuclear reactors and associated facilities of the type and size proposed from the standpoint of radiological health and safety considerations under the Atomic Energy Act of 1954, as amended, and the rules and regulations promulgated by the Nuclear Regulatory Commission in conformance with this Act. The Board has further considered the characteristics of the site in light of the particular design proposed and finds that the site and the facility design conform to the requirements of 10 CFR Part 100 for operation of the reactors at their design power level.

18. The facility will replicate Commonwealth Edison Company's Byron Nuclear Generating Station, Units 1 and 2. Construction Permits for the Byron station were issued on December 31, 1975 (SER Sections 1.1, 1.3). References to SER sections in this decision include sections of the SER, Supplement 1 to the SER, and Appendices C, D, and E of the SER which reproduce sections of the Byron SER.

19. The facility will utilize two pressurized water reactors provided by Westinghouse. The nuclear steam supply system ("NSSS") for each unit will be housed in a containment building consisting of a steel-lined, reinforced concrete structure designed to confine safely the radioactive material that could be released in the event of an accident (SER Section 1.2). Each of the proposed reactors will be designed to operate at a thermal power of 3,425 megawatts (MWt), which corresponds to a net electrical output of approximately 1,130 megawatts (MWe) (PSAR Section 1.1; FES at i, 8-1). All plant safety systems, including containment and engineered safety features, are designed and evaluated for operation with appropriate safety margins (SER Section 15).

20. The NSSS for each of the proposed units will include a pressurized water reactor and four coolant loops connected in parallel to the vessel. Each loop will be equipped with a coolant pump, two loop stop valves, and a steam generator. A pressurizer will be connected to one of the loops (SER Section 5.1). The proposed reactor fuel elements for each unit will employ Zircaloy-clad fuel rods with welded end plugs. Pellets of slightly enriched uranium dioxide are sealed in the tubes, which are internally pressurized

with helium (SER Sections 1.2 and 4.2.1). The four units will use fuel assemblies with a 17 x 17 fuel rod array. This fuel assembly furnishes more linear feet of fuel in a fixed reactor size than did the earlier 15 x 15 fuel assembly designs, and hence a lower linear power density will exist (SER Section 4.3).

21. The steam generators serve as heat exchangers, transferring energy from the reactor coolant to the secondary water systems. This heat transfer cools the reactor and provides steam to drive the turbine generator. The reactor coolant flows inside U-shaped tubes, which are in turn immersed in the secondary water circulating through the steam generator shell. The steam generator tubes form part of the reactor coolant pressure boundary (PSAR Section 1.2).

22. Each containment structure houses the NSSS and certain components of the engineered safety systems (SER Section 6.2.1). The containment buildings will be steel-lined, reinforced concrete structures anchored in the bedrock under the site. Each is designed for an internal pressure of 50 psig which is sufficient to withstand the internal pressure associated with loss-of-coolant accidents (LOCA) (SER Sections 1.2, 6.2.1). The Applicants have calculated the maximum internal pressure from a postulated LOCA to be 43.1 psig using very conservative assumptions about initial conditions. Independent calculations by the Staff of the maximum anticipated pressure confirm the results obtained by the Applicants (SER Section 6.2.1). The containment systems, along with other engineered safety features, are designed to protect the public from potential radiological consequences resulting from a postulated LOCA (SER Section 6). These systems will assure that the radiological consequences of postulated accidents will not exceed the guideline values in 10 CFR Part 100 (SER Sections 1.5, 15).

23. The facility will have a number of engineered safety features designed to prevent an accident and to minimize its severity and mitigate its consequences in the event an accident should occur. These features include the containment heat removal system (SER Section 6.2.2), the containment air purification and cleanup system (SER Section 6.2.3), the containment isolation system (SER Section 6.2.4), the combustible gas control system (SER Section 6.2.5) and the emergency core cooling system (SER Section 6.3)

24. The emergency core cooling system (ECCS) will be designed to provide emergency core cooling during those postulated accident conditions where it is assumed that mechanical failures in the reactor coolant system piping result in losses of coolant from the reactor vessel greater than the available coolant makeup capacity using normal operating equipment. The ECCS is also designed to protect against steam line break consequences. The Applicants' analyses identified the worst break as the double-ended, guillotine break in the cold leg (SER Section 6.3.2). The calculated peak

clad temperature reaches 2,148 degrees Fahrenheit, which is within the acceptable limit of 2,200 degrees Fahrenheit specified in 10 CFR Section 50.46(b). In addition, the calculated maximum local metal-water reaction of 6.7% and the total corewide, metal-water reaction of less than 0.3% are below the allowable limits of 17% and 1%, respectively (SER Section 6.3.3). On the basis of this review of the performance evaluation of the ECCS, the Staff concluded that: (1) the postulated loss-of-coolant accident analyses that were performed are in conformance with the requirements of Appendix K to 10 CFR Part 50; (2) the performance evaluation conforms to the peak clad temperature, maximum oxidation, and hydrogen generation criteria specified in 10 CFR Section 50.46; (3) the ECCS performance will be adequate despite any postulated failure of a single component; (4) adequate systems are available to provide long-term core cooling; and (5) the proposed design of the ECCS is acceptable (SER Section 6.3.5). The Board has reviewed the Staff's analysis, has found it to be satisfactory and concurs in its conclusions.

25. The engineered safety features will be designed to be capable of assuring safe shutdown of the reactors under various postulated design basis accidents. They will be designed to Category I standards and will function even with the complete loss of offsite power. As with the ECCS, the components and systems will be provided in sufficient redundancy so that a single failure of any component or system will not result in the loss of the capability to achieve safe shutdown of the reactors (SER Section 6.1).

26. On the basis of our review of the record related to the design of the facility as summarized above, the Board finds that the design of the Marble Hill facility can be completed and constructed and operated in compliance with the general design criteria set forth in 10 CFR Part 50, Appendix A, and all other relevant regulations (SER Sections 1.5, 3.1).

C. Independent Review of the Advisory Committee on Reactor Safeguards

27. The application for authorization to construct the Marble Hill units was independently reviewed by the Advisory Committee on Reactor Safeguards (ACRS). The facility had been considered at various ACRS meetings, both full and subcommittee meetings, and members of the ACRS have visited the site. On October 22, 1976, the ACRS forwarded to the Chairman of the Commission its letter reporting on its review (SER Section 18).

28. The ACRS concluded that the matters that merited additional consideration could be resolved during construction, and that, with due consideration given to these items, the Marble Hill Station can be constructed with reasonable assurance that it can be operated without undue risks to the

health and safety of the public. The Staff and Applicants have duly considered these items and are taking appropriate action to implement the recommendations of the ACRS (SER Section 18).

D. Common Defense and Security

29. The activities to be conducted under the construction permits will be within the jurisdiction of the United States. All of the Applicants' directors and officers are citizens of the United States, and the Applicants are not owned, dominated or controlled by an alien, a foreign corporation, or a foreign government. The activities to be conducted do not involve any restricted data but the Applicants have agreed to safeguard any such data which might become involved in accordance with the requirements of 10 CFR Part 50. The Applicants will rely on obtaining fuel as it is needed from sources of supply available for civilian purposes, so no diversion of special nuclear material from military purposes is involved (SER Section 19; App. Exh. 6, Section A.3; Tr. 5918-19, 5957-60, 6231). The Board finds that the issuance of construction permits for the Marble Hill Nuclear Generating Station, Units 1 and 2, will not be inimical to the common defense and security.

E. Development of Final Design

30. The nuclear steam supply systems for the proposed Marble Hill reactors are similar to other large pressurized water reactors now being designed and built by Westinghouse for plants being constructed under Commission construction permits. More specifically, as noted above, the proposed design replicates the design of Commonwealth Edison Company's Byron Nuclear Generating Station, Units 1 and 2, Dockets Nos. 50-454 and 50-455, which is currently being constructed pursuant to construction permits issued by the Commission. There are identified ongoing investigations to confirm and finalize the design of certain of the plant systems, which include generic design features (PSAR Section 1.5; SER Sections 1.7, 4.1). These investigations include 17 x 17 fuel design, cooling tower performance data, underfrequency trip set point, grid availability data, and anticipated transients without scram.

31. On the basis of the evidence that the scope and schedule of the various analytical efforts of such investigations are adequately designed to accomplish their respective development objectives on a timely basis for the proposed facility, the Board finds that the requirements of the Commission's regulations have been met in this regard (10 CFR Section 50.35; SER Section 1.7).

F. Financial Qualifications

32. The proposed "Marble Hill Nuclear Plant Purchase and Ownership Participation Agreement" between the two co-applicants, PSI and WVPA, specifies that the ownership, cost and rights to the output of the facility will be allocated 83% to PSI and 17% to WVPA (App. Exh. 13). The proposed agreement has not been signed, but it will be upon the closing of the agreement at the time of approval of the loan guarantee to WVPA by the Rural Electrification Administration (REA). The Applicants do not contemplate any substantial changes to the purchase and ownership agreements as now proposed (Tr. 6116-17; 6187).

33. The information supplied by the Applicants and the analysis performed by the Staff demonstrate that PSI is financially qualified to design and construct 83% of the proposed facility. PSI plans to finance its 83% ownership interest through internally generated funds, external sales of debt and equity securities, and short-term borrowing (SER Section 20.3).

34. Internally generated funds represented 43% of PSI's 1976 construction expenditures (SER Section 20.3). PSI plans to continue to provide about 40% of its overall construction program from internally generated funds. The remaining 60% balance of PSI's overall construction program will be generated externally, in a long-term debt equity ratio of approximately 50-50. The common equity portion will be slightly less than 40% and the preferred stock equity portion will be somewhat over 10% of the total external sales of debt and equity security and short-term borrowings (App. Exh. 6 at A.5-1; Tr. 6094). PSI's long-term debt bonds are rated double A, high-quality, by both Moody's and Standard and Poor's (SER Section 20.3).

35. The proposed financing is reasonably consistent with PSI's financing structure in 1976 as summarized by the Staff in the SER (SER Section 20.3). In addition, the proposed capital structure for PSI is historically typical of the electric utility industry and within the zone of reasonableness (SER Section 20.3). Furthermore, the Board agrees with the Staff that given prevailing and reasonably foreseeable capital market conditions, PSI's assumptions with respect to the capital structure and rate of return on common equity are reasonable (SER Section 20.3). Accordingly, the resulting projections for PSI appear obtainable. The Board finds that PSI is financially qualified to finance 83% of the proposed project.

36. WVPA consists of 24 rural electric cooperatives. It plans to finance its 17% ownership interest in the Marble Hill facility solely through long-term debt guaranteed by the Rural Electrification Administration (REA). This is a common method of long-term capital financing for rural electric cooperatives. The guarantee of this proposed loan by the REA is necessary

in order for WVPA to insure a source of funds for its participation in the Marble Hill facility. Guarantee of a proposed loan by the REA to a cooperative is the basis upon which a cooperative demonstrates its financial qualifications to participate in a nuclear project (SER Section 20.4).

37. WVPA is still in the process of applying to the REA for the necessary loan guarantee. Based on the contacts to date between the REA and WVPA, as testified to by the general manager of WVPA, there is no reason to expect that the REA will deny WVPA's application for a loan guarantee (Tr. 6019-23; 6173-75, 6178-79, 6232-34, 6247-48). However, at this stage WVPA has not provided sufficient evidence to be found financially qualified to participate in its proposed 17% share of the facility (SER Section 20.5).

38. Prior to this Board's being able to authorize the issuance of a construction permit, REA will have to formally issue its loan guarantee to WVPA. In addition, the proposed ownership participation agreement (App. Exh. 13) will have to be formally executed between PSI and WVPA and submitted for review to assure that the major points of the agreements, including the allocation of ownership, do not change from the presently proposed terms. As the Board stated at the close of the hearing, the record will be kept open for the receipt of evidence concerning the execution of the proposed agreement and the REA action on the loan guarantee required by WVPA. Upon receipt of that information from the Applicants, the Board will consider the positions of the parties, at that time, and will determine the appropriate action (Tr. 6540).

G. Technical Qualifications, Quality Assurance and Management

39. The PSAR describes the technical organization of PSI, identifies its architect-engineer, principal contractors and its technical consultants, and describes their background and qualifications (PSAR §§ 1.4 and 13.1). Westinghouse Electric Corporation will be responsible for the nuclear steam supply system, and Sargent and Lundy will act as the architect-engineer for the facility. These organizations have extensive experience in the nuclear field (PSAR §1.4; SER §13.1; Tr. 5992, 6103-04). In addition, PSI has and continues to make use of special consultants with nuclear experience, especially in fields of quality assurance, construction planning, and testing and startup (Tr. 5988-89).

The PSI responsibility for the design and construction of the facility is under the direction of Director-Nuclear Projects. He reports to the Vice President-Engineering, who in turn reports to the Senior Vice President-Operations who reports to the President and Chief Executive Officer (SER §13.1; SER Fig. 17.1). In addition, the Vice President-Nuclear has his own

staff, which includes the Licensing and Nuclear Operations Managers and the Manager of Quality Assurance and his staff (SER Fig. 17.1). PSI's nuclear and engineering staff at the present time includes almost 30 people with previous nuclear experience in the Navy or with other companies already engaged in the supply, construction or operation of nuclear power plants. PSI's nuclear staff has approximately 250 man-years of nuclear experience (App. Test. fol. Tr. 5982).

40. The proposed station staff for the operation of the facility will consist of approximately 130 persons in a conventional type of organization for plant operations. Technical support for the operation of the station will be provided primarily by the General Headquarters Nuclear Staff Group which reports to the Manager of Nuclear Operations. PSI's proposed minimum qualifications for the plant staff meet the requirements described in ANSI Standard N18.1 and Revision 1 to Regulatory Guide 1.8 (September 1975) (SER Section 13.1).

41. The NRC Staff has concluded that PSI has established an acceptable organization to implement its technical responsibilities and has concluded that PSI, together with its principal contractors and technical consultants, is technically qualified to design and construct the proposed facility. In addition, the Staff has concluded that PSI has provided an adequate preliminary description of its plans for plant organization, training of personnel and conduct of operations (SER §§13.1, 13.2 and 21 as modified by the Errata fol. Tr. 6527). The Board has independently reviewed the evidence and agrees with this assessment of the professional qualifications and organization of PSI.

42. There is no evidence showing that WVPA is technically qualified to design, construct or operate the proposed facility. This fact, however, does not preclude the issuance of appropriate authorizations or permits because PSI will be handling the lead responsibility with respect to these technical matters (App. Exh. 13; Tr. 6013-17). This private arrangement between PSI and WVPA does not and cannot, of course, override the public interest that WVPA, as an owner of the facility, be fully subject to all applicable regulatory authority and actions. This is one of the important underlying reasons for this Board's view that it was necessary for WVPA to be made a co-applicant for licenses for the proposed Marble Hill facility. From its own examination, the Board has satisfied itself that the proposed agreements between WVPA and PSI are structured in a manner that gives PSI transcendent authority and responsibility with respect to the health and safety of the public.

43. The submitted written QA programs of PSI, Westinghouse, and Sargent and Lundy were found by the Staff to comply with Appendix B to 10 CFR Part 50 and applicable guides and standards, and therefore found

to be acceptable for the design, procurement and construction of the proposed facility (SER Section 17.6). The organization of PSI is such that the Manager of Quality Assurance is free of prime responsibility for schedule and cost and is on at least the same organizational level as those whose work he verifies (SER Section 17.2). In addition, he reports directly to the Vice President-Nuclear who is free from cost and scheduling responsibilities for the work which the QA organization (under the QA manager) inspects and verifies. The Vice President-Nuclear is on the same reporting level as the official who does have prime cost and scheduling responsibilities, the Vice President-Engineering (SER Section 17.2).

44. As may be expected from the fact that the Licensing Manager reports to the Vice President-Nuclear, the Vice President-Nuclear has responsibility for licensing matters, including the schedule of the licensing review and interactions with the NRC. In this capacity, the Vice President-Nuclear also has the administrative and coordinating function as the PSI contact for initiating and receiving correspondence between the NRC Staff and PSI (App. Exh. 6, Section A.9; SER Fig. 17.1; Tr. 6307-08). This administrative role, and the responsibility of the Vice President-Nuclear for the licensing schedule, does not involve any cost and scheduling responsibilities for the design and construction activities which the QA organization verifies (Tr. 6306-07).

45. Based on the Board's inquiries and its review of the record in this proceeding, including the Staff's analysis in Section 17 of the SER, and with particular attention to the independence and organizational freedom of the QA organization to perform its functions and stop work to prevent unsatisfactory work, the Board agrees with the Staff's conclusions that the QA programs of PSI, Westinghouse and Sargent and Lundy meet applicable requirements and standards and are acceptable.

46. The Board was also particularly interested in the *implementation* of the QA program to date, as well as the state of readiness of PSI to undertake immediate quality assurance responsibilities as may be necessary for the commencement of safety-related construction under an LWA-2 or construction permits. As part of our inquiry, we are necessarily interested in the Staff's reviews of activities to date to assure itself of the proper implementation of PSI's QA program (Tr. 5801-02). The Board is limited at this stage to examining PSI's QA program and plans along with PSI's commitment and attitude and potential for proper implementation. However, a most important aspect of assuring proper implementation is the necessary reliance of this Board on the ongoing efficacy of the NRC Staff's inspection program, which must assure continuous and proper implementation of quality assurance and quality control as construction progresses. Accordingly, the views of NRC Staff inspection officials are given great weight by this Board.

47. In response to the Board's interest and concern, the Staff provided Mr. D.W. Hayes as a witness. Mr. Hayes is Chief of the Project Section of the Reactor Construction and Engineering Support Branch of the NRC Regional Office of Inspection and Enforcement in the Chicago area offices in Glen Ellyn, Illinois. Mr. Hayes is responsible for supervising the construction inspectors at nuclear power facilities under construction within the region, which includes the proposed Marble Hill nuclear facility (Professional Qualifications following Tr. 6351).

48. The NRC Staff has conducted seven inspections to date in regard to the Marble Hill facility, five of which concern the implementation of the QA program. In addition, NRC Staff inspectors have conducted an inspection at Sargent and Lundy, the architect-engineers for the Marble Hill facility. Because no safety-related construction and installation work has taken place to date, these inspections primarily focus on design and procurement activities since those were activities in progress. The inspections did, however, also include a predictive assessment of the status of the QA program with respect to its readiness towards future implementation of construction activities. The Staff concluded that the implementation of the QA program to date has been acceptable and that the necessary procedures required for the start of construction are in place (Tr. 6352-53). Mr. Hayes emphasized, however, that the Staff inspections involve an ongoing effort and that although an inspection of site activities was made in September 1977, it has been over a year since the last inspection concerning QA procedures required for the start of safety-related construction has taken place (Tr. 6353, 6365). As a result, the Staff plans to make at least one additional inspection covering QA and QA implementation before it would issue an LWA-2 in the event the Board makes all other prerequisite findings (Tr. 6353).

III. MATTERS IN CONTROVERSY—CONTENTION 13

Emergency Plan

49. The City of Madison, the Applicant and the Staff entered into a stipulation containing the following contention:

The Applicant has not demonstrated that an adequate emergency plan, to the extent required at the CP stage, can be developed in view of the limited hospital facilities available in Madison in the event of an emergency.

Jefferson County, Kentucky, contends that:

Whether it would ultimately be feasible to develop appropriate emergency plans in light of the proposed plant location, such plans limited to

Petitioner's interests and taking into account their distance of approximately thirty miles from the proposed facility.

(See Board Order of June 24, 1976.)

50. The City of Madison did not appear at the hearing. Nevertheless, all aspects of the contention as well as uncontested aspects of emergency planning were fully litigated. The Applicant and Staff presented witnesses on the subject who were cross-examined by the parties and questioned by the Board (Tr. 6404-6490). No testimony was presented by any intervenor.

51. The Applicant's preliminary plans for coping with emergencies are described in the PSAR (App. Ex. 7, § 13.3). Additional information was provided at the hearing by a witness for the Applicant who presented direct testimony and responded to questions by the Board and the parties (testimony following Tr. 6405; Tr. 6406-68).

52. The exclusion area for Marble Hill consists entirely of property owned by the Applicant (SER § 2.1). The minimum distance from the centerline of each reactor to the exclusion area boundary is 2,200 feet (670 meters) (*id.*). There will be no residences in the exclusion area (*id.*). The Board concludes that the Applicant has the authority and the ability to determine the activities within the exclusion area as required by 10 CFR Part 100.

53. The low population zone for Marble Hill will be the area within a two-mile radius of the plant. A portion of this area lies within Kentucky (SER §2.1, Fig. 2.3).

54. The PSAR contains a general description of the actions to be taken by the shift supervisor and the station manager in response to any emergency condition at the plant. If certain specified conditions exist, assistance would be provided by the Corporation Emergency Support Group, consisting of company officers and technical personnel who would have the full resources of the company in the power production, engineering, and reactor operation areas at their disposal to aid the response effort (App. Ex. 7, §13.3.2.).

55. Applicant's emergency plan will contain specific arrangements for assistance by local, state, and Federal agencies to be provided during certain emergencies. Applicant has contacted the King's Daughters' Hospital in Madison, Indiana, and the Clark County Memorial Hospital in Jeffersonville, Indiana, to determine the feasibility of treatment at each hospital of injured individuals who have been contaminated by radiation. Both hospitals consider such treatment to be feasible and have expressed a willingness to accept such injuries. In a new wing being constructed at King's Daughters' Hospital, modifications will be made to ensure that a radioactively contaminated individual could receive hospital medical care without affecting the hospital's ability to maintain routine services to the local community (App. Ex. 7, § 13.3.3; testimony following Tr. 6405; Tr. 6418-20).

56. The Applicant has also contacted other local organizations whose assistance may be required in responding to emergencies. Those contacts include local law enforcement agencies, fire departments, city and county officials, and local civil defense personnel. The Applicant has contacted the Indiana Department of Civil Defense to explain applicable regulatory requirements and to begin coordinated emergency planning. That agency will develop a response plan that will include those actions necessary for safeguarding the health and safety of the general public in the event of an emergency at the plant. If a similar response plan is to be developed in Kentucky, the Applicant has expressed its willingness to assist Kentucky officials, including those in Louisville and Jefferson County, in the development of such a plan (Tr. 6413). As planning becomes more detailed, appropriate additional contacts will be made by the Applicant in both Indiana and Kentucky. The responsibilities of the local officials will be determined, and detailed procedures will be established. Such procedures will include those applicable to residents in the low population zone living in both Indiana and Kentucky (testimony following Tr. 6405; Tr. 6436, 6454-56; 6464-66).

57. The PSAR also contains a general description of the emergency response actions that would be taken both within and outside the site boundary in the event of an emergency. In addition, the Applicant has described its preliminary plans for the training programs required to ensure proper implementation of the emergency plan, the methods to be used for determining offsite effects of an accident in both Indiana and Kentucky, emergency treatment of plant personnel, and reentry into the accident area (App. Ex. 7, §§ 13.3.4-13.3.8; Tr. 6456-58).

58. The Staff's description of the Applicant's preliminary emergency plan is contained in the SER (SER § 133). Supplemental testimony was also presented by the Staff at the hearing (testimony following Tr. 6471). The Staff observed that the Applicant has accomplished more than is necessary to meet NRC requirements at the construction permit stage, particularly in terms of the extent of Applicant's contacts made to date with state and local officials (Tr. 6489-90).

59. Louisville and Jefferson County, Kentucky, are concerned that it will not be feasible to develop appropriate emergency plans for the protection of their citizens. The Appeal Board has ruled that:

consideration is not to be given in a licensing proceeding to the feasibility of devising an emergency plan for the protection (in the event of an accident) of persons located outside the low population zone.

New England Power Company, et al. (NEP Units 1 and 2) and *Public Service Company of New Hampshire, et al.* (Seabrook, Units 1 and 2), ALAB-390, 5 NRC 733, 747 (April 7, 1977). The proposed Marble Hill site is a

minimum of 20 miles from Jefferson County, Kentucky, and about 30 miles from Louisville. These distances are well beyond the two-mile LPZ radius, and the Applicant need not develop emergency plans for the protection of persons located at this distance (Staff Testimony following Tr. 6471).

60. On the basis of its review, the Staff concluded that the Applicant's emergency planning program meets the requirements of Appendix E to 10 CFR Part 50, is consistent with the design and location of the plant, and provides reasonable assurance that appropriate protective measures can be taken within and beyond the site boundary in the event of a serious accident (SER § 13.3). The Board concurs in this finding. The Applicant will be required by the Commission's regulations to present its detailed emergency plan in the Final Safety Analysis Report.

IV. LWA-2 REQUEST

61. By letter dated September 16, 1977, the Applicant requested that the NRC issue an LWA-2 for Marble Hill, which would authorize Applicant to commence certain safety-related construction activities. Attached to the letter were four diagrammatic drawings of portions of the plant indicating the location of certain structures included in the request. Both the letter and the drawings were received in evidence at the hearing (App. Exs. 16, 17).

62. The Applicant presented a panel of two witnesses who explained the necessity for an LWA-2. In response to the Board's request, the witnesses described in more detail the particular construction activities included in the request. It was pointed out that in order to meet the scheduled startup date, work on certain safety-related items must commence by December 1, 1977. This could have been accomplished by the issuance of a construction permit by December 1, a date that the Applicant had anticipated and relied on as the basis for planning its construction schedule. However, when it became apparent that a CP would not be issued by December 1, the Applicant was compelled to request an LWA-2 to maintain its schedule (Tr. 6494-6504).

63. The Staff's Project Manager for Marble Hill testified that there are no outstanding problems with regard to any of the specific activities included in the request. However, he noted that the Staff had not confirmed whether each of the requested activities is properly within the limited scope of an LWA-2 (Tr. 6507-10).

64. The Applicant's witnesses pointed out that with the exception of certain site specific items, each of the activities included in the LWA-2 request was previously analyzed by the Staff when the design for the Byron plant was reviewed, and each of those activities was authorized when the construction permit for the plant was issued (Tr. 6497-98). In addition, the QA witnesses for both the Applicant and the Staff assured the Board that com-

mencement of construction activities under an LWA-2 would be accompanied by appropriate QA procedures conducted or supervised by presently available personnel of Applicant (Tr. 6264-65, 6305-06, 6366). The Staff has determined that there are no outstanding safety issues relating to the Applicant's request. The Board, from its own review, supports that finding. Therefore, and in light of the Staff's determination subsequent to the hearing that the items requested are within the scope of an LWA-2, the Board will authorize issuance of the LWA-2 requested by Applicant (Staff's letter of October 12, 1977).

V. CONCLUSIONS OF LAW

65. In the first Partial Initial Decision issued on August 22, 1977, the Board made Findings of Fact and Determinations and reached Conclusions of Law, regarding environmental and site suitability matters. The Board has considered these earlier findings, determinations, and conclusions, as well as all of the documentary and oral evidence of record in this proceeding. This consideration and review of the entire record, including that portion of the record created since the issuance of the Partial Initial Decision, have led the Board to the foregoing discussion and Findings of Fact, and to the Conclusions of Law that follow.

66. The Board concludes that the application and the record of the proceeding contain sufficient information and that the review of the application by the Staff has been adequate to support the following.

67. The Board, subject to the conditions noted, finds that:

1. In accordance with the provisions of 10 CFR §50.35(a):

- (a) The Applicants have described the proposed design of the facility including, but not limited to, the principal architectural and engineering criteria for the design, and have identified the major features or components incorporated therein for the protection of the health and safety of the public.
- (b) Such further technical or design information as may be required to complete the safety analysis, and which can reasonably be left for later consideration, will be supplied in the final safety analysis report.
- (c) Safety features or components, if any, which require research and development have been described by the Applicants and the Applicants have identified, and there will be conducted, a research and development program reasonably designed to resolve any safety questions associated with such features or components.

- (d) On the basis of the foregoing, there is reasonable assurance that (i) such safety questions will be satisfactorily resolved at or before the latest date stated in the application for completion of construction of the proposed facility, and (ii) taking into consideration the site criteria contained in 10 CFR Part 100, the proposed facility can be constructed and operated at the proposed location without undue risk to the health and safety of the public.
- 2. PSI is technically qualified to design and construct the proposed facility.
- 3. PSI is qualified to assume financial responsibility for 83% of the design and construction of the proposed facility. Prior to the issuance of construction permits, the qualifications of WVPA to finance the remaining 17% of the design and construction will be examined in light of action by the Rural Electrification Administration on the application of WVPA for a loan guarantee. In addition, the proposed ownership participation agreement will have to be formally executed and submitted for review.
- 4. The issuance of permits for construction of the facility will not be inimical to the common defense and security or to the health and safety of the public.
- 5. Subject to the conditions set forth in the first Partial Initial Decision:
 - (a) The Environmental review performed by the Staff (pursuant to the National Environmental Act of 1969) and set forth in the Final Environmental Statement and the record of this proceeding has been adequate.
 - (b) Sections 102(2) (A), (C) and (E) of NEPA and 10 CFR Part 51 of the Commission's regulations have been complied with.
 - (c) The board has considered the final balance among conflicting environmental factors, and has weighed the various benefits against costs, taking account of the need for power, the alternatives to the plant, and certain of its design features. As a result, the Board concludes that these considerations favor the issuance of construction permits for the facility.

68. Pursuant to the agreement on the concerns of the Louisville Water Company, any construction permits or operating licenses which are issued shall include the following six conditions in the permits and in either the licenses or technical specifications:

- a. The requirements for the Marble Hill preoperational radiological monitoring program are outlined in the NRC Staff's

Final Environmental Statement (FES) §6.1.2 (including Table 6.1). The FES requires that the closest LWC water intake and Louisville drinking water be monitored as indicated and in accordance with current and future requirements of NRC Regulatory Guide 4.8. Applicants agree to commence the LWC water intake and Louisville drinking water aspects of the preoperational radiological monitoring program two years prior to operation of the Marble Hill facility. Applicants and the NRC Staff agree that such monitoring shall be required to be continued as part of the operational monitoring program. The monitoring shall comply with all applicable current or future NRC Regulatory Guides, Federal regulations and environmental technical specifications throughout the operation of the Marble Hill facility.

- b. The closest LWC water intake shall be designated by the LWC and agreed to by Applicants and approved by the NRC Staff at the time for implementation of the preoperational radiological monitoring program.
- c. LWC shall have access to all monitoring conducted by Applicants at its water intake and shall be furnished with copies of all test results and all reports of monitoring and test results furnished by Applicants to the NRC.
- d. Applicants will notify LWC within 60 minutes after giving any required notification to the NRC of any release of radioactive materials in excess of the limits to be defined in the technical specifications. Applicants agree to notify LWC of the contents of any press release by Applicants regarding radioactive discharges to the Ohio River prior to issuance.
- e. Applicants agree to provide LWC with the unlisted number of the shift supervisor of the Marble Hill facility.
- f. Applicants will include provisions in their Emergency Plan requiring direct early notification to LWC in the event of any emergency situation.

VI. ORDER

69. Based upon the Board's Findings and Conclusions, and pursuant to the Atomic Energy Act of 1954, as amended, and the Commission's regulations, and subject to the precondition noted above on the provision of documents to the NRC Staff:

70. IT IS ORDERED THAT: The Director of Nuclear Reactor Regulation is authorized, in his discretion, to issue to Applicants an LWA-2 for

those activities specified in Applicants' request to the Staff of September 16, 1977.

71. IT IS FURTHER ORDERED THAT: In accordance with 10 CFR §2.760, §2.762, §2.764, §2.785 and §2.786 that this Partial Initial Decision shall become effective immediately and shall constitute with respect to the matters covered therein the final action of the Commission forty-five (45) days after the date of issuance hereof, subject to any review pursuant to the Commission's Rules of Practice. Exceptions to this Partial Initial Decision may be filed by any party within seven (7) days after service of this Partial Initial Decision. Within fifteen (15) days thereafter [twenty (20) days in the case of the Staff] any party filing such exceptions shall file a brief in support thereof. Within fifteen (15) days of the filing of the brief of the appellant [twenty (20) days in the case of the Staff], any other party may file a brief in support of, or in opposition to, the exceptions.

IT IS SO ORDERED.

THE ATOMIC SAFETY AND
LICENSING BOARD

G. A. Linenberger, Member

Dr. Quentin J. Stober, Member

Elizabeth S. Bowers, Chairman

Issued at Bethesda, Maryland,
this 9th day of December 1977.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Frederic J. Coufal, Chairman
R. Beecher Briggs
Dr. Paul W. Purdom

In the Matter of

Docket Nos. 50-338 OL
50-339 OL

**VIRGINIA ELECTRIC AND
POWER COMPANY**

**(North Anna Nuclear Power
Station, Units 1 and 2)**

December 13, 1977

Upon application by Virginia Electric and Power Company (VEPCO) for licenses to operate two pressurized water reactors at the North Anna Power Station, the Licensing Board authorizes the Director of Nuclear Reactor Regulation to make findings in accordance with 10 CFR §50.57(a) and to issue the licenses as sought. The Board also denies requests for license conditions by an intervenor and by the Commonwealth of Virginia but directs the staff to take or continue certain measures to assure full, easy public access to information about operations at the plant.

RULES OF PRACTICE: OPERATING LICENSE HEARING

The primary responsibility for evaluating the safety of nuclear power plants has been delegated to the Commission staff and the ACRS. In a contested proceeding on an operating license application, the Licensing Board is ordinarily to decide those matters put into controversy by the parties and those determined by the Board or the Commission to be issues; only in extraordinary circumstances where it finds a serious question involving safety, environment or common defense and security may the Board examine and decide matters not put into controversy by the parties.

RULES OF PRACTICE: OPERATING LICENSE HEARING

A licensing board is to use only sparingly its authority to consider and

resolve matters not put into controversy by the parties in an operating license hearing. 10 CFR §2.760a.

OPERATING LICENSE: CRITERIA

Generally, a facility seeking an operating license must be in compliance with standards and criteria listed in the PSAR at time construction permit was issued; under rules and regulations, compliance with all current standards is not a prerequisite to receiving an operating license.

SAFETY STANDARDS: COMPLIANCE

Plants may at any stage of construction or operation be required to be brought into compliance with latest standard if such action can be expected significantly to improve the safety of the facility. The extent to which a facility must comply with explicit requirements of latest standards and criteria in order to be considered safe to operate is to some extent a matter of judgment for the staff, the ACRS and, in some cases, the Commission.

EMERGENCY PLAN: CONTENT

Details of the implementation of an emergency plan need not be included in the plan submitted by an applicant for an operating license.

OPERATING LICENSE: CRITERIA (FINANCIAL QUALIFICATIONS)

Commission regulations do not require an operating license applicant to demonstrate the ability to raise money for potential capital expenditures.

TECHNICAL ISSUES DISCUSSED: Technical qualifications (effect of prior violations, infractions, and deficiencies); quality assurance program; management control systems and operations; reportable occurrences; differential settlement of structures; construction management; emergency plan; financial qualifications (decommissioning); release of radioactive materials in effluents to unrestricted areas; steam generator support structures.

INITIAL DECISION

Appearances

**Michael W. Maupin, Esq., and James N. Christman,
Esq., Hunton & Williams, P.O. Box 1535, Richmond,**

VA 23212, for the Applicant, Virginia Electric and Power Company.

Richard Foster, Esq., 1908-A Lewis Mountain Road, Charlottesville, VA 22903, for the Intervenor.

Anthony Gambardella, Esq., Office of the Attorney General, 1101 East Broad Street, Richmond, VA 23219, for the Commonwealth of Virginia.

Daniel T. Swanson, Esq., Steven Goldberg, Esq., and Stuart Treby, Esq., Nuclear Regulatory Commission, Washington, DC 20555, for the NRC Regulatory Staff.

I. INTRODUCTION AND BACKGROUND

1. This Initial Decision involves an application filed by Virginia Electric and Power Company (Applicant or VEPCO) for licenses to operate two pressurized water reactors owned by it and identified as the North Anna Power Station, Units 1 and 2. Each unit is designed to have an ultimate capability of 2,900 megawatts thermal and an ultimate gross electrical output of 984 megawatts. The station is located in Louisa County, Virginia, on Lake Anna, an impoundment of the North Anna River, approximately 40 miles north-northwest of Richmond.

2. On May 25, 1973, the Atomic Energy Commission published in the *Federal Register*¹ a Notice of Opportunity for Hearing on Application for Facility Operating License regarding the above-captioned proceeding. The notice provided, in part, that any person who had an interest which might be affected by the proceeding could request a hearing and file a petition for leave to intervene on or before June 15, 1973. On November 1, 1973, a Board designated to rule on petitions for leave to intervene granted a petition filed by Mrs. Geraldine Arnold and, on November 7, 1973, a Notice of Hearing was published in the *Federal Register*.² On January 22, 1974, the Board admitted the State of Virginia as a participant pursuant to 10 CFR §2.715(c).

3. On March 26, 1976, Sun Shipbuilding & Dry Dock Company (Sun Ship) filed a petition for leave to intervene in this proceeding, raising as a concern the structural integrity of the steam generator and reactor coolant

¹38 FR 13772.

²38 FR 30767.

pump supports for the facility, which had been manufactured by Sun Ship. On June 9, 1976, Sun Ship was admitted as a party to the proceeding. Applicant appealed Sun Ship's admission as a party, and on December 30, 1976, the Appeal Board ruled that, although Sun Ship did not meet judicial concepts of standing, it was equipped to make a significant contribution to the record, and admitted it as a party as a matter of discretion.³

4. On November 9, 1976, the parties (except for Sun Ship) submitted "Agreement on Statement of Issues" to the Board, in which the parties stipulated the statement of three contentions raised by Mrs. Arnold and in which she withdrew two others that she had previously raised. On November 15, 1976, the Board ordered a hearing to take evidence on the three stipulated contentions and that hearing was held November 30 through December 3, 1976.

5. Pursuant to Mrs. Arnold's motion of October 27, 1976, the Board, on December 15, 1976, adopted a somewhat modified version of the two contentions previously raised by Mrs. Arnold and then dropped by her. The parties presented testimony on these two issues on May 31 through June 2, 1977.

6. The Advisory Committee on Reactor Safeguards (ACRS) reported on its partial review of North Anna, Units 1 and 2, in a letter of October 26, 1976, to the Chairman of the Nuclear Regulatory Commission.⁴ The ACRS concluded that, if due regard were given to certain items mentioned in its letter and if there were satisfactory resolution of matters still under review, there was reasonable assurance that North Anna, Units 1 and 2, could be operated without undue risk to the health and safety of the public.⁵ On January 17, 1977, the ACRS again wrote to the Chairman of the Commission saying that it had completed its review of the application for a license to operate North Anna 1 and 2.⁶ The ACRS concluded that, if due regard were given to the items mentioned in its two letters, and if there were satisfactory completion of construction and preoperational testing, there was reasonable assurance that the station could be operated at power levels up to 2,775 MWt without undue risk to the health and safety of the public.⁷

7. During a conference call between the Board and the parties on April 13, 1977, the parties indicated that all of their differences relative to the Sun Ship contentions had been resolved except for one concern about the

³*Virginia Electric and Power Company* (North Anna Power Station, Units 1 and 2), ALAB-363, 4 NRC 631 (December 30, 1976).

⁴Staff Ex. 5.

⁵*Id.* at 3.

⁶Staff Ex. 13.

⁷*Id.* at 3. We interpret the letter to mean that each unit may be operated at levels up to 2,775 MWt.

temperature at which certain steel in the steam generator supports should be maintained during plant operation. The parties, which were active in this issue (Applicant, Staff, and Sun Ship), felt that the matter still unresolved could be submitted on affidavits. The Board approved that procedure by Order dated April 14, 1977. Sun Ship submitted the affidavits of the persons listed below and we have identified each affidavit with an exhibit number.

Affidavit	Exhibit No.
Peter Hepp	SS-1
William S. Pellini	SS-2

VEPCO submitted the following affidavits:

Herbert F. Corten	V-17
Robert D. Stout	V-18
Joseph M. McAvoy	V-19

The Staff submitted the affidavits of James P. Knight and Uldis Patapovs, which, with attachments are essentially one document which we identify as Staff 15. The affidavits above listed and identified are received.

8. In accordance with 10 CFR §2.715(a), many limited appearances were made during the proceedings, both in support of and in opposition to operation of the facilities.⁸ Both the Applicant and the Staff provided written responses to those questions asked by the limited appearances that were relevant to this proceeding.

9. Two of the limited appearances, one by June Allen of the North Anna Environmental Coalition (NAEC) and the other by Robert Pollard of the Union of Concerned Scientists (UCS), posed a variety of safety questions that had not been raised by the parties. Neither the NAEC, the UCS nor the speakers⁹ sought late intervention to provide new information; instead, they asked that the Board examine the questions and resolve the issues that they raised. Because the questions were relevant to the safety of the facility, we directed the Staff and VEPCO to respond in sufficient detail to help us to decide whether to adopt the issues.¹⁰ In order to decide this matter, we then studied the responses, additional comments by Mr. Pollard, and a variety of

⁸Tr. 2124-2275, 2991-3022, and 3563-3567.

⁹Mrs. Allen has participated in this proceeding by way of limited appearances and by assisting Intervenor Arnold since the beginning. Mr. Pollard is a newcomer to the proceeding.

¹⁰Tr. 3596-3602.

other documents. Among those documents were parts of the FSAR, the Safety Evaluation Report and Supplements 1 through 7 for the Units 1 and 2 operating license proceeding, parts of the PSAR, the Staff Safety Evaluation for the construction permit proceeding, parts of transcripts from ACRS meetings, several Regulatory Guides, reports related to soil and foundation issues including a preliminary USGS report on studies in Fairfax County, and some other relevant papers.

10. Within the Commission, the primary responsibility for evaluating the safety of nuclear power plants is delegated to the Staff and the ACRS.¹¹ In a contested proceeding on an application for an operating license, the Board is responsible for deciding those matters which have been put into controversy by the parties to the proceeding and matters which have been determined to be issues by the Commission or the Board. Matters not put into controversy by the parties are to be examined and decided by the Board only in extraordinary circumstances where the Board determines that a serious safety, environmental, or common defense and security matter exists. This authority is to be used sparingly.¹² After examining the information listed above, the Board has concluded that there is not sufficient reason to adopt the issues raised by Mrs. Allen and Mr. Pollard or to hold additional hearings to decide those issues.

11. The Board is satisfied that the issues raised by Mrs. Allen have received extraordinary attention by VEPCO, the Staff and the ACRS. Some information on remedial drainage, differential settling of key structures, and steam generator leakage problems was considered by the Board in deciding the issues in this proceeding. The seismic design criteria for the North Anna facility were considered in detail in earlier proceedings. The papers examined by the Board provided additional information on those matters and the extent to which they have been considered by the Staff and the ACRS.¹³ The Board has concluded that the questions raised by Mrs. Allen have been or are being resolved in a manner that provides reasonable assurance of the protection of the health and safety of the public.

12. As the Board sees it, the major issue raised by Mr. Pollard is that North Anna, Units 1 and 2, for which construction permits were issued on February 19, 1971, should be required to comply with the standards and criteria applied by the Staff to nuclear power plants for which construction permits are now sought. The Board considers each of Mr. Pollard's concerns to have been answered or to have been made a part of the major issue by the responses of VEPCO and the Staff to his limited appearance and to

¹¹10 CFR §1.20 and §1.61.

¹²10 CFR §2.760a.

¹³The NAEC made a similar presentation to the ACRS which indicated in a letter dated July 20, 1977, that it had no reason to alter its report of January 17, 1977.

additional questions asked by the Board. The major issue relates not only to North Anna but to all plants for which construction permits were issued before current standards and criteria became effective.

13. The rules and regulations of the Commission do not require that a facility comply with all the current standards in order to receive an operating license. Generally, compliance is required with the standards and criteria that were in effect and were listed in the PSAR when the construction permit was issued. Departures from the explicit requirements of some of the standards and criteria are permitted by the rules and regulations when those departures are described and justified. However, plants may at anytime, whether under construction or in operation, be required to be brought into compliance with a current standard when such action can be expected significantly to improve the safety of the facility. The extent to which a facility must comply with the explicit requirements of the latest standards and criteria in order to be considered safe to operate is, then, a matter of judgment. The Staff, the ACRS and in some cases the Commission make those judgments. The fact that there is disagreement among members of the Staff on some judgments is well known, having been heard by the Commission, the ACRS, committees of the Congress and published in the news media.

14. In its response to Mr. Pollard's limited appearance, the Staff identified provisions for isolating several pipe lines penetrating the containment as the places in which the design of Unit 1 does not comply with the explicit provisions of the General Design Criteria of Appendix A of 10 CFR Part 50. Those lines, and others listed in the FSAR as not complying, were studied in detail by the Board. Units 1 and 2 were designed in accordance with the requirements of Appendix A as it was published in 1967.¹⁴ Review of the PSAR and the Staff Safety Analysis for the construction permit proceeding indicates that the criteria for the design of these penetrations were carefully considered and justified by VEPCO and the Staff at a time when the current criteria were being developed. The departures from current criteria are described and justified in the FSAR and the Staff has described to the Board the bases for accepting the departures at the operating license stage. Although Mr. Pollard considers that some of the Staff's reasons for accepting the departures lack merit, our investigation revealed no extraordinary circumstances leading to serious safety concerns that would warrant the Board's reopening the hearings. We reached the same conclusion with regard to other questions raised in Mr. Pollard's limited appearance.

15. In the interim between the conclusion of the hearings on June 2, 1977, and the issuance of this Initial Decision, the Board received several

¹⁴32 FR 10213, July 11, 1967.

letters from the NAEC. The letters amplified some of the concerns voiced in Mrs. Allen's limited appearance, provided information concerning investigations by the Department of Justice into acts by VEPCO, and described contacts with the Staff. We concluded that the issues raised in the NAEC letters do not satisfy the criteria that would make it in the public interest for this Board to conduct further hearings. Intervenor Arnold, in a motion of October 10, 1977, asked that the hearings be reopened to obtain evidence on the Justice Department's investigation of "Alleged Material False Statements by Officers and Consultant of the Virginia Electric and Power Company." We received into evidence by Order of December 13, 1977, a Department of Justice memorandum but declined to reopen the hearings to receive further evidence. We also received letters from VEPCO and the Staff concerning problems encountered in the testing of Unit 1. These involved the lack of sufficient suction head for the recirculation spray pumps, the request for relief from certain pumps and mounting, and others. We consider the problems encountered in the testing of Unit 1 to be of the type that are normally resolved with the Staff and, where appropriate, the ACRS.

16. The record on which the decision is based in this proceeding consists of transcripts from prehearing conferences on May 7 and September 23, 1976, transcripts of evidentiary hearings held on November 30 through December 3, 1976, and May 31 through June 2, 1977, containing the testimony of witnesses presented by the parties, and all the exhibits identified and admitted into evidence as listed in Appendix A to this Initial Decision.

17. In making these findings and conclusions, the Board reviewed and considered the entire record of the proceeding and all of the proposed findings of fact and conclusions of law submitted by the parties in the proceeding. All of the proposed findings of fact and conclusions of Law submitted by the parties which are not incorporated directly or inferentially in this Initial Decision are rejected as being unsupported in law or fact or as unnecessary to this Initial Decision.

II. FINDINGS ON ISSUES

18. Six issues were established for resolution by the Board in this proceeding. Issues 1 and 2 are Intervenor Arnold issues as adopted by the Board in its Order of December 15, 1976. Board Issue 1 is concerned with VEPCO's commitment and technical qualifications to operate North Anna, Units 1 and 2, in compliance with the Commission's radiological health and safety requirements. Board Issue 2 is concerned with the implementation of VEPCO's quality assurance program in the construction of Units 1 and 2.

Issues 3, 4 and 5 are Intervenor Arnold contentions as they were stipulated in the Agreement on Statement of Issues, dated November 9, 1976; Contention 3 is concerned with VEPCO's emergency plan for the North Anna plant, Contention 4 with VEPCO's financial qualifications and Contention 5 with VEPCO's experience in operation of Surry, Units 1 and 2, as it related to assurance that radioactive releases in effluents from North Anna will be in compliance with the Commission's regulations. The final issue is the remaining Sun Ship issue that is concerned with the minimum operating temperature of the type A-36 steel in the steam generator support structures for Units 1 and 2.

Board Issue 1

Does VEPCO's performance [in the] operation of Surry, Units 1 and 2, and in the construction of North Anna, Units 1 through 4, demonstrate that it lacks the commitment or technical qualifications, or both, necessary to operate North Anna, Units 1 and 2, safely and in compliance with all applicable radiological health and safety requirements, including operational quality assurance requirements?

19. This issue deals only with VEPCO's commitment and technical qualifications to operate North Anna, Units 1 and 2, safely and in compliance with applicable regulations. The record contains considerable questioning and testimony that relate primarily to VEPCO's performance during construction of North Anna, Units 1 through 4, and some that related to construction at Surry. The Board considers such information to be relevant primarily to the issue of commitment and only secondarily to the question of technical qualifications. The technical qualifications required to operate a nuclear power plant differ in many respects from those required to design and construct such a plant. VEPCO's qualifications to do the latter are not a part of this issue.

20. Testimony concerning VEPCO's commitment to safe operation of North Anna, Units 1 and 2, was provided by Mr. John M. McGurn, Chairman of the Board of Directors and Chief Executive Officer of VEPCO, in response to a request from the Board for the appearance of someone from the corporate board level. Mr. McGurn said that VEPCO "is and will continue to be firmly committed to the construction and operation of its nuclear power facilities in a manner that will provide for the full protection of the public health and safety, and in conformance with all federal, state and local regulations."¹⁵ He stated that VEPCO's top management keeps

¹⁵Tr. 3121-3122.

informed about the Company's nuclear power program¹⁶ and that quality assurance is considered a vital function by the Company.¹⁷ He testified that VEPCO is committed to keeping the Commission informed about all developments that are safety related and he attached to his testimony a statement of Company policy reflecting that commitment.¹⁸ Mr. McGurn conceded that VEPCO had erred in the past but believed that substantial improvements had been made and that VEPCO's performance would continue to improve.¹⁹

21. VEPCO's commitment to safety is in part reflected in its quality assurance program. The Executive Manager, Licensing and Quality Assurance, testified that the importance of quality assurance is recognized throughout the Company.²⁰ He stated that his recommendations to upper management, although examined in depth, have always been accepted in principle.²¹ Also, all departments associated with the nuclear program are cooperating to achieve high quality.²² The Licensing and Quality Assurance Department was formally established in 1973 with the manager reporting directly to the Senior Vice President-Power.²³ Before that time, the quality assurance personnel for construction reported to the Director, Engineering and Construction.²⁴ Early in 1975 the organization for quality control of operations at the Surry Station was enlarged and authority for quality control at Surry was transferred from the Operations and Maintenance Department to the Licensing and Quality Assurance Department.²⁵ This same organizational arrangement has been provided for operations at North Anna.²⁶

22. VEPCO's program for quality assurance in the operation of nuclear power plants is described in VEPCO Topical Report VEP-1-3A.²⁷ The program is structured to conform to the requirements of 10 CFR Part 50, Appendix B, and industrial standards such as ANSI N45.2-1971, and ANSI

¹⁶Ex. V-16 at 3.

¹⁷*Id.* at 4.

¹⁸Attachment JM-2 to Ex. V-16. The Board observes that this policy statement was formalized on November 17, 1975, shortly after the Initial Decision, LBP-75-54, in the material false statement proceeding was issued on September 10, 1975.

¹⁹Tr. 3156-3170.

²⁰Testimony of E. Ashby Baum at 3-4 following Tr. 3037.

²¹*Id.*

²²*Id.*

²³*Id.* at 2-4.

²⁴Testimony of James L. Perkins at 4-5 following Tr. 3037.

²⁵Baum at 6.

²⁶*Id.*

²⁷Ex. V-14.

N18.7-1972; it follows other guidance developed by the Commission.²⁸ The program has been reviewed and approved by the Staff.²⁹ The procedures for implementing the program are provided in the VEPCO Nuclear Power Station Quality Assurance Manual.³⁰ The operational quality assurance staff has increased from one engineer at Surry and one technician at North Anna in 1972 to eight engineers and technicians at Surry, nine at North Anna and three in the Richmond office, in addition to the Supervisor, Quality Assurance, Operations and Maintenance.³¹ The quality assurance personnel are trained and qualified.³² At the time of the hearing, the operational quality assurance personnel at North Anna were auditing the preoperational testing program for Units 1 and 2.³³

23. VEPCO's Director, Nuclear Operation, testified that experience gained since Surry, Units 1 and 2, went into operation in 1972 and 1973, respectively, has been used to provide increased assurance that North Anna, Units 1 and 2, will be operated safely.³⁴ As we discuss later under Intervenor Arnold Contention 5, recent changes in organization, a larger, well trained health physics staff, improved equipment, and support available from the Richmond office should provide a health physics program at North Anna that is much improved over the early program at Surry.³⁵

24. According to testimony provided by VEPCO, the qualifications of the operators at North Anna far exceed the requirements of ANSI N18.1-1971, which provides standards for the selection and training of nuclear power plant personnel.³⁶ The operations personnel have done well on their NRC-administered examinations.³⁷ Some operations personnel have been at North Anna for about four years preparing and improving operating procedures and familiarizing themselves with the station as it was being constructed.³⁸ A control room simulator has been provided recently to improve the training and retraining of operating personnel.³⁹ The operations staff in the system office in Richmond has been augmented with experienced personnel who will provide engineering and operational support for North An-

²⁸*Id.* 17.2-1, testimony of J. W. Martin at 3-4 following Tr. 3037.

²⁹Ex. V-14.

³⁰Martin at 7.

³¹*Id.* at 8-9.

³²*Id.* at 6-7, Ex. V-14 at 17.2-20 through 17.2-21.

³³Martin at 11-16.

³⁴Testimony of R. B. Sylvia at 9, following Tr. 3037.

³⁵*Id.* at 2-5.

³⁶*Id.* at 8-9.

³⁷*Id.*

³⁸*Id.*

³⁹*Id.*

na when necessary.⁴⁰ The management personnel and the engineering staff that have been assigned to North Anna are experienced and appear to be well qualified.⁴¹

-25. As part of the design and construction program for North Anna, Units 1 and 2, VEPCO instituted a formal program of design improvement based on experience at Surry. This program investigated more than 200 areas for improvement of safety and nonsafety related equipment.⁴² These investigations resulted in major changes in secondary water treatment to reduce the likelihood of tube failures in the steam generators and in substantial improvements to the waste handling systems, both having the objective of reducing exposure to plant personnel and the amount of radioactivity in plant effluents.

26. The Staff provided several witnesses whose testimony concerning the commitment of VEPCO's management and the qualification of VEPCO's staff was largely corroborative of the VEPCO testimony. The Staff concluded that the organizational structure and qualifications of personnel at the North Anna facility are adequate to provide an acceptable operating staff.⁴³ They further concluded that the quality assurance program for the operations phase has been described and organized in compliance with the Commission's requirements and will be staffed with qualified personnel.⁴⁴

27. At the time of the hearing, the North Anna operational quality assurance program was still being inspected by the Staff. No non-compliances had been found, but some discrepancies or program weaknesses had been identified. These weaknesses were being corrected by VEPCO, and all parts of the quality assurance program that directly affect operational safety will have to be satisfactorily implemented before the Staff will issue an operating license.⁴⁵ The Staff noted as significant that, unlike Surry, the North Anna units will go into operation with the quality assurance program fully described and implemented.⁴⁶

28. Finally, the Staff concluded that VEPCO management has demonstrated that it possesses the commitment necessary to operate North Anna, Units 1 and 2, safely and in compliance with all applicable radiological and health requirements.⁴⁷ This conclusion was based in part

⁴⁰*Id.* at 10.

⁴¹*Id.* at 12.

⁴²*Id.* at 6.

⁴³Supplemental Testimony of Alexander W. Dromerick and Olan D. Parr following Tr. 3037, at 3.

⁴⁴*Id.* at 3-4.

⁴⁵Supplemental Testimony of the Nuclear Regulatory Commission, Office of Inspection and Enforcement, on Board Questions 1 and 2 following Tr. 3037 at 84-89.

⁴⁶*Id.* 89-92; Tr. 3448.

⁴⁷NRC Supplemental Testimony at 3, Tr. 3388-3389, 3558-3561.

on the Staff's evaluation of VEPCO's past performance in the operation and construction of nuclear power stations. The Staff testimony included an extensive analysis of past inspection and enforcement actions involving VEPCO's nuclear power stations.⁴⁸ The Staff found that VEPCO had been responsive in correcting noncompliances and adopting Staff recommendations,⁴⁹ that VEPCO's performance had improved over the years⁵⁰ and that the noncompliances found have been neither so numerous nor so serious as to be cause for denying VEPCO licenses to operate North Anna, Units 1 and 2.⁵¹

29. Intervenor Arnold produced no witnesses and no evidence to show that the qualifications and training of the operations, health physics, quality assurance, or other personnel, who are to be involved in the operation of North Anna, Units 1 and 2, do not satisfy the Commission's requirements. Except for emergency procedures, the adequacy of the procedures and specifications that are to govern operation of the plant were not challenged. Instead, Mrs. Arnold contended that the record of civil penalties levied against VEPCO, noncompliances described in inspection reports, and responses of VEPCO and Staff witnesses to cross-examination during the hearings provide substantial evidence of lack of commitment or technical qualifications.

30. A noncompliance is a failure to comply with the Commission's rules and regulations or the criteria, standards, procedures or specifications that govern the design, construction, or operation of a nuclear plant. Non-compliances are classified as violations, infractions, and deficiencies in decreasing order of severity of actual or potential consequence to the health and safety of the public.⁵² The usual enforcement action is to require the utility to identify and correct the cause of the noncompliance. If the number and type of noncompliances are such as to warrant stronger action, a civil penalty is levied.⁵³ None of VEPCO's noncompliances has been so serious as to constitute a violation.⁵⁴ However, VEPCO has been assessed two civil penalties in its operation of Surry, Units 1 and 2, and two civil penalties during construction of North Anna, Units 1-4—more than any other utility.⁵⁵

31. In examining Mrs. Arnold's concerns, the Board will first consider

⁴⁸NRC Supplemental Testimony.

⁴⁹Tr. 3409, 3493-3495.

⁵⁰Tr. 3330, 3376-3377, 3493-3495.

⁵¹Tr. 3307-3310, 3387-3388, 3558-3561.

⁵²Testimony of Francis J. Long following Tr. 2294 at 8-12.

⁵³Tr. 3495-3497.

⁵⁴Tr. 3300.

⁵⁵Tr. 3110, 3148.

the information provided by the parties regarding operation of the units at Surry and then the relevant information about construction at North Anna. The first civil penalty at Surry was levied against VEPCO in 1973. At that time the Commission became concerned about the lack, throughout the industry, of uniformity in management controls in meeting quality assurance criteria. Management audits were conducted at several facilities by the Staff and the audit of the operations at Surry in March and April of 1973 resulted in the identification of 28 items of noncompliance and a civil penalty of \$38,000.⁵⁶ Corrective action had been taken on all the items by the end of 1973.⁵⁷

32. The 1973 management inspection was repeated in 1975. An inspection of administrative procedures and quality assurance implementing procedures, which included many of the areas of the 1973 and 1975 inspections, was conducted in June 1976. Five infractions and three deficiencies were identified in the 1975 inspection.⁵⁸ One infraction and one deficiency were found in the 1976 inspection.⁵⁹ None of the items identified in any of these inspections resulted in an occurrence which affected the health and safety of the public.⁶⁰ Based on the results of these and other routine inspections, the Staff concluded that VEPCO had made significant improvements in management controls at Surry from 1973 through 1976.⁶¹

33. An inspection conducted in October 1974 to determine whether VEPCO had implemented upgraded security measures at Surry identified nine items of noncompliance. Three of these noncompliances were considered to be serious enough to warrant imposing a civil penalty of \$10,000 in January 1975.⁶² In taking corrective action, VEPCO changed from a contract guard force to a company guard force, increased the size and quality of the force, improved the physical security system and strengthened the administrative controls.⁶³ Although eleven noncompliances were identified by physical security inspections in 1975 and 1976, they were less serious in nature and the Staff had concluded that VEPCO had taken the corrective actions necessary to satisfy the physical security requirements.⁶⁴ However, an investigation in May 1977 of allegations involving improper security practices at Surry identified four more items of apparent noncompliance.

⁵⁶NRC Supplemental Testimony at 127.

⁵⁷*Id.* at 128.

⁵⁸*Id.* at 128-130.

⁵⁹*Id.* at 130-131.

⁶⁰*Id.* at 132.

⁶¹*Id.*, Tr. 3376-3378.

⁶²NRC Supplemental Testimony at 133-134.

⁶³*Id.* at 135.

⁶⁴Tr. 3311.

The Staff now concludes that the previous corrective actions have been inadequate and that additional positive measures must be taken by VEPCO.⁶⁵ Mr. McGurn indicated that VEPCO will make any changes that are necessary in order to comply with the security requirements.⁶⁶

34. Certain revisions to the Commission's regulations governing the physical protection requirements at licensed nuclear facilities became effective on February 24, 1977.⁶⁷ These revisions require a further upgrading of physical protection measures and VEPCO has submitted a revised security program for Surry and North Anna facilities in order to comply with the regulatory requirements.⁶⁸ The Staff had not evaluated the new program at the time of the May 31-June 2, 1977, hearings, but inspections will be conducted to assure that the requisite improvements have been made at North Anna before operating licenses are issued.⁶⁹

35. During the preoperational testing and operation of the Surry facility from December 1970 through April 1977, the Staff made 102 inspections that involved about 745 man-days at the site. One hundred fifty-eight non-compliances consisting of 130 infractions and 28 deficiencies were identified.⁷⁰ Some of the noncompliances resulted in the civil penalties described above. Although the Staff has no formal basis for comparing the performance of utilities that operate nuclear plants, the Staff witnesses opined that the number of noncompliances at Surry was greater than for other similar units in the region but about average for the entire U. S. and that they were no more or no less serious in nature.⁷¹ By the Staff's evaluation, one of the noncompliances, the inadequate design of the piping restraints for a decay heat release valve in the steam system, may have contributed to the death of two VEPCO employees during the startup of Surry, Unit 1. None of the items involved occurrences which affected the health and safety of the public.⁷² All items have been or are being resolved to the satisfaction of the Staff. Based on an analysis of the noncompliances and VEPCO's responsiveness in meeting commitments to take corrective action, the Staff concluded that VEPCO has made significant and continued improvements in the management control systems and the operations at Surry.⁷³

36. Nuclear power plant operators are required to report to the Commission unscheduled or unanticipated operational events that have public

⁶⁵Tr. 3304-3305, 3312-3318.

⁶⁶Tr. 3126-3127.

⁶⁷10 CFR §73.55.

⁶⁸Tr. 3081, 3209.

⁶⁹Tr. 3295.

⁷⁰NRC Supplemental Testimony at 36-27, Staff Ex. 6D.

⁷¹Tr. 3306-3310, 3363-3364.

⁷²NRC Supplemental Testimony at 15-18.

⁷³*Id.*, Tr. 3376-3377.

health or safety significance or environmental significance. These events sometimes involve noncompliance. From January 1971 through March 1977, twenty-four environmental events were reported at Surry. These events involved the water temperature in the James River in the vicinity of the plant cooling water discharge structure and impingement of fish on the intake screens. According to the Staff, appropriate corrective action has been taken to reduce thermal discharge excursions above assigned limits and to eliminate fish impingement mortality.⁷⁴

37. During the same period there were 197 reportable reactor events, 122 for Unit 1 and 75 for Unit 2. Most of these were caused by equipment failures; 24 percent resulted from faulty procedures or personnel errors.⁷⁵ According to the Staff's analysis, none of the events involved concurrent inoperability of redundant emergency core cooling systems, so effective core cooling was always possible. VEPCO has taken actions deemed necessary to prevent recurrence of these events.⁷⁶ Several of the events resulted in the release of radioactivity in effluents to unrestricted areas. None of the releases was in excess of the NRC regulatory limits or the current technical specification limits.⁷⁷

38. Finally, Mrs. Arnold expressed concern over VEPCO's actions, or lack of action, in an event that involved the possible differential settlement of major structures at Surry. If such settlement were great enough, critical piping between the structures could be damaged. In 1972 VEPCO had information suggesting the existence of differential settlement between a reactor containment and an auxiliary building. The indicated total settlement was as great as 1.5 inches and the differential settlement was about 0.7 inches.⁷⁸ The Surry Power Station FSAR predicted long-term settlements to be less than 0.5 inches.⁷⁹ The lone benchmark that was used as a common reference to establish elevations at the site was in a poor location near the riverbank. The surveyors suspected that the benchmark and not the buildings had moved but made no effort to substantiate this suspicion and the possible settlement was not reported to the Commission.⁸⁰

39. After repeated requests for more substantial evidence by an insurance inspector, VEPCO examined the structures for any indications of differential settlement in 1974 and found none. No surveys were made, however, until 1975 when a concerned individual brought the matter to the

⁷⁴Staff Supplemental Testimony at 103-104.

⁷⁵*Id.* at 104-113.

⁷⁶*Id.* at 111.

⁷⁷*Id.* at 119-120 and see paragraphs 96-101 herein.

⁷⁸Ex. I-3 at 3, Tr. 3345.

⁷⁹*Id.*

⁸⁰Tr. 3340-3346.

attention of the Staff and the Staff requested information.¹¹ The 1975 survey and inspection of structures showed that no significant settlement had occurred since 1972.¹² Whether this benchmark had moved prior to 1972 could not be determined because its initial elevation had not been established precisely.¹³

40. The Staff concluded that the total and differential settlements that might have occurred did not give rise to a safety concern. New benchmarks were established and VEPCO is now monitoring the settlement of critical structures.¹⁴ Although Staff witnesses stated the opinion that VEPCO should have reported their findings in 1972, the Staff conclusion was that no noncompliance had actually occurred and that the event had not required reporting under the technical specifications.¹⁵

41. We now turn to the experience at North Anna during construction to date of Units 1-4. Most of this experience bears more directly on the effectiveness of VEPCO's quality assurance program for construction which is the subject of Board Issue 2. Some of the experience can be related to VEPCO's commitment or technical qualifications, and that relationship will be considered here.

42. In 1975 hearings were conducted by an Atomic Safety and Licensing Board on allegations that VEPCO had made material false statements, within the meaning of Section 186 of the Atomic Energy Act, with regard to the geology of the North Anna site. The false statements dealt with knowledge about geologic faults at the site and included failure to provide information about the faults to a Licensing Board in the construction permit proceeding for Units 3 and 4. The Licensing Board in the false statements proceeding concluded that VEPCO had made twelve material false statements about matters important to safety and levied a civil penalty of \$60,000.¹⁶ In ruling on exceptions to the Licensing Board decision, the Appeal Board decided that only four of the statements were false and reduced the fine to \$17,500.¹⁷ On review the Commission found seven false statements and imposed the final penalty of \$32,500.¹⁸ This decision is now on appeal to the U. S. Court of Appeals for the Fourth Circuit.¹⁹

¹¹Tr. 3346, 3357-3358.

¹²Tr. 3343, NRC Supplemental Testimony at 22-23.

¹³Tr. 3344.

¹⁴NRC Supplemental Testimony at 23-25.

¹⁵*Id.*, Tr. 3345-3349.

¹⁶LBP-75-54, 2 NRC 498 (September 10, 1975).

¹⁷ALAB-324, 3 NRC 347 (April 15, 1976).

¹⁸CLI-76-22, 4 NRC 480 (November 12, 1976).

¹⁹*Virginia Electric and Power Company v. NRC*, Nos. 76-2275 and 76-2331, 4th Cir., pet. for review filed November 12, 1976.

43. The seriousness with which this matter is regarded is reflected in the decisions of the Licensing Board, the Appeal Board and the Commission, in the civil penalty, and in an investigation by the Department of Justice into whether VEPCO had violated criminal laws.⁹⁰ The information obtained by the Department of Justice indicates, as we understand it, that VEPCO made an ill-advised, unnecessary, and unsuccessful attempt to conceal from the public the presence of a geologic fault at the North Anna site until it could complete an investigation and to avoid a delay in the issuance of construction permits for Units 3 and 4.⁹¹ Mrs. Arnold sees VEPCO's behavior in this incident as evidence of a lack of commitment to provide the Commission with full and correct information on matters of safety significance. Although VEPCO did not inform the Licensing Board in the Units 3 and 4 proceedings about the investigation, it did notify the Staff. In its decision, the Appeal Board said that "it was neither claimed nor shown that VEPCO intended to deceive the Commission regarding the geologic conditions at the North Anna site."⁹² Also, the Appeal Board found "nothing in circumstances attendant to the four established Section 186 violations here which suggests to us some possible deficiency in VEPCO's 'internal management system' which might bring into question the company's ability to fulfill regulatory responsibilities."⁹³ The Commission affirmed the Appeal Board decision except for the number of false statements and the amount of the fines.⁹⁴ While we do not condone VEPCO's activities, outlined above, we are cognizant that the Appeal Board, with Commission affirmation, has already found that the Applicant's actions in that situation did not require a license suspension or revocation, penalties which might have been imposed. The Board does not feel that those past VEPCO transgressions, which have been fully reviewed by the Commission, provide the basis for denying an operating license for Units 1 and 2.

44. Another incident which involved the failure of VEPCO or its contractor to transmit information to the Staff occurred in 1974 and was cited by Intervenor Arnold as a cause for concern about VEPCO's commitment to safety. As a result of an allegation by Sun Ship, the Staff made an in-

⁹⁰By an Order of December 12, 1977, the Board denied a motion by Mrs. Arnold to reopen the hearings to obtain evidence about the investigation by the Department of Justice. The Board did, however, admit into evidence, as Int. Ex. 1, and consider a memorandum by Bradford F. Whitman of the Department of Justice which summarizes the information obtained during the investigation.

⁹¹VEPCO expected the investigation to show, and it did show the fault to be not capable and the site to be acceptable for construction of a nuclear power plant.

⁹²3 NRC 347 at 389.

⁹³*Id.* at 392.

⁹⁴CLI-76-22, 4 NRC 480 at 492 (November 12, 1976).

investigation into whether VEPCO had violated the Commission's regulations by failing to disclose information in its possession concerning a fracture mechanics study that was related to the repair of the steam generator and coolant pump support structures.⁹⁷ The study was made by VEPCO's contractor, Stone & Webster, and a report, DC-81, was available early in 1974. There was no evidence that DC-81 had been transmitted to VEPCO⁹⁸ and it was first disclosed to the NRC at an ACRS meeting in 1976.⁹⁹ The study included the calculation of the maximum flaw size that could be accepted in the ultrasonic examination of the repair welds and the testing of steel of the types used in the structures.⁹⁹ The Staff members agreed that information contained in DC-81 could have had an effect on their evaluation of the repairs to the structures,⁹⁹ but the Staff's final determination was that the information did not have safety significance and VEPCO had not violated the Commission's requirements.¹⁰⁰ There was no evidence that the material tested came from the North Anna supports. All the welds in the supports were replaced and no detectable cracks or linear indications were permitted in the welds,¹⁰¹ so the analysis of maximum flaw size went unused.

45. The fourth civil penalty was levied against VEPCO following a comprehensive investigation, by the Staff in the fall of 1976, into allegations involving welding and other deficiencies in construction of North Anna, Units 1 and 2. During the investigation, 12 of the 52 allegations were substantiated. It is possible that some of the other allegations were valid, but they could not be substantiated. Although the Staff considered the substantiated allegations to be of minor importance when taken separately, collectively they indicated the need for improvements and a civil penalty of \$31,900 was assessed against VEPCO.¹⁰² During a discussion of this investigation with the Advisory Committee on Reactor Safeguards (ACRS), Dr. Ernst Volgenau, Director of the Office of Inspection and Enforcement, NRC, attributed the problems that led to this investigation to weaknesses in supervision, leadership, and management control at North Anna. These problems were not found at other sites where, as at North Anna, Stone & Webster

⁹⁷Staff Ex. 7. IE Investigation Rpt. Nos. 50-338/77-3 and 50-339/7-2 at 2 (Staff Ex. 7, Ref. 20).

⁹⁸*Id.* at 7-9.

⁹⁹Tr. 3505.

⁹⁹Staff Ex. 7, Ref. 20 at 7-8.

⁹⁹*Id.*

¹⁰⁰Tr. 3506, 3557-3558.

¹⁰¹Staff Ex. 7, Ref. 20 at 8-9; Tr. 3534-3535.

¹⁰²NRC Supplemental Testimony at 140-141.

Engineering Corp. (Stone & Webster) is the architect-engineer-
constructor.¹⁰³

46. As a result of this investigation and additional urging by the Staff,¹⁰⁴ VEPCO has made some substantial changes in construction management at North Anna. Improvements have been made in the procedures and organization of Stone & Webster forces. Supervisors have been moved closer to the work areas and engineering surveillance of the work has been increased.¹⁰⁵ Additional engineers and designers have been provided for the field support office.¹⁰⁶ Organizational changes and a construction training program have been instituted to improve welding activities.¹⁰⁷ An advisory/assistant group has been formed to review quality-related problems.¹⁰⁸

47. Changes have also been made in VEPCO's own approach to construction management. A site construction supervision group and a project control supervision group have been added to the VEPCO organization.¹⁰⁹ VEPCO personnel will now take a more active role in monitoring the construction work and the handling of nonconforming items.¹¹⁰ In the future VEPCO plans to assume a more active role in directing major construction.¹¹¹

48. The Staff began its followup inspection in March 1977, to determine whether VEPCO was implementing the corrective measures that it had committed to take. The scope of this inspection program was extensive, involving a large sample, and in some instances a complete examination, of each VEPCO commitment. The inspection program confirmed that VEPCO has effectively implemented the commitments to improve management and quality controls over the project. The commitments that had not been fully implemented will be examined again in future inspections and operating licenses will not be issued until all identified items are satisfactorily resolved.¹¹²

49. Mrs. Arnold suggested during the proceeding that the handling of certain other problems at Surry and North Anna brings into question VEPCO's technical qualifications. Among these were that chlorite seams in the North Anna excavations, judged to be geologic faults by some experts in

¹⁰³Tr. 3490-3492.

¹⁰⁴NRC Supplemental Testimony at 141-142.

¹⁰⁵Testimony of S. C. Brown, Jr., following Tr. 3037 at 9-12, Tr. 3175.

¹⁰⁶*Id.* at 13.

¹⁰⁷*Id.* at 14-15.

¹⁰⁸*Id.* at 15-17.

¹⁰⁹*Id.* at 18.

¹¹⁰*Id.* at 19, 25-28.

¹¹¹Tr. 3757-3758.

¹¹²NRC Supplemental Testimony at 144-146.

1970, were not recognized as faults by VEPCO's contractors and consultants until 1973. VEPCO's problems with the denting and leaking of tubes in the steam generators at Surry and with settlement of structures founded on saprolite at North Anna were other examples.

50. The matter of the geologic faults was the subject of exhaustive hearings and need not be examined again in this proceeding. We consider the matter to be more relevant to VEPCO's qualifications to design and construct than to operate a nuclear plant. We note, however, that VEPCO experts did establish that the chlorite seams were faults and notified the Staff when they were identified as such. The matter was resolved by the determination that the faults are not capable as defined in 10 CFR Part 100, Appendix A, and that the North Anna site is an acceptable site for Units 1-4.¹¹³

51. Surry Units 1 and 2 have been plagued with corrosion, denting, and leaking of tubes in the steam generators. Similar problems are being experienced at other nuclear plants. They appear to result in part from chloride in the water in the secondary system and have been most serious in plants that use seawater or other highly saline water for condensing steam in the turbine condensers.¹¹⁴ There is usually some leakage of the saline water into the secondary system. This is a problem of the industry and nothing in the record reflects unfavorably on measures taken by VEPCO in attempting to mitigate the problems at Surry. Also, VEPCO has made changes at North Anna to give as much assurance as can presently be provided that the problems will not be encountered there.¹¹⁵ We find nothing in this matter that reflects unfavorably on VEPCO's technical qualifications to operate the North Anna facility safely.

52. During construction of North Anna, Units 1 and 2, certain of the structures founded on saprolite have settled more than had been predicted and published in the FSAR. Differential settlement of parts of the turbine building has required that shimming be done to maintain the crane rails at the same elevation.¹¹⁶ Differential settlement between the main steam valve building and the service building of Unit 2 has required replacement of a section of service water piping between the buildings to reduce the stresses that might occur over the life of the plant.¹¹⁷ More importantly, there has been sufficient differential settlement of the service water pump house at the service water reservoir to require that expansion joints be installed to prevent the service water piping from being overstressed.¹¹⁸ Also, the wing

¹¹³LBP-74-49, 7 AEC 1183 at 1221 (June 27, 1974).

¹¹⁴Tr. 3069-3071, 3081-3084.

¹¹⁵Tr. 3070-3071, 3227-3228, 3456-3467, 3585-3589.

¹¹⁶Tr. 3277.

¹¹⁷Tr. 3261.

¹¹⁸Staff Ex. 1 at 9-4 through 9-5.

walls have had to be separated from the pump house to prevent differential settlement from excessively damaging the walls.¹¹⁹ The problems with the service water pump house are of greatest concern because failure of the service water lines at the service water reservoir could result in loss of the primary sink for dissipating the heat from Units 1 and 2 in an emergency. The plant would then have to depend on the backup system which would supply service water from Lake Anna.¹²⁰

53. Mrs. Arnold was concerned because the settlement was greater than had been calculated by VEPCO and its contractor and because they had failed to properly evaluate the effect of the settlement and to realize that a safety problem existed. Also, the properties of the saprolite were still being determined at a time when the structures were essentially complete. The uncertainties may be such that it is still not possible to make an accurate prediction of the settlement. Finally, VEPCO had to revise its original prediction of ground water elevations for the completed plant and the water content of the saprolite could affect the settlement.

54. The record shows that VEPCO's contractor made the borings and the engineering tests that are generally considered to be necessary for designing foundations. The fact that the settlement of some structures is greater than had been predicted is not considered to be unusual, although the differential settlement of the pump house might be greater than usual.¹²¹ However, VEPCO's contractor made an erroneous assumption in the calculation of the effect of the settlement on the stress in the service water piping. The error was not recognized by VEPCO's engineers. It appears that neither VEPCO nor the contractor realized a safety problem existed until the error was pointed out by the Staff.¹²²

55. Based on elevations taken from the original borings, an elevation of 256 feet was used as the ground water level in designing the plant structures. The presence of water in some of the excavations during construction caused VEPCO to conclude that the ground water level could be higher at some locations sometime during the life of the plant.¹²³ As a result VEPCO analyzed the effect on the structures of having a static ground water level at the ground surface. This is the maximum possible level and varies from about elevation 270 feet south of the reactor buildings to 250 feet at the lakeshore.¹²⁴ The analysis showed the structures to be stable and the stability to be only slightly affected by the change in assumed ground water level.¹²⁵

¹¹⁹*Id.*

¹²⁰*Id.*

¹²¹Tr. 3283-3285.

¹²²Tr. 3468-3470.

¹²³Tr. 3256-3259.

¹²⁴Tr. 3257, FSAR at 2.4-36a through 36b.

¹²⁵*Id.*

56. Failure of VEPCO to recognize a safety problem in the differential settlement of the pump house does reflect unfavorably on its technical qualifications. Although the incident was concerned with design and construction, failure to recognize a problem in a system with important safety functions is also relevant to qualifications to operate a plant. However, we do not make the same finding with regard to the question of the ground water elevation. Although the original prediction seems to have been too low, the evidence does not show that an unreasonable assumption or omission of a significant factor was responsible. Conditions observed during construction were interpreted correctly to indicate the existence of a possible safety problem. Analyses were undertaken to resolve the question, and the highest reasonable values for ground water elevations were used in the calculations. We find no cause for concern in VEPCO performance in this matter.

57. The fact that the Staff recognized the error in the calculation of the effects of the pump house settlement and alerted VEPCO to the safety problem gives evidence of the importance of their independent review of problems of systems that have important safety functions. Since the problem was recognized, the saprolite and the foundation conditions have been the subject of much additional study and testing by VEPCO. The results indicate that saprolite will safely support the service water reservoir and the other structures founded on it.¹²⁶ These results have been evaluated by the Staff and its consultants and by the ACRS and its consultants. They concur in VEPCO's conclusions.¹²⁷ The Staff has required and VEPCO is installing a drain system to control the ground water elevation below the service water pump house. VEPCO's analyses do not show the need for such a system, but it is required by the Staff to provide an additional margin of stability against liquidation under earthquake conditions and to reduce the potential for settlement caused by fluctuations in ground water level.¹²⁸ The reasons for the continuing settlement are not entirely clear. VEPCO is now predicting future settlement on the basis of measurements of settlement over the past two and one-half years.¹²⁹ Monitoring of the settlement of important structures will continue. Limits have been established on the amount of settlement that can occur before remedial action must be taken.¹³⁰ The Board finds that the problem of differential settlement has been dealt with satisfactorily since it was identified as a significant safety matter.

¹²⁶Tr. 3247-3248, 3279-3280; FSAR 2.5-15 through 30, 3.6-1 through 3.11-9.

¹²⁷Staff Ex. 3 at 2-11 through 2-15; Staff Ex. 4 at 2-1; ACRS letters of October 26, 1976, January 17, 1977, and July 20, 1977.

¹²⁸Tr. 3247-3248, 3279; Staff Ex. 1 at 2-18 through 2-19.

¹²⁹Tr. 3246-3247.

¹³⁰Tr. 3277-3278.

58. After careful consideration of the entire record before us, the Board finds that the qualifications of the operations and support staff that are to be involved in the operation of North Anna, Units 1 and 2, will meet or exceed the requirements of the Commission. Also, the operational quality assurance program and staff will meet or exceed the requirements of the Commission before operating licenses are issued. In reaching these findings we rely heavily on the testimony of the Staff. However, as we indicated earlier, the evidence that leads to the findings is uncontroverted in this proceeding. As a result of the findings, we conclude that VEPCO has the technical qualifications necessary to operate North Anna, Units 1 and 2, safely and in compliance with all applicable radiological health and safety requirements including operational quality assurance requirements.

59. Surry Units 1 and 2 have been operated for a total of about 9 reactor years. There have been noncompliances and unintended releases of radioactivity. These have resulted from equipment failures, design errors, faulty procedures, and personnel errors. However, the record shows that the operations at Surry have been steadily upgraded and that none of the events has posed a threat to the health and safety of the public. Furthermore, the experience at Surry has been used to provide greater assurance of safe operation from the beginning at North Anna. On consideration of the entire experience, the Board concludes that errors by VEPCO in operation of the Surry units and design and construction of the North Anna units have been neither so numerous nor so serious as to provide substantial support for an adverse finding with regard to VEPCO's technical qualifications to operate North Anna, Units 1 and 2, safely.

60. We turn now to the question of VEPCO's management's commitment to safe operation of North Anna, Units 1 and 2. Although non-compliances have occurred in operations at Surry and in construction at North Anna, and some of these have led to civil penalties, the Board accepts the assurances of Mr. McGurn and other VEPCO witnesses that the management is committed to operating VEPCO's nuclear plants safely and in compliance with the Commission's rules and regulations. The past decade has been a period of continual upgrading and elaboration of the Commission's requirements that are intended to ensure safe operation of nuclear facilities. We find persuasive the testimony of the Staff that VEPCO has steadily improved the performance of its management and staff in order to comply with those requirements. The record of non-compliances and civil penalties shows, and Mr. McGurn agreed, that VEPCO management has erred in the past. To the Board it appears that those errors stemmed primarily from lack of appreciation of the effort, discipline, and aggressive management that are required to design, build and operate power plants in accordance with the high standards that must

be applied to nuclear plants. There is evidence that VEPCO management has relied too much on its contractors to discharge their responsibilities with a minimum of supervision by VEPCO. Also, the Staff has had to take extraordinary measures, such as civil penalties and special meetings with management, to ensure that VEPCO's upper management fully comprehended the promptness and extent of action that would have to be taken in order to comply with regulatory requirements.

61. The record makes it clear that VEPCO has lagged in upgrading its management to provide the leadership and control that the Commission finds necessary to ensure the proper operation of nuclear plants. Statements by Mr. McGurn and the content of letters to the Commission show that VEPCO management does not regard most of the non-compliances that led to civil penalties as being serious enough to warrant the action taken. Mr. McGurn also contended that VEPCO received unusual attention from or surveillance by the Staff. The record does not support these views. Instead, the record indicates to the Board that extraordinary measures were required to bring unsatisfactory situations to the full attention of and to obtain remedial action by top management. However, the testimony shows that VEPCO management has improved as the regulatory requirements have increased and in response to Staff recommendations. The Board is particularly impressed by VEPCO's use of experience at Surry in staffing and preparing for operation of Units 1 and 2 at North Anna. Also, the recent extensive changes in construction organization and practices and the review of past construction provide further evidence of management's present commitment to safe operation at North Anna.

62. Consideration of the entire record leads the Board to find that VEPCO has the commitment necessary to operate North Anna, Units 1 and 2, safely and in compliance with all radiological health and safety requirements. According to the Staff's testimony a high priority will be given to the assignment of a resident inspector to the North Anna site when the proposed resident inspector program has been approved. The total NRC inspection program should provide the Staff with early indication of any deterioration in VEPCO's commitment to safe operation. The Staff has the authority to take any actions deemed to be necessary to protect the health and safety of the public.

Board Issue 2

Has VEPCO implemented its quality assurance program in the construction of North Anna, Units 1 and 2, in a manner which provides reasonable assurance that those units can be operated without endangering the health and safety of the public?

63. VEPCO, as owner of the North Anna facility, bears full responsibility for the proper design, procurement and construction of the facility. VEPCO contracted with Stone & Webster to be the architect-engineer-constructor of the plant and with Westinghouse Corporation (Westinghouse) to provide the nuclear steam supply systems for Units 1 and 2. The quality assurance program is a coordinated effort involving VEPCO and its two contractors. The execution of the quality assurance program for the control of procurement for the nuclear steam supply system was delegated to Stone & Webster and Westinghouse. The execution of the remaining part of the quality assurance program was delegated to Stone & Webster. VEPCO's primary function has been to review and approve the organizations, programs, specifications, vendor qualifications, and quality standards of its contractors and to ensure conformance through surveillance and audits of specific activities by its quality assurance personnel.¹³¹ The NRC Staff reviews the quality assurance program to ensure that it complies with the Commission's requirements. Then, through its inspection program it determines that the program as implemented is effective.¹³²

64. The quality assurance and control program for construction at North Anna has grown with the construction activity and the increase in regulatory requirements. From early in 1971 to October 1976, the Stone & Webster quality control staff in the field increased from about 30 to 150 persons and the number of procedures increased from about 15 to 60. At the same time the VEPCO field quality control staff increased from 1 to 8 persons.¹³³ Additional personnel from Stone & Webster and VEPCO headquarters perform various inspections and audits.¹³⁴

65. Construction inspections by the Staff began in February 1970. Through August 1976, 92 inspections of Units 1 and 2 had been conducted involving 570 man days at the construction site, contractor offices, and vendor manufacturing facilities.¹³⁵ Fifty-nine items of noncompliance consisting of 40 infractions and 19 deficiencies were identified by the inspectors.¹³⁶ The most significant of these were the weldment problems with the steam generator and coolant pump support structures and the settlement of the service water pump house.¹³⁷ Twenty-five of the items were identified as

¹³¹Testimony of James L. Perkins at 6-7, Staff Supplemental Testimony at 75-76, both following Tr. 3037.

¹³²NRC Supplemental Testimony at 74, 77-79.

¹³³Perkins at 10-11, Attach. JLP-2.

¹³⁴*Id.* at 8-14.

¹³⁵NRC Supplemental Testimony at 62-63. The information in Staff Ex. 6A indicates that these numbers include the inspections through April 1977.

¹³⁶*Id.* at 64.

¹³⁷*Id.* at 67.

not complying with the quality assurance program in the areas of audits (1), document control (3), programmatic controls (4), instrument calibration (1), nonconformances (2), procedures (13), and storage requirements (1).¹³⁸ Based on an analysis of the items and the corrective actions taken, the Staff found that none of the items has significance adverse to the safe operation of the plant.¹³⁹

66. The special investigation by the Staff in the fall of 1976, into allegations of welding and other deficiencies in construction at North Anna, discussed in part in paragraphs 45 through 48 bears on the quality assurance program also. Of the 12 allegations that were substantiated, ten involved pipefitter craftsmen performing work in a manner contrary to instructions, one involved cutting of reinforcing steel in structural concrete in Unit 1 Auxiliary Building without appropriate instructions or engineering analysis, and one involved quality control inspectors not performing and documenting inspections of general piping installation activities. As we indicated previously, the Staff concluded that the substantiated allegations, when considered alone, were of minor significance, but, collectively, they indicated the need for improvements.¹⁴⁰

67. As a result of the inspection, VEPCO is upgrading its quality assurance program and procedures. Changes are being made to improve the quality, handling, approval and auditing of Nonconformance and Disposition Reports and Engineering Design and Coordination Reports. The adequacy of audit activities by VEPCO and Stone & Webster has been reviewed and improvements are being made.

68. North Anna, Unit 1, is essentially complete and only a small fraction of the construction of Unit 2 remains to be done. Improvements being made now cannot have much effect on the construction of the plant. Therefore, the Staff divided its investigation into four phases, three of which went well beyond consideration of the allegations. Phase 1 was the investigation of the specific allegations. Phase 2 consisted of a detailed inspection of certain safety-related piping not directly involved in the original allegations but subject to similar problems. The civil penalty was based on the results of Phases 1 and 2. Phase 3 involves detailed monitoring of the nondestructive preservice baseline examination of selected welds in safety-related piping by VEPCO and its contractors. Phase 4 is concerned with inspection of the performance of selected components in specific piping during the preoperational testing program.¹⁴¹ Phase 3 has been completed. Two items of non-

¹³⁸*Id.* at 80-81.

¹³⁹*Id.*

¹⁴⁰*Id.* at 140.

¹⁴¹*Id.* at 137.

compliance were identified. One was an infraction involving control of documents. The other was a deficiency involving failure to have records of the qualifications of a contractor's inspector at the site.¹⁴² Phase 4 is in progress and will continue through the preoperational testing. The hot functional testing of Unit 1 had been completed and the preoperational testing was 50-60% complete at the time of the June 1977 hearings. No welding had to be redone as a result of preoperational testing.¹⁴³

69. VEPCO has investigated and corrected specific deficiencies uncovered by the Staff investigation.¹⁴⁴ Also, VEPCO has reviewed independently those Nonconformance and Disposition Reports and Engineering and Design Coordination Reports previously issued for Units 1 and 2 that had not been the objects of significant independent review all along. This audit included a 100% review of the dispositions of those reports affecting the pressure boundary of safety grade piping.¹⁴⁵

70. Recently, the Staff has investigated additional allegations concerning improper welding identification procedures and electrical quality control procedures. An inspection confirmed that VEPCO's internal procedures for stamping identification numbers on welds had been violated during the installation of pipe hangers for the heating, ventilation and air-conditioning systems. However, it was determined that the welds were satisfactory and had been made by qualified welders using qualified procedures. No enforcement action resulted from this investigation. Stamping of identification numbers on the welds is not an NRC or a code requirement.¹⁴⁶ The investigation of the electrical inspection program did not reveal any items of safety significance. Enforcement action was taken, however, because it was determined that commitments made in the quality control manual were not always adhered to when documenting nonconformances.¹⁴⁷

71. Based on its experience with VEPCO's quality assurance program for construction at North Anna since 1970 and consideration of the non-compliance items and VEPCO's corrective actions, the Staff has concluded that VEPCO has implemented its quality assurance program in a manner which provides reasonable assurance that these units can be operated without endangering the health and safety of the public.¹⁴⁸ Although Dr. Ernst Volgenau, Director of the Office of Inspection and Enforcement had

¹⁴²Staff Ex. 7, Ref. 14 at 2-3.

¹⁴³Tr. 3186, 3581.

¹⁴⁴Brown at 32-38, following Tr. 3037; Staff Ex. 7, Ref. 4, 6, 8, 13.

¹⁴⁵Brown at 22-23.

¹⁴⁶NRC Supplemental Testimony at 147.

¹⁴⁷*Id.* at 148-150.

¹⁴⁸Tr. 3559-3561.

been critical of VEPCO's performance in an appearance before the ACRS, the Staff conclusion was that of the entire Office of Inspection and Enforcement including Dr. Volgenau.¹⁴⁹ In reaching its finding, the Board has reviewed the testimony and the numerous exhibits with care. It has examined in detail the noncompliances that led to civil penalties and VEPCO's responses and corrective actions. We find a preponderance of the evidence to support the Staff's conclusion and concur in it.

72. The Board notes the Government Accounting Office (GAO) monitoring the 1976 inspection of allegations of poor construction practices at North Anna.¹⁵⁰ The GAO report concluded that the investigation team was very thorough and aggressive and the inspectors worked diligently and seemed to be motivated to determine the facts without being influenced by the magnitude or significance of the individual allegations.¹⁵¹ The GAO disagreed with the Commission's conclusion that the items found did not have any direct safety significance. In particular, the GAO believed the public should have been informed that if some of the items had not been found and corrected, there could have been a decrease in reliability in certain secondary, backup, or supporting components or systems.¹⁵² Also the GAO recommended that Phases 2, 3 and 4 of the investigation should be expanded to include Unit 2 and that an independent audit of past engineering judgments should be made by experts with no vested interest in the North Anna plants.¹⁵³

73. The safety significance of the finding of the inspection are included in the Staff's testimony and the cross-examination in this proceeding and are now readily available to the public. We note further that Phases 2, 3 and 4 will, in effect, be expanded to include Unit 2.¹⁵⁴ Also, the Staff will ensure that the scope and depth of the VEPCO audits are adequate and the independence of the audits meets criteria in the NRC regulations.¹⁵⁵ The GAO has said that it will continue to monitor the Commission's inspection and enforcement actions at North Anna.¹⁵⁶ The Board finds that these matters can be best resolved and are being resolved between the agencies. No Board action is necessary.

Arnold Contention 3

Does VEPCO's emergency plan provide reasonable assurance that ap-

¹⁴⁹Tr. 3490-3493, 3558.

¹⁵⁰Staff Ex. 8, Ref. 2.

¹⁵¹*Id.* at 8.

¹⁵²*Id.* at 9.

¹⁵³*Id.* at 10-11.

¹⁵⁴Staff Ex. 16.

¹⁵⁵*Id.*

¹⁵⁶Staff Ex. 8, Ref. 2 at ii, 11.

appropriate measures can and will be taken in the event of an emergency to protect public health and safety and prevent damage to property?

74. The obligations of an applicant for an operating license to present plans for coping with emergencies are found at 10 CFR Part 50, Appendix E. Paragraph I of that appendix provides in part:

Each applicant for an operating license is required by Sec. 50.34(b) to include in its Final Safety Analysis Report plans for coping with emergencies.

This appendix establishes minimum requirements for emergency plans. These plans shall be described in the Preliminary Safety Analysis Report. Procedures used in the detailed implementation of emergency plans need not be described in the Preliminary or Final Safety Analysis Report.

Paragraph III provides:

The Final Safety Analysis Report shall contain plans for coping with emergencies. The details of these plans and the details of their implementation need not be included, but the plans submitted must include a description of the elements set out in section IV to an extent sufficient to demonstrate that the plans provide reasonable assurance that appropriate measures can and will be taken in the event of an emergency to protect public health and safety and prevent damage to property.

Paragraph IV contains subparagraphs A through J, each of which describes in general terms material that must be included in the FSAR.

75. VEPCO, in the presentation of its case on the contention, offered the testimony of Messrs. Massey and Bennett¹⁵⁷ and Exhibits V-1 entitled "North Anna Power Stations Emergency Plan" and V-10, which is an amendment to V-1. The Commonwealth offered the testimony of Norman S. McTague, Operations Officer, Virginia State Office of Emergency Services.¹⁵⁸ The Staff offered the testimony of James A. Martin, Jr.¹⁵⁹ and James W. Hufham.¹⁶⁰ Intervenor Arnold offered no direct testimony but raised the concerns discussed hereafter in questions put to the various witnesses.

76. During questions of the VEPCO witnesses, Mr. Foster (counsel for Mrs. Arnold) elicited the information that documents called "Emergency Plan Implementing Procedures" (EPIP) were not part of the Emergency

¹⁵⁷Tr. 2295.

¹⁵⁸Tr. 2420.

¹⁵⁹Tr. 2519.

¹⁶⁰Tr. 2520.

Plan, though a list of their titles was; that the EPIP were not yet prepared and that they were the documents which would be relied on by plant personnel for direction in the event of an emergency rather than the Emergency Plan, which was a broader document from which the EPIP were being developed. Staff testimony was to the effect that the Emergency Plan covered the requirements of Appendix E and that though they were not completed, the EPIP had been reviewed in draft by the Staff and would be complete, approved, and in place before an operating license would be issued.¹⁶¹

77. The Board finds that the EPIP are among the details of implementation of the Emergency Plan, and it is not necessary to include them in the Emergency Plan. They are directions to individuals to take specific actions in an emergency to carry out the Emergency Plan. The same may be said of Mrs. Arnold's contention, urged at page 5 of her proposed findings, that the details with respect to the availability and commitment of doctors should be included. In regard to both subjects, we refer to the Commission's recent Denial of the Petition for Rulemaking in Docket No. PRM-50-14, Public Interest Research Group, *et al.*¹⁶² There it is said:

Lastly, the petitioners also requested that NRC require licensees to submit for review the details of their Emergency Plans and the implementation procedures. The Commission has not found it necessary to have detailed implementation information submitted for review along with the emergency plans provided in the FSAR. These details are kept onsite where various aspects, such as specific phone numbers and personnel assignments, etc., can be promptly modified to reflect minor day to day changes. This detail can be provided to the Commission if there should be some serious question as to whether the applicant can actually carry out the plans set forth in the FSAR.

The implementation procedures maintained onsite are reviewed customarily by the Office of Inspection and Enforcement to determine whether they are consistent with the plans set forth in the FSAR. Prior to issuing an operating license and annually thereafter for the life of the plant, the NRC inspection program looks into the adequacy of the details of the Emergency Plan and the implementing procedures. Assurance is provided through these inspections that the commitments made in the Emergency Plan are in fact met, and reasonable assurance is obtained that appropriate measures can and will be taken in the event of an emergency. The inspection program includes verification that imple-

¹⁶¹Tr. 2529.

¹⁶²42 FR 36326.

menting procedures have been developed, and representative procedures are reviewed by NRC personnel at this time. Furthermore, the NRC inspection program verifies by observation and review of records that the implementing procedures are tested and evaluated for adequacy when actually used.

78. Mr. Foster's questions indicated concern about the willingness of plant personnel to remain at the plant to operate it in the event of an emergency involving radiation releases¹⁶³ and the willingness of volunteer members of fire departments or rescue squads to accept radiation as a part of the risk in responding to an emergency.¹⁶⁴ The response of VEPCO to those inquiries indicated that operators remaining in the control room during an emergency would receive little radiation because a control room is designed to protect its occupants against radiation, though overexposures are not impossible.¹⁶⁵ It was VEPCO's further testimony that the offsite groups, which are expected to be of help in an emergency, were aware of the radiation risks involved and would receive dosimetry instructions prior to entering areas where high radiation levels might exist. VEPCO assumed that emergency personnel were willing to accept the exposures involved in emergency situations.¹⁶⁶ The Board finds that the Emergency Plan could contain little more than it does to assure that employees will remain at their jobs in an emergency or to assure the response of emergency organizations to accidents at the facility.

79. Mrs. Arnold is concerned about the possible inability of station personnel to warn of the direction in which a release of radioactivity would travel if the station's meteorological tower becomes inoperative. The Applicant contemplates calls to the Weather Bureau, radio stations or an airport or observation by station personnel for wind direction; to determine stability class, a chart would be used to interpret observed conditions such as daylight, fog, etc.¹⁶⁷ We find that the loss of the meteorological tower does not raise concerns that should be addressed further in the Emergency Plan.

80. Loss of offsite communications was another concern of Mrs. Arnold. It appears from the evidence that there are five independent systems that can be used. These are commercial telephone, battery-operated microwave, VHF radio system, and two UHF radio systems.¹⁶⁸ This seems

¹⁶³Tr. 2319.

¹⁶⁴Tr. 2338.

¹⁶⁵Tr. 2319.

¹⁶⁶Tr. 2339.

¹⁶⁷Tr. 2324.

¹⁶⁸Ex. V-10 at 5-3.

to the Board to be sufficient communication redundancy for emergency situations.

81. Mrs. Arnold is critical of the Emergency Plan for its failure to provide for distribution of information to the public so that it could react to an actual or potential offsite release of radioactivity. This is an area that also interested the Board.¹⁶⁹ Mr. McTague of the Commonwealth Office of Emergency Services, thought such education desirable¹⁷⁰ and advocated it, but did not believe it a requirement for prompt public response to an emergency.¹⁷¹ In addition to Mr. McTague, VEPCO witness Bennett¹⁷² and Staff witness Martin¹⁷³ testified that public education on emergency plans, conducted before hand, would not be essential to public reaction in an emergency, but Mr. Martin thought general knowledge of the public of such plans might be helpful.¹⁷⁴ The plans do provide for occasional drills involving VEPCO people as well as offsite agencies which may be needed in an emergency.¹⁷⁵

82. Mrs. Arnold, in her proposed findings at page 10, cites part of paragraph 10 of Appendix E, and interprets it as requiring preknowledge and participation in emergency planning by members of the public. The relied upon material is:

The emergency plans shall contain, but not necessarily be limited to, the following elements:

* * *

I. Provisions for testing, by periodic drills, of radiation emergency plans to assure that employees of the licensee are familiar with their specific duties, and provisions for participation in the drills by *other persons whose assistance may be needed in the event of radiation emergency.* (Emphasis supplied.)

83. In its Petition for Rulemaking in Docket No. PRM-50-14, one of the rule changes called for by the Public Interest Research Group would require that licensees:

¹⁶⁹Tr. 2387-2390, 2476.

¹⁷⁰The Commonwealth of Virginia has a program for the education of the public about radiological and other emergencies. The program is conducted on request by interested groups (Tr. 2432-2435, 2476).

¹⁷¹Tr. 2444.

¹⁷²Tr. 2354.

¹⁷³Tr. 2544.

¹⁷⁴Tr. 2545.

¹⁷⁵Martin Testimony, page 3, following Tr. 2519.

(a) distribute instructions explaining what emergency safety steps the citizen should take in case of a nuclear incident to the public within a radius of at least 40 miles of the facility; (b) disseminate information explaining these plans through educational sources and the public media . . .

The Commission denied the petition and held by implication that the part of Appendix E said by Mrs. Arnold to require the distribution of emergency plans to at least some members of the public does not so require. Further, we may infer from the Commission's action that the regulations do not require public dissemination of emergency plans. Pertinent parts of the Commission's statement are as follows:

Based on experience working with States over the course of years, as well as our assessment of the comments received from the States, we believe that it is essential that the state emergency coordinator have substantial flexibility to deal with the complexity of planning for emergencies and to modify such plans should be coupled with an adequate followup program to assure that modifications are provided to all persons possessing the initial plan, in order to avoid the simultaneous existence of differing versions of the same plan. Such widespread dissemination of all revisions to the plan to every household, and other establishments, within 40 miles of a facility would be very difficult.

In addition, the specific action to be taken in any instance must be evaluated and based upon the best information available at the time and such actions must be centrally coordinated to assure that they are not mutually counterproductive. For example, the egress patterns selected by the emergency coordinator could become congested if occupants that are not in the downwind sector evacuate and merge with the downwind sector evacuees. Wide dissemination of detailed complex plans could result in increased unnecessary casualties caused by misinterpretation of complex and variable conditions in terms of the nature of the release and effect of meteorological conditions. However, it appears that a number of States feel that a more limited distribution of general information to persons living close to the facility may be desirable.

For these reasons, the Commission does not consider that it is advisable to provide for mandatory widespread dissemination of emergency plans. Such information should, of course, be available to those members of the public who desire it. This is current Commission policy.

A third element that the petitioners request is that licensees and applicants disseminate information explaining emergency plans through educa-

tional sources and the public media, including both printed and electronic media.

The Commission considers that all emergency actions depend upon the nature of the nuclear accident and the resulting threat, the prevailing weather and environmental conditions, and the location of the individual relative to the power plant. In some circumstances, it would be best for the individual to remain in his home rather than to leave. Information explaining the emergency plan would be so general as to be subject to misinterpretation and would be of little help; or, if written to cover the wide range of possibilities, would be too complex for the public to understand or follow in an emergency. A simple instruction directing public evacuation by pre-set routes in the event of any threatening nuclear accident could be in error in particular circumstances.

84. The Board concludes that Commission regulations do not require dissemination of emergency plans to the public except by making them available to those who ask.

Arnold Contention 4

Is VEPCO financially qualified to operate North Anna, Units 1 and 2, in a safe manner?

85. 10 CFR §50.33(f) requires an applicant for an operating license to show that it possesses or has reasonable assurance of obtaining the funds necessary to cover estimated operating costs for the period of the license, plus the estimated cost of permanently shutting down the facility and maintaining it in a safe condition.

86. The Applicant presented a detailed analysis of the estimated cost of operating North Anna, Units 1 and 2, for the years 1977 through 1981.¹⁷⁶ The costs range from \$142.8 million for Unit 1 in 1977 to \$163.5 million in 1981, and for Unit 2, from \$93.0 million in 1978 to \$115.2 million in 1981. This assumes a plant capacity factor of 75% following the second year of operation. The Staff performed an independent evaluation of the unit cost of producing electricity for North Anna, Units 1 and 2, assuming a hypothetical 60% factor which is lower than that used by VEPCO in its cost estimates.¹⁷⁷ At a 60% plant capacity factor, the total unit operating cost would be 30.1 mills per kilowatt hour, which is lower than the sales price per

¹⁷⁶Ex. V-3 following Tr. 2861.

¹⁷⁷Tr. 2952.

kilowatt hour experienced by VEPCO in 1975. This analysis did not assume any growth caused by retail or wholesale rate increases received by the company subsequent to 1975.¹⁷⁸

87. The Applicant expects to cover all operating costs through revenues generated from its systemwide sales of energy. Current operating costs will be paid out of current operating revenues. VEPCO has historically recovered its operating expenses through operating revenues and has, in addition, produced a net income.¹⁷⁹

88. The Staff assumed that regulatory commissions which have jurisdiction over the rates charged for utility services are required by law to allow the utility company to charge rates that will enable it to fully perform its duty to the public, assuming prudent management of the company; this includes the recovery of proper operating costs (including fuel cost) necessary for the discharge of the utility's public responsibilities. Accordingly, the Staff, based on (1) the fact that VEPCO has covered its operating expenses through operating revenues for many years, and (2) the assumption that the responsible regulatory commission will grant rates sufficient to cover operating costs, concluded that VEPCO will have sufficient sources of funds to operate North Anna, Units 1 and 2.¹⁸⁰

89. VEPCO estimated the initial cost of shutdown and dismantling Units 1 and 2 at \$27 million, and the annual cost thereafter of maintaining the units in a safe shutdown condition at \$672,000. It was further testified that such costs are properly recoverable through operating revenues, and that the \$27 million figure represents only 2-1/2% of VEPCO's operating revenues for the 12 months ending September 30, 1976. Furthermore, VEPCO could request a rate increase to recover such costs if that action became necessary in the future.¹⁸¹

90. NRC regulations do not specify what level of decommissioning is required of nuclear facilities. Accordingly, the Staff did not have independent estimates of the cost of decommissioning nuclear power reactors. The Staff, instead, noted that state and Federal regulatory commissions have historically treated plant decommissioning and maintenance costs as allowable operating expenses recoverable through rates charged to customers. The Staff accordingly concluded that decommissioning and subsequent maintenance costs of Units 1 and 2 could be charged to operating expenses either in the year they are incurred or be amortized over a period of years according to the policy of the ratemaking authorities. On

¹⁷⁸*Id.*

¹⁷⁹Testimony of Jim C. Petersen at 2, following Tr. 2949; O. James Peterson III at 3-8, following Tr. 2847.

¹⁸⁰Petersen at 2-3; Tr. 2950.

¹⁸¹Petersen at 9.

this basis, the Staff was able to conclude that VEPCO is financially qualified to permanently shutdown North Anna, Units 1 and 2, and maintain the facility in a safe shutdown condition.¹¹²

91. Mrs. Arnold, in her proposed findings, indicates dissatisfaction with the Staff's conclusion on several grounds. One is that the evaluation did not consider the possibility of sizeable future capital costs which might be incurred, she says, in a steam generator replacement such as is reportedly necessary at Surry. The short answer to this is that the regulations of the Commission, paraphrased above, do not require a showing by an applicant for an operating license that it has the ability to raise money for capital expenditures. We find, further, that VEPCO has been able to raise capital funds sufficient to have spent almost \$900,000,000 on these units by the end of 1976. Perhaps a need for large amounts of additional capital for Units 1 and 2 (or any other station) would have the effect of upsetting VEPCO construction schedules but it has not been demonstrated that such a need would cause unsatisfactory operation of existing units.

92. The other two points raised by Mrs. Arnold are a supposed need to decommission Units 1 and 2 in the very near future which might bankrupt the company¹¹³ and a refusal by the Corporation Commission to grant rate increases because of imprudent management which Mrs. Arnold believes is evidenced by the several enforcement actions lately taken against VEPCO. These are hypotheses which might be applied to any utility in any license case. There is no evidence that either is a reasonable possibility.

93. The Appeal Board has spoken lately about the problem of reasonable assurance that a utility can raise money. In *Seabrook*¹¹⁴ the Board put great reliance on the facts that a power company is regulated, that it is bound to provide service, that its facilities are licensed, and that it has a right to be granted rates large enough to cover costs. The Board quoted from *F.P.C. v. Hope Nat. Gas. Co.*, 320 U.S. 591, 603 (1944):

The rate-making process under the [Natural Gas] Act, *i.e.*, the fixing of "just and reasonable" rates, involves a balancing of the investor and the consumer interests. . . . the investor interest has a legitimate concern with the financial integrity of the company whose rates are being regulated. From the investor or company point of view, it is important that there be enough revenue not only for operating expenses but also for the capital costs of the business. . . . the return to the equity owner . . . should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital.

¹¹²Petersen at 4; Tr. 2969.

¹¹³Mrs. Arnold's proposed findings of fact at 21.

¹¹⁴*Public Service Company of New Hampshire, et al.* (Seabrook Station, Units 1 and 2), ALAB-422, 6 NRC at 77 (July 26, 1977).

94. The Board finds that Applicant has satisfied the burden of proving that it has reasonable assurance of having the funds it needs to operate the facility in compliance with the Commission's regulations.

Arnold Contention 5

In light of VEPCO's operating experience at Surry, is there reasonable assurance that release of radioactive materials in effluents from North Anna, Units 1 and 2, to unrestricted areas will be in compliance with applicable AEC regulations?

95. In its consideration of this question, the Board has examined the experience at Surry, differences between the Surry and the North Anna plants that might affect releases, and the safety evaluation of North Anna, Units 1 and 2, as it relates to the release of radioactivity in effluents from the plant.

96. Since Surry Unit 1 was licensed in 1972 through August 1976, the NRC Office of Inspection and Enforcement has cited 24 noncompliance items related to control of radiation or release of radioactivity from VEPCO's two-unit Surry plant.¹⁸⁵ Of these noncompliances, seven were concerned with adherence to health physics procedures, four with posting of radiation areas, three with survey records, two with survey requirements and eight with various Technical Specification and NRC regulatory requirements.¹⁸⁶ Twenty-two of the noncompliances were related to in-plant radiation controls; two pertained to offsite releases.¹⁸⁷

97. From 1972 through August 1976, VEPCO reported 22 instances in which there were unplanned releases in which the release rate exceed 4 percent of the limits allowed by the Technical Specifications.¹⁸⁸ ¹⁸⁹ None of the releases exceeded the Technical Specification limits.¹⁹⁰

98. In September 1976, VEPCO determined that the average gaseous release rate for the prior 12 months through August 1976 was 10.37 percent of the allowable instantaneous release rate; this exceeded the 10 percent limit in the Technical Specifications.¹⁹¹ Apparently, this happened because VEPCO did not interpret the Technical Specifications to require that iodine and noble gases be included with particulates when calculating the average

¹⁸⁵Supplemental Testimony of Albert F. Gibson III at 1-2 following Tr. 2765.

¹⁸⁶*Id.*

¹⁸⁷*Id.*

¹⁸⁸*Id.* at 6, Tr. 2823.

¹⁸⁹In January 1976, the requirement for reporting release rates exceeding 4 percent of the Technical Specification limits was removed (Tr. 2822).

¹⁹⁰Gibson at 2.

¹⁹¹*Id.* at 6.

release rate. The Technical Specifications have been changed to provide separate limits for noble gases and for iodine and particulates. All past releases would have been well within the current specifications.¹⁹²

99. Mrs. Arnold contends that although the unplanned releases and the radiation control incidents have not resulted in the specified limits being exceeded, the number of incidents and the causes give reason for concern. Several were caused by errors, or by Mrs. Arnold's definition, carelessness on the part of VEPCO's Surry personnel.¹⁹³ Others resulted from failure of plant personnel to follow procedures.¹⁹⁴ Faulty methods of calculation, assumptions and arithmetic used in estimating releases have also been cause for investigations and citations by the Staff.¹⁹⁵

100. The Staff testified that there have been some problems with control and monitoring of radiation at the Surry plant. During most of the operation, the onsite health physics staff has been at a minimal level, although augmented by contract and nonstation personnel during maintenance and refueling outages.¹⁹⁶ No deficiencies have been found in the training program and the procedures have been found adequate, but the station management has had difficulty in obtaining adherence to health physics procedures by all station personnel.¹⁹⁷ Recently, two additional health physicists were added to the staff at Surry. Also, the organization was changed to make a separate health physics group under a separate supervisor to provide more attention to health physics matters.¹⁹⁸ Management has been receptive to recommendations for improvements by the Staff and has acted to implement the suggestions and to improve the performance of plant personnel.¹⁹⁹ Because of leakage and other problems with equipment, radioactivity levels have been higher than normal in some buildings. Personnel exposures to radiation have increased with increasing time of operation. Although the exposures have not exceeded the regulatory limits, management is concerned and is committed to reduce the exposures to levels that are as low as are reasonably achievable.²⁰⁰

101. With regard to releases in effluents to unrestricted areas, the principal concern of this contention, the Staff testified that “. . . at no time

¹⁹²*Id.* at 7.

¹⁹³Ex. I-6 p. 7, Ex. I-8 pp. 5-6, Ex. I-13, Ex. I-14, Ex. I-19, Ex. I-30, Ex. I-31, Ex. I-17, Ex. I-22.

¹⁹⁴Ex. I-37, IE Rpt. pp. 2-3; Ex. I-38 p. 3.

¹⁹⁵Ex. I-40 p. 3, Ex. I-41, Ex. I-40 p. II-5, Tr. 2658-2660.

¹⁹⁶Gibson at 2.

¹⁹⁷*Id.* at 3.

¹⁹⁸*Id.* 2-3.

¹⁹⁹*Id.* at 3; Tr. 2817, 2821.

²⁰⁰Gibson 3-5.

have any of the radioactive releases to unrestricted areas exceeded applicable AEC/NRC Regulations.²⁰¹ Examination of the inspection reports shows that the unplanned releases were far below the limits of the Technical Specifications. Also, the record shows that the radioactive releases from Surry 1 and 2 in 1974-1976, averaged over each year, did not exceed 2.3 percent of the Technical Specification limits for liquids, 1.2 percent for noble gases, 0.28 percent for halogens, and 0.08 percent for particulates. The Technical Specification limits are equal to the 10 CFR Part 20 limits for liquids and noble gases and much lower than the Part 20 limits for halogens and particulates.²⁰²

102. Some of the radiation control problems encountered at Surry have resulted from or have been aggravated by difficulties with equipment such as leaking tubes in the steam generators and fouling of tubes in the liquid waste disposal evaporator.²⁰³ Improvements have been made in the design of North Anna, Units 1 and 2, as a result of operational experience at Surry.²⁰⁴ In order to reduce the likelihood of tube leaks, VEPCO has made extensive changes in treatment of the secondary water including full flow demineralization of the condensate.²⁰⁵ A high capacity system has been installed which directs blowdown from the steam generators to the condensate system for processing by the demineralizers instead of discharging the blowdown to the environment.²⁰⁶ A clarifier has been added to increase the capability of the low-capacity steam generator blowdown system and the low level liquid waste system.²⁰⁷ Design of the liquid waste disposal evaporator has been modified to eliminate the fouling problems.²⁰⁸ Improvements have been made in the solid waste disposal system.²⁰⁹

103. Also, the health physics staff at North Anna is larger than that provided initially at Surry and is a separate group under separate supervision. The health physics staff appears to be well qualified. Training has been in progress since June 1975 and all except two of the staff of 15 have had on-the-job training at Surry.²¹⁰ The Staff has concluded that the personnel and training program comply with the requirements of the Commission's regulations.

²⁰¹*Id.* 9.

²⁰²Testimony of B. R. Sylvia following Tr. 3037, Attach. BRS-1.

²⁰³Testimony of William H. House II at 4-7, following Tr. 3037, Gibson at 3-4.

²⁰⁴House at 2, Tr. 2723-2724.

²⁰⁵Tr. 3070.

²⁰⁶House at 5-6.

²⁰⁷*Id.* 6-7.

²⁰⁸*Id.*

²⁰⁹*Id.* 7.

²¹⁰Sylvia at 1-5, Tr. 3580.

104. The Staff and VEPCO provided testimony to show that North Anna, Units 1 and 2, are designed and equipped and the limits in the Technical Specifications will be specified so that the radioactive effluents during normal reactor operations will be kept "as low as is reasonably achievable" in accordance with Appendix I to 10 CFR Part 50 of the Commission's regulations.²¹¹ This testimony is uncontroverted and whether the plant was designed and equipped to provide the capability for complying with the Commission's rules and regulations is not an issue in this proceeding.

105. In consideration of all the evidence on the issue, the Board must find that the experience at Surry and the improvements that have been incorporated at North Anna provide reasonable assurance that release of radioactive materials in effluents from North Anna, Units 1 and 2, to unrestricted areas will be in compliance with applicable NRC regulations. In reaching this conclusion, the Board has taken into consideration that perfection in operation of such large and complex plants is difficult to attain. For this reason, the plants are designed and the operating limits are specified so that substantial failures of equipment and errors in operation can be accommodated without exceeding the requirements of the regulations. VEPCO is committed to safe operation of the North Anna station.²¹² Surveillance by the NRC Office of Inspection and Enforcement provides additional assurance that North Anna, Units 1 and 2, will be operated in compliance will applicable NRC regulations.

Steam Generator Support Issue

Is there reasonable assurance that the A-36 steel in the steam generator supports for North Anna, Units 1 and 2, can be operated at temperatures as low as 80°F without undue risk to the health and safety of the public or must the A-36 steel be maintained at temperatures not lower than 120°F?

106. The six steam generator supports and the six reactor coolant pump supports for North Anna, Units 1 and 2, were originally fabricated by Sun Ship pursuant to plans and specifications prepared by VEPCO and its agents. Inspections of the structures by VEPCO after they had been delivered to the site revealed extensive cracking of welds and VEPCO decided to replace all the welds in the support structures.²¹³ The Unit 1 steam generator supports were repaired in place at the North Anna site and the

²¹¹Ex. V-2; House at 3; Testimony of Jacques S. Boegli, following Tr. 2760, at 1-2; Staff Ex. 3, pp. 11-1 through 11-13; Tr. 2840-2841.

²¹²Tr. 3119, 3121-3122.

²¹³Staff Ex. 15 at 5.

coolant pump supports were shop-repaired. Most of the repairs to the Unit 2 supports were made at Surry.²¹⁴

107. The repair program, including the quality assurance programs of the organizations involved, was reviewed and approved by the NRC Office of Inspection and Enforcement.²¹⁵ Visual, magnetic particle, and ultrasonic methods were used for inspecting the welds as they were replaced. Defects found by the inspections were repaired. The Unit 1 coolant pump supports and all the Unit 2 support structures were heat treated to relieve the stresses in the new welds. The new welds in the steam generator supports for Unit 1 were peened to help to relieve stresses.²¹⁶

108. The steam generator and pump supports are complicated, frame-type structures made by welding together various heavy structural steel members. The steam generator supports were fabricated of ASTM A-572 and A-36 steels.²¹⁷ The pump supports were fabricated of ASTM A-36 steel, except that ASTM A-272 Type 1 steel was substituted for two members of one pump support.²¹⁸ Assurance that structures of this type will not fail in service depends on several factors. One of the more important of these is that the metal be adequately tough and ductile at the operating temperature. However, the standards that governed the fabrication of the supports did not require toughness tests of the materials,²¹⁹ so no toughness data were obtained.

109. Sun Ship, in intervening in this proceeding, contended that the supports might fail in a brittle manner during operation because (a) the structures as repaired by VEPCO contain flaws that could provide sites for initiation of fractures, (b) the structures would be subject to high applied and residual stresses, and (c) the steel in the supports was chosen without regard for its fracture toughness.²²⁰

110. In efforts to resolve Sun Ship's concerns, extensive examinations were made of the support structures.²²¹ VEPCO performed Charpy and drop-weight tests on material from more than half the heats of A-36 steel that were used in the supports and from several heats of the A-572 steel.²²²

²¹⁴*Id.*

²¹⁵*Id.*

²¹⁶*Id.*

²¹⁷Staff Ex. 4 at 5-2.

²¹⁸*Id.*

²¹⁹Staff Ex. 15 at 23.

²²⁰Sun Ship Ex. 1 at 2.

²²¹Staff Ex. 15 at 2, 7-9, 15, 17-19.

²²²According to Sun Ship Ex. 1 at 10, 19% of the A-572 steel and 64% of the A-36 steel have been tested. Staff Ex. 15 at 7-8 indicates that more than 50% of the A-36 steel and about 50% of the A-572 steel have been tested. V. Ex. 19 at 10, which was concerned only with the A-36 steel, states that at least 5, and probably 6, of the 8 heats of A-36 steel used in the steam generator supports have been tested.

Those tests were supplemented by similar tests of A-36 steel by Sun Ship.²²³ VEPCO also calculated the stresses that would be expected in the structures under normal and severe accident conditions and the effects of failure of structural members.²²⁴ The Staff and its consultants made an extensive review of the adequacy of the supports including independent analyses of the structures.²²⁵ Finally, the matter was reviewed by the ACRS with aid from consultants.²²⁶

111. Based on the Charpy and drop-weight test data, the Staff and VEPCO concluded that the A-36 steel would have adequate toughness at 80°F, the expected minimum service temperature.²²⁷ However, the NDT temperature of some of the A-572 was as high as 100°F, indicating that brittle fracture of that material might occur at the minimum service temperature under the expected service loads if a large enough defect were present.²²⁸ VEPCO proposed to make the use of the A-572 steel, which was in the upper part of the steam generator supports, acceptable by increasing the minimum service temperature to 180°F. This was to be accomplished by removing some insulation from the piping and installing a blanket of insulation around the supports. This remedy was acceptable to the Staff.²²⁹

112. The ACRS letter to the Commission, following its review, stated: The toughness of the A-36 steel was good, but the toughness of the A-572 steel was relatively poor at an operating temperature of 80°F. The Applicant, therefore proposes to operate so that all A-572 material is at 180°F or above. . . . The Committee believes that increasing the operating temperature is an acceptable solution, but recommends that the operating temperature of the A-572 material be substantially above the proposed temperature.²³⁰

In additional comments on the letter, ACRS Member Spencer H. Bush suggested that:

. . . equilibrating at 225-250°F prior to pressurizing fully is recognized as conservative, but is considered desirable.²³¹

Based on the ACRS recommendation, VEPCO agreed to maintain the A-572 steel in the steam generator supports at a temperature of at least

²²³V Ex. 19 at 10.

²²⁴Staff Ex. 15 at 15, 17-18.

²²⁵*Id.* 2, 15.

²²⁶*Id.* 20.

²²⁷Staff Ex. 4 at 5-3.

²²⁸*Id.* 5-4.

²²⁹*Id.* 5-4, 5-8.

²³⁰Staff Ex. 5 at 3.

²³¹*Id.* at 4.

225°F during operation.²³² All parties agree that a temperature of 225°F assures the requisite ductility for the A-572 steel in the support structures.²³³

113. Sun Ship has advised the Board that it now has only a single, limited concern about the susceptibility of the supports to brittle failure.²³⁴ It contends that a minimum service temperature should be specified for the A-36 steel in the steam generator support structures and that the minimum service temperature should be at least 120°F.²³⁵ This contention is based on Sun Ship's reasoning that a minimum service temperature of 225°F was specified to assure that the A-572 steel would have certain toughness characteristics. Sun Ship concludes that the same criterion should be applied to all steel in the supports and this would require that the A-36 steel be held at 120°F or higher.²³⁶ The Staff and VEPCO find that the A-36 steel satisfies the Commission's and other generally accepted criteria for service at the design minimum operating temperature of 80°F and is, therefore, acceptable for use at that temperature.²³⁷

114. Two generally accepted methods are used for evaluating and comparing the fracture toughness of steels.²³⁸ Charpy tests provide values of mils lateral expansion, percent shear, and energy-to-fracture over a range of temperature. Section III (NF) of the ASME code, which is incorporated in the Commission's regulations in 10 CFR §50.55(a), requires only that the material have 25 mils lateral expansion at the lowest service temperature.²³⁹ Lloyds uses minimum values of 30 percent shear and 35 ft. lb. fracture energy at the lowest service temperature as its toughness criteria.²⁴⁰ Drop-weight tests provide values for the NDT temperature and the Pellini NDT method can be used to determine a minimum service temperature.²⁴¹ By this method, the minimum service temperature is taken as:

- (a) NDT + 30°F, for structures where the stress level does not exceed 1/2 the yield strength of the steel,
- (b) NDT + 60°F, when the general stress level is equal to the yield strength, and
- (c) NDT + 120°F, when the intent is to restrict service to full shear

²³²Staff Ex. 12 at 5-1.

²³³Sun Ship Ex. 1 at 5.

²³⁴*Id.* at 4.

²³⁵*Id.* at 10 and Sun Ship Ex. 2 at 5.

²³⁶Sun Ship Ex. 1 at 4, 5.

²³⁷Staff Ex. 15 at 25, V Ex. 19 at 18, V Ex. 18 at 4.

²³⁸Sun Ship Ex. 1 at 5.

²³⁹*Id.* at 6, Staff Ex. 15 at 7.

²⁴⁰Sun Ship Ex. 1 at 6.

²⁴¹*Id.* at 8.

fracture temperatures in order to develop the utmost of fracture resistance.²⁴²

115. According to the criteria embodied in these methods, the minimum service temperature should be specified on the basis of the properties of the material and the stress level. The evidence shows that the A-36 material tested had a maximum NDT temperature of 40°F and 25 mils lateral expansion at about 80°F.²⁴³ The A-572 material tested had a maximum NDT temperature of 100°F and 25 mils lateral expansion at about 200°F.²⁴⁴ The record indicates that the much larger difference between the NDT and 25 mils lateral expansion temperatures for the A-572 steel is cause for applying more conservative criteria to that material and might have influenced the ACRS recommendation.²⁴⁵ Also, the maximum operating tensile stress in the A-36 beams in regions of the steam generator supports where the temperature will be below 120°F is calculated to be only 51% of yield strength under worst postulated accident conditions.²⁴⁶ Stress levels in other parts of the supports may be near 90% of yield under accident conditions.²⁴⁷

116. In light of the above facts, the Board finds that it is not necessary to require the same toughness characteristics of all the A-36 steel in the support structures as the A-572 steel is expected to have at 225°F in order to provide reasonable assurance of the safety of those structures. In arriving at this finding, the Board has taken into consideration that tests have not been made on metal from all the heats of A-36 material or A-572 material. The preponderance of evidence, to be discussed later, indicates to us that the properties of the untested heats are unlikely to fall outside the range of those that have been tested. We also noted that the ACRS, while recommending that the operating temperature of the A-572 steel be substantially above the 180°F proposed by VEPCO and accepted by the Staff, made no equally conservative recommendation concerning the A-36 steel.²⁴⁸ The Board concludes that the appropriate standard to apply is that the fracture toughness of the A-36 steel shall satisfy the requirements for the intended service.

117. In deciding whether the A-36 steel is acceptable for the intended service, we need only consider the lower region of the steam generator sup-

²⁴²*Id.*

²⁴³Staff Ex. 15 at 7; V Ex. 19 at 10, 16; Sun Ship Ex. 1 at Figure 2A.

²⁴⁴Staff Ex. 15 at 8, 9; Sun Ship Ex. 2 at 3; Sun Ex. 1 at Figure 1A.

²⁴⁵V Ex. 18 at 3, V Ex. 19 at 4-5.

²⁴⁶V Ex. 19 at 6.

²⁴⁷*Id.*

²⁴⁸Staff Ex. 5 at 3.

port structures. Measurements made during the hot functional tests of Unit 1 show that the heat, applied to the upper part of the structure, and the insulation result in only the lower 2-1/2 feet of the structures operating below 120°F. The temperature will not drop below 80°F and much of the material will be above 90°F.²⁴⁹

118. The critical A-36 beams of the support structures were obtained from eight heats of material.²⁵⁰ Charpy and drop-weight tests have been run on material from five, and probably from six, of those heats.²⁵¹ The drop-weight tests have shown the NDT temperature of the material to be a maximum of 40°F.²⁵² According to the Pellini NDT criterion, 70°F or a little higher would be acceptable operating temperature in regions where the design stress level is near 50% of the yield strength.²⁵³

119. All the Charpy test data for the A-36 steel are plotted in Figures 2A, 2B and 2C of Sun Ship Ex. 1. The data plotted on Figure 2A indicate that the material would not satisfy the Commission's 25 mil lateral expansion criterion at 70°F but that it would satisfy the criterion at 80°F or a little above. Only two points of more than 70 shown for the range of about 75 to 80°F had less than 25 mils lateral expansion. Those points had 23 and 24 mils and were recorded for the same sample of material tested at 80°F.²⁵⁴ ²⁵⁵ The bulk of the points were well above 25 mils lateral expansion.²⁵⁶

120. Although not all the A-36 heats were tested, there is reason to believe that the properties of the untested heats fall within the range of properties of those that have been tested. All heats of A-36 steel were produced during a short time in 1971 by the same steel producer.²⁵⁷ All except one heat, which showed lower than average and a large variation in toughness,

²⁴⁹V Ex. 19 at 6.

²⁵⁰V Ex. 19 at 10, FSAR Tables S56.4-1 and S56.4-2.

²⁵¹V Ex. 19 at 16.

²⁵²*Id.*

²⁵³*Id.*; Sun Ship Ex. 2 and 3 states *that* four heats of A-36 steel were NDT tested and that the limited NDT data are not adequate to establish a reliable statistical definition of the highest NDT temperature. The arguments for using a higher value are not persuasive.

²⁵⁴V Ex. 19 at 10.

²⁵⁵Figures 2B and 2C show that the percent shear and energy values fall below Lloyd's criteria but these criteria are not used as the basis for acceptance of a steel by Section III (NF) of the ASME code or by the Commission's regulations. Sun Ship Ex. 1 at 7-8 provided a statistical analysis of the energy data which purported to show that the A-36 steel would have to be heated to 120°F to have the properties of the A-572 steel at 225°F. Although the conclusion might be correct, the discussion in V Ex. 17 at 5-7 casts doubt on the validity of the analysis. In any event, the Board has rejected equality of properties as the basis for specifying the minimum operating temperature for the A-36 steel.

²⁵⁶Sun Ship Ex. 1 at Figure 2A.

²⁵⁷V Ex. 19 at 10-11.

have nearly the same chemical analysis.²⁵⁸ These factors provide confidence that all the heats have similar properties.²⁵⁹ Type A-36 is a structural grade of carbon steel that is used in immense tonnages for bridges and buildings as well as for structural components of other types of welded structures.²⁶⁰ That one can have confidence in the fracture toughness of the steel for use at temperatures of 80°F and above is evidenced by a newly proposed criterion of the ASME Section III Toughness Task Group N 70-45. Under this proposal, no toughness testing of the A-36 steel of the thicknesses used in the lower support structures would be required if the lowest service temperature is 80°F.²⁶¹

121. The Staff and VEPCO have provided other evidence in support of a conclusion that 80°F is a safe minimum temperature for operation of the A-36 steel. Over the decades during which millions of tons of A-36 steel with no explicit fracture toughness requirements have been used in bridges, buildings, and other structures, failures in service have been few; most have occurred at winter temperatures; all have occurred at temperatures below 80°F.²⁶² Calculations by the Staff and by VEPCO have demonstrated the redundancy of the support structures. In those calculations, which involved removal of major support members and loadings imposed by accident conditions, the stress in the remaining members did not exceed 90% of the yield strength.²⁶³ Current code design criteria would permit the stress to be 120% of yield.²⁶⁴

122. Finally, the Staff and VEPCO have made fracture mechanics analyses to estimate the size of the smallest flaw that could serve as an initiation site for brittle fracture. The Staff, employing some very conservative assumptions, calculated that a surface crack 0.15 in deep by 1 inch long would be required.²⁶⁵ VEPCO's consultant, employing assumptions that were appropriate for the worst postulated accident, calculated the smallest critical crack size to be 0.24 in deep by 2.4 inches long.²⁶⁶ There is reasonable assurance that flaws of these sizes would have been detected by the extensive examinations given the structures during and following the repairs.²⁶⁷

²⁵⁸*Id.*; FSAR Table S56.4-1.

²⁵⁹V Ex. 18 at 2, V Ex. 19 at 11, Staff Ex. 15 at 7.

²⁶⁰V Ex. 18 at 1-2.

²⁶¹V Ex. 19 at 16, Staff Ex. 15 at 23.

²⁶²Staff Ex. 15 at 22, V Ex. 18 at 2, V Ex. 19 at 17 and Attachment 3.

²⁶³Staff Ex. 15 at 18-19.

²⁶⁴*Id.*

²⁶⁵Staff Ex. 15 at 7-8.

²⁶⁶V Ex. 17 at 2-3.

²⁶⁷Staff Ex. 15 at 8, V Ex. 17 at 3.

123. Although the Board gives much weight to the views of Sun Ship and its consultants, consideration of all the evidence leads us to find that 80°F is an acceptable minimum temperature for operation of the A-36 steel in the lower regions of the steam generator support structures of North Anna, Units 1 and 2. The evidence would not, however, support the use of any lower temperature. The support structures were fabricated before the current regulations were in force and do not fully comply with them.²⁴⁸ The Staff has generally assumed the actual minimum service temperature to be about 90°F. The toughness properties decrease rapidly with decreasing temperature. VEPCO has agreed to monitor the temperatures of the structures.²⁴⁹ The Staff should be certain that several sensors are located in regions of lowest temperature. The Technical Specifications should require that the minimum indicated temperatures of the support structures be above 80°F, say 85°F, before the reactor coolant systems is pressurized fully in order to ensure that the actual minimum temperature is at least 80°F.

License Conditions Proposed by Parties

124. Mrs. Arnold has proposed that five conditions should be imposed on the operating licenses for Units 1 and 2 if the Board determines that the record supports the issuance of licenses. The conditions and the Board's conclusions regarding these conditions are given below:

Conditions 1 and 2

Prior to the loading of fuel at North Anna, there shall be conducted by the NRC Office of Inspection and Enforcement or an independent contractor which has no direct vested interest in the North Anna plants, a 100% audit of all engineering judgments made in connection with those plants which were not subject to audit during the I&E investigation during the fall of 1976.

Phases 2, 3 and 4 of the Office of Inspection and Enforcement's Fall 1976 Investigation of Poor Construction Practices on the North Anna Nuclear Power Plants shall be expanded to include North Anna, Unit 2.

125. Conditions 1 and 2 were derived from the recommendations of the GAO that were discussed in paragraph 72. There it was noted that the Staff will ensure that the scope and depth of VEPCO's audits are adequate and

²⁴⁸Staff Ex. 4 in footnote on p. 5-4.

²⁴⁹Staff Ex. 15 at 7.

the independence of the audits satisfies the criteria in the Commission's regulations. Also, Phases 2, 3 and 4 of the Staff investigation will, in effect, be expanded to include Unit 2. The GAO has indicated that it intends to continue to monitor the Commission's inspections and enforcement actions at North Anna. The Board finds no need to include Arnold conditions 1 and 2 in the operating licenses.

Condition 3

Prior to the loading of fuel at North Anna, the Applicant shall develop, and implement an Amendment to its Emergency Plan which shall provide for the education of the public on the subject of emergency procedures that might be anticipated by or required of them during Radiological Response Levels Yellow or Red or a Station Emergency (as defined in VEPCO Emergency Plan p. 4-10). The population to be covered in such an educational program shall include at a minimum all persons within the Applicant's service area who might predictably experience exposure to higher than background levels of radioactivity during a Radiological response level red, and in any event all persons residing within the low population zone.

126. The Board concludes that Arnold condition 3 should not be included in the licenses for the reasons discussed previously under Arnold Contention 3 in paragraphs 74-84.

Condition 4

During operation of Units 1 and 2, there shall be instituted a program of monitoring by an entity other than the Applicant which does not have a vested interest in the North Anna facility. This program of independent monitoring shall include as a minimum:

- a. Quarterly monitoring and calculation of radioactive elements including alpha emitting transuranium elements in soil samples taken at representative locations on the boundaries of the plant.
- b. Verification of all Applicant calculations respecting the magnitude and consistent elements of all planned and unplanned gaseous and liquid radioactive releases from the plant.
- c. Making available monitoring and verification results referred to in (a) and (b) above for public review by placing this information in the NRC Public Document Room and the public document room of the University of Virginia Library in Charlottesville, Virginia, where copies of other North Anna public documents are maintained.

127. The radiological monitoring program was not an issue in this proceeding and the record provides no basis for imposing Arnold condition 4. Moreover, the Commission does contract with the Commonwealth of Virginia to monitor the environment around the plant and also verifies the Licensee's results on some samples.

Condition 5

Prior to the loading of fuel at North Anna, all confirmatory tests required and information requested by the Staff as identified in the Safety Evaluation Report and Supplements thereto shall be performed or provided by the Applicant and the results satisfactorily analyzed.

128. The Board finds no basis in the record for incorporating Arnold condition 5 in the licenses. By the Commission's procedures, the Director of Nuclear Reactor Regulation is required to determine that all the necessary information has been provided and that the plant is in the appropriate state of readiness before fuel loading or any subsequent phase of nuclear operation is undertaken.

129. The Commonwealth of Virginia proposed that two conditions be incorporated in the operating license. The first condition would state substantially as follows:

As soon as possible after a resident inspector program is adopted by the Commission, the Staff or other appropriate official within the Commission shall appoint a resident inspector to reside at the North Anna site. All inspection reports filed by such resident inspector shall be transmitted to the Attorney General of Virginia as well as to the persons to whom distribution of such reports is normally made.

130. The Board concludes that this is not a condition that should be incorporated in the license. By testimony at the hearing, the Staff has committed to providing, on a priority basis, a resident inspector at the North Anna site and less formal arrangements can be made for distribution of the inspection reports. The presence of a resident inspector was not relied on by the Board in reaching its conclusions regarding the issues in controversy.

131. It seems likely that not all the equipment provided for processing the radioactive effluents from the plant will have to be operated in order to comply with the requirements of Appendix I of 10 CFR Part 50. The Commonwealth of Virginia is concerned that VEPCO, with the Staff's consent, may decide not to operate some of the equipment without fully informing the public and providing opportunity for a public hearing. The Commonwealth proposes, therefore:

No equipment for the control of radioactive releases during normal operation shall be removed from the plant, and no change in the requirements for the release of radioactive effluents from the plant during normal operation shall be made, without prior notice and opportunity for hearing in accordance with the Commission's regulations.

132. The Commission's regulations require notice and provide an opportunity for hearing when a change in equipment would result in a significant hazards consideration or a proposed license amendment would allow a significant increase in the radioactivity in the plant effluents. The Board finds no good cause for incorporating the proposed condition in the licenses.

133. Although the Board has denied the requests of Mrs. Arnold and the Commonwealth of Virginia, we believe that the Staff should continue, or should take, certain measures to be sure that the public has easy access to full information about the operations at the North Anna station. First, copies of information concerning the station that are filed in the NRC Public Document Room should also be sent to the public document files in Louisa County and in the University of Virginia Library and should be transmitted to the Attorney General of Virginia, if he so desires. Second, if VEPCO plans to remove or to make significant changes in the normal operation of equipment that controls the amount of radioactivity in the effluents from the North Anna station, the Staff should be notified in writing regardless of whether the change affects the amount of radioactivity in the effluents. Such action need not interfere with VEPCO's operation of the plant, and the public and the Commonwealth would be kept informed on a matter in which a considerable interest has been demonstrated. Continuing these measures for as long as the public interest warrants does not appear to us to be burdensome to the Staff or to VEPCO.

III. CONCLUSIONS OF LAW

134. Based upon the foregoing Findings of Fact which are supported by reliable, probative and substantial evidence as required by the Administrative Procedure Act and the Commission's Rules of Practice, and upon consideration of the entire evidentiary record in this proceeding, the Board makes the following Conclusions of Law.

135. VEPCO's performance in the operation of Surry, Units 1 and 2, and in the construction of North Anna Units, 1 through 4, does not demonstrate that it lacks the commitment or technical qualifications, or both, necessary to operate North Anna, Units 1 and 2, safely and in compliance with all applicable radiological health and safety requirements, including operational quality assurance requirements.

136. VEPCO has implemented its quality assurance program in the con-

struction of North Anna, Units 1 and 2, in a manner that provides reasonable assurance that those units can be operated without endangering the health and safety of the public.

137. VEPCO's emergency plan provides reasonable assurance that appropriate measures can and will be taken in the event of an emergency to protect public health and safety and prevent damage to property.

138. VEPCO is financially qualified to operate North Anna, Units 1 and 2, in a safe manner.

139. In light of VEPCO's operating experience at Surry, there is reasonable assurance that releases of radioactive materials in effluents from North Anna, Units 1 and 2, to unrestricted areas will be in compliance with applicable NRC regulations.

140. There is reasonable assurance that the A-36 steel in the North Anna, Units 1 and 2, steam generator supports can be operated at temperatures not lower than 80°F without undue risk to the health and safety of the public.

IV. ORDER

WHEREFORE, IT IS ORDERED, in accordance with the Atomic Energy Act of 1954, as amended, and the Rules of Practice of the Commission, and based on the findings and conclusions set forth herein, that the Director of Nuclear Reactor Regulation is authorized to make findings in accordance with 10 CFR §50.57(a) and to issue operating licenses for the North Anna Power Station, Units 1 and 2, for full-term and full-power operation as sought by the application.

IT IS FURTHER ORDERED, in accordance with Sections 2.760, 2.762, 2.764, 2.785, and 2.786 of the Commission's Rules of Practice, that this Initial Decision shall be effective immediately and shall constitute the final action of the Commission, subject to review thereof under the above-cited rules. Exceptions to this Initial Decision may be filed by any party within seven days after the service of this Initial Decision. A brief in support of the exceptions shall be filed within 15 days thereafter (20 days in the case of the Staff). Within 15 days after the service of the brief of appellant (20 days in the case of the Staff) any other party may file a brief in support of, or in opposition to, the exceptions.

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

Paul W. Purdom, Member

R. Beecher Briggs, Member

Frederic J. Coufal, Chairman

Dated at Bethesda, Maryland,
this 13th day of December 1977.

[The List of Exhibits in Evidence has been omitted from this publication but is available in the NRC Public Document Room, 1717 H Street, N.W., Washington, D.C.]

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Sheldon J. Wolfe, Chairman
Dr. Frederick P. Cowan
Frederick J. Shon

In the Matter of

PORTLAND GENERAL ELECTRIC
COMPANY, et al.

(Trojan Nuclear Plant)

Docket No. 50-344
(Proposed Amendment
for Fuel Storage
Pool Modification)

December 14, 1977

Upon intervenors' objections to prehearing order and request for revision of order or certification, the Licensing Board determines, *inter alia*, that (1) it did not err in denying intervenors' motions for issuance of order to cease and desist ongoing spent fuel pool modifications, (2) it was not improper for it to defer ruling on the need for an environmental impact statement on spent fuel pool modifications until after consideration of evidence and staff's environmental impact appraisal, and (3) proposed amendment to operating license to permit spent fuel pool modifications need not be preceded by issuance of construction permit.

Objections and request denied.

NEPA: GENERIC ISSUES

Licensing Board can consider individual cases involving expansion of spent fuel capacities at unrelated nuclear facilities before Commission completes generic environmental impact statement on handling and storage of spent light-water reactor fuels. *Kleppe v. Sierra Club*, 427 U.S. 390 (1976).

ENERGY REORGANIZATION ACT: SCOPE OF NRC ACTIVITIES

Under the Energy Reorganization Act of 1974, NRC is precluded from engaging in plan or program for regional or national promotion or development of nuclear energy.

NEPA: NEGATIVE DETERMINATIONS

Council on Environmental Quality guidelines provide that agency may make negative determination if it decides that environmental impact statement is unnecessary for proposed action. 40 CFR §1500.6(e).

OPERATING LICENSES: AMENDMENTS

Construction permit must be issued prior to issuance of operating license amendment only if proposed amendment involves a material alteration of licensed facility.

STATUTORY INTERPRETATIONS: WEIGHT

Administrative interpretations of statutes, consistently followed by agency charged with their administration and not expressly changed by Congress, are entitled to great weight.

REGULATIONS: INTERPRETATION

Interpretations of regulations by agency charged with their administration are entitled to great deference.

MEMORANDUM AND ORDER

On November 11, 1977, Ms. Garrett filed Objections To Prehearing Order And Request For Revision Of Order Or Certification. Thereafter, on an unknown date, Mr. McCoy filed an identically captioned document. Therein, said Intervenors objected to certain rulings denying the admissibility of certain contentions and denying motions as set forth in our Prehearing Conference Order dated October 31, 1977.

Applicants filed opposing responses on November 23 and Staff filed opposing responses to Mr. McCoy's and Ms. Garrett's submissions on November 28 and December 8, 1977, respectively.

We deny the requests for revision of our Prehearing Conference Order of October 31, 1977.¹ Further, we deny the requests for certification.

¹We deny Ms. Garrett's requests for our *re*-reconsideration of our previous rulings denying the admissibility of her Contention C1 (re: long-term storage) and Contention B2 (re: sabotage). As indicated at page 5, n.3, of our Prehearing Conference Order of October 31, 1977, we denied her motion for reconsideration dated October 14, 1977, re: Contention C1 and

(Continued on next page)

MEMORANDUM

I. Intervenor's Arguments Are Without Merit In Contending That The Board Erred In Denying Their Motions For The Issuance Of An Order To Cease And Desist Ongoing Spent Fuel Pool Modifications, And We Deny Their Requests For Certification.

A. The Board Properly Deferred Determining Whether Or Not An Environmental Impact Statement Is Required Until After Hearing The Evidence And Reviewing The Staff's Environmental Impact Appraisal.²

The Intervenor's argue, in substance, that the National Environmental Policy Act of 1969, 42 U.S.C. 4321, *et. seq.*, requires that a full Environmental Impact Statement be prepared before proceeding to an evidentiary hearing because the NRC's consideration of the instant proposed modification to the Trojan spent fuel pool system is part of a major Federal action. However, in *Kleppe v. Sierra Club*, 427 U.S. 390 (1976), the Supreme Court held that NEPA does not require a regional environmental impact statement absent some agency proposal for major Federal action af-

(Continued from previous page)

at pages 6 and 7 of said order we denied her motion for reconsideration dated October 7, 1977, re: Contention B2. Motions for *re*-reconsideration will not be entertained by this Board—finality, at this stage of the proceedings, must attach to our rulings upon motions for reconsideration. We also deny Ms. Garrett's Motion for Reconsideration of our Order of October 31 (p. 6, par. 2) wherein we denied her Motion to Compel Meaningful Inspection dated October 7, 1977. Her motion has been apparently mooted by the Licensee's Answer of November 11, 1977, (responding to Ms. Garrett's renewed motion dated November 7) wherein the same tour was offered to Ms. Garrett during the week ending November 19, 1977, as had been previously afforded to the other parties.

We also herein deny Mr. McCoy's Motion for Reconsideration of our October 31 Order (p. 1, par. A1), wherein we denied the admissibility of his Contention A6. Mr. McCoy has merely restated the Contention. He has presented neither new facts nor arguments not previously advanced concerning the admissibility of the contention, and the Board sees no reason to change the ruling. Further, the stipulation between Staff and PGE and Mr. McCoy is not binding on this Board especially when, as here, the Board could see no nexus to the matter at hand (the SFP expansion) and no showing of special circumstances concerning the pressure vessel.

Finally, we deny Mr. McCoy's Motion for Reconsideration of our October 31 Order (p. 1, par. A2) wherein we denied the admissibility of his Contention B4. Mr. McCoy requests that we consider a modification to this Contention—*viz.* "the Applicant did not consider the economic costs and benefits of the proposed amendment in relation to the burnup of fuel." The proposed modification is no more specific than the wording in the original Contention and the thrust of said modification is vague.

²This ruling was initially set forth in our Order of September 20, 1977, (p. 2, par. IIA.1) and was thereafter orally stated, in part, at transcript p. 128 during the course of the §2.752 prehearing conference held on October 14, 1977.

fecting an entire geographical region, and it follows that the Commission need not have completed its generic environmental impact statement on the handling and storage of spent light water reactor fuels before a Licensing Board can consider, on a case-by-case basis, whether to permit the expansion of spent fuel capacity for individual, unrelated power reactor facilities. Indeed, not only is there no NRC plan nor program for regional or national nuclear development, the NRC is precluded under its enabling legislation, the Energy Reorganization Act of 1974, from engaging in any such promotion or development of nuclear energy. See *Portland General Electric Company, et al.* (Pebble Springs Nuclear Plant, Units 1 and 2), LBP-76-37, 4 NRC 428, 432 (1976).

Further, the Intervenor's argument is without merit because the Council on Environmental Quality's guidelines, 40 CFR §1500.6(e), provide that, if an agency decides that an environmental statement is not necessary for a proposed action, it may make a negative determination. It was pursuant to this guideline and pursuant to 10 CFR §§51.5(c) and 51.7 that the Staff issued its negative declaration and its Environmental Impact Appraisal on November 11, 1977.

In light of the above, we conclude that we properly deferred determining whether or not an Environmental Impact Statement is required until after hearing the evidence and until after reviewing the Staff's Environmental Impact Appraisal. By virtue of our Order of September 20, 1977, and of our oral ruling during the prehearing conference on October 14, 1977, the Intervenor may present affirmative evidence and/or cross-examine with regard to McCoy Contention B1.³ (Ms. Garrett's Contention B1, being similar, was consolidated with Mr. McCoy's Contention B1.)

B. The Argument That The Proposed Amendment To The Operating License Must Be Preceded By The Issuance Of A Construction Permit Lacks Merit.

The Intervenor urge that the Board's denial of their motions for a cease and desist order was in error because a construction permit for the alteration of a utilization facility must be issued prior to the issuance of an amendment to an operating license.⁴ In supporting their argument, the Intervenor direct our attention to 42 U.S.C. 2235 and to several sections of

³McCoy Contention B1 reads as follows: "The proposed licensing amendment constitutes a major Federal action which significantly affects the quality of the human environment, and, therefore, requires the preparation, circulation for comment, and issuance in final form of a formal Environmental Impact Statement, in accordance with the requirements of the National Environmental Policy Act and the guidelines of the Council on Environmental Quality, prior to any Commission action on the proposed license amendment."

⁴This is a new argument which had neither been raised in the Intervenor's Motions for a Cease and Desist Order nor in their arguments during the prehearing conference.

Part 50 of our regulations. The legislative history of Section 185 of the Atomic Energy Act of 1954, as amended, is inconclusive with respect to whether Congress intended that all license changes had to be preceded by a construction permit. However, when §§50.23, 50.45, 50.55, 50.56, 50.90, 50.54(n) and 50.91 are read as a whole, it is clear that only if an application for an amendment to an operating license *involves a material alteration* of a licensed facility, must a construction permit be issued prior to the issuance of the amendment. The Staff advises us that past Commission practice appears to be entirely consistent with this legal position that a construction permit is only required for license amendments which authorize a "material alteration" of a facility, and that its research disclosed only one license amendment which required the prior issuance of a construction permit. This was an amendment issued on March 2, 1971, to the University of Maryland's research reactor license. The facility alteration involved complete removal of the existing control rods, rod drive mechanisms, core instrumentation and control room equipment supplied by Allis-Chalmers Corporation and replacement of these components with new components of the TRIGA design. The change essentially rendered major portions of the original safety analysis for the facility inapplicable to the modified facility. The construction permit for this alteration was issued on March 25, 1970 (Docket No. 50-156).

The Staff advises that, other than on this one occasion, all other license amendments issued by the Commission have not been preceded by the issuance of a construction permit. Moreover, we are advised that no construction permits have been issued in conjunction with onsite SFP modifications which have been authorized to date. It is a firmly established principle of law that administrative interpretations of statutes, consistently followed by the agencies charged with their administration, and not expressly changed by Congress, are entitled to great weight (*Allison v. United States*, 301 F.2d 670, 673, cert. den. 371 U.S. 901 (1962)), and it is likewise well established that great deference is given to the interpretation of regulations by the Agency charged with their administration (*Udall v. Tallman*, 380 U.S.1, 16-17 (1965)). Accordingly we conclude that the SFP modification need not be preceded by the issuance of a construction permit.

C. Other Arguments Raised Nothing New And, Lacking Any Factual Support Whatsoever, Are Denied.

The Intervenor's argue that they have been denied due process because certain preparatory work has been allowed to be performed prior to the hearing. However, as indicated in Part III at page 9 of our Order of October 31, 1977, both PGE and the Staff have been directed, among other things, to present evidence at the hearing with respect to the exact nature of the preparatory work being performed, and certainly the Intervenor's will have

the opportunity to cross-examine. Moreover, in our Order, PGE was once again warned that, if it proceeded with the preliminary work prior to our decision, it did so at its own risk. We note that even though the Intervenor have conducted extensive discovery and have visited the spent fuel pool, they have neither presented documentation to us nor factually asserted wherein this preparatory work in the SFP violates NEPA or has resulted in or will present any immediate danger to the public health and safety.

Said Intervenor again urge that the performance of this preparatory work violates the technical specifications. But again, despite their visit to the SFP and despite having conducted extensive discovery, they have not documented nor factually asserted wherein the technical specifications have been violated.

D. The Requests For Certification Are Denied.

Exercising the discretion delegated to us by 10 CFR §2.718(i), we deny the requests to certify the Cease and Desist issue to the Appeal Board.

ORDER

1. We deny Intervenor's Garrett's And McCoy's Objections To Prehearing Order And Request For Revision Of Order Or Certifications.

Dr. Cowan concurs but was unavailable to sign the instant Memorandum and Order.

IT IS SO ORDERED.

**THE ATOMIC SAFETY AND
LICENSING BOARD**

Frederick J. Shon, Member

Sheldon J. Wolfe, Esquire
Chairman

Dated at Bethesda, Maryland,
this 14th day of December 1977.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Edward Luton, Chairman

Ernest O. Salo

Gustave A. Linenberger

In the Matter of

Docket No. 50-320

**METROPOLITAN EDISON COMPANY
JERSEY CENTRAL POWER &
LIGHT COMPANY
PENNSYLVANIA ELECTRIC
COMPANY**

**(Three Mile Island Nuclear Station,
Unit No. 2)**

December 19, 1977

Upon environmental review pursuant to 10 CFR Part 50, Appendix D, Section C, and upon request for operating license, the Licensing Board (1) concludes that the construction permit for Three Mile Island, Unit 2, should be continued; and (2) subject to certain technical conditions, authorizes the Director of Nuclear Reactor Regulation to make such additional findings on uncontested issues as may be necessary for issuance of a full-term operating license.

TECHNICAL ISSUES DISCUSSED: Environmental impact of thermal releases; biological surveys; cooling tower design; safety standards; capacity factor; aircraft crash risk; radioactivity monitoring program; flood protection; emergency plans; gaseous rad-waste treatment system; chlorine discharge; dose calculations; effect of cooling towers; need for power; Table S-3 (Rn-222 releases); water pollution control; compliance with Federal and state provisions.

INITIAL DECISION

Appearances

**George W. Trowbridge, Esq., and Ernest L. Blake
Esq., Shaw, Pittman, Potts and Trowbridge, for the
Applicants**

Chauncey R. Kepford, for Joint Intervenors York
Committee for a Safe Environment and Citizens for a
Safe Environment

Karin W. Carter, Esq., for the Commonwealth of Penn-
sylvania

Henry J. McGurren, Esq., and **Gregory H. Fess, Esq.**,
for the NRC Regulatory Staff

I. INTRODUCTION

1. This is a proceeding on the application of Metropolitan Edison Company, the Jersey Central Power and Light Company, and the Pennsylvania Electric Company ("Applicants") for licenses to construct and operate the Three Mile Island Nuclear Station, Unit No. 2 ("TMI-2"). The plant is located adjacent to a similar unit (Three Mile Island Nuclear Station, Unit No. 1) on Three Mile Island in the Susquehanna River in Londonderry Township, Dauphin County, Pennsylvania.

2. Construction of TMI-2 was authorized on November 4, 1969. By application dated April 4, 1974, Applicants requested authorization, pursuant to Section 104.b of the Atomic Energy Act of 1954, as amended, to possess, use, and operate TMI-2, a pressurized water nuclear reactor, at a steady state power level of 2,772 megawatts thermal. On May 20, 1974, the Commission issued a notice which provided that any person whose interest might be affected by the proceeding could file a request for a public hearing in the form of a petition to intervene in accordance with the Commission's regulations contained at 10 CFR §2.714. Petitions to intervene were received from the Citizens for a Safe Environment and the York Committee for a Safe Environment (as "joint petitioners"), and from Mrs. Barbara Pradel of Greencastle, Pennsylvania. Additionally, the Commonwealth of Pennsylvania requested leave to participate as an interested State pursuant to 10 CFR §2.715(c). On July 24, 1974, the Atomic Safety and Licensing Board designated to rule on intervention requests granted the joint petitioners' request to intervene, granted the Commonwealth's request to participate, and denied the intervention petition of Mrs. Barbara Pradel.¹

3. This Atomic Safety and Licensing Board ("Board" has conducted a public evidentiary hearing to consider (1) issuance or denial of a full-term operating license for TMI-2 or its appropriate conditioning to protect en-

¹On August 15, 1974, a petition to intervene was filed by Gertrude and Frederick Hellrich, *et al.* Intervention was granted by the Board but thereafter, on August 20, 1976, these intervenors withdrew from the proceeding.

vironmental values and (2) because TMI-2 is subject to the provisions of Section C of Appendix D of 10 CFR Part 50, whether considering those matters covered by Appendix D, the provisional construction permit for TMI-2 should be continued, modified, terminated, or appropriately conditioned to protect environmental values. With respect to its consideration under Appendix D of the TMI-2 construction permit, the Board has conducted a full NEPA review covering both contested and uncontested environmental matters. With respect to the operating license the Board has, in accordance with §2.760a of the Commission's Rules of Practice, confined its findings to the matters in controversy.²

4. The Board has considered the entire record of this proceeding and all of the proposed findings of fact and conclusions of law submitted by the parties. All proposed findings and conclusions submitted by the parties which are not incorporated directly or inferentially in this initial decision are rejected as being unsupported in law or in fact, or as being unnecessary to the rendering of this decision.

II. FINDINGS OF FACT

A. Matters in Controversy

Contention 1

Applicants have failed to consider the environmental impact on the atmosphere and weather of the combined thermal releases of the generation facilities on the lower Susquehanna River. These releases will add a significant amount of energy to the local area to be dissipated by radiation and convection with possible alterations in the local climate. No operating license should be granted until such effects are discussed.

5. Witnesses presented by Applicants and the NRC Staff provided bases for concluding that there will be no significant impact on the local weather due to operation of TMI-2. The evidence indicates that, in reaching the conclusion that the impact of operation of TMI-2 on the weather will be negli-

²At the evidentiary hearing in this matter, the Applicants and the Commission's Regulatory Staff made their responses to a number of questions asked by the Licensing Board. The matters raised by the Board concerning the issues in controversy among the parties, or the environmental review, are discussed in this decision. Additional matters raised by the Board are not discussed herein for the reason that examination of them has revealed no "extraordinary" circumstances warranting further concern (10 CFR §2.760a).

ble, consideration was given to the effects of TMI-2 operation on the air temperature, local air circulation patterns and the ambient wind fields convective cloud development, enhancement of fog, and the possibility of triggering convective vortices such as dust devils, water spouts, and tornadoes. The only potentially noticeable effects on local conditions expected from operation of the cooling towers would be some increase in local fogging (prepared testimony of Applicants' witness C. L. Hosler on Contention 1, following Tr. 284; prepared testimony of Staff's witnesses L. Andrews, E. H. Markee, R. L. Drake on Contention 1, following Tr. 304; Tr. 300, 301, 333-34; FSFES, Appendix B, §V.A.3.b., at pp. B-38, 39). Snowfall attributed to a cooling tower plume has been observed. However, the record indicates that such snow would not create a significant environmental problem, since the snowfall would be extremely localized. Further, evidence indicates that plume meander lessens the potential for accumulation of snow and that snowfall attributable to the plume would only occur during the time of the year when snowfall would normally be expected. For snowfall to occur from the plume, the centerline of the cooling tower plume must fall below 10°F (-12°C) and the atmospheric conditions must be stable. TMI's size, considering both units, is significantly less than the 8,000-10,000 MW size which appears to be the threshold for a concentrated energy source to cause detectable effects on the climate (Andrews, Markee, Drake, as cited above; Tr. 298, 314).

6. The Applicants and the Staff provided witnesses who addressed the concern raised in the contention that TMI's cooling tower releases in combination with releases from other power plants located along the Susquehanna could impact weather in the area. The Board, after considering the full record on this matter, concludes that this concern can be dismissed for the following reasons. The distribution of generating plants along the Susquehanna is such that they act independently on weather conditions; the impact of each on the atmosphere is diffused and lost before it can combine with impacts due to other plant releases under any conceivable combination of winds in the Susquehanna River Basin. If all the generating capacity which releases heat to the air along a 100-mile stretch of the Susquehanna were combined in one concentrated complex, one might expect local weather effects; spread over 100 miles, however, it is insignificant when compared to the naturally released energy in the same area (Witnesses Hosler; Andrews, Markee, Drake, as previously cited).

7. The Board finds that the environmental impact on the atmosphere and weather due to operation of TMI's cooling towers singly and in combination with releases of other generation facilities on the lower Susquehanna has been adequately evaluated and that any such impacts will be insignificant and within naturally occurring variations in the area.

Contention 2

The biological survey performed by the Applicants' consultant (as amended by Supplement II of the Environmental Report) is inadequate, in that it consists of little more than a listing of species which may be in the area. A more thorough survey is necessary, including population estimates on a year-round basis, to positively assess any possible impact of Unit 2 on the environment. No operating license should be granted until such a study is made.

8. Aquatic surveys, on specific aspects of the aquatic environment, have been initiated by the Applicant at varying times, some of which have been continuous on an annual basis. Some surveys have been overlapping in time and on species emphasis and although the purposes for the surveys may have differed (some served as background and operational monitoring for TMI-1), they have all contributed, with varying success, to the accumulation of usable data.

9. The evidence shows that an annual survey on the macroinvertebrate fauna was begun in 1967. In 1970, two aquatic biology programs were initiated to meet requirements imposed on the York Haven Power Project by the Federal Power Commission. Personnel from Millersville State College were engaged to conduct fish and macroinvertebrate studies of the Susquehanna River in the vicinity of Three Mile Island and the York Haven Hydroelectric Station. The fish study for Three Mile Island Nuclear Station, Unit 1, began in July 1970 and continued through October 1973 (four summer seasons). The second aquatic study conducted during the TMI-1 preoperational period was a study of macroinvertebrates in the vicinity of the plant. The aquatic biological programs were increased in scope in 1974. Early in 1974 Metropolitan Edison Company's consultant, Ichthyological Associates, Inc., initiated an aquatic biological surveillance program to meet certain environmental technical specifications for TMI-1. These studies are being continued, although no NRC environmental technical specification requirements for TMI-1 are in effect at the present time. The history of these is summarized in Applicant's Exhibits 4, 5, 6, 7, and 8.

10. At the present time, the Applicant is continuing studies of impingement, entrainment of ichthyoplankton, benthic macroinvertebrates, fisheries, thermal plume mapping, ambient water quality, and some supplemental studies. These include ichthyoplankton sampling in the reservoir, estimation of fish populations, and surveys (census), fish movements, and food habits (Tr. 956).

11. The impingement in 1974 was extrapolated to be 21,243 fish weighing 33.5 kilograms (73.7 lbs). This is an extrapolation of 21, 24-hour

surveys. The Applicants attempt to do two surveys per month. The intakes (three each for Units 1 and 2) have a three-eighths-inch mesh with an intake velocity of 0.2 feet per second (Tr. 958-59). An estimated 82.7 lbs were impinged in 1975. This was an extrapolation from 23 surveys in 1975.

12. The ichthyoplankton surveys consisted of taking six 10-minute samples (at four-hour intervals) in a 24-hour period, semimonthly from April through October 1974 (Applicants' Answer to Board Questions, p. 7). The fourteen samples (April through October) contained a total of 390 fish eggs and 167 larval of 18 taxa. In 1975, 67 larval fish, six juvenile fish, and zero fish eggs were collected. No extrapolations were attempted, as no reasonable confidence limits could be attached (Tr. 962).

13. Entrainment surveys for phytoplankton and zooplankton were done on a similar schedule, *i.e.* semimonthly at four-hour intervals over a 24-hour period (Applicants' Answer to Board's Questions, pp. 7-8; Tr. 962), and the Applicant's experts believed that the numbers entrained, directly associated with the volume of water pumped, were so small compared to the total biomass in the (so-called) reservoir that the biomass entrained was insignificant (Tr. 963).

14. Samples of zooplankton were taken at four-hour intervals during semimonthly studies April through October 1974. A total of 85 taxa (80 through early September (Applicants' Answers to Board's Questions, pp. 8-9)) of zooplankton and other invertebrates was identified. Samples were taken at the intake and discharge, and the mean values of percent zooplankton mortality ranged from -1.2% to 3.7% through September and 3.2% to 8.8% through October (Applicants' Answers to Board's Questions, p. 9). In 1975, 85 taxa of zooplankton and other invertebrates were identified, and the mortality rates ranged from 0.6 to 9.6%.

15. Fishes were sampled at two-week intervals by seine and trapnet from April through October 1974. A total of 108 trapnet samples caught 1,970 specimens of 22 species. The channel catfish was the most common single species while the sunfish family accounted for approximately 50% of the trapnet catch (Applicants' Answers to Board's Questions, p. 11). The seine collections caught 8,587 specimens of 30 species. The spottail and spotfin shiners were the most common (Applicants' Answers to Board's Questions, p. 11). The effort and catches of trapnet fishing and seining were of the same orders of magnitude in 1975, while in 1976, 90 seine collections yielded 10,478 fish of 35 species. Significant differences in species rank at one upstream and one downstream station were observed between 1975 and 1976. The variations in fish abundance are attributed, by the Applicants' consultants, to year-class fluctuations. The fact that the macroinvertebrate communities have been sampled by three separate programs has led to some confusion and difficulties in analyses. Since 1967, Dr. Wurtz has

sampled annually, in the first week of August, at ten stations (testimony of James E. Mudge, following Tr. 980). Starting in 1970, personnel from Millersville State College sampled eight stations at monthly intervals from May through November. Early in 1974, the Applicants' consultant, Ichthyological Associates, included macroinvertebrates in its sample program. Ichthyological Associates collected semimonthly, April through October, at five stations (*Ibid.*). The trend indicated by Dr. Wurtz' sampling was questioned by the Joint Intervenors (para. 33 of Joint Intervenors' Findings of Fact). There was a drop in numbers of species from 145 in 1967 to 79 in 1969 (mean per station varied from 48 in 1967 to 24 in 1969). The recovery (119, 118, and 106 in 1972, 1973, and 1974, respectively) has not been complete but is within the sampling error (means of 32, 29, and 30 per station). On the other hand, TMI-1 started operation in 1974 and it is doubtful that construction activities were the cause of the decline in 1968 and 1969. Dr. Wurtz attributes the decline to upriver perturbations (FSES §II-13, B-18). This is illustrated by Station 8 which is well beyond the influence of TMI-1 and -2. The Board agrees that these declines were caused by influences other than construction and operation of TMI-1 and -2.

16. Selected water quality parameters were studied semimonthly April through October 1974. The pattern of monthly distribution of the parameters, with some exceptions, was similar (Applicants' Answers to Board's Questions, p. 15). The parameters studied included total dissolved oxygen, total alkalinity, nitrate-nitrogen, nitrite-nitrogen, chlorides, and total suspended solids. The pattern of monthly distribution of the parameters with some exceptions was similar. Mean values were high in September and low in April and May.

17. The TMI-1 discharge plume was mapped semimonthly May through December 1974, with additional mappings done during high and low ambient river temperature conditions. The discharge temperatures ranged from 5.6°C (10.1°F) below to 3.9°C (7.0°F) above ambient river temperatures. Plume characteristics usually were distinguishable less than 20 meters into the river and downstream 50 meters. In 1975, 28 plume maps were made during various river flow conditions and station operation levels. In 1976, 33 plume surveys were conducted at various river flow conditions and station operation levels.

18. Larval fishes were sampled in 1974 by towed 0.5-meter nets during semimonthly 24-hour studies and during weekly daytime surveys May through September as reported in the 1974 Supplemental Report. A total of 467 larvae was taken during the 24-hour studies. Cyprinids were the most common; Catostomids, Percids, and Ictalurids, and Centrarchids were also taken. Three stations in York Haven Pond were sampled for fishes by fyke net in October and November 1974 (1974 Supplemental Report). Ten collec-

tions caught 59 specimens of eight species. Some 137 specimens of 12 species were taken in 21 trapnet collections during June and July. Sunfish were the most common. The sampling was repeated in 1975 (1975 Supplemental Report). Trawl collections were taken in the center and east channels of the Susquehanna River in 1974 (in the vicinity of TMINS). A boat-mounted electrofisher was used in the York Haven Pond during July through November 1974 when 2,903 fish of 24 species was captured. The redbreast sunfish, pumpkinseed, rockbass, and smallmouths comprised 77.5% of the catch. Population estimates of the larger fishes were attempted in 1974 and in 1975 by the conventional methods of capture, tagging, and then recapture using a tag-to-untag ratio to determine the estimates.

19. A creel census was conducted by interviewing over 2,000 anglers in 35 surveys from May through December 1974. The creel census was repeated in 1975. The catch per unit of effort 1974 was 0.93, in 1975 it was 0.92 and in 1976 it was 0.93, *i.e.* a fisherman could expect to catch approximately one fish per hour. The fishery is considered to be a good smallmouth bass and sunfish fishery. The fishery consists of approximately 11,000 angler days.

20. The study of diseases in natural (wild) populations of fishes is difficult. The best that can be done is to superficially examine representative samples up and downriver from the plant, for external parasites, tumors and any other abnormalities. During periods of high temperatures, monitoring for bacteria (particularly *Aeromonas*) is worthwhile; however, any causal implications with respect to the operation of the plant would be speculative. The best indicator at TMI has been the catch per unit of effort in the sampling year and in the recreational catch. The Board has not seen any undue causes for concern.

21. There was extensive cross-examination of both the Applicants' (Tr. 1992-2039) and Staff's (Tr. 2041-2073) panels of witnesses presented to address aquatic impacts, particularly with respect to the capability of aquatic monitoring programs to detect adverse impacts caused by station operation. Intervenors posed numerous questions with respect to how large a change in species composition would have to be in order to conclude that a significant effect had occurred, and how a determination would be made that the nuclear facility had caused the effect (Tr. 2011-30; 2043-2055; 2057-63; 2066-73). The testimony of both the Applicants' and Staff's witnesses was in agreement that no specific percent or number could be placed on the magnitude of impact which an aquatic species must experience in order to classify the impact as significant. The witnesses consistently testified that numerous parameters had to be measured in order to determine the significance of the aquatic impact and its source. Included among these

parameters would be measurements from sampling stations outside the plant's impact area (Tr. 2015, 2024-25, 2027, 2052-53), the time of year (Tr. 2017), previous catastrophic events (Tr. 2099-2100, 2019, 2058-59), turbidity, pollution load, river level, temperature changes (Tr. 2028), changes in species dominance, and movement of fishes.

22. The Board finds that entrainment can be expected to kill all organisms that enter the cooling system, but the volume of water used in relation to the flow of the river cannot be expected to produce a significant impact upon fishes of concern. The net water use of 9,250 gal/min is 0.1% of the Susquehanna flow fifty percent of the time and up to 1% of the river flow less than one percent of the time (Applicants' Answers to Board's Questions, p. 2, Tr. 935). The size and composition of the populations existing in the river at the present time are such that they are able to compensate for any losses of larvae due to entrainment.

23. The changes in species ranking that occurred between 1974 and 1975 in the trapnet catches can be accounted for by natural fluctuations (a catch of a large number of channel catfish) rather than to station operation. The same can be said for any changes in the indices of affinity or diversity in the macroinvertebrate populations.

24. The thermal plume studies have been adequate enough to determine that no significant impact either through mortalities or undue avoidance are to be expected.

25. The losses due to impingement are within the range that might be expected from an increase in fishing effort equivalent to two or three fishermen on a single day below or near York Haven Dam.

26. The macroinvertebrate communities appear to be more affected by natural conditions such as ice and high river flow than by the influence of the operation of the plant.

27. There appears to be no adverse impact upon any of the food organisms utilized by the resident fishes.

28. Although the Applicants' consultant obtained point estimates for the numbers in the populations of the principal species, the variances were such that perhaps a mortality of 50% might be detected. However, lower mortality rates may or may not be detectable.

29. The creel census indicated catch-per-unit-of-effort, in this case the catch-per-hour. Although this was not correlated with the population estimates (the creel census encompassed the entire reservoir while the population estimates were for specific areas), the catch-per-unit-of-effort indicates that a fairly healthy fishery has been maintained.

30. Although the population estimates are not refined enough to determine small changes in the population—that are either instantaneous or continuous—and although the creel census is not tied in directly with the

population estimates, the impact of the operation of TMI-1 and TMI-2 is expected to be so insignificant that increases in scope and refinement of the biological studies to a level that would measure slight changes are unwarranted.

Contention 3

The design for the cooling towers is inadequate to withstand the earthquake or tornado that the rest of the plant is built to withstand. As a result, if this earthquake or tornado does occur and the main plant does withstand it, it is highly probable that the cooling towers will not. Then, either the plant will shut down for two or three years while the towers are rebuilt or repaired, or the plant will continue to operate without cooling towers using once-through cooling. In this latter event, it is highly likely that state water quality criteria would be violated and severe environmental impacts would ensue. Therefore, no operating license should be granted until the entire plant is rendered capable of withstanding the maximum anticipated earthquake or tornado or until an adequate cost-benefit analysis pursuant to NEPA is conducted taking into account the impact of possible loss of the cooling towers.

31. Testimony with respect to Contention 3 was presented by witnesses for both the Applicants and the Staff. This testimony supports the Joint Intervenors' assertion that the cooling towers are not designed to withstand the maximum anticipated earthquake or tornado that certain safety-related structures, systems, and components of the plant are built to withstand. The record corrects a possible misinterpretation that might derive from the first sentence of the Contention; namely, that all but the cooling towers is built to withstand the maximum anticipated earthquake and tornado. The towers have been designed to conventional standards which are common for similar structures and equipment in an area of fairly low seismic activity and low tornado probability (SER, Chapter 2). This resulted in the present design which permits the structures to withstand one hundred-mile per hour winds thirty feet above the ground, and approximately one hundred forty-mile per hour winds at the top of the towers. No consideration was given to seismic activity, although some resistance to seismic shock is expected (prepared testimony of Applicants' witness R. W. Heward, Jr., following Tr. 1114; prepared testimony of Staff witnesses Jan Norris, Harley Silver, and Robert Samworth, following Tr. 1123).

32. The Applicants and the Staff maintain that since the cooling towers are nonsafety-related structures, that is, the loss of the cooling towers would not inhibit the safe shutdown of the plant, NRC regulations do not

require such stringent design. In its review, the Staff did determine that failure of the cooling towers would not affect any safety-related structure, component, or system of the plant (*Ibid.*). Answers to Board questions verified that safe plant shutdown can be achieved and maintained irrespective of loss of cooling tower and loss of cooling tower catch basin integrity (Tr. 1120, 1128).

33. Testimony was presented to show that, from considerations of cost-benefit and of alternatives, there is no need to upgrade the design of the cooling towers to the same criteria established for safety grade equipment. It was noted by both Applicants and Staff that should a natural event occur at the site that had the capability of disrupting the operation of the cooling towers, other operationally important but nonsafety-related structures might be disrupted also. Thus, the upgrading of the towers to withstand the maximum anticipated earthquake or seismic event would not assure the ability of the overall plant to maintain operation. It was the expert opinion of witness Heward that the cost of upgrading all appropriate portions of the plant to meet safety-grade standards for natural phenomena would be substantial. Mr. Heward further testified that it is implicit in industry practice that very large capital costs are not justified on an economic basis to avoid plant outages due to such improbable events. Furthermore, a consideration of alternatives indicates that the cost of upgrading a fossil plant to the same criteria in order similarly to increase reliability would require a substantial redesign and would cost even more than to perform such a task at a nuclear plant, where portions of the plant are already so qualified (*Ibid.*; Tr. 1119).

34. The concern of Contention 3 that the TMI-2 plant would be operated with once-through cooling if the cooling towers were lost is now addressed. It is noted that since TMI-2 is designed and built to operate with closed-cycle cooling, in order to operate it in a once-through cooling mode would require substantial design and construction modifications, which would necessitate a further environmental impact review, request for license modification, and possibly a public hearing. Since an event that damaged the towers would likely damage other structures and components designed to similar standards, it is unlikely that such modification of the cooling system alone would allow the plant to remain in operation or would even pace the schedule of repairs needed to reactivate the plant. Finally, the present operating limitations placed on the Applicants by the NRC (*e.g.*, via technical specifications), the Environmental Protection Agency, and the Commonwealth of Pennsylvania would not allow discharges into the Susquehanna River from once-through operation of TMI-2 (testimony of witnesses Heward, Norris and Silver, and Samworth as previously cited; Tr. 1117-1119).

35. Based upon the foregoing, the Board finds as follows:

- (a) Although the TMI-2 cooling towers, per the allegation of Contention 3, are not designed to safety Category I standards and criteria, they are designed in accordance with the general practices of industry.
- (b) There is no justification, technically, for requiring that the cooling towers be upgraded to meet safety Category I standards, and no economic justification that the entire plant be so upgraded.
- (c) There is no basis for the Joint Intervenors' concern that loss of the cooling towers will lead to an unauthorized and environmentally unacceptable once-through cooling mode of operation, in view of the various constraints that will militate against such operation; hence this concern likewise cannot justify the application of Safety Category I criteria to the cooling towers and the balance of plant components. The Joint Intervenors have elicited nothing through cross-examination nor through the production of direct evidence which successfully contradicts the foregoing.

Contention 4

The cost-benefit figures used by the Applicants are fallacious. In particular, the assumption that the unit will operate over its lifetime at a capacity factor of 0.8 is totally unjustified in the operating history of U.S. nuclear reactors. Through 1973, no U.S. nuclear reactor had a lifetime average capacity of 0.8 and only 2 of 37 licensed through 1973 exceeded 0.7. The average capacity factor for all licensed reactors in 1973 was 0.55. No operating license should be granted until the Applicants can justify in a factual manner their capacity factor assumptions.

36. The Applicants and the Staff both presented prepared testimony and proposed findings on this Contention (Applicants' Witness S. J. Zuckernick, following Tr. 1141; Staff's Witness R. G. Easterling, following Tr. 1919). The Joint Intervenors presented no evidence in this regard.

37. The Board makes the following findings. Neither the Applicants nor the Staff holds that a capacity factor of 0.8 is currently the appropriate value to use for the TMI-2 plant. Both parties, however, have shown to the satisfaction of the Board, and without meaningful contradiction by the Joint Intervenors, that commensurately compared with an existing coal-fired plant at the same site, operation of the TMI-2 facility is the economical choice down to a capacity factor range of 35% (FES, Fig. 8.2) to 46% (Zuckernick testimony). By comparison the Applicants currently project a value of 65% (Zuckernick testimony); and the Staff, by a rather

rigorous statistical analysis, calculated a 10-year, size-independent capacity factor of $62 \pm 21\%$. For the size-related calculation (an assumption of questioned validity on the Staff's part), the prediction is $54 \pm 22\%$. Thus, the Board finds that there is a sufficiently adequate margin between predictions of capacity factor and break-even generation costs such that a coal-fired plant is not a viable economic alternative. In other words, the prescriptive aspect of Contention 4 has been satisfied.

Contention 5

The containment structure and other buildings designed to withstand certain aircraft impact events are of inadequate strength to withstand the impact of airplanes which can reasonably be expected to frequent Harrisburg International Airport. Both the Boeing 747 and the Lockheed C-5A are reasonably expected to frequent Harrisburg International Airport and greatly exceed the kinetic energy set for the design consideration.

38. The Board views this Contention as, in effect, comprising the following two allegations:

- (a) A first allegation that claims that critical (safety Category I) structures are not capable of withstanding the impact of the Boeing 747 and the Lockheed C-5A aircrafts.
- (b) A second and follow-on allegation that these two types of aircraft will potentially use the Harrisburg International Airport with sufficient frequency to generate more than a *de minimus* concern for the health and safety of the public.

39. The Applicants and the Staff both presented prepared testimony and proposed findings on this Contention (testimony of Applicants' Witness J. M. Vallance, following Tr. 511; testimony of Staff's Witness J. B. J. Read, following Tr. 617; supplemental testimony of Read, following Tr. 1297). The Joint Intervenors relied on cross-examination of the Applicants' and Staff's witnesses and upon argument presented in their proposed findings.

40. The evidence is that the TMI-2 facility is not capable of withstanding the impact of an aircraft weighing in excess of 200,000 pounds. In addition, the Boeing 747 and the Lockheed C-5A, in flight at 200 knots or greater velocity, each has a kinetic energy that exceeds the impact resistance for which the TMI-2 structures (particularly the containment) are designed to withstand (Vallance, cited above). The Board thus finds that Item (a) is a correct statement of fact.

41. The follow-on allegation, Item (b) above, reflects the remaining

substantive issue within this Contention. The nature of the direct testimony and the scope of the Joint Intervenors' cross-examination prompts the Board to, in effect, subdivide Item (b) into three subissues:

- i) Has the computation of the probability of an aircraft impact been properly carried out?
- ii) If so, is the result adequate to justify a negligible concern for the health and safety of the public, absent an analysis of the consequences of such an impact?
- iii) Are the current and anticipated frequencies of heavy aircraft operations at the Harrisburg Airport properly taken into account?

The Board considers it appropriate to resolve Item (b) via these subissues.

42. The probability computation (Item (b)(i) above) is addressed first. The Applicants have calculated a probability of about 3×10^{-9} events per year, per unit, for aircraft larger than 200 thousand pounds, based upon Harrisburg International Airport data that yielded an estimate for 1976 of approximately 511 operations (takeoffs or landings) of such planes, using those runways that could require a flight pattern imposing a potential threat to TMI-2. This result includes all strikes upon any structure, irrespective of whether there is disabling damage leading to shutdown; it disregards the angle of strike; and, further, it disregards any protective shielding effect from the cooling towers and other noncritical structures. Finally, the Applicants' analytical approach incorporates an angular correlation consideration that results in a *decrease* of strike probability for planes whose approaches lie along lines displaced at *increasing* angles from the extended runway centerline (Vallance, *loc. cit.*).

43. According to the testimony of Vallance, the Staff assumed for the sake of conservatism that the TMI Station lies within (although it is slightly outside of) a 60° sector centered on the runway centerline, and that all strike locations are equally probable within that sector. Using otherwise similar geometry and flight frequency assumptions, the Staff, per Vallance's testimony, has obtained a probability of 10^{-7} events per year, per unit (Vallance, *loc. cit.*). The Staff's witness stated the Staff's conclusions as follows:

The staff (sic) has concluded that, with respect to the TMI-2 site, the risk from aircraft is acceptably low if fewer than 2400 operations per year at Harrisburg International Airport are flown by aircraft larger than the design basis aircraft. The basis for this conclusion is that the expectation of aircraft larger than the Boeing 720 striking the plant would then be less 10^{-7} per year (estimated by the algorithm contained in Standard Review Plan Section 3.5.1.6, NUREG-75/087 (September 1975)).

At present, about 600 four-engine jets per year use the airport, which is considerably within our criterion of 2400.

(Testimony of J. B. J. Read, following Tr. 617.)

44. The Board here interprets the above quoted airport usage of "600 four-engine jets per year" to be consistent with the Applicants' value of 511 operations per year. The two different probability results are judged by the Board to be compatible in the sense that the difference between them is plausible, based upon the cited assumptions regarding conservatism. The Board finds that the probability assessments have been properly carried out.

45. The Joint Intervenors, as the result of cross-examination, have submitted proposed findings that challenge the validity of the computational model used by the Applicants and by the Staff, criticize the lack of "peer review" given to the model, and question the applicability of the results. After a careful weighing of the cross-examination and the results of our own examination of the witnesses, the Board finds that, while certain of the Intervenors' proposed findings are literally true, none of them represents a significant flaw in the adequacy and applicability of the strike probability results. Nor were the competence and judgments of the two witnesses impugned to any significant extent. We find to be acceptable and conservative the result that the probability of an impact of any nature on some portion of the TMI-2 facility by a heavier than 200 thousand-pound aircraft is currently less than 10^{-7} per year, under the various qualifying conditions imposed.

46. Item (b)(ii) is addressed next. Regarding the health and safety of the public, neither the Applicants nor the Staff refuted the concern of the Joint Intervenors that the impact of a plane weighing more than 200 thousand pounds into a safety Category I structure might give rise to radiological consequences greater than the exposure guidelines of 10 CFR Part 100. This concern, in turn, prompted the Intervenors to file a motion to compel the appearance of a witness to discuss the consequences of such an event (nature and disposition of this motion discussed below).

47. Applicants' witness and counsel for the Staff appealed to the guideline probability values set forth in NUREG-75/087 (in particular, §3.5.1.6, AIRCRAFT HAZARDS), whereby an analysis of consequences is not required if, as here, the probability assessment yields a value of less than 10^{-7} per year. The Staff's witness, in response to Board questions, indicated that in his professional judgment consequences are not entirely ignored by the 10^{-7} probability guideline. If, for example, the consequences were so severe as to threaten a monumental loss of life or property, a different approach would be taken before deciding whether to permit plant operation (Tr. 673-675).

48. Irrespective of the foregoing, the Joint Intervenors at various times

during the course of the hearing requested that the Applicants and the Staff provide witnesses to discuss the consequences of an accident caused by a larger than 200 thousand-pound aircraft colliding with the facility (Tr. 590-600, 615-616, 621, 632-650, 713). By written motion dated April 15, 1977, Joint Intervenors sought to have this Board compel the Applicants to produce witnesses on such consequences. We denied that motion orally at the evidentiary hearing on May 18, 1977 (Tr. 1549). On August 8, 1977, we set out in writing the basis for that denial. We there took the position that under the Commission's scheme of regulation, Applicants need not be concerned with the consequences of extremely improbable accident events (less than 10^{-7} per year) such as we find here. We adhere to that view for the reasons stated in our Order of August 8.

49. We turn now to the frequency of heavy aircraft operations (Item (b)(iii) above). As noted above, the Applicants have established that for 1976 about 511 heavy (200 thousand pounds or greater) aircraft used the Harrisburg International Airport in those flight patterns that could potentially pose a threat to the TMI-2 facility. This corresponds to one to two operations per day for 1976, compared with five to six per day at the time of the Staff's review of Unit 1. At that time, the Staff concluded that about 2,400 operations per year represented no undue risks to the health and safety of the public. The Unit 1 technical specifications require that the Applicants monitor and report to NRC the number and size of craft using the field. Only a substantial increase in the usage rate would warrant the Staff's reconsideration of its position (supplemental testimony of J. B. J. Read, following Tr. 1297). The Board's questions concerning the options that the Staff might then exercise resulted in supplemental Staff testimony to the effect that Department of Transportation information projects a 50% to 100% increase in airport operations during the period 1975 to 1990; conservatism in the crash probability analyses are consistent with the Staff's judgment that a significant increase in the frequency of operations is needed to justify a reevaluation of the risk to the public of larger than design basis aircraft; corrective measures such as restrictions of airspace in the site vicinity or hardening of plant structures could potentially be undertaken; alternatively, plant shutdown may be required if the crash probability becomes unacceptably large.

50. We find that proper account has been taken of the current and anticipated airport traffic. Indeed, we find that there will be an adequate opportunity to anticipate an increase in heavy aircraft traffic well in advance of any increase potentially posing an unacceptable risk. We find that such an increase is unlikely and that should it nevertheless occur, acceptable corrective measures can be taken to make the risks acceptable.

Contention 6

The environmental radioactivity monitoring program of the Applicants is inadequate to accurately measure the dose delivered to the public during normal and accident conditions. Only active, real-time detectors can determine what the actual dose rate is. Furthermore, an array of offsite detectors could greatly aid in possible evacuation plans. No operating license should be granted until the Applicants provide a network of active radiation monitors.

51. The Board views this Contention as comprising two allegations:

- (a) The actual radiation dose received by the public during normal and accident conditions can be properly measured only if offsite, real-time detectors are deployed.
- (b) The implementation of evacuation plans could be greatly aided by the deployment of such detectors.

52. Based upon a review of Applicants' present capabilities to monitor and assess radioactive releases from TMI-2, as well as upon the advantages and disadvantages of employing active real-time detectors, the Applicants and the NRC Staff are in agreement that the current monitoring capabilities of Applicants are adequate. They also agree that installation of the type of real-time detectors currently commercially available would provide no meaningful improvement over the existing system; indeed, certain disadvantages were noted. For normal releases, the Applicants sample and analyze the release at its source prior to discharge, monitor the release at the time of discharge, and variously take continuous composite samples and grab samples of releases. Through a wide variety of types of samples, of types of detectors, and of locations, including thermoluminescent dosimeters, sampling of surface water, drinking water and rain water, collection of particulates and iodines, and collection and analysis of vegetation, soil, and agricultural products in the TMI site environs, radiation levels and radioactivity around the plant site are measured to assist the Applicants in assessing the impact of releases, and to provide confirmation of the effluent monitoring results done at the points of release.

53. With respect to off-normal conditions that might justify the evacuation of members of the public within the low population zone, testimony was offered to the effect that the environmental monitoring program is not intended for use in formulating nor in implementing evacuation plans. With respect to the ability of active, real-time detectors to aid in evacuation plans, such detectors would again be of little or no value. Instrumentation

used to determine the severity of an accident, and the need for any offsite emergency action, is located on site and is monitored from the reactor control room. This instrumentation monitors area conditions and process variables such as the reactor coolant temperature and pressure and any abnormal release of radioactivity. In the event that accident conditions arose for which evacuation would be an effective protective measure, necessary measurements and corrective actions to mitigate the consequences, including notification of offsite emergency personnel, would be performed quickly, within 10-15 minutes of the incident. It would, therefore, be unlikely that any offsite active detectors would register any abnormal reading since no release from the containment would as yet have occurred. Only after some period of time (to allow the release and transport of radiation emitters) would the detectors be of any use, and even then they would add nothing to the information that the previously dispatched offsite survey teams would not already have gathered.

54. In summary of this matter, the Board finds that the radiological effluent and environmental monitoring programs as proposed by the Applicants and approved by the Staff are adequate to measure and evaluate normal radioactive effluent releases and to measure radioactivity in the plant environs; and that active, real-time detectors would add nothing to the present capability. We further find that the response or effectiveness of both in-plant instrumentation and offsite personnel in the event of an accident would not be aided or improved by such detectors (testimony of Porter, following Tr. 1011; testimony of Osloond and Stoddart, following Tr. 1060; testimony of Van Niel, following Tr. 1060; testimony of Wayne Britz).

Contention 7

The flood protection system for Unit 2 is inadequate. This is because the flood data presented and the floods designed against are based on historical data which do not include the intentional efforts of man to effect weather modification. Such efforts at weather modification render the historical data of questionable value. No operating license should be granted until the effects of human efforts at weather modification are understood.

55. The Applicants' witness Hosler is an expert in the field of meteorology and weather modification (see biographical sketch and publications of C. L. Hosler, following Tr. 284). His testimony establishes that no weather modification efforts of man can conceivably be expected to increase the precipitation rate during a hurricane or heavy storm episode,

nor to increase the flood threat to the TMI site. "The water is either there or coming into the region or it isn't and nothing man can do is going to change this" (Hosler testimony, following Tr. 481).

56. The Staff's witnesses concurred in the above conclusion. They further explained the various elements of conservatism not only used to estimate the probable maximum precipitation that might initiate a flood, but also used to estimate the probable maximum flood that could result therefrom. The estimation methodology, a portion of which had been previously developed for TMI-1, was tested during the 1972 hurricane "Agnes" flood and was found to overpredict the river stages that actually occurred. In addition to this conservatism, four feet of freeboard protection has been provided at TMI-2 to eliminate wave effects produced during a probable maximum flood by up to 40 mph winds blowing from the least desirable direction. Examination by the Board established that the reason the TMI site was flooded during the occurrence of Hurricane Agnes was because certain protective levees had not been completed (Tr. 509).

57. From a review of the available evidence, we find that weather modification does not represent a material threat with respect to the adequacy of the flood protection design at the TMI-2 facility, which design we find to be acceptable and conservative (testimony of Hosler, following Tr. 481; testimony of Johnson and Bivins, following Tr. 508).

Contention 8

The warning and evacuation plans of the Applicants and the Commonwealth of Pennsylvania are inadequate and unworkable. The plans assume that all local and state officials involved are on 24-hour notice and can be contacted immediately. They further assume that all people notified will promptly react and know how to respond and are trained in what to do. They also assume that the public which has been assured that accidents are "highly unlikely" or "highly improbable," will respond and allow themselves to be evacuated. No operating and evacuation plans are shown to be workable through live tests.

58. The Applicants' prepared testimony described the plans and procedures which govern their actions in accident situations; described the equipment relied upon both for accident detection and evaluation and for assured communications with offsite authorities; and described pertinent portions of their training program, including emergency drills (testimony of J. G. Herbein, G. P. Miller, and R. W. Dubiel, following Tr. 757; testimony of Thomas Potter, following Tr. 1556). The Joint Intervenors presented no prefiled testimony, but conducted extensive cross-

examination and submitted proposed findings on this contention. This was the only contention for which the Commonwealth presented prepared testimony and submitted proposed findings, adopting as its own the Applicants' proposed findings numbered 43 through 56.

59. The witnesses for the Commonwealth of Pennsylvania were from the state and local civil defense organization. Their testimony described the civil defense organizational structure; the action plans that would be followed in the event of an emergency, including a nuclear power incident; and described their experience in evacuation involving nonnuclear events (testimony of K. J. Molloy and C. A. Williamson, following Tr. 801).

60. The Staff's testimony described the results of its review of the Applicants' emergency response plans, including the ability to provide early warning to the public, to arrange for public evacuation, and to interface appropriately with the state (testimony of C. R. Van Niel, following Tr. 1701; testimony of Charles Gallina and Phil Stohr).

61. We see no need to recite here—as do the proposed findings of the Applicants, the Commonwealth, and the Staff—those uncontradicted, descriptive characteristics of the Applicants' state of preparedness, nor that of the cooperating state and local agencies upon whom the success of the emergency plans depend. We find these to be adequate. We do address those assumptions deemed by the Intervenor to be necessary for the success of the emergency plans, and hence challenged by this contention, namely,

- (a) that appropriate state and local officials are available to be contacted any time they are needed;
- (b) that such personnel, upon being notified, will know the right thing to do and will do it promptly because they have been so trained; and
- (c) that any members of the public that should be evacuated will respond appropriately and will permit themselves to be evacuated despite there having been no live drills or tests of the public response.

Underlying all of those is the need for the existence of dependable, prompt, and intelligible modes of communication amongst the emergency plan participants and with the public. The referenced testimony is replete with evidence confirming this. Examination by the Intervenor and the Board cast no doubt upon the adequacy of the communications equipment and the various modes of communication. The Board finds these matters to be satisfactory.

62. We turn now to Item (a) above. In the event of an accident, TMI-2 personnel initially contact the State Council of Civil Defense Duty Officer and the Dauphin County Civil Defense Headquarters. Calls also would be made by Applicants directly to Pennsylvania State Police, Hershey Medical Center, and the Brookhaven Assistance Group, as necessary. The State's

Civil Defense (CD) Duty Officer is available twenty-four hours a day, seven days a week; the County Civil Defense Headquarters, which serves as the constant communications center for all emergencies in the county, is always manned. Similarly, Pennsylvania's Bureau of Radiological Health (BRH), which is the Commonwealth's expert radiological advisor and whose personnel are notified immediately by the state civil defense duty officer, maintains a number of contact points where BRH representatives can be reached by the CD duty officer. Upon receipt of the call from the CD duty officer, the BRH representative then contacts TMI on one of its multiple phone lines to confirm the validity of the initial notice to CD and to receive details of the event. In the event that BRH cannot be contacted (considered remote in view of BRH's multiple contact points and successful drills in the past), civil defense could proceed based on Applicants' expert recommendations as to the need for protective action.

63. The Dauphin County CD unit claims to have responded effectively to several disasters over the past several years involving evacuation of the public and the handling of physical injuries. These claims were not disputed. The Board finds that a randomly required initiation of the appropriate emergency response plans will not fail due to any inability to contact state and local officials.

64. Regarding Item (b) as noted above, prior successful disaster responses (albeit to nonradiological events) also support the conclusion that state and local officials are knowledgeable about their jobs. Joint Intervenors and the Board were particularly interested in the effect on the emergency response plans if the state's lead radiological assessment agency, *i.e.*, the Bureau of Radiological Health, should suffer a reduced capability. This possibility was suggested by a press release from the Department of Environmental Resources, within which BRH operates, indicating that the state budget may reduce funds for radiological monitoring (Board Exhibit 1). NRC Staff witnesses, when presented with information in the press release, generally observed that the NRC requires an adequate emergency plan, and that should that plan become insufficient for some reason, the Applicants would be required to fill the gap (Tr. 1075-1090). In fulfilling the Board's request to specifically address the question of responsibilities (Tr. 1097-1099), the Staff determined that it would, in fact, have several options available to it, including having the Applicants fill the void, looking to other groups within the state, or perhaps filling the void at the Federal level (Tr. 1745-1749). Furthermore, the Staff's witness observed that the Applicants' monitoring capability outside the LPZ would be more than adequate until such time as subsequent or supplemental monitoring teams would be available to the Commonwealth. Indeed, the NRC regional office itself could provide up to 20 additional inspectors, in addition to other

teams from Brookhaven Laboratory and radiological teams from western Pennsylvania (Tr. 1806-1809).

65. The testimony stresses the drills and training that various emergency response groups undergo. The Commonwealth's civil defense witnesses saw no compromise of their own effectiveness of response because of their not having technical knowledge and training concerning radiological matters. Staff witnesses testified that the Commonwealth's BRH possessed the requisite radiological know-how needed to assist with protection of the public health and safety. The Board finds that the evidence adequately supports the conclusion that the effectiveness of state and local officials is based upon an adequate knowledge of their job. These officials will not be hampered by not having had technical training in radiological matters.

66. Finally, we address Item (c), regarding the necessity of the public's being subjected to live tests or drills in order to insure that it will respond appropriately. All witnesses agreed that members of the public need not be drilled to assure their proper response to emergency evacuation instructions. Witnesses for the Commonwealth's CD organization explicitly offered the opinion that such drills might be counter-productive, citing a Stanford Research Institute study to support this opinion, and pointed to the actual behavior of the public during disasters in their own recent experience as being satisfactory and supportive of the lack of need for drills. The Staff similarly cited an EPA evacuation study. Examination by the Intervenors elicited the information that conclusions regarding the lack of need for public drills were without the benefit of experience with radiological events requiring evacuation. Nevertheless, the Board's examination revealed that such a diversity of nonradiological events had been successfully dealt with to provide confidence that drills are not necessary. Furthermore, the Board additionally determined that the civil defense emergency preparedness literature that has been disseminated to the public is being revised to include radiological awareness and response information. The ability of the County's CD organization to adequately cope with the management of public vehicular traffic during an evacuation was also examined by the Board (Tr. 1731-1735; Tr. 1840-1841; Tr. 2528-2541).

67. The Board thus finds that Item (c) states an assumption supported by a preponderance of the evidence. More broadly, we find that the record supports the conclusion that Contention 8, in its entirety, is without merit, and that the Staff has properly assessed the adequacy and workability of the emergency response. We also find the emergency and evacuation plans to be both adequate and workable.

Contention 9

The releases of gaseous radioactivity exceed the "as low as practicable"

guidelines of Appendix I to 10 CFR Part 50. Systems exist for significantly reducing the emissions from Unit 2. In a plant of similar design (Rancho Seco), equipment is being utilized to reduce by a factor of 10 the release of radioactive iodine from that expected to be released from Three Mile Island, Unit 2. Also, at the San Onofre, Unit 1, plant a cryogenic system is used to reduce the release of radioactive noble gases. These practicable and workable systems are available at modest cost to reduce by approximately a factor of 10 the emission of gaseous radioactive fission products from Three Mile Island, Unit 2. No operating license should be granted for Unit 2 until such systems, or comparable ones, are installed.

68. The Applicants and the Staff each put on a direct case (for the Applicants, the testimony of W. A. Rodger, dated March 25, 1977, following Tr. 1858; and, for the Staff, the testimony of P. G. Stoddart, following Tr. 1869). The Applicants' witness answered several questions posed by the Board (Tr. 1859-1867). These answers, along with the direct testimony, have been fully reviewed and found to be dispositive of this contention.

69. At the time this contention first was advanced by the Joint Intervenors, the Appendix I "as low as practicable" rulemaking hearing (RM-50-2) was underway and there existed only a qualitative standard in this regard. In April 1975, the rulemaking hearing was completed and Appendix I was promulgated, establishing quantitative standards. ("Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion As Low As Practicable for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents," CLI-75-5, 1 NRC 277 (1975)). Since Appendix I was adopted, Applicants have performed a detailed cost-benefit analysis of the rad-waste systems at TMI-2, which demonstrated for gaseous effluents that there is compliance with the design objectives in Section II.B and II.C of Appendix I. The analysis also demonstrated that there are no cost-effective ways of augmenting the TMI-2 gas handling system pursuant to Section II.D of Appendix I.

70. TMI-2's present gaseous rad-waste treatment systems have been compared with Rancho Seco's equipment. Testimony produced by the NRC Staff indicates that the treatment systems for radioiodines at Rancho Seco and at TMI are essentially the same and that the releases from these plants are expected to be similar, rather than different by a factor of 10 as the contention asserts. The Applicants' witness noted that the Rancho Seco treatment system is atypical in that its liquid wastes are discharged as vapor to the air; if a similar technique were employed at TMI-2, the resultant doses to the offsite population would be increased rather than decreased.

71. As for the assertion that TMI-2's rad-waste equipment should be

augmented with a cryogenic system such as that used at San Onofre, Unit 1, Staff testimony indicates that the basic principle employed to reduce off-gas releases at both San Onofre, Unit 1, and Three Mile Island, Unit 2, is radioactive decay during collection and storage, and that the available collection and storage times are approximately equal. Thus, neither off-gas system has an inherent advantage over the other with respect to reduction of radioactive effluents. The Staff and the Applicants both presented testimony indicating that such a modification would be far from cost-beneficial, using the Appendix I (10 CFR Part 50) basis of \$1,000 per one man-rem reduction of whole body exposure to the population within a 50-mile radius. The Staff estimated that the total annual cost of operating a cryogenically cooled off-gas system is \$120,000; this compares with the cost estimate by the Applicants of \$500,000. Both estimates, coupled with their respective calculated exposure reductions, yielded costs per man-rem of exposure reduction considerably in excess of \$1,000.

72. The Board finds that, in the context of this contention, TMI-2's gaseous radioactive releases do not exceed the design objectives of Appendix I to 10 CFR Part 50. We further find that there are no modifications—including Rancho Seco-type equipment or a cryogenic system—that can be made to TMI-2's gaseous rad-waste system that would be cost-beneficial with respect to the above mentioned basis of comparison (testimony of W. A. Rodger, following Tr. 1858; testimony of P. G. Stodart, following Tr. 1869).

Contention 10

The discharge of chlorine from Three Mile Island, Unit 2, will have an adverse effect on water quality, and this has not been adequately considered in the NEPA cost-benefit analysis.

73. TMI-2 will employ chlorine gas as a biocide in the circulating water system (4,000-6,000 ppd) and the service water system (150 ppd) for control of fouling. The chlorine will be introduced in three 15-20 minute periods per day. The Applicants calculate that chlorination of the circulating water system will result in no more than 1.0mg/l total residual chlorine in the natural-draft cooling tower blowdown, resulting in no detectable total residual chlorine at the plant discharge to the Susquehanna River.

74. The operation of the circulating water chlorination system will be on an alternating and intermittent basis with that of the service water system, so that the two systems will not be chlorinated simultaneously. In addition, no chlorine will be discharged from Unit 1 and Unit 2 at the same time. Tests at Unit 1 indicated virtually no detectable residual chlorine in the sta-

tion effluent; however, the Applicants might need to increase the use of chlorine in the circulating water system since algae growth had not been controlled in the cooling tower distribution trays (testimony of Robert B. Samworth, following Tr. 2077).

75. The effluent limitations on TMI-2 imposed by the NPDES permit include a limitation of 0.5mg/1 for free available chlorine, but do not include a limitation for total residual chlorine. If chlorination occurs at the maximum allowable rate, total residual chlorine at the discharge could be as high as 1.5mg/1, which is toxic to aquatic biota. However, even if chlorination occurred at the maximum allowable rate, the Staff concluded, based on the experience at Unit 1 and the quick dilution in the river water, that the introduction of chlorine at toxic levels would not constitute a significant adverse impact, since the maximum rate would rarely occur, would be of short duration, and the affected area would be small. Experience at Unit 1 shows that the discharge concentration has rarely approached the potential toxic level of 0.2mg/1 total residual chlorine and that when such levels did occur, the Applicants took steps to reduce the concentration.

76. The discharge is not located in an important aquatic habitat. The Staff also noted that with two units in operation, additional dilution will occur which will lower chlorine concentrations even further and the Applicants' consulting biologist predicts that no adverse impact will occur to aquatic biota (testimony of James A. Fava, following Tr. 1889).

77. The Board finds that no expected significant impact on aquatic biota is to be expected from the proposed chlorination program for TMI-2. The Board also finds that should the Applicant chlorinate at the maximum rate allowed under the NPDES permit, the impact on aquatic biota will continue to be insignificant.

Contention 11

In its dose calculations the Applicant has ignored the effect of the cooling towers. Interaction between the gaseous release of radioactivity (in particular, radioactive iodine isotopes) and the cooling tower plumes can increase the thyroid dose by the cow-milk pathway by up to a factor of 10. Such a possible increase in the dose would exceed that allowed by the "as low as practicable" guidelines of Appendix I of 10 CFR Part 50. No operating license should be granted until the Applicant considers the effect of the cooling towers on the gaseous iodine and reduces the releases as necessary.

78. The treatment of this contention proceeded upon the direct, prefiled testimony of witnesses for the Applicant and the Staff, followed by ex-

aminations of these witnesses by the Joint Intervenors and the Board. The Joint Intervenors did not offer direct testimony, nor did they file proposed findings hereon. In response to questions from the Board, the Staff also provided a witness who discussed certain aspects of proposed Regulatory Guide 1.109. The witnesses were as follows:

- For the Applicants, the prepared testimony of C. L. Hosler, dated March 25, 1977, following Tr. 360.
- For the Staff, the prepared testimony of L. Andrews, E. H. Markee, Jr., J. Osloond, following Tr. 380.
- Witnesses K. F. Eckerman re Regulatory Guide 1.109 (no prepared testimony) following Tr. 2552.

79. Cross-examination by the Joint Intervenors was helpful to the Board's understanding of the treatment of this contention. However, their examination in no way successfully contradicted the testimony of the Applicants and the Staff, nor compromised the validity of the proposed findings, which we make use of below.

80. The Applicants explicitly testified, in agreement with the first sentence of the contention, that the dose calculations did indeed ignore any interaction of the radioactive gaseous effluent releases (primarily iodine) with the cooling towers and their vapor plumes. To take account of the various possible types of interactions would either reduce offsite doses or minimally increase them to well within acceptable levels. Interaction of the radioiodine releases in the gaseous effluent with the cooling tower effluent can be postulated to occur in several ways—by entrainment of the gaseous effluent with the tower plume; by intersection of the two plumes at or above the release point of the cooling towers; or by the washout of the radioactive plume due to drift droplets from the cooling towers. Each of these possibilities was addressed by witnesses for the NRC Staff and the Applicants, and the impact of them on the Appendix I evaluation of radioiodines were found not to be significant, even if they were to occur.

81. Intersection of the two plumes or entrainment of the gaseous plume in the towers with some portion contained in the existing plume can be considered together. In either case, because the effect would be to elevate the gaseous plume to at least 1,500 feet, the deposition rates within a few miles of the plant (including the critical dairy receptor which for TMI-2 is located about 1.2 miles from the unit), would be decreased. Dr. Hosler conservatively calculated that the downwind concentrations of radioiodines would be reduced to 4/100ths of the concentration calculated based on no interaction. This would be so even if the radioactive gases were assumed to be absorbed onto or dissolved in drift droplets exiting the tower, since such droplets evaporate before reaching the ground, leaving the radioactive

residue to disperse in the atmosphere but from an elevation greater than the level used in the Appendix I calculation. The Staff testified that the resultant deposition estimate due to entrainment of the radioactive gases into the cooling tower plume is about a factor of ten less than the dry deposition estimates calculated by the Staff in its 10 CFR Part 50, Appendix I, evaluation.

82. In response to a Board question concerning the entrainment of gaseous plume from the plant and the effect of drift eliminators and ultimate release in the cooling tower blowdown, the Applicants conservatively estimated an increase of less than one mrem per year whole body or thyroid dose would result to the maximum exposed individual, a dose still well within the limits of 10 CFR Part 50, Appendix I (Tr. 1864-1865).

83. The possibility of drift droplets from the cooling towers falling through the gaseous plume and washing the radionuclides to the ground was examined. The Applicants' witnesses testified that this mechanism is of extremely minor significance, amounting to something less than 1/4,000ths of the washout effect due to natural rainfall in the area (Tr. 477-478). The washout effect of rain was not included in the NRC Staff Appendix I calculation, due to the insignificant effect of rain on deposition rate at TMI-2 (Tr. 468-471). Using a conservative equation in response to this contention, the Staff calculated that drift droplet washout could increase the deposition rate used in the Appendix I analysis by a little less than a factor of 1.5, thereby increasing the critical cow-milk pathway dose from 1.6 to 2.4 millirem per year, which is still well below the Appendix I value of 15 millirem per year (Tr. 470-471). The Board also asked questions of the Staff concerning the use of proposed Regulatory Guide 1.109 that were later answered by its witness Dr. Eckerman. The Board is satisfied that the guide, based in part upon experimental data, has been properly interpreted and applied.

84. Upon careful consideration of all of the evidence in this matter, the Board finds that the various plausible mechanisms for interaction between the gaseous radioactive plume from TMI-2 and the cooling tower plumes—when evaluated—do not overturn our prior determination, made with regard to Contention 9, that TMI-2 complies with 10 CFR Part 50, Appendix I. Contention 11 of the Joint Intervenors is without merit.

B. Compliance with the National Environmental Policy Act of 1969 (NEPA) and Appendix D to 10 CFR Part 50

1. General Description

85. The TMI-2 construction permit was issued on November 4, 1969. On September 9, 1971, the Commission revised 10 CFR Part 50, Appendix A,

in such a way as to require an environmental review of the facility. Pursuant to Appendix D, the Board has conducted a full NEPA review of TMI-2. The results of that review are described below.

86. In accordance with Appendix D, the Applicants submitted an environmental report in October 1970 and, following revision of the Appendix D regulations, a revised environmental report in December 1971. Based on the environmental information thus supplied, the Staff made an assessment of the considerations specified in Section 102(2)(C) of NEPA and Appendix D to 10 CFR Part 50. The results of the Staff's assessment were published in a Draft Environmental Statement (DES) which was issued in June 1972. Following receipt of comments by interested members of the public and by appropriate governmental agencies, the Staff published its Final Environmental Statement (FES) in December 1972.

87. On April 4, 1974, Applicants made application for an operating license for TMI-2. In support of that application, they filed a document entitled "Supplement II to Environmental Report, Operating License Stage, Unit 2, Three Mile Island Nuclear Station, Units 1 and 2." This filing updated the discussion of the environmental considerations related to the operation of TMI-2. Thereafter, the Staff determined that its original environmental review should be supplemented. This resulted in the issuance by the Staff of a draft supplement to the FES in July 1976. Interested members of the public and appropriate governmental agencies were invited to comment on this document. Following receipt of such comments, a Final Supplement to the Final Environmental Statement (FSFES) was published in December 1976. The FSFES contains a detailed description of the site and the plant, and contains a discussion of the status of compliance of the facility with applicable Federal, state, regional, and local environmental requirements. The FSFES includes an evaluation of the probable environmental impacts of continued plant construction and plant operation. It contains an assessment of Applicants' effluent and environmental measurement and monitoring programs, and an assessment of the environmental effects of postulated accidents. In the FSFES, the Staff analyzed the need for the power to be generated by the facility and assessed alternatives to the plant, its site and its design. In addition, the FSFES includes an evaluation of the adverse environmental effects which cannot be avoided, and the irreversible and irretrievable commitment of resources. Finally, the FSFES contains a cost-benefit analysis which considers and balances the environmental effects of the facility and the alternatives available for reducing or avoiding adverse environmental effects. The Staff's conclusion in the FSFES is that the action called for under NEPA and Appendix D of 10 CFR Part 50 is the continuation of the construction permit and issuance of an operating license for TMI-2, subject to certain conditions for the protection of the environment.

a. Impacts of Construction

(1) Impacts on Land Use

88. Construction of TMI-2 is substantially complete at the present time (FSFES §4.1 and Table 4.1). Site preparation and construction for both units has affected 472 acres on Three Mile Island and a small area totaling ten acres on the river's east bank. The major portion of the disturbed land was previously farmland, although about 28 acres of woodland were also disturbed. Most of the forest land on the island, about 172 acres, remains untouched (FES §IV.B.1; FSFES §4.2). Approximately 190 acres of land have been removed for the duration of the plant life from use for agriculture or as wildlife habitat (FSFES §4.4.1).

89. A major impact of construction has been the removal of 70 recreational cabins and a small picnic area from the island. This impact has been reduced, however, by the relocation of all but two of these cabins to nearby islands (FES §IV.B.1).

90. The proximity of human activity has decreased the attractiveness of the uncleared areas for wildlife. This is an unavoidable but acceptable cost.

91. The construction of the transmission system is substantially completed at this time. The right-of-way for the 67.3-mile 500 kV TMI-2 to Bechtelsville line occupies about 1,620 acres. An additional 7.36-mile transmission line from Bechtelsville to Hosensack has been constructed parallel to an existing 230 kV corridor, requiring an additional 175 feet of right-of-way for the new line. Approximately 254 acres of forest or woodlands have been cleared and one home in the right-of-way purchased. Clearing was carried out consistent with U.S. Departments of Agriculture and Interior guidelines. The predominant land use through which the right-of-way passes is agricultural. Easements have been obtained which permit the owners of the right-of-way to use the land for growing crops, grazing cattle, or growing trees to a limited height (FES §V.A.2; FSFES 4.4.1). The Board finds that the effects of construction and maintenance of the transmission corridor is an acceptable environmental cost.

(2) Impacts on the Aquatic Environment

92. The effects on shoreline aquatic environs were due primarily to the construction of the intake channel and pumphouse. This resulted in some temporary silting of the river and changes in the topography of the shoreline and near-shore river bottom. These impacts were kept to a minimum and although some of localized changes are permanent, the adverse impacts are reversible.

(3) Summary of Construction Impacts

93. The Board finds that the adverse impacts on the site area from construction of TMI-2 have been described reasonably correctly and that the Applicants' attempts to limit these impacts have been appropriate. The Board considers the unavoidable impacts of construction on the terrestrial and aquatic environment to be acceptable costs. Considering the completion and operation of TMI-1 and near completion of TMI-2, completion of construction will not result in any additional significant adverse impacts.

b. Impacts of Operation

(1) Impacts on Land Use

94. The facility is located on an island wholly owned by the Applicants. In addition, the Applicants own all the land within the exclusion radius. Thus, station operation will not deny access to any locations that would otherwise have been accessible (FES §V.A.1; FSFES §5.2.1). The Staff has reviewed possible operational effects which may be attributable to the transmission system, including electrostatic induction and ozone production. The Staff concluded that no adverse impacts due to ozone production will occur, and that the Applicants' grounding of all transmission towers and ground fences where electrostatic induction hazards exist will remedy any potential inconvenience or nuisance from electrostatic induction (FES §V.A.2; FSFES §5.2.2).

(2) Impacts on Water Use

95. In response to a Board question (Tr. 144-145), the Staff provided up-to-date data on expected water use, with particular reference to operating experience at Unit 1 (Samworth Testimony, following Tr. 988). The net maximum consumption of water from the Susquehanna River by both units operating at full power will be 20,800 gal/min. This amounts to 2.7% of the minimum river flow of 1,700 ft³/s, 0.23% of the median river flow of 20,000 ft³/s, and 0.14% of the mean river flow of 34,000 ft³/s (FSFES §5.3.1). Experience with Unit 1 operation confirms these projections (Samworth, *supra*). The Applicants' calculations indicate that the monthly average consumption at TMI-1 during 1976 was 0.045%, based on actual river flow and consumption observed (Applicants' Environmental Responses, following Tr. 935). The Board finds that removal of water at these rates will not have a significant effect on either the physical balance or biological systems in the Susquehanna River.

96. The TMI nuclear station represents about one-fourth of the total installed and currently planned capacity for steam electric power production for the Susquehanna River Basin. Although there is no evidence that the availability of water will be of concern at TMI, additional demands for water may be cause for concern near the end of the useful life of the TMI station. The Staff's review indicates that the Susquehanna River Basin Commission intends to review the impact on river flow due to consumptive withdrawals, and that the need for water required for power generation is being adequately recognized (FSFES §5.3.1).

(3) Aquatic Impacts

97. The effects of both impingement and entrainment were considered by the Staff in its FSFES, and by the Applicants in the ER (FES §V.C.2; FSFES §§5.5.2.1 and 5.5.2.2; ER §§5.5.1.5 and 5.5.1.7). In addition, in response to a Board question, (Tr. 144-145), the Staff and the Applicant both provided analyses of impingement and entrainment potential from station operation. The analyses were supported by the Unit 1 operational history (Hickey Testimony, following Tr. 988; Applicants' Environmental Responses, *supra*). The design velocity at the intake structure is approximately 0.2 ft/s. Consequently, most of the fish impinged during Unit 1 operation were juveniles (FSFES §5.5.2.1; Applicants' Environmental Responses, *loc. cit.*). Most of the fish impinged were forage fish, with few game or food fish impacted (*Ibid.*; Hickey, *supra*). Phytoplankton, zooplankton, fish eggs, and larvae small enough to pass through the 3/8-inch mesh traveling screens will be entrained in the cooling system and killed by the combination of mechanical, thermal, and biocidal effects. It is not expected that any adverse effects on local planktonic populations will occur due to entrainment because of the small cooling water requirements of the station. The numbers of larval fish entrained at TMI-1 were minimal so that no significant extrapolation can be made as to total mortality.

98. A major water quality influence of station operation will occur through the concentration of naturally occurring substances in the evaporative cooling system, through the addition of sulfuric acid to the cooling system, to control scaling, and through the chemical regeneration of high purity water treatment systems (FES §V.B.3; FSFES §3.3, Table 3.5). The concentration of sodium, sulfate, and chloride ions in the discharge is predicted to be noticeably higher than the concentration at the intake. However, the predicted discharge concentrations of these substances are below their toxic levels (FSFES §5.5.2.2; Samworth, *supra*). The Staff's and the Applicants' analyses indicate that the discharge of chemicals from the station will not cause any adverse effect on river biota (*Ibid.*, ER §5.3.1).

The Board has reviewed these analyses and agrees with the assessment that no adverse impact will occur.

99. In addition to evaluating the thermal discharge effects on the Susquehanna River pursuant to the standard environmental review (FES §§V.B.2, V.C.2; FSFES §5.5.2.3; ER §5.1), both the Staff and the Applicants provided additional analyses of thermal effects (Hickey, *supra*; Applicants' Environmental Responses, *supra*) in response to a Board question (Tr. 144-145). During 1974, the discharge temperature at Unit 1 ranged from 5.6°C below ambient on July 17 to 3.9°C above ambient on December 3. The relatively small size of the plume along with its diffuse character will allow fish to avoid it. The temperature differential is not of a magnitude that will either cause mortalities or serve as a significant attraction.

100. In response to a Board question (Tr. 145), both the Staff and the Applicants provided further analyses of reported fish kills in the Susquehanna River near the TMI-1 facility in the spring of 1974 and 1975 (Hickey, *supra*; Applicants' Environmental Responses, *supra*). The Staff concluded that since initial criticality was not achieved for the unit until June 5, 1974, the spring 1974 fish kill, reported to be about 200, could not have resulted from Unit 1 operation. In addition, the Staff reviewed the ambient river conditions and the operating history of Unit 1 for the spring of 1975 and compared these data with the temperature tolerances of the fish species observed in the kills. The Staff's analysis indicated that the species involved are capable of withstanding the potential thermal stresses which may have been imposed on them. Data compiled by the Staff shows that numerous fish kills occur in the Susquehanna River and its tributaries. Their causes, including the 1974 and 1975 kills, could be linked to several causative agents (Hickey, *supra*). The Board finds that the investigations of the reported fish kills performed by the Staff and the Applicants have been thorough and comprehensive, and agrees that the available evidence on the reported fish kills does not indicate that they were the result of Unit 1 operation.

101. In response to a Board question (Tr. 145), clarification was requested with respect to the term "complete mixing zone" as it appeared in the FSFES §11.1.5.9. The responses (Samworth *supra*; Applicants' Environmental Responses, *supra*) by the Staff and the Applicants have provided detailed explanations of the expected mixing zone, Unit 1 operational experience, and Pennsylvania requirements in this regard. The Board finds that those responses satisfy our concerns with respect to the mixing zone.

(4) Terrestrial Impacts

102. The only potential source of significant environmental damage to the terrestrial environment from the operation of Unit 2 is the drift from the

natural-draft cooling towers (FSFES §5.5.1). Although no impacts from the operation of Unit 1 have been reported, since Unit 2 will approximately double the salt load from drift, the Staff recommends that the Applicants implement a low altitude true and false color aerial photographic monitoring program augmented by on-the-ground verification of the aerial photography results; the termination of said monitoring being contingent upon the review and approval of the Staff. The present Unit 1 monitoring program may be continued and considered as satisfying this recommendation, or a new ground phase investigation may be submitted for staff approval (*Ibid.*). Although the Board finds that there has been no evidence of adverse terrestrial impact from Unit 1 operation, to assure that operation of both units will not impact surrounding vegetation, the Board requires that the Staff's recommendation with respect to monitoring be adopted by the Applicants.

103. The Staff's analysis of bird impactions at the TMI site (FSFES Tables 5.13-5.14) indicates that neither the total numbers nor the species involved represent an unacceptable impact. The Staff recommends that the current bird impaction monitoring program be terminated. We find that bird impaction does not presently constitute a significant adverse effect; however, the matter ought not be entirely ignored. To that end, the license to be issued hereunder shall be appropriately conditioned to require the reporting of significant bird impactions to the Regulatory Staff.

(5) Atmospheric Impacts

104. Two large natural-draft cooling towers will be used to dissipate most of the condenser heat from the station. In addition, a three-celled wet mechanical-draft cooling tower will be used to cool the combined service water effluent and the blowdown from the natural-draft towers. At full load, 5.75×10^9 Btu/hr will be discharged to the atmosphere. A maximum of 10,000 gal/min of water will be evaporated and discharged to the atmosphere (FES §V.A.3). Under the worst meteorological conditions, the Applicants predict that there may exist some potential for ground fogging; however, the effects would be slight, and the Staff considers the Applicants' estimates conservative, since experience at operational cooling towers shows that plumes rarely, if ever, reach the surface (FES §§V.A.3-4; ER §5.1). It is not expected that ground fogging will have any effect on Harrisburg International Airport, three miles away from the station. Similarly, no increase in humidity, precipitation, or icing is expected to occur (*Ibid.*). The Board finds that atmospheric effects of station operation will be insignificant.

(6) Radiological Effects

105. The radiological releases from TMI-2 have been calculated to

assure that the Commission's regulations contained in Appendix I to 10 CFR Part 50 are met. Appendix I requires that levels of radioactive materials released to unrestricted areas are "as low as is reasonably achievable." The Staff independently reviewed and evaluated the Applicants' Appendix I analysis. The Staff's evaluation considered releases of radioactive materials in liquid and gaseous effluents for normal operation and anticipated operational occurrences based on expected rad-waste inputs over the 30-year operating life of the plant. Both the Applicants' analysis and the Staff's independent calculations demonstrate that the proposed liquid and gaseous rad-waste treatment systems are capable of reducing releases of radioactive materials in liquid and gaseous effluents to "as low as is reasonably achievable" levels in conformance with 10 CFR §50.34a and Sections II.A, B, C, and D of Appendix I to 10 CFR Part 50 (FSFES §3.2.1.2; SER Supp. 1 §11.7). In addition, the Staff considered the potential effectiveness of augmenting the proposed liquid and gaseous rad-waste systems in order to reduce the dose to the population reasonably expected within 50 miles of the reactor at a cost of \$1,000 or less per man-thyroid rem. The Staff's cost-benefit analysis concluded that there is no reasonably available equipment embracing demonstrated technology that, when added to the system, can effect dose reductions to the population (on the above cost basis) within 50 miles (FSFES §3.2.1.2). The Board finds that the releases of radioactivity will meet the requirements of 10 CFR Part 50, Appendix I.

106. Radioactive effluents released to the atmosphere and hydrosphere from the facility during normal operation will result in small radiation doses to individuals and populations (FSFES §§5.4.1.2, 5.4.1.3). Using pathways to maximize the amount of radiation received (FSFES §5.4.1.1), the Staff calculated the maximum doses which could be received by an individual and the U.S. population in the year 2010 (FSFES §5.4.1). The maximum annual individual dose commitment resulting from routine operation of the plant is a small fraction of the dose limits specified in 10 CFR Part 20 and within the Appendix I design objectives. The maximum individual dose is 5.9 mrem/yr calculated for the dose to any organ from all pathways. The Appendix I design objective is 15 mrem/yr (FSFES §5.4.1.6; FSFES Table 5.10). The annual population dose commitment is a small fraction of the dose from natural environmental radioactivity. The calculated dose to the general public within fifty miles of the facility is 11 man-rem, which compares with a natural background level of 310,000 man-rem (FSFES §5.4.1.6; FSFES Table 5.7); the annual dose commitment to the U.S. population for the year 2010 is calculated to be 33 man-rem as the result of TMI-2 operation, which compares with a dose from natural background of 28 million man-rem.

107. The Applicants have agreed to design features and operating prac-

tices that will assure that individual and total plant population doses will be as low as is reasonably achievable. Based upon its review of exposure experience at operating light-water cooled nuclear reactors, the Staff estimates the projected occupational radiation exposure impact of TMI-2 to be 500 man-rem per year (FSFES §5.4.1.4).

108. The radiological effects of the transportation of cold fuel to the reactor, of irradiated fuel from the reactor, and of solid radioactive wastes from the reactor to burial grounds is within the scope of the NRC report entitled "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants." These effects are adequately described in the Staff's FSFES Table 5.8.

109. On March 14, 1977, the Commission promulgated in the *Federal Register* (42 FR 13803) an interim rule regarding the environmental considerations of the uranium fuel cycle. As a result of the Appeal Board's June 1, 1977, ruling in ALAB-407, this Board was instructed to consider the revised values presented in the interim Table S-3 rule. During the hearing, the Staff presented its evaluation of the revised environmental impacts associated with the uranium fuel cycle (testimony of Jan Norris, following Tr. 2620). The effects are not significantly different from those which the Staff had considered pursuant to its earlier review and which appeared in the FSFES §5.4.3 now superseded by the Norris testimony (Tr. 2620, 2647-2648). The environmental effects from the uranium fuel cycle, as presented by the Staff, are sufficiently small in their contribution to environmental costs that the overall environmental impact assessment is not significantly affected.

110. The Board finds that the radiological impacts associated with the operation of TMI-2, including those resulting from the uranium fuel cycle, have been adequately described and evaluated, that radiological releases will meet the requirements of applicable Commission regulations, and that there will be no unacceptable radiological impact on man from the routine operation of the plant.

(7) Community Impacts

111. The impacts on the local community due to the influx of construction workers to construct Unit 2 are substantially over, since construction is essentially complete. Due to the small plant operating force moving into the area, *i.e.* 165 people, no significant impacts are expected on the community (FSFES §5.6).

(8) Summary of Operational Impacts

112. The Board finds that the impacts on the site area from construction

and operation of the facility have been adequately described and evaluated, and they are acceptable. The Board further finds that the operation of the TMI-2 plant will not have a significant impact on the terrestrial and aquatic biota on or near the site, and that the radiological effects will be small. Further, the influx of operating personnel will constitute a minimal impact on the surrounding communities. The Board notes that the site is sufficiently remote and rural so that its visual impact is limited to relatively small numbers of people.

c. Environmental Monitoring

113. The Applicants' aquatic and terrestrial monitoring programs have already been discussed in connection with the Board's resolution of Contention 2, above. The Applicants have conducted a hydrological monitoring program in the Susquehanna River that includes measurements of temperature, conductivity, pH dissolved oxygen, turbidity, color, odor, and other chemical parameters (FSFES §6.2).

114. The onsite meteorological monitoring program was begun in May 1967 with the installation of a 100-foot high instrumented mast to measure wind speed and direction. In October 1970, a 150-foot high meteorological tower became operational onsite, measuring wind speed and direction, ambient air temperature, relative humidity, vertical temperature differences, and horizontal and vertical wind fluctuations. The Applicants provided combined frequency distributions of wind speed and direction for two one-year periods, with a joint recovery rate of 79%. Meteorological data collection is continuing onsite. The Staff will require that the Applicants submit a year of onsite data with 90% recovery rate to confirm its radiological impact assessment. The meteorological data collection will continue throughout the entire period of plant operation (FSFES §6.3.2).

115. Radiological environmental monitoring programs have been established to provide data on measurable levels of radiation and radioactive materials in the site environs (FSFES §6.6; FSFES Table 6.1). Monitoring programs are conducted to verify the proper operation of in-plant controls used for controlling the releases of radioactive materials and to assure that undetected radioactivity will not build up in the environment (FSFES §6.6). The preoperational phase provides for the measurement of background levels and their variations along the anticipated important pathways. The radiological monitoring proposed by the Applicants has been reviewed by the Staff and found to be generally acceptable (FSFES §6.6.1); but the Staff has recommended certain additions to improve the effectiveness of the program. The Board, upon its own review of the evidence, agrees that the radiological monitoring program is acceptable, subject to the

changes recommended by the Staff in the FSFES at paragraph 6.6.1, pages 6-9, which changes the Board hereby adopts.

116. In response to a Board question (Tr. 145), both the Staff and the Applicants discussed FSFES §11.1.6.2 dealing with the monitoring of radioactive releases entering the river. The Board has determined that the operational radiological environmental monitoring program for Unit 2 will include a composite water sampler capable of collecting hourly aliquot samples from the Susquehanna River one mile downstream of the plant discharge. Compositing water samples will be analyzed monthly for gamma isotopic content and analyzed for Sr-89, Sr-90, and tritium, all on a quarterly basis (testimony of Joseph Osloond, following Tr. 1062; Applicants' Environmental Responses). The Board finds that the Staff and the Applicants have sufficiently clarified the meaning of FSFES §11.1.6.2, and that the sampling program provides a means for confirming that concentrations of radioactivity between the plant release point and the sampling location are low.

117. The Board finds that the various preoperational and operational monitoring programs performed or proposed by the Applicants, when revised to include the Board's modifications and additions, are adequate to provide the required information with which to assess the environmental impacts which may result from the operation of TMI-2.

d. Environmental Effects of Postulated Accidents

118. The environmental effects of postulated accidents have been assessed by the Applicants (ER §7). The Staff has reviewed the Applicants' assessment, has made independent calculations, and has concluded that the environmental risks are extremely small (FES §VI; FSFES Chapter 7). The radiological effects of accidents on the environment have been assessed using the standard accident assumptions and guidance issued as a proposed annex to Appendix D to 10 CFR Part 50 on December 1, 1971 (36 FR 22851). The annual potential radiation exposure of the population from all postulated radiological accidents is assessed to be a very small fraction of the exposure from natural background. The Board thus finds that the environmental impact due to postulated radiological accidents is acceptably small.

e. Need for Power

119. TMI-2 is to be a base loaded plant, which will contribute to meeting the energy demand placed on the General Public Utilities (GPU) System. The General Public Utilities Corporation, with its subsidiaries, the Metropolitan Edison Company, the Pennsylvania Electric Company, and

the Jersey Central Power and Light Company (Applicants), supplies electricity to an area of about 24,000 square miles, in parts of Pennsylvania and New Jersey, having a population of about 4 million. The Metropolitan Edison Company operates in an area of 3,274 square miles in eastern Pennsylvania. Pennsylvania Electric Company supplies an area of 17,600 square miles in western, northern, and south central Pennsylvania, with the Jersey Central Power and Light Company operating in an area of 3,256 square miles in north central, east central, northwestern, and western New Jersey (FSFES §8.2.1).

120. The GPU system service area is included in the Federal Power Commission (FPC) Northeast Power Survey Region. The GPU system is a member of the Pennsylvania-New Jersey-Maryland (PJM) Interconnection, which is a formal power pool that serves three-quarters of Pennsylvania, most of New Jersey, more than half of Maryland, a small part of Virginia, and all of the District of Columbia and Delaware. In addition to coordination of planning, the companies in the PJM Interconnection share in any load curtailment or voltage reduction if conditions warrant it (FSFES §8.2.2).

121. TMI-2 is scheduled for fuel loading in late 1977, with commercial operation anticipated for the spring of 1978 (see FSFES Table 8.1). With the addition of TMI-2, in 1978, the GPU system reserves will meet the criterion of 20 percent over summer peak load that both GPU and the Pennsylvania-New Jersey-Maryland (PJM) Interconnection have set as the standard for their reserves margin, based on reliability standards of the Mid-Atlantic Area Council (MAAC). Should TMI-2 be delayed a year, the GPU systems reserves would stand at 13.8 percent, *i.e.*, considerably below the standard (FSFES §§8.2.2, 8.3.1). The Board has reviewed the 5.9 percent (for 1976-1980) compound annual growth rate of energy requirements developed by GPU for its system and finds it to be reasonable. This is below the 6.9 percent annual growth rate computed by the Staff using FEA provided regional forecasts for the time period 1974-1985 (FSFES §8.3.1). Energy conservation alternatives were considered by the Staff, including load shedding, load staggering, interruptible load contracts and, pricing alternatives (peak load pricing, flat rates, and increasing block rates). The Staff determined that none of these measures would be a viable alternative to a base load facility such as TMI-2 and, therefore, concluded that construction of TMI-2 should continue (FSFES §8.3.2). The Board, upon its own review of the evidence, agrees. The Staff further concluded that, because TMI-2 would be one of the lowest cost sources of baseload power in the GPU system, operation of TMI-2 can be justified even if there is no load or energy requirement growth (FSFES §§8.3.1, 8.3.3). The Board has reviewed this conclusion and finds that there is a need for the operation of the TMI-2 plant on its current schedule.

f. Alternatives

122. Alternative energy sources, sites, and designs to TMI-2 have been evaluated. As alternatives to TMI-2, hydroelectric potential, fossil-fired generating plants (including oil, natural gas, and coal-fired), and the purchase of power from other companies, as well as substitution of MHD, solar heat, fuel cells, wind, or tidal power, and conservation of energy have been considered. In the December 1976, FSFES, these alternatives were dismissed as (a) neither feasible nor viable, or (b) viable but less desirable from the standpoint of economic and environmental impacts ((a) included MHD, solar, fuel cells—FSFES, Appendix B, XI.A.2.6, and purchased power—FSFES, Appendix B, XI.A.2.a; (b) included gas-fired, oil-fired, and coal-fired plants—FSFES, §9.2, Appendix B, XI.A.6, XI.B.). As for alternative sites, a number of sites were evaluated including a site on the coast of New Jersey where this unit was originally sited until 1968; no other site is obviously superior to the Three Mile Island site selected (FSFES, Appendix B, XI.A.3). Alternative cooling systems and methods of operation for the cooling system installed at TMI-2 have been evaluated, but none is judged overall to have advantages that would suggest its use in lieu of the present system (FSFES §9.3.1, Appendix B, XI.A.5).

123. Pursuant to a decision by the Atomic Safety and Licensing Appeal Board in the *Hartsville* case (ALAB-367, 5 NRC 92 at 103, fn. 52 (1977)) that consideration of alternatives in certain cases should include a discussion of the comparative incremental health effects associated with viable alternatives, the NRC Staff and the Joint Intervenors offered witnesses on the comparative health effects associated with the nuclear and coal fuel cycle. This consideration is relevant here since this proceeding falls within Section C of Appendix D of 10 CFR Part 50. The Staff presented as its witness Dr. R. L. Gotchy, a senior radiologist with the NRC (Gotchy Testimony, following Tr. 1883). Joint Intervenors' representative in the proceeding, Dr. Chauncey Kepford, also submitted prepared testimony and presented himself as Joint Intervenors' witness on the subject (following Tr. 2835). Both witnesses were examined extensively by the Board and the parties.

124. The Applicants and the Staff objected to the admission into evidence of Dr. Kepford's testimony on the basis that it constitutes a challenge to the Commission's Table S-3, relating to effects of offsite portions of the uranium fuel cycle activities necessary to support a typical nuclear plant, and on the basis that Dr. Kepford's professional credentials do not qualify him to testify on this subject matter. The Board ultimately admitted the entire testimony for whatever weight is deemed appropriate (Tr. 2801-2803, 2806, 2828, 2931). Dr. Kepford's testimony alleges that Table S-3 errs by not considering that the Rn-222 that emanates from a uranium mill tailings pile does so for an indefinite time (billions of years) in-

to the future, thus increasing the dose commitment to future generations, and thus modifying the nuclear assessment of Dr. Gotchy's analyses. We note, parenthetically, that this Board has received a letter from the Staff dated November 30, 1977, transmitting a letter from Dr. W. Jordan to Chairman Yore of the ASLB Panel, in which Dr. Jordan alleges that an error exists in Table S-3. We see this as being analogous to Dr. Kepford's allegation. The Staff notes that Dr. Gotchy's testimony may be affected by this Jordan claim, and commits itself to a later assessment of the matter.

125. We need not address the questions of whether this aspect of Dr. Kepford's testimony poses a permissible challenge to Table S-3, nor whether Dr. Gotchy's conclusions are affected by the Jordan allegation, for our decision does not require a resolution of these matters. Dr. Kepford—under cross-examination—testified that even with the significantly larger releases of Rn-222 that he alleges should have been used by Dr. Gotchy, one is still dealing with releases that are small compared with the natural background (Tr. 2864-2866). The corresponding TMI-2 related health effect would amount to an increased mortality rate of one additional death per billion deaths from other causes over the time span of several billion years required (by Dr. Kepford's reckoning) to account for the decay of the parents of Rn-222 (Tr. 2867-2875). Hence, granting for the sake of argument the correctness of Dr. Kepford's analysis, we find the relative impact of the Rn-222 consideration to be of negligible materiality.

126. The results of Dr. Gotchy's analyses, summarized in Tables 1 and 2 attached to his written testimony, indicate that there are more severe health effects associated with a coal-fuel cycle than with a nuclear fuel cycle, by factors ranging from 3 to 250, depending upon various assumptions and uncertainties. However, Dr. Gotchy characterizes either fuel cycle as contributing a very small or minute increase in the risk of health effects to which the public is exposed already. Without belaboring the details, we find these results plausible, of little materiality, but technically in need of considerable refinement because of the numerous unknowns that Dr. Gotchy indicates have not been quantitatively considered. Dr. Gotchy indicated that a soon-to-be published National Research Council Report may assist in reducing much of the uncertainty in his analyses.

127. The Board finds that despite the uncertainties of the Gotchy testimony and the possibly improper treatment of the impact of Rn-222 alleged by Dr. Kepford, the nuclear fuel cycle is environmentally an acceptable alternative to coal and an economically more desirable alternative than coal, consistent with the Staff's conclusions in the Final Supplement to the FES.

2. Cost-Benefit Balance

128. The Board finds from the evidence in this proceeding that a sys-

tematic, interdisciplinary approach has been employed in the environmental review of TMI-2, that environmental factors have been given appropriate consideration in decisionmaking, along with technical and other considerations, and that an appropriate evaluation of alternatives to minimize environmental impacts and suitable cost-benefit analyses, as required by NEPA and Appendix D to 10 CFR Part 50, has been conducted. The primary benefit of continuing construction and operating TMI-2 will be the generation of 906 MWe (880 MW summer rating) net generating capacity (FSFES §10).

129. The Board, on the basis of the entire record, finds that the principal costs of TMI-2 may be summarized as follows:

- (a) Removal from use for agricultural or wildlife habitats of approximately 190 acres of land for the unit's facilities for the duration of the plant's life.
- (b) Use of land for approximately 75 miles of transmission line right-of-way.
- (c) Some temporary disturbance of land onsite and of adjacent waters, which has occurred during construction.
- (d) Consumptive use of 10,000 gal/min of Susquehanna River water.
- (e) Possibility of some increased local fogging from operation of cooling towers.
- (f) Some visual impact from the cooling towers, their plumes, and the transmission lines.
- (g) Discharge to the river of about 18,000 gal/min of water with small amounts of chemicals and heat. Average effluent temperatures will be less than 3°F above river ambient.
- (h) Some small and localized destruction of minute aquatic organisms by entrainment and of small fishes by impingement.
- (i) Annual release of about 550 curies of radionuclides (0.24 Ci/yr excluding tritium) in liquid effluents and about 6,700 Ci/yr of noble gases, 0.01 Ci/yr of iodine-131, 560 Ci/yr of tritium, 25 Ci/yr of argon-41 and 0.06 Ci/yr of particulates in gaseous effluents.
- (j) A very low likelihood of accidental radiation exposure to nearby residents.
- (k) Minimal environmental effects associated with the uranium fuel cycle and transportation of fuel and waste to and from the facility.
- (l) Consumptive use of uranium fuel resources.
- (m) The capital and operating costs of the plant.

130. The Board finds that the benefits of construction and operation of

TMI-2 outweigh the environmental, economic, and other costs, and, therefore, that the balancing of these factors favors continuation of the TMI-2 provisional construction permit.

3. Compliance with the Federal Water Pollution Control Act Amendments of 1972

131. On June 22, 1977, the Commonwealth of Pennsylvania, through its Department of Environmental Resources, certified, pursuant to §401(a)(1) of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) that any discharge from the construction and operation of TMI-2 will comply with the applicable provisions of §§301, 302, 306, and 307 of the FWPCA and will not violate the applicable water quality standards of the Commonwealth of Pennsylvania as approved by the United States Environmental Protection Agency (Applicants' Exhibit 9). On November 9, 1977, the Commonwealth of Pennsylvania revised the 401 Certification previously issued on June 22, 1977. The revised sections pertain to thermal effluent limitations (Affidavit of Clarence R. Hickey, Jr., dated December 6, 1977, with attached copy of the revised 401 Certification, dated November 9, 1977, both of which are hereby received in evidence). The Board finds that this certification satisfies the requirement of Section 401 and the FWPCA. Pursuant to §401(d) of the FWPCA, this Commission is required to include in any NRC license or permit such conditions or effluent limitations as are set forth in the §401 Certification. The §401 Certification issued by the Commonwealth of Pennsylvania for this station includes the following conditions and/or limitations:

- a. That the Applicants comply with Pennsylvania's Clean Streams Law.
- b. That the Applicants comply with Industrial Waste Permits 2270204 and 2272202 and Sewerage Permit 2275419 issued by the Department of Environmental Resources.
- c. The following effluent limitations should be imposed:
 1. Discharge 101—Effluent of sewage treatment facilities. Total phosphorous shall not exceed 2 mg/1 on an average basis, nor 4 mg/1 at any time.
 2. Discharge 001—Combined mechanical-draft cooling tower blowdown.
 - a. The Applicants shall at all times maintain in good working order and operate the mechanical-draft cooling towers (MDCT's) as efficiently as possible so as to minimize temperature differential between ambient river temperature and the temperature of

the discharge; provided, however, the MDCT's may be shut down when in the judgment of the responsible TMINS personnel a combination of atmospheric conditions and river temperature may exist which causes the waste water to be heated as it passes through the MDCT's or ice formation is observed to occur within the MDCT's.

- b. The temperature of the discharge shall never exceed a maximum of 87°F, except when the ambient river temperature exceeds 87°F, in which case, the discharge temperature shall not exceed the ambient river temperature; the temperature of the discharge shall not change by more than 5°F during any one-hour period.

Ambient river temperature is the temperature of the river upstream of the heated waste discharge. The ambient temperature sampling point should be unaffected by any sources of waste heat. The temperature of the intake water will be considered as ambient river temperature so long as the intake water is unaffected by TMI's or any other nearby heated water discharge.

- c. The following temperature limitations shall never be exceeded:
 - 1. During the period November 1 through April 30, the temperature of the discharge shall not exceed 12°F above ambient river temperature.
 - 2. During the period May 1 through October 31, the temperature of the discharge shall not exceed 7°F above ambient river temperature.
 - 3. During plant cooldown operations the temperature of the discharge shall not exceed 12°F above ambient river temperature.
- d. At no time shall the discharge exceed the rate of 150 million gallons per day.
- e. The Chief of the Operations Section of the Harrisburg Regional Office of the Bureau of Water Quality Management shall be advised by telephone within 24 hours when the MDCT's are shut down for reasons other than those specified in condition 2(a) above and again when tower operation is resumed; shall be notified within 24 hours when the discharge limitations

specified in paragraph 2(c) above are exceeded and again when the discharge is in compliance with such limitations; and shall be notified, at least thirty (30) days in advance, whenever possible, of all scheduled plant cooldown operations.

- f. Within two years after both nuclear reactor units are in commercial operation, the Metropolitan Edison Company will collect and submit to the Department of Environmental Resources stream data which accurately defines the thermal plume or zone of impact from the TMINS heated waste discharge. As a minimum, thermal plume mapping data collected to meet the Nuclear Regulatory Commission's requirements shall be submitted to Pennsylvania Department of Environmental Resources.
- g. That the Applicants submit to the Pennsylvania Department of Environmental Resources within ninety (90) days of issuance of Amendment No. 1 to the NPDES permit, an application for a new Pennsylvania Water Quality Management permit for the facilities associated with the thermal component of discharge 001.

III. CONCLUSIONS OF LAW AND LICENSE CONDITIONS

132. In accordance with the Atomic Energy Act and the Commission's regulations, and on the basis of the record in this proceeding, the Board concludes as follows:

- a. The environmental review conducted by the NRC Staff pursuant to the requirements of Section 102(2) (A), (C), and (E) of the National Environmental Policy Act of 1969 and Appendix D to 10 CFR Part 50 has been adequate.
- b. The requirements of Section 102(A), (C), and (E) of the National Environmental Policy Act and Appendix D of 10 CFR Part 50 have been complied with in this proceeding.
- c. Having considered and decided all matters in controversy among the parties related to construction, and having independently considered the final balance among conflicting factors contained in the record with a view to determining the appropriate action to be taken, and after weighing the the environmental, economic, technical, and other benefits against environmental costs, and considering the available

alternatives, the construction permit for Three Mile Island Nuclear Station, Unit No. 2, should be continued.

- d. Having considered and decided all matters in controversy among the parties related to operation, the Director of Nuclear Reactor Regulation should be authorized to make such additional findings on uncontested issues as may be necessary to issuance of a full-term operating license for Three Mile Island Nuclear Station, Unit No. 2, subject, however, to the following conditions:
- (1) Before engaging in additional construction or operational activities which may result in an environmental impact which has not been evaluated by the Commission, the licensee shall prepare and record an environmental evaluation of such activity. If the evaluation indicates that such activity may result in a significant adverse environmental impact which has not been evaluated, or an impact which is significantly greater than that which has been evaluated, the licensee shall provide a written evaluation of such activities to the Director, Office of Nuclear Reactor Regulation, and shall obtain the approval of that office prior to proceeding with the proposed activity.
 - (2) Since Unit 2 will approximately double the salt load from drift, after startup of Unit 2 the Applicants shall implement a low altitude true and false color aerial photographic monitoring program augmented by on-the-ground verification of the aerial photography results. These efforts are to continue for at least two years, with subsequent termination only upon approval by the Regulatory Staff.
 - (3) The current bird impaction monitoring program may now be terminated; however, if the Applicants should become aware of any case of excessive bird impaction (*i.e.*, greater than 100 in any one day), they shall analyze the occurrence and report the matter to the Regulatory Staff within 30 days thereafter.
 - (4) The changes in the radiological monitoring program recommended by the Staff in its FSFES at paragraph 6.6.1, page 6-9, shall constitute conditions upon the license to be issued hereunder.
 - (5) The Applicants shall develop an environmental monitoring program for inclusion in the environmental tech-

nical specifications that uses as a baseline a consolidation of the data (particularly that relating to macroinvertebrates) gathered by the Applicants' consultants, *i.e.*, Dr. Wurtz, Millersville State College, and Ichthyological Associates, Inc.). The Regulatory Staff, paying particular attention to the macroinvertebrates and to the population estimates of fishes in specific areas, shall assure that the monitoring program thus developed utilizes the collected information in an efficient and meaningful manner. The program shall also include a sampling of fishes by various methods, if meaningful statistics in the form of catch-per-unit-of-effort can be obtained. Additionally, creel census shall continue to be performed and if a significant deviation from pre-operational conditions is discovered, the reasons for the deviation shall be determined.

The monitoring program described in this paragraph shall continue for a period of at least three (3) years following the beginning of plant operation. At the expiration of the three-year period, it shall be evaluated by the Staff for its continued usefulness. The monitoring program shall be terminated only upon a Staff determination that its further continuation would serve no significantly useful purpose.

IV. ORDER

133. On the basis of the foregoing findings and conclusions, and pursuant to the Atomic Energy Act of 1954, as amended, and the Commission's regulations, **IT IS ORDERED** that the Director of Nuclear Reactor Regulation is authorized to continue in effect the construction permit of Metropolitan Edison Company, Jersey Central Power and Light Company, and Pennsylvania Electric Company for Three Mile Island Nuclear Station, Unit No. 2, and to make such additional findings on uncontested issues as may be necessary to the issuance of a full-term operating license for that unit, consistent with the terms of this Initial Decision.

134. **IT IS ORDERED**, in accordance with 10 CFR Sections 2.760, 2.762, 2.764, 2.785, and 2.786 that this Initial Decision shall be effective immediately and shall constitute the final action of the Commission 45 days after the date of issuance hereof, subject to any review pursuant to the above cited rules. Exceptions to this Initial Decision must be filed within

seven (7) days after service of this decision. A brief in support of the exceptions must be filed within 15 days thereafter (20 days in the case of the NRC Staff). Within 15 days of the filing and service of the brief by the appellant (20 days in the case of the NRC Staff), any other party may file a brief in support of, or in opposition to, the exceptions.

**THE ATOMIC SAFETY AND
LICENSING BOARD**

**Ernest O. Salo, Member
Gustave A. Linenberger, Member
Edward Luton, Chairman**

**Dated at Bethesda, Maryland,
this 19th day of December 1977.**

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Ivan W. Smith, Chairman

Lester Kornblith, Jr.

Dr. George C. Anderson

In the Matter of

Docket No. STN 50-484

**NORTHERN STATES POWER
COMPANY (MINNESOTA)
NORTHERN STATES POWER
COMPANY (WISCONSIN), et al.**

(Tyrone Energy Park, Unit 1)

December 23, 1977

Upon consideration of issues under the National Environmental Policy Act related to application for permit to construct Tyrone Energy Park, Unit 1, the Licensing Board determines that statutory and regulatory requirements have been complied with and that issuance of the construction permit should be authorized, subject to several environmental protection conditions. (The Board's earlier decision on radiological health and safety issues, LBP-77-30, 5 NRC 1197, becomes part of this decision.)

TECHNICAL ISSUES DISCUSSED: Decommissioning (effects); thermal discharge; river water diversion; cooling towers (effects); transmission line location; eagle nesting and habitat; use of herbicides; land requirements and usage; protection during transportation of radioactive materials; fuel supply; need for power; alternatives; fuel cycle costs.

**INITIAL DECISION
(Construction Permit)**

Appearances

**Gerald Charnoff, Esq., Thomas A. Baxter, Esq., and
John H. O'Neill, Jr., Esq., for the Applicants.**

Jocelyn F. Olson, Esq., Special Assistant Attorney General, for the Minnesota Pollution Control Agency.

Willard E. Fantle, III, and Thomas Galazen, for the Intervenor, Northern Thunder.

Stanley Cider, *pro se.*

Joseph P. Schaeve, Esq., for Wisconsin Department of Natural Resources.

Stephen H. Lewis, Esq., and Barry H. Smith, Esq., for the U.S. Nuclear Regulatory Commission.

TABLE OF CONTENTS

	Page
I. Preliminary Statement and Description of the Record	1234
II. Findings of Fact—Uncontested Environmental Matters	1236
A. Environmental Report and Final Environmental Statement	1236
B. Impacts of Construction	1237
C. Impacts of Operation	1239
D. Monitoring Programs	1241
E. Environmental Effects of Postulated Accidents	1241
F. Need For Power	1242
G. Alternatives	1242
H. Cost-Benefit Balance	1248
I. Federal Water Pollution Control Act	1249
III. Findings of Fact—Contested Environmental Matters	1250
Contention 6.C Effects of Decommissioning	1250
Contention 7.A Thermal Discharge	1252
Contention 7.B River Water Diversion	1253
Contention 7.C Cooling Towers	1254
Contention 7.D and 7.E Transmission Lines Location	1256
Contention 7.F Eagle Nesting and Habitat	1259
Contention 7.G Herbicides	1260
Contention 7.H Land Use	1262

	Page
Contention 8 Protection During Transportation of Radioactive Materials	1264
Contention 9 Fuel Supply	1267
Contention 10.A-H Need for Power	1269
Contention 11.A Alternatives not Requiring New Generation Capacity	1280
Contention 11.B Alternative Methods of Generation	1287
Contention 11.C Combinations of Alternatives	1295
Contention 12.A-F Facility Generation Costs	1296
Contention 13.B and C Cost-Benefit Balance	1301
 IV. CONCLUSIONS OF LAW	 1302
V. ORDER	1305
 ADDENDUM	 1305

I. PRELIMINARY STATEMENT AND DESCRIPTION OF THE RECORD

1. On May 3, 1977, the Atomic Safety and Licensing Board issued a "Partial Initial Decision (Construction Permit)" in this proceeding in which all issues concerning radiological health and safety under the Atomic Energy Act were decided. LBP-77-30, 5 NRC 1197. The Board concluded, among other things, that issuance of a construction permit would not be inimical to the health and safety of the public with respect to those radiological issues. *Id.*, p.1246. In this initial decision the Board has considered all issues under the National Environmental Policy Act (NEPA), under 10 CFR Part 51, and upon the entire record, authorizes the Director of Nuclear Reactor Regulation to issue a permit to construct the Tyrone Energy Park, Unit 1, in Dunn County, Wisconsin, subject to certain conditions.

2. The partial initial decision of May 3, 1977, is a part of this initial decision. In it we describe the Applicants,¹ other parties, and the general background of these proceedings.

3. In its Memorandum and Order dated December 10, 1976, the Board set a prehearing schedule for the environmental phase of the proceedings

¹Northern States Power Company of Wisconsin, Northern States Power Company of Minnesota, (usually referred to jointly as "Northern States" or "NSP"), Cooperative Power Association, Dairyland Power Cooperative and Lake Superior District Power Company.

and in an appendix to that order set forth a revised and consolidated version of contentions to be heard in the environmental phase. Subsequently in its Order dated January 10, 1977, the Board deleted Contention 8.B and redesignated Contention 8.A as Contention 8.

4. On April 19, 1977, pursuant to 10 CFR §2.749 the Applicants moved for summary disposition of Contentions 13.A and 13.E. In its Order of May 10, 1977, the Board found that there were no genuine issues of fact with respect to either contention. We found that Contention 13.A (impact upon the local economy) was not an appropriate contention for the Board's consideration and dismissed it. Contention 13.E (cost of the facility) was decided by the Board in favor of the Intervenor.

5. In its Order of May 31, 1977, the Board dismissed the intervention petitions of Intervenor Helen Kees, Citizens Against Unsafe Sources of Energy (CAUSE) and Citizens For Tomorrow (CFT). This action was based upon findings by the Board that (1) all three intervenors ignored Staff's discovery requests; (2) Ms. Kees and CAUSE ignored the Applicants' discovery requests; (3) CFT responded inadequately to Applicants' discovery requests; (4) all three intervenors ignored the Board's orders pursuant to 10 CFR §2.740(f) to respond to the respective discovery requests; and (5) the three intervenors ignored the Board's Order of May 13, 1977, requiring them to report their intentions as party intervenors in the proceeding.

6. During the evidentiary hearing the Board readmitted CFT as an intervenor on a limited basis. Tr. 2470-2483. CFT, however, declined to participate further in the proceeding. Tr. 2612.

7. As a result of the foregoing some contentions raised solely by the dismissed intervenors were dismissed but others were retained by the Board so that a full record would be produced. The Board dismissed Contentions 6.A(1), 6.A(2), 6.A(3), 6.B, 13.D, and 13.F. The Board retained Contentions 10.F, 10.G, 10.H, 11.A(2) and 11.B(7) in addition to the contentions of the surviving intervenors.

8. Pursuant to an Order and Notice of Continuation of Hearing on Application for Construction Permit, issued by the Board on May 18, 1977,² sessions of the evidentiary hearing to receive evidence on environmental matters were held in Eau Claire, Wisconsin, on June 21 through 25, June 27 through 30, July 12 and 13, 1977. Appearing and presenting evidence at the hearing were Applicants, the NRC Staff, and intervenors Northern Thunder and Mr. Stanley Cider. Intervenor Minnesota Pollution Control Agency had no environmental contentions and did not participate in the

²42 *Fed. Reg.* 27073 (May 26, 1977). The notice of hearing was subsequently amended on June 7, 1977, to reflect a change in the hearing room location. 42 *Fed. Reg.* 30255 (June 13, 1977).

NEPA phase of the hearings. The Agency did, however, monitor some of the hearing sessions. Tr. 2128.

9. An appearance was also entered by counsel for the Wisconsin Department of Natural Resources (DNR), which is participating in the proceeding pursuant to 10 CFR §2.715(c). Subsequent to the hearing the Wisconsin DNR submitted advice to the Board, which advice was considered by the Board after opportunity to comment was afforded to the parties.³

10. The Public Service Commission of Wisconsin, also participating in the proceeding as an interested State pursuant to 10 CFR §2.715(c), advised the Board that it deems it inappropriate under Wisconsin statutes to present evidence and to participate even in a quasi-adversary role in Nuclear Regulatory Commission proceedings. The Public Service Commission submitted affidavits of its staff members who sponsor the advice given to the Board pursuant to §2.715(c). Tr. 2319, *et seq.* The Board has considered the advice and the affidavits to the extent permitted by the Nuclear Regulatory Commission's Rules of Practice.

11. Pursuant to §557(c) of the Administrative Procedure Act and 10 CFR §2.754 all parties were provided an opportunity to file proposed findings of fact and conclusions of law. Proposals were filed by the Applicants, the NRC Staff and Northern Thunder. In some instances, where supported by the record, the Board has adopted proposed findings of parties in substantially the form submitted. Those proposed findings submitted by the parties which are not adopted directly or inferentially, or specifically discussed elsewhere, are rejected as not being supported by reliable, probative and substantial evidence. This initial decision, the conclusions of law and the order are based upon the entire record and upon full consideration of all of the proposed findings.

A list of exhibits offered by the parties, marked for identification, and either received into evidence or rejected, is set forth as an attachment appended to this initial decision.

II. FINDINGS OF FACT—UNCONTESTED ENVIRONMENTAL MATTERS

A. Environmental Report and Final Environmental Statement

12. Pursuant to 10 CFR §51.20, Applicants submitted an Environmental Report (hereinafter "ER") (Exhibit 30), which contains a description of the proposed action, a statement of its purposes, and a description of the environmental effects. Notice of the availability of Applicants' Environmen-

³Board Order dated October 28, 1977, circulating letter from Wisconsin DNR.

tal Report was published on August 16, 1974. 39 *Fed. Reg.* 32347 (September 6, 1974), 33023 (September 13, 1974), 33815 (September 20, 1974). Based on the information submitted by Applicants and on its own independent review and analysis, the Staff prepared a Final Environmental Statement (hereinafter "FES").⁴ Notice of the availability of the FES was published on April 19, 1977. 42 *Fed. Reg.* 21671 (April 28, 1977). The FES contains a detailed description of the site and the plant and a discussion of the status of compliance of the facility with applicable Federal, state, regional, and local environmental requirements. The FES includes an evaluation of the probable environmental impact of plant construction and operation. It contains an assessment of Applicants' effluent and environmental measurement and monitoring programs and an assessment of the environmental effects of postulated accidents. In the FES, the Staff analyzed the need for the power to be generated by the facility and assessed alternatives to the plant, its site and design. In addition, the FES includes an evaluation of the adverse environmental effects which cannot be avoided, the relationship between short-term uses of man's environment and maintenance and enhancement of long-term productivity, and the irreversible and irretrievable commitments of resources. Finally, the FES contains a cost-benefit analysis which considers and balances the environmental effects of the facility and the alternatives available for reducing or avoiding adverse environmental effects, as well as the environmental, economic, technical, and other benefits of the facility.

13. The Board finds that the Staff review has appropriately considered the information supplied by the Applicants in the ER and that the Staff review set forth in the FES, as supplemented, has been adequate and that the requirements of the National Environmental Policy Act (NEPA) and 10 CFR Part 51 have been complied with in this proceeding. The Board accepts the facts set forth in the FES and concurs in the conclusions by the Staff with the exception of certain factors set forth herein.

B. Impacts of Construction

14. The total land area of the proposed Tyrone site is 4,597 acres. ER, Fig. 4.1-1; FES 4.1; Hoysler Testimony⁵ at p.1. Approximately 375 acres will be impacted by construction-related activities on the site and 1,434 acres will be required for transmission line rights-of-way. A railroad spur will affect 40 acres offsite. Additional considerations regarding land use are discussed in Contention 7.H, *infra*.

⁴Following Tr. 2210.

⁵Applicants' Testimony of Layton C. Hoysler in response to Contention 7.H, following Tr. 3154 (herinafter "Hoysler Testimony").

15. Plant construction will involve some community impacts. Those residents displaced from their current homes on the site are expected to find replacement farms and housing in the area. Traffic on local roads will increase due to construction and commuting activities, resulting in some inconveniences to local residents and the potential for increased road maintenance. The influx of construction workers' families (a peak work force of about 1,500) is expected to cause no major housing or school problems with the exception of possible impact on the Durand Unified School System. The Durand System is expected to be required to accommodate most of the students of construction families that locate near TEP. The extent of the impact will probably depend on the degree to which mobile home parks are developed in the area. FES §§4.4.5, 4.4.8. The general sights, sounds and odors common to a large construction project are not expected to cause any significant adverse effects to local residents because of the distance of the major construction activities from the nearest residents. FES at iii, §4.4; ER §8.2.2.

16. Present wildlife animal populations in the proposed construction zone are impoverished in species number and in density because of the intense use of the land for agricultural purposes. The impacts of construction on wildlife, therefore, will be minimal. The effects of construction on natural vegetation will likewise be minor, since only about 30 acres of woodlots and tree lines will be cleared. FES §4.3.1; ER §4.1.

17. Erosion as a result of construction activity is not expected to have a serious impact on land use on the site or on adjacent lands. Applicants' erosion control plan, which involves selective vegetation removal, maintenance or diversion of natural drainage to accommodate additional runoff, proper grading, and restoration of cleared areas that are highly susceptible to erosion, will be adequate to avoid serious impacts from the relatively small amount of excavation required for construction of the plant. FES §4.1.1.2; ER §§4.1.4.3, 4.1.3.5.

18. Construction activities will result in some temporary increases in turbidity and in ambient noise which may temporarily decrease the suitability of the Chippewa River for recreational use in those areas adjacent to the construction sites of the makeup water intake structure and the blowdown discharge diffuser structure. The dewatering of plant excavation areas will have no effect on wells outside the site because of the distance from the excavations to the offsite wells, the geology of the underlying earth strata, and the expected low volumes of water to be pumped. FES §4.2; ER §4.1.2.9.

19. The aquatic environment may be affected during construction as a result of intake and discharge structures, construction, storm drainage runoff from the site, and discharge of construction effluents. Construction of the intake and discharge structures will temporarily increase turbidity in

the Chippewa River and disturb the benthic organisms that inhabit small sections of the river, but these effects are expected to be localized and temporary, with no long-term adverse effects on the Chippewa River ecosystem. Applicants are committed to Environmental Protection Agency turbidity standards and to preventing surface runoff into Fall and Duscham Creeks, thus ensuring against excessive turbidity in the streams (including the Chippewa River). Disposal of sewage effluents from the site during construction and operation should not be a problem because sewage will be treated and disposed of in a tile drain field. FES §§4.3.2, 10.1.2.2; ER §4.1.2.9.

20. The Staff examined the impact of construction on the proposed Red Cedar State Park Trail and concluded that TEP would not necessarily restrict the use of the proposed trail. The Board agrees with the Staff that the Applicants should consult with the Wisconsin Department of Natural Resources in developing a plan to accommodate the proposed Red Cedar State Park Trail. FES §4.1.1.2.

21. The Wisconsin Department of Natural Resources identified two natural areas in the vicinity of the proposed transmission line routes. Only the Meridian Chippewa River Savanna, which is located along the proposed TEP-Eau Claire-King line, will be affected. It does not appear reasonable to reroute the line to avoid intersecting this natural area. The Staff identified methods of minimizing the impact of the line. FES §4.3.1.2. The Board concurs in the Staff's requirement that Applicants consult with Wisconsin's Department of Natural Resources on final route selection and development of plans for construction and maintenance methods and that the route selection and construction and maintenance plans be submitted to the Staff for approval prior to initiation of line construction. FES §4.5.2.

22. The Board has considered the unavoidable impacts of construction, including the effects on the community, the impacts on land use and water use, the terrain, the terrestrial ecosystem and the aquatic environment. The Board finds that Applicants plan appropriate measures and controls to minimize such impacts (FES §4.5) and that the impacts have been adequately described and evaluated in the record.

C. Impacts of Operation

23. The Tyrone plant is designed to operate with forced-draft cooling towers, which will require a consumptive use summer maximum of 31.7 ft³/s from the Chippewa River. FES §5.2.1. Applicants and the Staff have assessed the potential impacts of plant operation on the aquatic environment due to the withdrawal of cooling tower makeup water and the discharge of effluents. Water velocity through the trash racks of the intake

structure will be 0.2 ft/s at low river flow, and the velocity through the travelling screens will be no greater than 0.4 ft/s. At these low velocities, impingement is not expected to occur to an extent that would adversely affect fish populations of the Chippewa River. Based on 100 percent mortality of entrained organisms and on mean monthly river flows, monthly entrainment losses of organisms in the Chippewa River will range from about 0.4 percent in April to about 1.8 percent in July. The generation times of all organisms that will be entrained, except fishes, are relatively rapid, and therefore these entrainment losses should have no significant effect on the Chippewa River aquatic ecosystem. Based upon data collected by Applicants, it is not expected that entrainment of fish eggs and larvae would adversely affect the fish populations of the river. Most chemical concentrations are expected to be at sufficiently low levels that no adverse effects on the biota of the river are affected. A potential does exist for the formation of combined chlorine in the form of chloramines, but the Staff determined that the combined chlorine in the blowdown will quickly be diluted to non-toxic concentrations. FES §§5.5.2.2, 5.5.2.3. No thermal impacts to aquatic biota are anticipated to result from cooling tower blowdown, nor should this blowdown discharge create any significant problems of thermal blockage or benthic scour. FES §§5.3, 5.5.2, 10.1.2.2; ER §§5.1, 5.4.

24. The principal environmental effects associated with the operation and maintenance of the TEP transmission line system are considered in our findings on Contentions 7.D, 7.E, and 7.G, *infra*. In addition, the Staff determined that since the TEP transmission lines will operate at 345 kV, vegetation damage due to ozone is unlikely. The Staff also determined that low-level electric fields produced by the 345 kV lines should not have any adverse physiological effect on wildlife or human, either through chronic exposure to the electric fields or discharges of static electricity from ungrounded objects within the electric fields. The Board's assessment of the impacts on waterfowl and eagles by the transmission line crossing of the Mississippi River is included below in our evaluation of alternative sites and design features. Paragraphs 35-41, *infra*.

25. Both the Staff and Applicants have estimated the radiation doses to man at and beyond the site boundary via the most significant pathways and utilizing conservative assumptions on the dilution of effluent gases, the dilution of radionuclides in the liquid discharge, and the use by man of the plant surroundings. FES §5.4.1; ER §5.3. These analyses show that the estimated radiation doses to individuals and to the population from normal operation of the plant will be an extremely minor contribution to the dose that persons in the area normally receive from natural background radiation, and represent no measurable radiological impact. *Ibid*. Occupational radiation exposure of the Tyrone plant is estimated to be 500 person-

rem/year. The environmental impact of the transportation of fuel and waste to and from the plant is summarized in the FES at Table 5.8. The contribution of the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials and management of low-level wastes and high-level wastes related to uranium fuel cycle activities, to the environmental costs of a light-water reactor is summarized in the Staff's FES at Table 5.12. No measurable radiological impact on the aquatic or terrestrial biota is expected as a result of the routine operation of the facility. *Id.* at 5.4.2.4. See also Addendum to this Initial Decision.

26. The Board has assessed the evaluation by the Staff of the environmental effects of plant operation, including radiation doses to man and other organisms. The Board concludes that operational effects will be environmentally acceptable and that the release of radioactive materials will be as low as practicable.

D. Monitoring Programs

27. The Staff has reviewed Applicants' proposed preoperational and operational environmental measurement and monitoring programs for the monitoring of chemical, thermal, and radiological effluents, and for aquatic, terrestrial and radiological effects. FES §6; ER §6. Subject to the conditions recommended by the Staff in the FES, as modified by our findings herein, the Board finds that the preoperational monitoring programs are adequate. An evaluation of the Applicants' proposed operational monitoring program will be performed during the operating license review. FES §6.2.5.

E. Environmental Effects of Postulated Accidents

28. The probability of occurrence of accidents and the spectrum of their consequences to be considered from an environmental effects standpoint have been analyzed using best estimates of probabilities and realistic fission product release and transport assumptions. The impact of postulated accidents has been assessed by Applicants in response to Commission guidance issued on September 1, 1971,⁶ requiring the consideration of a spectrum of accidents with assumptions as realistic as the state of knowledge permits. ER at §7. The Staff has evaluated Applicants' assess-

⁶36 Fed. Reg. 18071 (September 9, 1971).

ment using the standard accident assumptions and guidance issued by the Commission as a proposed amendment to (now) 10 CFR Part 51.⁷ FES §7.

29. When considered with the probability of occurrence, the annual potential radiation exposure of the population from all the postulated accidents is a small fraction of the exposure from natural background radiation and, in fact, is well within naturally occurring variations in the natural background. The results of realistic analysis have caused the Staff and Applicants to conclude, FES §7; ER §7, and the Board to find that the environmental risks due to postulated radiological accidents are exceedingly small and need not be considered further.

F. Need for Power

30. The Board has considered the need for power to be generated by the proposed Tyrone facility. An extensive record was developed on this subject under Contentions 10.A to 10.H where it was found that the Tyrone Energy Park will be needed on the schedule proposed by the Applicants.

G. Alternatives

31. Alternatives to the plant which do not require the creation of a new generating facility, alternative energy sources, alternative sites and design features have been considered. All except alternative sites and design features have been discussed under Contentions 11.A-C, *infra*.

32. Applicants' site selection study for the location of additional baseload capacity included an examination of Applicants' service areas in Minnesota, Wisconsin, North Dakota, and South Dakota. ER §9.2.1.1. The selection of the general location of a generating facility must include consideration of system reliability and economy. Also, as indicated in paragraph 112, *infra*, the NSP-Wisconsin service area has experienced a considerable energy capacity deficit and there is a clear need for additional baseload capacity in that area if the planning goal of economy and reliability is to be met. Forest Testimony⁸ at 15-18. As a result, Applicants' site selection study concentrated on the NSP-Wisconsin and DPC's Wisconsin service area. FES §9.2.1.

33. Within the three general regions in Wisconsin identified as potentially suitable for locating a large power facility, 48 coal-fired and 30 nuclear sites were located and evaluated on the basis of defined siting criteria. Fur-

⁷36 Fed. Reg. 22851 (December 1, 1971).

⁸Testimony of James R. Forest on Contentions. 10.E, 11.A(7 and 8), 11.B(7), 12.D, 12.E, 13.B, and 13.F, following Tr. 2603 (hereinafter "Forest Testimony").

ther study led to the selection of three coal and three nuclear sites. Among the coal sites, both Applicants and the Staff concluded that a site on the Mississippi River near Trenton, Wisconsin, represented the most economical choice. This site was then used in the economic comparison of nuclear and coal-fired generation costs. FES §§9.2.2, 9.2.3; ER §9.2. Regarding the nuclear sites, on the basis of both the environmental and economic analysis, Applicants and the Staff have concluded that the TEP site near Durand, Wisconsin, is the preferred location for a nuclear plant. FES at §9.2; ER at §§9.2, 9.3. The Board finds that the Applicants and the Staff have conducted a reasonable analysis of alternative sites, that the alternative sites are not superior to the proposed site, and that the Tyrone site is preferable on a cost-benefit basis.

34. The principal alternative design features evaluated in the record pertain to the cooling system design and to the transmission line crossing of the Mississippi River.⁹ Alternatives to the mechanical-draft, wet cooling towers proposed for arrangement in a rectangular configuration, include once-through cooling, cooling ponds or lakes, spray ponds or spray canals, wet natural-draft cooling towers, circular mechanical-draft cooling towers, dry cooling towers, and a wet-dry cooling tower. FES at §9.3.1; ER at §10.1. Weighing the overall advantages and disadvantages of these alternatives, from both an environmental and economic perspective, the Board finds that Applicants' selection of the proposed cooling system is reasonable.

35. The transmission line from Tyrone Energy Park to NSP's Prairie Island Plant must cross the Mississippi River.¹⁰ The Mississippi waterfowl and eagle resource is of sufficient environmental importance that feasible alternatives for any proposed power line through the Mississippi River bottoms should be carefully evaluated. FES at §9.3.2. The Staff found an underground crossing to be environmentally acceptable. *Ibid.* However, the Staff stated that additional information was needed to determine whether crossings other than an underground crossing of the Mississippi River would be environmentally acceptable. *Ibid.* Therefore, the Staff proposed the issuance of a construction permit to be conditioned on either (1) using the underground crossing at Prairie Island, or (2) submitting for Staff approval detailed additional environmental and socioeconomic data on overhead crossings.¹¹

⁹Applicants also evaluated alternative intake and discharge systems, chemical waste treatment systems, biocide treatment systems, sanitary waste systems, and liquid and gaseous rad-waste systems. ER §§10.2-10.8.

¹⁰Applicants and NRC Staff considered deletion of the Prairie Island interconnection. This alternative is not considered feasible because it would result in unacceptable reliability and stability problems. FES §9.3.2.

¹¹Condition c, FES (Summary and Conclusions) at iv.

36. Subsequent to the issuance of the FES, Applicants submitted additional detailed information on the waterfowl and eagle ecology of the Mississippi River in the Prairie Island-Red Wing region; an analysis of the potential impacts of an overhead crossing on waterfowl and eagles; a comparative evaluation of four potential crossings of the Mississippi River; updated analysis of the transmission line corridors utilizing the four potential crossings; and additional information on an underground crossing of the Mississippi River at Prairie Island. Prestin-Grosshans Testimony;¹² Exhibits 42-45. The Staff presented its own updated analysis of the alternative Mississippi River crossings and an assessment of the additional information submitted by Applicants. Staff Supplemental Testimony.¹³ The locations for the crossings under consideration are as follows:¹⁴ (1) the crossing at Prairie Island proposed as part of the "selected corridor" in the ER §3.9.1.3.3.2 ("Prairie Island Crossing"); (2) a crossing at North Red Wing that was originally proposed by Applicants ("N. Red Wing I Crossing"); (3) a crossing at North Red Wing that was originally proposed by the Staff ("N Red Wing II Crossing"); and (4) a crossing west of Trenton originally proposed in the Prestin-Grosshans Testimony ("Trenton Crossing"). Prestin-Grosshans Testimony at pp. 11-18.

37. The major impact on waterfowl of an overhead crossing of the Mississippi River is considered to be the potential for bird mortality due to collisions with the transmission lines.¹⁵ Prestin-Grosshans Testimony at 7; Staff Supplemental Testimony at 4, 5, 22. The number of waterfowl that would be killed cannot be predicted with accuracy. Staff Supplemental Testimony at 22. Applicants calculated that a number in the range of 6 to 100 waterfowl killed per year is a *rough* approximation of the potential

¹²Supplemental Testimony of Richard L. Prestin and Robert Grosshans with respect to Nuclear Regulatory Commission Staff's Proposed Condition c to the Construction Permit, following Tr. 4005 (hereinafter "Prestin-Grosshans Testimony").

¹³Supplemental Testimony of NRC Staff in Response to Applicants' Supplemental Testimony of Richard L. Prestin and Robert Grosshans with respect to Nuclear Regulatory Commission Staff's Proposed Condition c to the Construction Permit, following Tr. 4156 (hereinafter "Staff Supplemental Testimony").

¹⁴See Ex. 42 for the location of the four crossings on a map. A potential crossing at Lock and Dam No. 3 and one at Red Wing (which would cross parallel to an existing transmission line) were rejected as unacceptable relative to other available routes. FES §9.3.2; Staff Supplemental Testimony at 2.

¹⁵Waterfowl may also be impacted by the transmission lines due to construction and long-term reduction in suitable habitat. Staff Supplemental Testimony at 4. However, construction effects will be localized to a narrow corridor through the wetlands, and will be relatively temporary. *Ibid.* Any reduction in habitat suitability would involve a relatively small area of habitat and should have little impact on waterfowl populations because of the relatively low populations that breed and overwinter in the area. *Id.* at 22, 23.

waterfowl mortality due to collisions with a transmission line across the Mississippi River Valley. Prestin-Grosshans Testimony at 9, 10; Ex. 45 at pp. 4, 5. In terms of actual numbers, waterfowl mortality due to collisions with transmission lines would be many times smaller than the number that are killed and crippled during hunting in the fall each year in the Prairie Island-Red Wing area alone. Staff Supplemental Testimony at 22; Prestin-Grosshans Testimony at 9. The Board agrees with Applicants and the Staff that the transmission line crossing of the Mississippi River will have only a small impact on waterfowl populations.

38. Northern Bald Eagles are observed in the Prairie Island-Red Wing area as winter residents and as migrants in the spring and fall. Staff Supplemental Testimony at p. 6; Ex. 43. There is the potential for impacts due to transmission lines on eagles resulting from the same factors as for waterfowl. Staff Supplemental Testimony at p. 6. For the same reasons as for waterfowl, impacts on eagles associated with construction and reduction of habitat suitability are considered to be small. *Id.* at pp. 6, 21, 22. Collision-related impacts are expected to be unlikely since eagles are keen sighted and slow flying. However, there are data which indicate that the potential for eagle mortality is a factor of concern relative to transmission line routing and design. It is therefore not unreasonable to expect that a few eagle mortalities from collision may occur over a period of several to many years. Staff Supplemental Testimony at pp. 6, 21; Tr. 2894. Even though such deaths are a cause for concern, they would represent only a small impact on eagle populations relative to other sources of mortality. Staff Supplemental Testimony at p. 21.

39. Applicants have committed to take actions to mitigate the impacts on waterfowl and eagles. Routes through the Mississippi River Valley have been selected to take advantage of riparian forests. Also, double steel pole structures with short spans (approximately 500 feet) have been selected which will make it possible to keep the poles approximately 70 feet tall, which is about treetop level. Prestin-Grosshans Testimony at pp. 11, 13, 15, 17, 18; Staff Supplemental Testimony at p. 7. Potential mortality to waterfowl and eagles should thus be reduced since these birds would generally fly above the tops of trees. Prestin-Grosshans Testimony at p. 17; Staff Supplemental Testimony at p. 7; Tr. 4111. Additionally, Applicants have selected the routes through the Mississippi River Valley to avoid open marshes where waterfowl might seek food or shelter. Prestin-Grosshans Testimony at pp. 13, 16-18. The Board finds that Applicants, with advice from the Staff, have taken all reasonable actions to design the transmission line routes through the Mississippi River Valley in a manner to minimize the potential impacts on waterfowl and eagles.

40. A transmission line placed underground across the Mississippi River

Valley would eliminate most potential impacts to waterfowl and eagles. The present-day cost of an underground transmission line across the Mississippi River Valley at Prairie Island is estimated to be \$12 million, about \$11.5 million more than an overhead crossing. Prestin-Grosshans Testimony at pp. 26, 27. The Staff found that if the underground line would cost from \$6 to \$12 million more than an overhead line, the additional economic costs of undergrounding would outweigh the benefits. Staff Supplemental Testimony at p. 26. The Board concurs with Applicants and the Staff and finds that an underground crossing of the Mississippi River Valley is not a reasonable alternative on a cost-benefit basis.

41. In comparing the data collected by Applicants and the Staff on the four potential transmission line crossings, it appears that the greatest potential impact on waterfowl would be at the Prairie Island crossing. Prestin-Grosshans Testimony at pp. 34, 35; Staff Supplemental Testimony at pp. 22, 28. The N. Red Wing II Crossing would have the least impact on waterfowl. Prestin-Grosshans Testimony at p. 19. N. Red Wing I Crossing and Trenton Crossing would rank second and third.¹⁶ *Id.* There appears to be no significant difference among the crossings with respect to potential impacts to eagles. Staff Supplemental Testimony at p. 17. On the other hand, the N. Red Wing II crossing would have the greatest impact on human settlement and land use. Prestin-Grosshans Testimony at 19.

42. Since the Mississippi River crossing is less than 4 percent of the total length of the transmission line corridor, a comparison must also be made of the other portions of the various routes which would utilize the four crossings. *Id.* Applicants evaluated six potential corridors which incorporate the four proposed overhead crossings.¹⁷ Prestin-Grosshans Testimony at pp. 19-23, 36-45. The corridors considered were (1) the original "selected corridor" utilizing the Prairie Island crossing ("Prairie Island route"); (2) a corridor which utilizes the "alternate corridor" until near Node 129 which then parallels the existing 69 kV line and crosses the river at N. Red Wing I ("N. Red Wing I route"); (3) a corridor which is identical to the N. Red Wing II ("N. Red Wing II route"); (4) a corridor which utilizes the "selected corridor" to west of Node 132 then follows the existing 69 kV line and crosses the river at N. Red Wing I ("N. Red Wing III route"); (5) a corridor identical to the N. Red Wing III route except that it crosses the river at N. Red Wing II ("N. Red Wing IV route"); and (6) a corridor which utilizes

¹⁶The Staff found no obvious differences in impacts on waterfowl in comparing the Trenton Crossing and the N. Red Wing I Crossing. Staff Supplemental Testimony at p. 17. However, at their table of advantages and disadvantages the Staff ranked N. Red Wing I as having less impact on waterfowl than Trenton. *Id.* at p. 28.

¹⁷See also discussion in Contention 7.D. E.

the "alternate corridor" until a point north of Trenton where it follows the Trenton crossing of the river ("Trenton route"). *Id.* at 19, 20, 30-32.

43. Both Applicants and the staff found that among the Prairie Island, Trenton, and N. Red Wing I and II routes, no one route is obviously superior to the others, in the overall terms of environment, aesthetics and land use, nor does one appear to have a significant overall advantage; therefore, the four routes are environmentally acceptable. Prestin-Grosshans Testimony at p. 28; Staff Supplemental Testimony at p. 26. However, the overall environmental impacts of N. Red Wing III and IV routes were found to be greater than those of N. Red Wing I and II. Prestin-Grosshans Testimony at pp. 27, 45. The Staff conducted an independent general search for other possible routes through the Mississippi River Valley and, based on existing information, concluded that there does not appear to be any other route that would have a significant overall advantage. Prestin-Grosshans Testimony at p. 28; Staff Supplemental Testimony at p. 25. The Staff gave its opinion that the North Red Wing I crossing was the most acceptable based solely on environmental criteria and that the "selected corridor" would have considerably greater impacts on the waterfowl. The acceptability of the routes changes when economic costs are also considered, in which case the selected corridor appears to be the most acceptable. However, the Board agrees with the Staff that no one corridor has a significant overall advantage. Staff Supplemental Testimony at pp. 21-24, 27, 30.

44. The Board agrees with the Staff that there is adequate information in the record to allow a comparison and determine the acceptability of the various proposed overhead crossings of the Mississippi River Valley. Staff Supplemental Testimony at pp. 25, 26. Therefore, the proposed Condition c to the construction permit, set forth in the FES, is no longer appropriate.¹⁴ The Board finds that the Prairie Island, Trenton, and N. Red Wing I and II routes are environmentally acceptable and agrees with Applicants and the Staff that no one route is obviously superior to the other routes. Under this

¹⁴On August 24, 1977, the Staff submitted to the Board, with a copy to the parties to this proceeding, a "Proposed Construction Permit Condition" (hereinafter "Condition"), which would take the place of the now obsolete proposed Condition c. The proposed Condition would require Applicants to monitor waterfowl and/or eagles (depending on final crossing selection) in the area of the transmission line crossing of the Mississippi. By letter dated September 16, 1977, to the Board, Applicants concurred with the Staff's proposed monitoring condition. The Board agrees that the monitoring condition is appropriate and it is adopted as Condition 3 below.

The Board has considered the uncontested construction permit conditions proposed by the Staff, FES at pp. iv-v, and not discussed elsewhere in this decision, and finds them to be reasonable and appropriate. They are incorporated in our Order below.

circumstance, the Board finds it appropriate that the final selection of the Mississippi River crossing from among those found environmentally acceptable should be made by Applicants in conjunction with the appropriate state agencies with jurisdiction over the transmission line route in the states of Minnesota and Wisconsin.^{19 20}

H. Cost-Benefit Balance

45. The Board has weighed the environmental, economic, technical, and other benefits of construction of the proposed plant against environmental and other costs upon the basis of the evidence of record. This weighing has included consideration of the impacts associated with the uranium fuel cycle as set forth in revised Table S-3, 10 CFR §51.20(e). The principal environmental and other costs identified are those which have been described by the Board in its findings herein and are as follows:

- a. Construction-related activities on the primary site will disturb about 375 acres.
- b. Approximately 1,434 acres will be required for the offsite transmission line rights-of-way and a railroad spur will affect 40 acres offsite.
- c. Fifty-five residents will be displaced from the site property. Traffic on local roads will increase due to construction and commuting activities. The influx of construction workers and their families is not expected to cause major problems with community services, housing, or institutions except for the

¹⁹The Commission has held that its responsibility in passing judgment on the various alternatives in transmission line routing is "to the end that the environmental aftermath of licensing may be minimized 'to the extent reasonably practicable.'" *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-422, 6 NRC 33, 86 (1977). However, where none of the alternatives being considered present a significant environmental threat, the Board need not compel one alternative over the other. *Northern States Power Co.* (Prairie Island Nuclear Generating Plant, Units 1 and 2), ALAB-244, 8 AEC 857 (1974). The Board can issue a construction permit without first compelling a decision on one among the acceptable alternatives. *Philadelphia Electric Co.* (Limerick Generating Station, Units 1 and 2), ALAB-262, 1 NRC 163, 200 (1975).

²⁰The Board has considered to the extent permitted by the Commission's regulations the views submitted by James R. Huntoon, Director, Bureau of Environmental Impact, Wisconsin Department of Natural Resources (DNR), in his letter of October 25, 1977. Wisconsin DNR believes that the Prairie Island crossing is not an acceptable choice. Based upon the evidentiary record before us, with which we are satisfied, and for the reasons stated above, we are unable to adopt the views of the Wisconsin DNR. Nothing in this Initial Decision is intended to impede the Wisconsin DNR in the exercise of its responsibilities, and we contemplate that full consideration will be given the views expressed by Mr. Huntoon in the final route selection.

Durand Unified School System which will absorb the majority of the students.

- d. The heat dissipation system will have a maximum consumptive use of 31.7 ft³/s. Thermal alterations and chemical effluents will not adversely affect the biota of the Chippewa River.
- e. Aquatic organisms entrained in the circulating water system will be killed but these losses are small relative to the total population of organisms inhabiting the river. Impingement of fishes at the intake structure is not considered to constitute a serious impact.
- f. Impacts on waterfowl and eagle populations from transmission lines, including the overhead crossing at the Mississippi River, are expected to be small.
- g. No measurable impacts on man or other biota are expected from normal operational releases of radioactive materials.
- h. Exposure of plant personnel to 500 person-rems per year of radiation.
- i. The capital and operating costs of the plant.

46. The principal benefit of the plant is the production of electrical energy to meet the needs of Applicants' customers. Based on a 70 percent capacity factor, which the Board in paragraph 190, *infra*, finds reasonable for a plant such as Tyrone, the generation of electricity will be approximately 7 billion kilowatt hours per year.

47. The Board finds that, based upon the entire record regarding need for power and the available alternatives to the plant, construction of Tyrone Energy Park, Unit 1, for operation on the schedule proposed by Applicants is required to meet the need for electric power and that the plant, as designed and selected from available alternatives, represents the optimum selection based on overall economic and environmental considerations. The Board further finds that the environmental and economic benefits from the construction and operation of the plant are greater than the environmental and economic costs which will necessarily be incurred. Therefore, the Board finds that the balance between the benefits and costs involved favors the issuance of a construction permit for Tyrone Energy Park, Unit 1.

I. Federal Water Pollution Control Act

48. The State of Wisconsin, through its Department of Natural Resources (DNR) responded on April 18, 1977, to Applicants' request of June 15, 1976, for a water quality certificate, pursuant to Section 401 of the Federal Water Pollution Control Act, as amended ("FWPCA"), 33 U.S.C. §1341, for Tyrone Energy Park. Letter from Anthony S. Earl, Secretary,

Department of Natural Resources, State of Wisconsin, following Tr. 2209. The Department has not identified any potential discharge from the proposed plant which would not comply with the applicable provisions of Sections 301, 302, 306 and 307 of the FWPCA. However, certain state reviews in connection with the proposed plant have not been completed and the Department has determined not to act on the application for certification in advance of the completion of such review procedures. Since the subject state review procedures are not expected to be completed within one year of the date of the application for certification, the Department expressly waived certification pursuant to Section 401(a)(1) of the FWPCA. *Id.* at 2.

49. Section 401(a)(1) of the FWPCA provides, *inter alia*, that [i]f the State. . . fails or refuses to act on a request for certification, within a reasonable period of time (which shall not exceed one year) after receipt of such request, the certification requirements of this subsection shall be waived with respect to such Federal application. No license or permit shall be granted until the certification required by this section has been obtained or has been waived as provided in the preceding sentence.

The Board finds that the State of Wisconsin has waived certification, pursuant to the above quoted provisions, with respect to this construction permit application, and that the requirements of Section 401 of the FWPCA have been satisfied.

III. FINDINGS OF FACT—CONTESTED ENVIRONMENTAL MATTERS

Contention 6.C: The Applicants have failed to consider the environmental effects of decommissioning the facility (NT-12).

50. After the Board received into evidence Applicants' Weinstein Testimony,²¹ Staff's Erickson Testimony²² and the Final Environmental Statement,²³ Northern Thunder appropriately modified its Contention 6.C to conform with its view of the evidentiary record. Northern Thunder now contends that neither the Staff nor the Applicants have given adequate consideration and weight to the various environmental effects associated with decommissioning the proposed Tyrone Energy Park particularly because

²¹Applicants' Testimony of Albert A. Weinstein in response to Contentions 6.C and 12.E following Tr. 2924 (hereinafter "Weinstein 6.C/12.E Testimony").

²²Staff Testimony in response to Contention 6.C by Peter B. Erickson, following Tr. 3052 (hereinafter "Erickson Testimony").

²³See §10.2.4.

experience with decommissioning large reactors has been limited and because Applicants and Staff have not identified a specific decommissioning mode. NT Proposed Findings 4 and 11.

51. So that the health and safety of the public may receive maximum protection, the exact method of decommissioning large nuclear reactors will be controlled by the rules and regulations in effect at the time of decommissioning. This is consistent with the Commission's current regulations which require detailed consideration of decommissioning near the end of a reactor's useful life. FES §10.2.4.

52. Nevertheless useful data on the probable effects of decommissioning a reactor such as Tyrone are now available. Three methods of decommissioning nuclear reactors have been used to date and the environmental effects of each have been evaluated.²⁴ All parties agree that the eventual choice of decommissioning will be from among three alternatives: dismantlement, entombment, mothballing or a combination of these. Mothballing consists essentially of placing a nuclear plant in protective storage with fuel assemblies, radioactive fluids and radioactive wastes being removed. Entombment consists of sealing off radioactive plant components after removal of fuel assemblies, radioactive fluids, and radioactive wastes. Dismantlement involves removing all radioactive materials from the site necessary to render it acceptable for unrestricted access. NT Proposed Findings 5 and 7; Applicants' Proposed Finding 6; Staff's Proposed Finding 2.

53. The Board agrees with the Staff that the Applicants will probably choose to decommission initially by mothballing because that mode would have the lowest economic cost and the least environmental impact among the alternatives. FES at §10.2.4; NRC Staff Testimony in response to Contention 12.E at 3 following Tr. 3054. The feasibility of subsequent dismantlement and restoration would be determined by an economic and environmental study of the land and scrap value versus the demolition and removal of the complex. FES §10.2.4.

54. Even though the mothballing decommissioning mode is more likely, it is appropriately conservative to accept the Staff's analysis of the environmental effects of undelayed dismantlement because that mode is expected to have the greatest potential environmental impact. Erickson Testimony at 4. The Staff has analyzed the environmental impacts of dismantlement in terms of the use of natural resources and energy and radiological exposure. It has concluded that the energy used would be no

²⁴Decommissioning activities have been or are being conducted on five licensed power reactors, six licensed test reactors, four government-owned demonstration power plants, 28 licensed research reactors, and 22 licensed critical facilities. Weinstein 6.C/12.E Testimony at 1. However, decommissioning experience in the United States has been with small reactors. *Id.* at 12 and 13; NT Proposed Finding 6.

more than the amount used during normal facility operation. *Id.*, p.4. Similarly radiological exposure would be less than or equal to exposure during normal operations depending upon the cause of exposure. *Id.* at 5-8; Weinstein Testimony at 69-70. Resource commitments are not large. Erickson Testimony, *supra*. Applicants' witness Weinstein presented a detailed assessment of the long-term and short-term environmental effects of the three decommissioning modes considered. Weinstein 6.C/12.E Testimony, *passim*. In each instance the Board finds that the postulated environmental impacts are acceptable.

55. The Board has considered Northern Thunder's Proposed Finding 9 in which it contends that concrete rubble from the dismantled plant would be simply broken up and shipped in plywood containers to be ultimately disposed of merely by covering the rubble with dirt. This, according to Northern Thunder, would permit the migration of radioactive isotopes from the plant residue which would expose the ecosystems and perhaps the food chain to varying levels of radioactivity. The Board, however, agrees with the Applicants²⁵ that there is no citation to the record nor is there record support for Northern Thunder's statement.

56. Therefore the Board finds that although there is little actual experience with decommissioning large reactors such as Tyrone there is an adequate data base for estimating the environmental impacts of decommissioning large reactors. Moreover there has been sufficient consideration and analysis by the Applicants and the Staff to demonstrate that the decommissioning of Tyrone can be expected to have an acceptable environmental impact. Erickson Testimony at 8; Weinstein 6.C/12.E Testimony at 81.

Contention 7.A: Heated water from the plant will cause increased algal growth in the Chippewa River and Tyrone Lake (Cider-2).

57. It is impossible for heated water discharged from the plant to enter Tyrone Lake because the lake is upstream from the plant's discharge into the Chippewa River. Owen Testimony²⁶ at p. 1; Szluha-Robertson Testimony²⁷ at p.3. Therefore, heated water from the plant cannot cause increased algal growth in Tyrone Lake.

58. The record also shows that heated water from the plant will have little impact on the algae in the Chippewa River. Under the "worst-case" conditions of low river flow, only 5.6 percent of the cross sectional area of the

²⁵Applicants' Reply to Proposed Findings.

²⁶Applicants' Testimony of Bradford B. Owen in Response to Contention 7.A, following Tr. 2908 (hereinafter "Owen Testimony").

²⁷Testimony of NRC Staff on Contention 7.A, following Tr. 3910 (hereinafter "Szluha-Robertson Testimony").

Chippewa River will be exposed to a temperature differential of 5°F, and that the thermal plume will extend only 15 feet downstream of the discharge ports. Owen Testimony at pp. 1, 2; Szluha-Robertson Testimony at pp.1, 2. This condition will only occur in the winter, when algae will be least susceptible to thermal shock. Owen Testimony at p.5. The diffuser discharge system to be used at TEP will provide for a very rapid mixing of the thermal effluent, and given the small size of the thermal plume and even assuming the minimum velocity of the river, the duration of the exposure of algae to the plume will be only a few seconds. *Id.* at pp. 1, 5.

59. The Board agrees that heated water from the plant cannot cause increased algal growth in Tyrone Lake and that there will be a negligible effect on algae in the Chippewa River.

Contention 7.B: Diversion of river water will adversely affect the human environment and wood duck nesting habitat (NT-8).

60. The diversion of Chippewa River water for circulation through the plant's closed-cycle cooling system will reduce, to only a small extent, the flow and elevation of the Chippewa River. Haerer Testimony²⁸ at p. 1; Robertson-Kroodsma Testimony²⁹ at p. 1. The maximum amount of water that would be required by the plant (under meteorological conditions which are exceeded only one percent of the time) is 44.5 ft³/s. The flow and elevation of the Chippewa River at the TEP site and downstream fluctuate considerably. The average flow and elevation of the river at the site vary from 6,700 ft³/s at 719 feet in winter, to 4,000 ft³/s at 716.5 feet in summer. The diversion of 44.5 ft³/s from the Chippewa River at the TEP site amounts to 0.8 percent of the average flow, 1.1 percent of the average summer flow, and 3.7 percent of the 10-year, 7-day low flow of 1,220 ft³/s. These reductions in flow would not measurably lower the average or summer average river elevations and would reduce elevation during the 10-year, 7-day low flow by no more than approximately 0.1 foot. Haerer Testimony at p. 2.

61. The consumptive use of the Chippewa River downstream from the TEP site is limited to agricultural use for irrigation. One farm about 4 miles downstream from the site uses about one ft³/s in the summer. The nearest downstream potable use is in the Mississippi River in the area of Davenport, Iowa—approximately 330 miles downriver. There are no known industrial users within 10 miles of the site. Nonconsumptive uses of the river include

²⁸Applicants' Testimony of W. A. Haerer in Response to Contention 7.B and 7.F, following Tr. 2481 (hereinafter "Haerer Testimony").

²⁹NRC Staff Testimony on Contention 7.B and 7.C, following Tr. 3937 (hereinafter "Robertson-Kroodsma Testimony").

fishing, boating, hunting, and hiking along the river banks. Haerer Testimony at p. 3; FES §5.2.1. The maximum 0.1 foot drop in the river elevation during the 10-year, 7-day low flow is not expected to have any adverse effects on the human environment. Haerer Testimony at p. 4.

62. Wood ducks nest in bottomlands in natural cavities along the Chippewa River. Haerer Testimony at p. 4; Robertson-Kroodsma Testimony at pp. 1, 2. Migrants first appear in April and incubation lasts about 30 days, with most incubations completed by late May or early June—before summer low flows are common. During the nesting period water should be present and remain through the incubation period; and if water is available within one-half mile of the nest site, then the loss of temporarily flooded lands is not critical. The wood duck nesting habitat of the lower Chippewa River naturally experiences considerable fluctuations in river flow and elevation. For these reasons, the maximum diversion of 44.5 ft³/s by the plant will not adversely affect wood duck nesting habitat. Haerer Testimony at pp. 4, 5; Robertson-Kroodsma Testimony at p. 2. The Board concurs.

Contention 7.C: The proposed cooling towers will have significant adverse effects in that:

- (1) They will cause icing of roads and crops, increased fog, and intensified snowfall (Cider-1, NT-13).
- (2) The plumes will be aesthetically undesirable (NT-13).
- (3) The plumes will adversely affect navigation on the Chippewa River (NT-13).

63. Mechanical-draft wet cooling towers release warmed air with evaporated moisture. As the air stream mixes with the relatively cooler ambient air, water vapor may condense to produce a visible plume. In addition, a relatively small amount of the circulating cooling water is entrained into the air stream and, due to drift loss, leaves the system in the form of small water droplets. During freezing conditions, these water emissions may produce ice formation in the vicinity of the cooling system. Fisher Testimony³⁰ at pp. 2, 7; FES §5.1.2.1. Applicants' assessment of the environmental effects of the cooling tower system includes predictions, made with various computer models, of fogging and visible plumes, icing, and the horizontal and vertical dimensions of the plume under different meteorological conditions. Input to these analyses were meteorological data

³⁰Applicants' Testimony of George E. Fisher in Response to Contention 7.C, following Tr. 2964 (hereinafter "Fisher Testimony").

representative of the site region, spatial layout and orientation of the cooling towers, performance characteristics of the cooling towers, and identification of environmentally sensitive areas around the site. Fisher Testimony at p. 3. The Staff made an independent assessment of the environmental effects of the cooling tower plumes, using predictive mathematical models different from those used by Applicants. FES §§5.1.2.1, 5.3.2.

64. Applicants' analysis shows that the maximum occurrence of tower-induced fog³¹ on any offsite roadway is expected to be approximately 5 hours per year on a section of State Highway 85. The Staff's calculations, which the Staff characterizes as conservative, predict a greater maximum frequency of fog occurrence on that highway, but the Staff's calculations do not consider the mitigating effect of the high ground between the towers and the highway. FES §5.1.2.1; Robertson-Kroodsma Testimony at p.2. Both Applicants and the Staff note that since these occurrences are usually predicted to precede immediately or follow periods of natural fog,³² their impact on motorists would be minimal. Fisher Testimony at p. 12; FES §5.3.2. Applicants' analysis predicts no occurrence of tower-induced fog on any portion of the Chippewa River, and the Staff predicts no significant problems to recreational boat navigation on the river. Fisher Testimony at p. 12; Robertson-Kroodsma Testimony at p. 2.

65. Visible plume occurrences³³ are predicted to be relatively frequent within 3 miles of the plant. Plumes are expected to be visible infrequently, however, over relatively populated areas, such as Eau Claire (4 hours per year), Durand (8 hours per year), and Menomonie (1 hour per year). Given an ideal vantage point, average visible plume lengths are predicted to range from 1,640 to 6,560 feet during typical winter mornings and afternoons, and from 1,300 to 3,300 feet during summer mornings. Visible plumes would generally be of negligible length during summer afternoons, when ambient air is in a neutral condition and the relative humidity is low. The majority of the predicted visible plumes would occur during cold, humid weather, especially during the night time hours, when their visible impact would be nearly absent. In many cases, the elevated visible plumes would be virtually indistinguishable from surrounding clouds. Fisher Testimony at

³¹In Applicants' analysis, an occurrence of fog is considered to take place when the visibility at ground level is reduced to 1,000 meters or less (in accordance with the international definition of fog). The visibility limit of 1,000 meters or less is well above maximum automobile stopping distance. Fisher Testimony at pp. 11, 12.

³²Naturally occurring fog averages about 417 hours per year. Fisher Testimony at p. 12; FES §5.1.2.1.

³³An occurrence of a visible plume is considered to take place whenever the plume is predicted to be saturated with water vapor. Fisher Testimony at p. 13.

pp. 13, 14; Robertson-Kroodsma Testimony at p. 3. Thus, the aesthetic impact of the cooling tower plumes is considered to be small.

66. When icing occurs as a result of TEP cooling tower operation, it will form close to the towers with relatively little effect outside the plant boundary. Robertson-Kroodsma Testimony at p. 3. Applicants' analysis forecasts negligible icing for all offsite roadways and for vegetation offsite. Fisher Testimony at p. 12. It should also be noted that any icing conditions would occur in the winter when snow and ice are likely to exist on the ground, so that the cooling tower-induced icing effect would be minimized. *Id.* at p. 13; FES §5.3.2; Robertson-Kroodsma Testimony at p. 3. Much of the land around the site is crop and grazed land, which, being in a dormant state during the winter, is not susceptible to damage by ice. Fisher Testimony at p. 12. The total annual increase of snowfall at any location as a result of cooling tower operation, including natural snow augmentation, has been estimated to be 1 to 2 inches. *Id.* at p. 15.

67. The Board finds that, on the basis of the analyses of cooling tower plume behavior presented in the record, operation of the TEP cooling tower system will not have significant adverse environmental effects as alleged in Contention 7.C and in Northern Thunder's Proposed Finding 20.

Contention 7.D: The Applicants have failed to consider placing the transmission lines underground in their entirety or in visually sensitive areas (NT-15).

Contention 7.E: The Applicants have failed to provide adequate data on the effects of transmission lines on roads and recreational areas (NT-18).

68. Contentions 7.D and 7.E address only two of the many environmental considerations which were evaluated by Applicants in selecting the proposed routes for the TEP transmission lines. ER §§3.9, 4.2, 10.9. Applicants supplemented the detailed information in the ER concerning the methodology employed in the transmission line corridor routing process and, in particular, the consideration given in the routing process to roads, recreation areas, and other visually sensitive areas. Prestin Testimony.³⁴ Applicants also presented detailed cost estimates of underground transmission lines and some of the environmental and operational problems with underground transmission lines. Grosshans Testimony.³⁵ The Staff sup-

³⁴Applicants' Testimony of Richard L. Prestin in Response to Contention 7.E, following Tr. 4001 (hereinafter "Prestin Testimony").

³⁵Applicants' Testimony of Robert Grosshans in response to Contention 7.D, following Tr. 4000 (hereinafter "Grosshans Testimony").

plemented its transmission line discussions in the FES at 2.7.1.3, 3.8, 4.1.2, 5.5.1, 5.1.3, 9.3.2 with additional testimony. Kroodsmas Testimony;³⁶ Keblusek Testimony.³⁷ Also, additional facts were presented to the Board about the methodology for transmission line route selection and the costs of undergrounding transmission lines regarding the proposed crossing of the Mississippi River. Prestin-Grosshans Testimony; Staff Supplemental Testimony.

69. The proposed transmission system, described in the ER at §3.9, consists of three main projects: an East Project which is a single circuit 345 kilovolt (kV) line from the TEP site to the Eau Claire substation; a North Project which consists of a double circuit 345 kV line from the TEP site to tap into the existing Eau Claire/King 345 kV line; and a West Project consisting of a single circuit 345 kV line from the TEP site to the Prairie Island Nuclear Plant site. Prestin Testimony at pp. 1, 2, Appendix A. The transmission line corridor selection methodology included formulating general criteria which took into account eight major environmental concerns. *Id.* at pp. 2-8. The information was quantified, and with the aid of computers, all possible corridors were identified and evaluated.³⁸ *Id.* at pp. 7, 8. The selected and alternative routes were field-checked to verify the accuracy of data and reliability of the selection process. *Id.* at p. 8.

70. The major impact of the proposed transmission lines on roads and recreation areas will be of a visual or aesthetic nature. *Id.* at p. 9; Kroodsmas Testimony at p. 3. The proposed corridors for the TEP transmission lines do not cross any designated recreation areas.³⁹ Kroodsmas Testimony at p. 3; Prestin Testimony at pp. 11-14. Applicants discussed the potential impact of the transmission lines on each designated scenic road along the proposed corridor. Prestin Testimony at pp. 11-13. Construction techniques such as setbacks from rivers and streams, use of natural vegetation for visual screening whenever possible, and complete spanning of the narrower river valleys will be utilized to minimize visual impact. *Id.* at p. 13. Specifically designed structures such as steel poles may also be used where needed to limit adverse visual impact. *Ibid.* The Board finds that the effects of pro-

³⁶NRC Staff Testimony on Contentions 7.D, 7.E, 7.F, and 7.G, following Tr. 4147 (hereinafter "Kroodsmas Testimony").

³⁷NRC Staff Testimony in Response to Contention 7.D, following Tr. 4147 (hereinafter "Keblusek Testimony").

³⁸The data groupings can be found in ER Table A 3.9-2.

³⁹The selected corridor for the West Project would pass through part of an area on the west bank of Nine Mile Slough which is being considered for acquisition by the Department of Natural Resources for the expansion of the Dunnville Wildlife Area. Prestin Testimony at p. 12. The proposed line would pass through only a small portion of the area that is being considered for acquisition. Tr. 4041.

posed transmission lines on roads and recreation areas have been adequately considered and that the recreational uses of land and water areas in the vicinity of the transmission line corridor will be subject to minimal impact.

71. One means of reducing the visual impacts of transmission lines would be to place the lines underground.⁴⁰ Applicants considered placing the TEP transmission line underground in its entirety or in visually sensitive areas.⁴¹ The overhead transmission line cost is estimated to be \$14.9 million. Grosshans Testimony at p. 3. The total cost for placing the entire transmission line underground would be \$174.3 million, or 11.7 times the cost of overhead transmission. *Id.* The Staff found this estimate to be realistic. Keblusek Testimony at p. 2. The principal benefit from undergrounding the entire TEP transmission line would be a marginal improvement in the aesthetic quality of areas primarily dedicated to intense agricultural use. Grosshans Testimony at p. 10; Kroodsma Testimony at p. 2. The Board agrees with Applicants and the Staff that any aesthetic benefits gained by placing the transmission lines underground would not be sufficient to warrant the additional investment.

72. Ten visually sensitive areas were identified along the proposed transmission line corridor. Grosshans Testimony at pp. 6, 7; Prestin Testimony at pp. 11-13. Estimates were prepared to determine the cost of placing the transmission lines underground in each of these ten sections of the transmission line corridor. Grosshans Testimony at pp. 7-10.

73. The total cost of placing the transmission lines underground in these ten visually sensitive sections was estimated to be \$69.5 million.⁴² *Id.* at p. 7.

⁴⁰Placing transmission lines underground would not eliminate the visual impact. Pumping stations (for the oil in oil cooled/insulated cables), reactance compensation stations and terminal stations could detract from visually sensitive areas. Grosshans Testimony at p. 10; Keblusek Testimony at p. 1. In addition, if the stations were located on agricultural land, more land would be removed from agricultural production than with overhead transmission. Grosshans Testimony at pp. 10, 11.

⁴¹Placing the entire TEP transmission lines underground was not considered a likely alternative, however, because of the length of the circuit, the location of the electric generating plant and the transmission lines in a rural community, and the additional cost of undergrounding 345 kV transmission lines. To date, 345 kV transmission lines have been placed underground only in congested urban areas. Grosshans Testimony at p. 1.

⁴²These are minimum estimated costs. The costs are based on material and labor estimates of two parallel, high-pressure, oil-filled underground cable systems per circuit. Grosshans Testimony at pp. 3, 4. For reasons of reliability, spare cables might be installed along all or parts of an underground system, particularly at a river crossing. Underground river crossings might necessitate thicker pipe walls and better pipe coatings than are included in these estimates. Reliability can also be improved by providing redundant pumping systems, by deeper trenches, by dredging a separate trench for each cable with a 50 to 100-foot separation

Continued on next page.

The cost for an overhead transmission line for the same ten sections would be approximately \$5.4 million. *Ibid.* While placing the transmission lines underground might enhance the aesthetic vista, there are other undesirable environmental impacts of undergrounding, including excavation of trenches; dredging in rivers, streams and wetlands; and potential oil leaks from the oil-cooled cables. *Id.* at pp. 10, 11. Undergrounding transmission lines presents additional reliability and operational problems due to the difficulty in locating and repairing a fault in an underground cable. *Id.* at pp. 11, 12.

74. The Board finds that Applicants considered placing the transmission lines underground in their entirety and in visually sensitive areas. The marginal benefit in aesthetics due to underground transmission lines in visually sensitive areas, including scenic roads, is outweighed by the increased economic cost.

Contention 7.F: The facility will adversely affect eagle habitat and nesting compatibility near the Nine Mile Island and other areas (NT-19).

75. The Staff viewed this contention regarding the assessment of impact of transmission lines on eagle habitat and nesting compatibility near the Nine Mile Island and other areas, to include the proposed transmission line crossing at Prairie Island. The Board agrees with the Staff interpretation, and our findings on this subject matter are found in paragraphs 35 to 41, *supra*.

76. Surveys of bald eagles in the TEP site area in 1973, 1974, and 1976 indicate that migrating bald eagles are fairly common in early winter and, again, in late winter and in spring. Haerer Testimony at pp. 6, 7. There is no evidence that bald eagles nest on or in the vicinity of the TEP site (including Nine Mile Island) or along the Chippewa River from Eau Claire to the Mississippi River. *Id.* at p. 7; Kroodsmma Testimony at p. 4; FES §2.7.1.3. The greatest concentrations of nesting bald eagles nearest Nine Mile Island are found in the Chippewa National Forest in Minnesota, about 200 miles from the island. Haerer Testimony at p. 6.

77. The noise and activity of plant construction will probably make the immediate site area temporarily less attractive to migrating eagles. It is

Continued from previous page

and by installing a cover over the cables. All of these measures would increase the cost of the underground lines. *Id.* at p. 4. For example, a 2.2-mile crossing of the Mississippi River and County TH "E" was estimated to cost \$7.8 million. *Id.* at p. 10. However, an underground crossing of just the Mississippi River that would be *equivalent* in current carrying capacity and reliability to an overhead crossing was estimated to cost \$12 million. Prestin-Grosshans Testimony at p. 26.

unlikely, however, that eagle habitat along Nine Mile Island will be affected by plant construction or operation, since the activity and noise on the site will be attenuated by trees, differences in elevation, and by the distance (2.0 to 2.5 miles) between Nine Mile Island and the site. *Id.* at p. 7; FES §4.3.1.1. Bald eagles will probably temporarily avoid areas near Nine Mile Island (and other areas) where transmission corridors are being developed and transmission lines are being erected. Haerer Testimony at p. 7; FES §4.3.1.2. The Board finds that there is no evidence that construction and operation of the transmission lines will adversely affect bald eagle habitat or nesting compatibility near Nine Mile Island and other areas along the Chipewa River, contrary to the findings by Northern Thunder in their Proposed Findings, paragraph 16.

Contention 7.G: Applicants do not adequately discuss the types of herbicides to be used, their methods of application, and their effects (NT-16, 17).

78. Applicants discussed the method of application and effects of the herbicides that will be used by NSP beneath the TEP transmission lines. Moline Testimony.⁴³ The NRC Staff discussion of herbicide use in right-of-way maintenance, found at §5.5.1.2 of the FES, was also supplemented and updated at the hearing. Kroodsmas Testimony at p. 5.

79. NSP's long-range goal in its vegetation management program for transmission line rights-of-way is to eliminate tall-growing, woody plants that would, at maturity, interfere with its electric lines, and thus reduce system integrity. Moline Testimony at p. 1. A new, stable, low-growing vegetative community would develop in place of the tall, woody plants, would limit the reinvasion of tall-growing species, and would reduce maintenance to a minimum. Also, food and cover for a variety of animals and birds would be provided. NSP has found the selective use of herbicides to be the most effective method of right-of-way maintenance. *Ibid.*

80. Herbicides are applied only by personnel licensed by the state. Moline Testimony at pp. 2, 7; Tr. 4044, 4045. NSP's field inspectors supervise the herbicide application program. Moline Testimony at pp. 2, 7; Tr. 4056-4058. All herbicides used by NSP are registered with the EPA and are applied in accordance with the instructions and precautions of the product label which is approved by the EPA. Moline Testimony at p. 3; Kroodsmas Testimony at p. 5.

81. Herbicides are only used by NSP where the landowner agrees that they may be used. No herbicides are applied within 100 feet of any lake,

⁴³Applicants' Testimony of William L. Moline in Response to Contention 7.G, following Tr. 4002 (hereinafter "Moline Testimony").

stream, irrigation ditches or other open water. Moline Testimony at p. 8; Tr. 4047; Kroodsmas Testimony at p. 5. In addition, herbicides for brush management are not used in urban areas or in visually sensitive areas such as road screens. Moline Testimony at p. 8. Weed control herbicides are not used in meadows, pastures, cultivated fields or lawns. Written permission for the use of herbicides during both initial clearing and subsequent maintenance operations on transmission rights-of-way is obtained from the landowner in the execution of the easement document. It is also NSP's practice to obtain oral permission from each property owner for application of any herbicides to the right-of-way on their property just prior to their application. Moline Testimony at p. 8; Tr. 4048, 4049.

82. During the initial clearing operations the stumps of freshly cut trees are treated with a herbicide to kill the root system of the plant and prevent regrowth. The chemical presently used by NSP for this purpose is DuPont AMMATE X. The active ingredient of AMMATE X, ammonium sulfamate, is nonvolatile, odorless, and has a low toxicity to fish, other wildlife, and domestic animals. Moline Testimony at p. 2. As a contact spray, AMMATE X is also frequently used for control of unwanted weeds and grasses of golf courses, tennis courts, public parks and along driveways. *Id.* at p. 4.

83. For brush control, herbicides are applied by a basal spray application, which minimizes the drifting of herbicide sprays so that nontarget plants will be minimally affected. *Id.* at p. 6; Kroodsmas Testimony at p. 5. The chemical presently used by NSP for brush control is WEEDONE 170. Moline Testimony at p. 5. The chemical constituents of WEEDONE 170 have been used in the United States for over thirty years. *Id.* at p. 10.

84. For weed control around wood poles, herbicides are applied once every three years by a low-pressure spray system to a circular area within a radius of approximately 3 to 8 feet. *Id.* at p. 7. The chemical used for this purpose is KROVAR I, and it is the least toxic of the herbicides used by NSP. *Id.* at p. 11.

85. While mechanical control of brush and weeds is an alternative to a maintenance program which utilizes herbicides, it is more costly, involves more frequent entry into the right-of-way, and is ineffective in accomplishing the objective of a stable, low-growing vegetative community. *Id.* at pp. 12, 13. It is estimated that herbicides will be required to control brush and weeds on only 17 of the total 79 miles of right-of-way for the TEP transmission lines, or approximately 250 acres. *Id.* at p. 8.

86. The Board finds that the types of herbicides which will be used by NSP in its program of right-of-way clearing and maintenance, their methods of application, and their effects were adequately considered by Applicants and Staff. The Board agrees that the use of herbicides as

described by the Applicants and Staff is an economical and environmentally acceptable method of right-of-way clearing and maintenance. Therefore, the Board rejects Northern Thunder's allegation (Proposed Finding 20) that the information presented is inadequate to determine the effects of herbicides used for right-of-way clearing and maintenance.

Contention 7.H: The Applicants do not adequately justify the amount of land required for the site (NT-11).

87. The Board has examined the evidence presented on Contention 7.H in light of the Commission's responsibilities under NEPA—which in this instance are not to determine whether Applicants have adequately justified the amount of land acquired for the site, but rather to determine the environmental costs and benefits of the acquisition of the site lands, and to include those costs and benefits in the overall cost-benefit analysis of the proposed issuance of a construction permit. Under NEPA, the Commission also has the obligation to examine the relationship between short-term uses and long-term productivity entailed in use of the site for a nuclear power reactor. Jackson-Kroodsma Testimony;“ Tr. 3162, 3164, 3167-8, 3170, 3172.

88. Applicants presented the testimony of their consultant, an Accredited Farm Manager and Accredited Rural Appraiser, who has advised them on land use planning at the Tyrone Energy Park site. A detailed description was provided of the use of the 4,597-acre site lands prior to development of the TEP project, and the proposed site land during the operation of Tyrone Energy Park. Hoysler Testimony.

89. It is estimated that 2,350 acres of the TEP site were used for cropland in recent years. In the period 1970 to 1974, the agricultural land was used mainly for the production of corn, soybeans, oats and alfalfa. The acreage not utilized for cropland in the past (2,247 acres), was devoted mostly to natural areas of grass, trees and brush. A very small amount of this land was used in farmsteads and roads, and a larger (though still small portion of the 2,247 acres) area has been planted to trees and windbreaks. *Id.* at pp. 1-3.

90. After Tyrone begins operation intended utilization of the 2,350 cropland acres includes retention of 1,774 acres for the production of corn, soybeans, small grain and hay. Approximately 126 acres, which is now open land, have been recommended for tree plantings. These open fields are extremely marginal agricultural areas, with erosion problems and low crop

“NRC Staff Testimony in Response to Contention 7.H by Jeremiah D. Jackson and Roger L. Kroodsma, following Tr. 3961 (hereinafter “Jackson-Kroodsma Testimony”).

yield potential. *Id.* at pp. 3-5, 10, 11. The 600-acre, owner-controlled area, to be enclosed by a security fence, has 450 acres of cropland, all of which will be removed from production. This area is estimated to be average agricultural land compared with other cropland within the TEP site. Based upon information from farmers operating the land, and also from the Soil Conservation Service and the Agricultural Stabilization and Conservation Service, it is estimated that the 450 acres of cropland removed from production would produce an annual gross income of \$47,193. The yields and net return on this land are substantially lower than for other cropland in Dunn County and the State of Wisconsin, and lower still than for the nationwide average. *Id.* at pp. 3-9.

91. The Staff has minimum size criteria for any site, which are based on radiological health and safety factors. Any additional land acquired for the site is examined for the environmental impact of the acquisition. Jackson-Kroodsma Testimony at pp. 1, 2. Since the principal uses of the land which is being preempted by Tyrone Energy Park are crop and livestock production, the Staff considered in detail the impacts on these uses. FES §4.1.1.1.

92. The Board concurs with the Staff's concern for the preemption of productive land for nonfarm uses. The Staff recognized that there continues to be an increase in the yields from agricultural lands and that the increase is due largely to technological breakthroughs which require additional increments of energy. The Staff, in order to place the impact of removing Tyrone Energy Park land from agricultural use in perspective, looked at actual cost in land and value. Their analysis assumes that 2,900 acres of the site will be preempted from cropland and pasture. Finding that the 2,900 acres of agricultural area are about 0.8 percent of the total Dunn County 1967 area of cropland and pasture, and about 0.02 percent of the Wisconsin 1967 area of cropland and pasture, the Staff concludes that, as a result of loss of land to the site, farm production and income will be reduced for the life of the plant by 0.8 percent in Dunn County and by 0.02 percent in Wisconsin. FES §4.1.1.1. However, under Applicants' land use plan, not all (only roughly one-quarter) of the cropland on the site will be removed from production during plant operation. Hoysler Testimony at p. 3. Even utilizing the larger number of acres lost for agricultural production, the Staff concludes that the land use effects of the construction and operation of Tyrone do not outweigh its benefits.⁴⁴ FES §10.2.3.1, Table 10.8, §10.4.1.

93. Northern Thunder cites a Staff witness' statements that TEP could

⁴⁴The Staff balanced the costs against the benefits of generation of electric power to satisfy demands in the Applicants' service areas. FES §§4.1.1.1, 10.4. The electric power produced could be used to increase agricultural production through the greater use of energy-intensive technology. *Id.* §4.1.1.1.

be built and operated using much less land than 4,600 acres in support of their contention that the amount of land is not justified. Tr. 3963. However, the Staff witness was addressing NRC's minimum site criteria (10 CFR Part 100) from a health and safety standpoint. As stated in paragraph 91, *supra*, additional land acquired for the site is examined for the environmental impact of the acquisition. Based upon Applicants' and the Staff's analysis, the Board finds that the land use impacts of the construction and operation of Tyrone are outweighed by the benefits from the plant.

94. Mr Cider, an intervenor in this proceeding, has claimed that the Village of Tyrone has historical significance which the Staff should consider. FES A-32. The Staff, in carrying out its duties under NEPA, reviewed the appropriate documents to determine if there were any historical or natural landmarks (as listed in the National Register of Historic Places or the National Registry of Natural Landmarks) within 2 miles of the proposed facility. FES §2.3. The Staff also reviewed letters from the state and county historical societies which indicated that there was no significant historical value in the area of the proposed facility and that its construction and operation would not impact on the marginally important sites located more than 2 miles from Tyrone Energy Park. FES Appendix C. There has been no evidence presented in this proceeding which would contradict the findings of the state and local historical preservation authorities that the Village of Tyrone does not have historical value. Tr. 3983, 3985. In fact, the substantial evidence in the record shows that the Village of Tyrone does not exist. Exs. 17, 50, 51.⁴⁶ The Board finds that the Staff has ascertained the views of the relevant governmental authorities and has fully discharged its obligation to investigate historical aspects of the site. Northern Thunder's claims to the contrary are hereby rejected.

95. Mr. Cider offered into evidence Exhibit 48 (excerpts from an 1888 Dunn County Plat Book) in support of his informal contention that there is now a Village of Tyrone which would be eliminated by including it into the TEP site. Exhibit 48 establishes only that as of 1888 lots known as "Tyrone" were platted. All indications from the informal and unscheduled presentations by Mr. Cider and the evidence cited above are that the platted lots were never incorporated. A site visit by the Board failed to reveal any area resembling a village.

Contention 8: The Applicants do not adequately consider the protection of new or spent fuel and radioactive waste against sabotage, diversion, or terrorism during shipment to and from the plant, and the consequences of any such sabotage, diversion, or terrorism (NT-9).

⁴⁶See also Partial Initial Decision, 5 NRC at 1238, n.64.

96. Shipments to nuclear power plants of new fuel elements are not attractive targets for sabotage, diversion, or terrorism, since the low enriched uranium cannot be used directly to fabricate a nuclear explosive. Furthermore, the radioactivity of this material is so low that dispersal by manual means or acts of sabotage or terrorism would not produce a significant radiological hazard. Kasun-Hodge Testimony⁴⁷ at p. 1; Weinstein-8 Testimony⁴⁸ at pp. 10-11. If large amounts of high explosives were used in an act of sabotage, some fraction of the fresh fuel might become converted to a respirable aerosol and released to the atmosphere. Calculations by the Staff show that in such an event involving 100% release of a fuel element an individual 50 meters downwind who is completely immersed in the radioactive cloud during its passing (2 minutes) would receive through inhalation and ingestion, a dose of about 30 rems.⁴⁹ Kasun-Hodge Testimony at pp. 1, 2.

97. Radioactive materials to be shipped from Tyrone Energy Park include solidified wet waste (spent resins, evaporator bottoms, spent filter cartridges, chemical wastes, spent charcoal and reverse osmosis concentrate), solid dry waste (contaminated paper, clothing and other soft materials), and spent fuel. Only the spent fuel contains a large quantity of radioactive material: Weinstein-8 Testimony at pp. 1, 2; Kasun-Hodge Testimony at pp. 2-5. The annual quantities of radioactive materials generated by the plant once it reaches equilibrium are estimated to be equivalent to 2,100, 55-gallon drums of solidified wet waste, 450, 55-gallon drums of solid dry waste, and 65 spent fuel assemblies (65 shipments by single-element truck or, roughly, 10 shipments by seven-element rail cask). Weinstein-8 Testimony at p. 5.

98. Low-level waste in the form of trash is shipped in drums by truck. Whether the drums were to be broken by an accident or by criminal act there would not be a significant release of radioactive material. The Staff has made calculations of the consequences of a release of radioactive material assuming that an entire truck of 50 drums were to be consumed by fire. These calculations show that there would be approximately zero early deaths and latent cancer fatalities.⁵⁰ Kasun-Hodge Testimony at pp. 2-3.

⁴⁷Testimony of Donald J. Kasun and C. Vernon Hodge, following Tr. 4176 (hereinafter "Kasun-Hodge Testimony").

⁴⁸Applicants' Testimony of Albert A. Weinstein in Response to Contention 8, following Tr. 2924 (hereinafter "Weinstein-8 Testimony").

⁴⁹This assumes complete fragmentation of one fresh fuel element and conversion of the material to respirable size, which, because of its dense, ceramic form, is highly unlikely. Kasun-Hodge Testimony at p. 2.

⁵⁰The Staff's calculations were based on a population of 100 persons per square mile and were averaged over many weather histories.

Because of the form of the materials and the relatively low levels of radioactivity, low-level wastes are considered to be unlikely targets for diversion, sabotage or terrorism. The Staff's calculations of the expected effects of release show that, even if low-level wastes are subjected to criminal acts, no major hazard would result. *Id.* at pp. 2-4.

99. The NRC at 10 CFR Part 71 and the U.S. Department of Transportation at 49 CFR Part 173 prescribe design standards which containers for the shipment of radioactive waste (including spent fuel) must meet. One of the Commission's requirements for the licensing of a cask to transport spent fuel is that the cask be so designed and constructed that it can withstand without leakage a test which simulates the sequential effects of a severe accident and includes resistance to high speed impact, puncture, fire, and immersion in water. 10 CFR §71.36; Appendix B to 10 CFR Part 71. Weinstein-8 Testimony at p. 4.

100. The Staff has analyzed the effects of a sabotage-induced breach in packaging containing consolidated resins and sludge and the subsequent dispersion of this material as an aerosol. Calculations show that the effects of a release from such a packaging would be approximately zero early deaths and latent cancer fatalities. The effects of a massive breach, combined with crushing and scattering of the cemented waste, would be limited to the vicinity of the vehicle and the consequence would be small. Kasun-Hodge Testimony at pp. 3-4.

101. Spent fuel contains low-enriched uranium, fission products, plutonium and other transuranics. Kasun-Hodge Testimony at p. 4. The spent fuel is shipped in durable, heavy casks which contain a series of shells and levels of shielding. *Id.* at pp. 4, 5. The Staff has determined that the outer jacket of the cask could be penetrated by a high-power rifle or machine gun fire. If such an event were to occur, the external radiation would still be within regulatory limits. *Id.* at p. 5. The Staff has also determined that certain projectiles could enter into the central cavity of the cask and has analyzed the consequences of this event. The Staff's calculations show that the effect of such a release from a 10-element rail cask would be no early deaths and 10 latent cancer fatalities.⁵¹ *Id.* at p.6.

102. The Staff also analyzed the possibility of success of deliberate acts directed at mechanical breaching of a cask, taking into account the following: (1) the results of drop tests on land; (2) the removal of the cask cover by

⁵¹All the calculations performed by the Staff on the effect of a release from a spent fuel cask do not give credit in the calculations to evacuation of downwind areas which would reduce the calculated consequences by a factor of 10. Also the Staff has not taken into account the effects of tall buildings on micrometeorology and effects due to vertical distribution of the population, both of which are important for urban situations and would presumably tend to decrease the calculated consequences. Kasun-Hodge Testimony at pp. 6, 9.

mechanical means, which is very difficult and dangerous due to the bulk and weight of the cask and the lethal radiation emanating from the open end; and (3) the possibility of saboteurs using power tools, burning bars or similar types of equipment. The Staff concluded that an attempt to break the cask by mechanical means probably would not be successful. Kasun-Hodge Testimony at pp. 6, 7. Weinstein-8 Testimony at pp. 4, 8.

103. The Staff reviewed tests which demonstrated that, even when explosives were used, a large rupture would not occur in the cask. Even if a large release of solid, nonvolatile, nonaerosol material were to occur, the hazard would be restricted to the vicinity of the transport vehicle. Kasun-Hodge Testimony at p. 9. If sufficient quantities of certain explosives are used, by persons with expert knowledge and using explosive properly designed and placed, a hole could be blown completely through the cask releasing the radioactive gases (principally krypton) and a portion of the solid and volatile inventory. A range of potential release fractions was considered up to a one percent release of the solid inventory in the form of a respirable aerosol. Kasun-Hodge Testimony at p. 8. The Staff calculated that, if the unlikely event were to occur, the release could have the effect of causing no more than one early death and 38 latent cancer fatalities.

104. Spent fuel contains plutonium which can be used to make a weapon for an illicit use. In order to extract the plutonium, a group must be willing to subject itself to great danger and it must possess unusual skills and resources which, to date, have been available only to nationally supported organizations. The Board agrees with the Staff that it is highly unlikely that a terrorist group could successfully divert a shipment of spent fuel from the Tyrone Energy Park and extract plutonium.

105. The Board finds that, contrary to Northern Thunder's Proposed Finding 34, adequate consideration has been given to the protection against, and consequences of, potential sabotage, diversion, and terrorism in connection with the shipment to and from the plant of new and spent fuel and radioactive waste.

Contention 9: The Applicants have failed to explain the extent to which the expected fuel supply for the generating facilities is dependent on the implementation of the breeder reactor program or the plutonium recycle program by the NRC. Since neither of the two programs has been fully evaluated or approved, and the future of each is increasingly uncertain, any dependency involved in current cost projections should be eliminated. Any licensing of construction or operation of facilities which are justified either in whole or in part by the nonexperimental recycle of plutonium before the completion of the required environmental assessment process and final decision

regarding the plutonium recycle and breeder program should not be allowed (NT-7).

106. Witnesses for both the Staff, Krug Testimony³² at 2, and the Applicants, Peterson Testimony³³ at 3, testified that the fuel supply for Tyrone is not dependent on either the breeder reactor or plutonium recycle. The Applicants' witness further testified that their fuel cost estimates used in the cost comparison of nuclear and coal-fired generation did not depend on implementation of either program. *Id.* at 2-3. Witnesses for both parties supported their positions by analyses of uranium resources and needs.

107. The Staff's principal testimony on resources was presented in section 10.3.4.3 of the FES and was updated in the oral testimony of its witness, the Chief of the Supply Evaluation Branch of ERDA's Division of Nuclear Fuel and Production. Tr. 3844-48. His conclusion, based on ERDA's ongoing assessment program,³⁴ was that the currently estimated ore reserves and probable potential resources consist of 1.9 million tons at a forward cost cutoff of \$30 per pound and 2.3 million tons at \$50. Total currently estimated domestic reserves and resources are 3.5 million and 4.3 million tons at \$30 and \$50, respectively. Tr. 3845-46. Applicants' witness presented an evaluation of the present and future supply of uranium from the perspective of a uranium explorationist. Applicants' Testimony of F. A. Groth Uranium Supply in Response to Contention 9, following Tr. 2625. He concluded that the ERDA assessment of reserves is relatively conservative and quite conservative in relation to reserve estimates which an explorationist or mining operator might make. *Id.* at 10. With respect to potential resources, he concludes that the ERDA appraisal should be considered to be the low or minimal resource potential ultimately available. *Id.* at 30.

108. Witnesses for both the Staff and Applicants examined the combined lifetime uranium requirements for the reactors currently operating, under construction, ordered or announced in order to evaluate the adequacy of fuel supply for the operational life of Tyrone. Using generally similar assumptions, both witnesses concluded that the requirements would be about 1.8 million tons of U₃O₈. Krug Testimony at 2; Peterson Testimony at 17. Both of these estimates were based on a tails assay of 0.3%. For a tails assay of 0.2%, the Applicants' estimate of U₃O₈ re-

³²Testimony of the NRC Staff on Contention 9, following Tr. 3843 (hereinafter "Krug Testimony").

³³Applicants' Testimony of David H. Peterson in Response to Contentions 9, 12.B, C, and 12.F, following Tr. 2624 (hereinafter "Peterson Testimony").

³⁴ERDA National Uranium Resource Evaluation (NURE) program. FES at 10-8.

quirements was about 10% less.³³ *Ibid.* During examination by the Board one of the Staff's witnesses stated that in view of the incorporation of centrifuge plants into the enrichment facilities 0.3% tails assay was unrealistically high and that the average tails enrichment over the lifetime of the Tyrone facility would be in the range of 0.1% to 0.25%, significantly reducing the U₃O₈ requirements. Tr. 3874-77.

109. The Board finds that the available uranium supply, consisting of about 1.9 million tons of reserves and probable potential resources and almost an equal amount of somewhat less assured potential resources at \$30 per pound plus additional reserves and resources at forward costs of \$30-50 per pound are ample to supply this reactor and all other existing and presently planned reactors throughout their lifetimes. We further conclude that a less conservative but sounder basis for estimating requirements would be to assume a lower tails assay (in the neighborhood of 0.2%) and probable future recycling of uranium. In this event, the requirements would be of the order of 1-1/4 million tons, or about equal to the reserves plus about 20% of the probable resources at \$50 per pound. In addition, we find that satisfaction of the uranium requirements for Tyrone is not dependent on the implementation of either the breeder reactor or plutonium recycle program.

110. Northern Thunder has proposed that we find that the ERDA resource projections rely upon figures given to it by industry (Proposed Finding No. 36), that the witness was not familiar with any ERDA procedures for verifying the accuracy of the information, and that the witness testified that it is possible that a company could give unreliable or inaccurate information to ERDA without the agency's knowledge. The witness did so testify, Tr. 2638-40, but he did go on to say that most of the data is provided by third party contractors whose results are not subject to much question in the area of reliability, and in response to a question by the Chairman, that there is no motivation for a company to underestimate or overestimate the supply. Tr. 2640-41. The Intervenor's proposed finding, while accurate as far as it goes, is incomplete and does not substantiate Proposed Finding Number 37 that uranium availability has not been demonstrated.

Contention 10: Applicants have erred in their projections of the need for power in the following respect[s]:

A. They have concluded that the difficulty involved in quantifying

³³There appears to be an error in the testimony. Assuming the requirements figure for 0.3% tails assay in Table 1 is correct (as it appears to be), the 0.2% figure, by the Board's calculation, should be about 1.48 million tons. The figure given appears to be correct for 0.25% tails assay. The error, if error it be, has no effect on our conclusions.

- price elasticity of electricity precluded its use in the forecast model (NT-4).
- B. The assumptions upon which the forecast model is based are questionable, particularly in that Applicants have largely ignored the effects upon energy usage of the events of the last several years (NT-4).
 - C. The Applicants rely heavily on a study by the Futures Group which attempts to quantify a number of unquantifiable variables and which assumes an erroneous real GNP growth rate of 3.4% per year in the 1975-1987 period (NT-4).
 - D. The Applicants' assumptions regarding substitution of electricity for other nonrenewable, scarce forms of energy is flawed (NT-4).
 - E. The Applicants incorrectly assume that increasing amounts of energy will be needed to meet the needs of a growing labor force (NT-4).
 - F. NSP, Wisconsin, has used national statistics of a straight line projection of a 10% increase in electrical energy and has failed to use up-to-date population statistics, changes in specific areas of electrical uses, and voluntary or involuntary conservation practices.
 - G. Even if the latest NSP, Wisconsin, projection of a need for 490 megawatts in 1984 were correct, construction of the unit would exceed needs by 630 megawatts.
 - H. The application should be denied because NSP, Wisconsin, does not know its 1984 or 1987 needs as indicated by the fact that it has changed its projections three times since September 18, 1973.

111. The Board must, in order to include the energy to be generated by Tyrone as a benefit in the cost-benefit analysis, evaluate the predictions of whether or not the plant is needed by the Applicants to serve the requirements of their customers. This analysis is set forth below. In the several parts of Contention 10 the intervenors allege various aspects in which the Applicants' projections are in error. We will deal with all of these in the course of our analysis.

112. Tyrone Energy Park has an estimated facility net output of 1,100 megawatts (MW). That capacity will be divided among the Applicants as follows: Northern States Power Company—744 MW; Cooperative Power Association—191 MW; Dairyland Power Cooperative—143 MW; Lake

Superior District Power Company—22 MW. Kolkmann Testimony³⁶ at 2, n. 1. Of the NSP share, 400 MW will be owned by NSP-Wisconsin and 344 MW by NSP-Minnesota. *See* Tr. 2275. Since NSP is evaluated as an integrated system, this split is of no importance to our conclusions. We note it, however, and also the fact that the Wisconsin portion of the system has consistently imported power from the Minnesota portion in order to point out that part G of Contention 10 is neither relevant nor supported by the facts. *See* Forest Testimony³⁷ at pp. 14-18 and Figures 1 and 2.

113. Because the bulk of the plant's capacity will be owned by Northern States Power Company, the record on the need for the plant is dominated by forecasts of the rate of growth of the demand for electricity in NSP's service area. The record contains forecasts for NSP from four sources, as further elucidated and modified in the oral testimony. First, we have the Company's forecast as set forth in §1.1 of the Environmental Report and in the Kolkmann Testimony. Next we have a forecast prepared for NSP by their consultant National Economic Research Associates (NERA) and contained in Exhibit 31.³⁸ Third, the Staff has prepared the forecast shown in §8.3 of the FES. Finally, Northern Thunder's witness has made certain predictions set out in the Bradley Testimony³⁹ and the examination following presentation of that testimony. His testimony, however, was more in the nature of comments on and criticism of the NSP projection and a discussion of projection techniques.

114. NSP has developed separate projections of energy requirements and peak loads using econometric models. The first step in constructing the models was to determine which of the several available factors were significant predictors of energy and peak load requirements. On the basis of these studies the predictors selected were population, economic product, employment. Lagged price was also included as a significant predictor for energy requirements but was found not to be significant for peak demand predictions. Using these variables, additive predicting equations were found with coefficients based on historic energy and weather-normalized peak load data. The energy and peak loads predicted by these equations were then adjusted to reflect air-conditioning saturation, conservation, fuel substitution, efficiency improvements, and load management programs. The results con-

³⁶Applicants' Testimony of Richard J. Kolkmann in Response to Contentions 10.A - 10.F, 10.H and 11.A (1, 2 4-6), following Tr. 2221 (hereinafter "Kolkmann Testimony").

³⁷Applicants' Testimony of James R. Forest in Response to Contentions 10.G, 11.A (7 and 8), 11.B (7), 12.D, 12.E, 13.B and 13.F, following Tr. 2603 (hereinafter "Forest Testimony").

³⁸This exhibit also includes similar forecasts for CPA and DPC. The fraction owned by LSDP was considered too small to warrant similar treatment.

³⁹Testimony of Dr. Wendell G. Bradley, following Tr.3682 (hereinafter "Bradley Testimony").

stitute the NSP forecast which is set out on a year-by-year basis through 1991. ER at 1.1-4—1.1-45a; Kolkmann Testimony at 8-13 and Table 1. The forecast for 1984 is a peak load demand of 7,610 megawatts and an energy requirement of 35,500 gigawatt-hours. *Id.* at Table 1. The corresponding figures for 1976 are 4,317 megawatts and 20,895 gigawatt-hours. Based on these two pairs of data, the projected average annual rate of growth for the 1976 to 1984 period is 6.85 percent for energy and 7.34 percent for peak demand. *Id.* at 3.

115. Several subparts of Contention 10 and some of the comments of Northern Thunder's witness deal with the methodology used by NSP. Contention 10.A asserts that Applicants have not used price elasticity of electricity in their model because of the difficulty of quantifying it. It is true that NSP does not include in its econometric forecast model a quantification of the price elasticity of demand of electricity. Through the use of a proxy for the real marginal price of electricity, which has been found to have a statistically significant relationship with the consumption of electrical energy, NSP has quantified in its forecast the short-run responsiveness of consumption to changes in price. Further, the adjustments to the forecasts made by NSP and other Applicants to account for conservation, efficiency improvements and fuel substitution reflect the responses of consumers to changes in electricity prices and to the relative prices of alternative fuels. Kolkmann Testimony at 15; Spore Testimony⁶⁰ at 2. There is no evidence in the record to suggest that the forecasts which do not include an explicitly quantified price elasticity of demand for electricity are necessarily in error. In fact, the NERA forecast, which we discuss below, incorporates a quantified price elasticity coefficient derived from NERA research on energy sales. Kolkmann Testimony at 16. In addition the Staff energy and demand projections, also discussed below are based on the results of the FEA Project Independence model which explicitly estimates and employs price elasticities. Spore Testimony at 2.

116. Northern States Power has excluded from the historic data base used for determining the coefficients of its forecasting equations the period beyond the third quarter of 1973. Northern Thunder asserts in Contention 10.B and in Proposed Findings 44 and 45 that this results in incorrect predictions. The data that have been excluded arise from the economic recession combined with inflation, the oil embargo, and appeals for voluntary conservation. Exclusion of the oil embargo is justified on the basis that it is not expected to recur. The recession is excluded because cycles of recession and prosperity are expected to occur periodically and, while they have

⁶⁰Supplemental Testimony of NRC Staff on Contention 10, following Tr. 2546 (hereinafter "Spore Testimony").

important short-term effects, tend to cancel out in the long-term and to not affect the overall trend. Voluntary conservation appears to be partially temporary. The continuing effects of conservation measures instituted as a result of the oil embargo had the primary effect of delaying load growth instead of changing the growth rate trend. Additional current or future conservation measures are taken into account in the various adjustments to the forecasts discussed above. Spore Testimony at 2-3; Kolkmann Testimony at 16-17. Northern Thunder criticized NSP's forecast in particular for omitting the peak demand data for 1974 and 1975. Bradley Testimony at 6. While it is true that they were omitted in determining coefficients of the forecasting data (for the reasons set out above), they are reflected in determining the values of the variables themselves because the projections start from a lower data base. Tr. 2250-51. Put another way, the data affect the constant term of the predicting equation rather than affecting the coefficients. The Board finds that NSP's handling of 1973-1975 data is appropriate.

117. Northern Thunder asserts in Contention 10.D, that NSP's assumptions regarding substitution of electricity for other forms of energy is flawed. It is now widely recognized that domestic supplies of natural gas and oil are declining and that, in view of the obvious need to limit supply vulnerability, imported fuels cannot be expected to supplement these supplies, particularly in the case of oil. Although the exact response by consumers to this situation will depend in part on the corresponding changes in the relative prices of these alternative fuels, it is reasonable to expect, as the Applicants do, that the shortfalls in supplies of natural gas and oil will be made up in part by the substitution of electricity. NSP's procedure was to estimate, from historical data, the future trend of oil and natural gas consumption in their service area. They then reduced these values to compensate for assumed improvements in efficiency of use. Supplies were then subtracted from requirements and it was assumed that most of the shortfall would be filled by electricity with the fraction decreasing to 50% by 1987. Supplies were estimated on the assumption that, with the exception of natural gas from Canada, gas supply would remain essentially constant through 1981 and then decrease at the rate of 1% per year.⁶¹ Fuel oil was assumed to remain constant until 1985 and then drop at the rate of 1-1/2% per year. Kolkmann Testimony at 18-20; Spore Testimony at 5-6. The Board finds it reasonable to expect, as do Applicants and the Staff, that the

⁶¹NSP has reduced (over previous forecasts) its projection of near-term substitution of electricity for natural gas, reflecting revised estimates of natural gas availability in the service area. Spore Testimony at 5; ER at 1.1-6. NSP's projection of natural gas supply in the area is, however, more optimistic than that of the Minnesota Energy Agency. Tr. 2309-11, 2452-53.

shortfalls in supplies of natural gas and oil will be made up in part by the substitution of electricity. There is no evidence to suggest that either the projected occurrences of such substitution, or the projections of the extent of the substitution as presented in the record, are in error.

118. Northern Thunder asserts, in Contention 10.E, that the Applicants incorrectly assume that increasing amounts of energy will be needed to meet the needs of a growing labor force. Intervenors provided no evidence to clarify the contention. Applicants do contend that in the long-term both employment and economic product will increase and that this will result in increased use of electricity. No information was presented, and the Board knows of none, tending to show that this is an incorrect assumption. If the allegation is taken literally, as the Staff points out, the NSP forecasting equation shows a negative relationship between growth of employment and growth of electricity usage. Spore Testimony at 6. Northern Thunder's witness asserted that this is contrary to all experience and common sense. Bradley Testimony at 5. At first glance, his statement appears appropriate, but upon reflection one realizes that it is the combination of the effects of employment and economic product that is important, not either factor alone. Actually, if all other factors, including economic product, are held constant, it is reasonable that a negative relationship could exist indicating substitution of human effort for electrical energy.

119. Contention 10.F, originally advanced by CFT, asserts that NSP has used national statistics of a straight line projection of a 10% increase in electrical energy and has failed to use up-to-date information. The first portion is clearly wrong. The projection is neither straightline or 10%. No evidence was presented to show that NSP used other than current data in their forecasting, other than the matters covered in our discussion above of Contention 10.B.

120. In Contention 10.C, Northern Thunder alleges that the data used by NSP in formulating their equations relied heavily on a study by the Futures Group which attempts to quantify unquantifiable variables and which assumes an erroneous rate of growth of real GNP. This allegation apparently arises from use by NSP in earlier forecasts of work done for them by the Futures Group. The only data from this organization being currently used are projections of employment. Kolkmann Testimony at 17. Real GNP growth has also been replaced by regional economic product as a predictor variable. *Id.* at 18. Thus, this contention requires no further consideration.

121. Finally, part H of Contention 10 asserts that the application should be denied because NSP, Wisconsin, does not know its 1984 and 1987 needs as indicated by three changes in its projections since September 1973. This contention is entirely without merit; first because, as we have pointed out earlier, need is not to be established solely on the basis of the Wisconsin

subsidiary, and second because changes in projections result from continuous review and updating and, in general, reflect increasing accuracy. Kolkman Testimony at 23-24; Spore Testimony at 9. On the contrary, a utility would be subject to censure if it made long-range predictions and never attempted to improve or update them.

122. We consider next the NERA energy and peak load projections. The energy projection is an econometric-based analysis which analyzes sales to each of three customer classes—residential, commercial and industrial. Forecasts are presented for each of the Applicants except LSDP. The analysis is a very detailed one and it is extensively described in Exhibit 31. No useful purpose would be served by discussing it in detail here. The prediction for NSP's 1984 energy requirement ranges from 31,596 to 36,255 gigawatt-hours. Exhibit 31 at Table I-4. This range brackets the NSP forecast of 35,500 gigawatt-hours. The situation with respect to peak load demand is somewhat different. Here NERA predicts a range of 6,589 to 7,357 MW. *Ibid.* This compares to the NSP forecast of 7,610 MW. NERA's peak load forecast, however, is developed on a much less rigorous basis than its energy forecast. It is basically a qualitative, rather than quantitative, assessment. See Exhibit 31, Chapter V. NSP's peak load forecast, on the other hand, is developed in exactly the same way as its energy forecast.

123. The Staff used the Federal Energy Administration's Project Independence forecast to serve as a basis for the Staff's independent estimate of the rate of growth in peak demand in the NSP service area. This forecast, which was prepared for the period 1974 through 1985, predicted growth rates under a conservation scenario, a reference case, and an electrification scenario. FES at 8-8. The Staff constructed a blend of the conservation and electrification scenarios to reflect the policies embodied in President Carter's proposed national energy plan. This calculation yields a national peak load growth rate of from 4.56 to 4.9 percent per year. The Staff then applied a correction factor of 1.25⁶² to approximate the conditions of the NSP service area. The resultant annual average peak load growth rate is a range of 5.7 to 6.1 percent. Tr. 2548-51, 2558-59. This range applied to the 1976 base of 4,317 indicates, by the Board's calculation, a 1984 peak load range of 6,726 to 6,933 MW. For energy growth rate, the range shown in the FES is 4.8 to 6.3%. These values are based on the correction factor of 0.99. The record is not clear on whether the new correction factor of 1.25 should also apply to energy growth, but there is no obvious reason why it should

⁶²The Staff uses a correction factor of 0.99 in the FES. The value of 1.25 represents a correction based on more accurately approximating economic conditions in NSP's actual service area. Tr. 2550-51.

not. If it is used, the range becomes 6.1 to 8.0. The 1984 forecast, then, would be 33,600 to 38,700 gigawatt-hours (with the original correction factor, it would be 30,400 to 34,100 gigawatt-hours).

124. Summarizing the forecasts, we have annual peak load growth rate forecasts for 1976 to 1984 of 7.34% by NSP, 5.5 to 6.8% by NERA, and 5.7 to 6.1% by the Staff. The corresponding 1984 peak loads (using the midpoint of the ranges) are 7,610 MW for NSP, 6,960 for NERA, and 6,830 for the Staff. The corresponding figures for annual growth rate and 1984 consumption of energy are 6.85% and 35,500 gigawatt-hours according to NSP, 5.7 to 7.1% and 33,900 gigawatt-hours according to NERA, and 6.1 to 8.0% and 36,000 gigawatt-hours according to the Staff. The agreement on energy forecasts is excellent. With respect to peak load, the agreement between NERA and the Staff is excellent, with NSP predicting a growth rate about 1.3% higher and a peak load about 700 MW higher.

125. In addition to the matters discussed previously, Northern Thunder's witness criticized NSP's forecast in a number of aspects. We will now discuss the three most significant of these. The remainder are of much lesser importance and could not substantially affect our conclusions and in many cases are clearly contrary to the facts. First Dr. Bradley asserts that a study⁶³ directed by Alvin Weinberg at the Oak Ridge Institute for Energy Analysis estimates a maximum rate of growth in the U.S. electrical component of energy of about 4.3% and that NSP has historically paralleled the national trend. Bradley Testimony at 6. This number does not actually appear in the Weinberg study, which Dr. Bradley had not read, but was calculated by the witness from information in a *Science* article about the Weinberg study. Tr. 3713, 3765, 3790, 3798. Dr. Bradley's calculations appear in an attachment to his prepared testimony entitled "New Study Supports Low Growth Scenario in Electrical Demand." His method of calculating was to accept the statement in the *Science* article that the electrical portion of the total energy supply would go from 28% in 1975 to 50% in 2000 (the correct number is 47%) and estimate from the article a total energy growth rate of 2%, giving an average electrical growth rate of 4.3%. Actually the total energy growth rate indicated by the *Science* article is 1.42%. He then assumed that his calculated growth rate for 1975-2000 would also apply to the period 1975-1985. Going directly to the Weinberg Study, Exhibit 39, Table 1, we can calculate its actual growth rates for 1985 data are given there as well as separate figures for electricity. This calculation yields a growth rate of 4.36% (fortuitously close to Dr. Bradley's value) for 1975-1985 and 3.48 for 1975-2000. This is for the "low" estimate

⁶³The study (hereinafter "Weinberg Study") was subsequently offered into evidence by the Applicants and received as Exhibit 39.

in the Weinberg Study. The high estimate yields a value of 5.43% for 1975-1985 and 4.74% for 1975-2000. If we apply to the Weinberg values the Staff's regional correction factor of 1.25 (to which Dr. Bradley did not object, Tr. 3750), we get a 1975-1985 growth rate range of 5.45 to 6.79. This range is not substantially different from those predicted by NSP, NERA and the Staff. No data in the Weinberg Study on peak demand have been cited to us nor has any been revealed by our cursory examination of the entire report.

126. During the examination of Dr. Bradley by Applicants' counsel considerable time was devoted to discussion between the two as to whether the numbers they were using for electric energy, for example 20.1 quads in 1975, represented fuel used to generate electricity or end-use energy, with Dr. Bradley asserting that they represented fuel input for generation of electricity and Applicants counsel taking the position that they referred to electrical demand. Tr. 3792-93, 3795, 3797-3799, 3827. Applicants pick up this same point in an extensive critical footnote to their proposed findings. They are dead wrong. The very material in the Weinberg Study to which they direct us clearly show that the figures represent input figures. For example, we find the statement on page 21 of Exhibit 39 ". . . our estimate for electricity demand . . . (47q of fuel for electricity . . .)." A simple calculation clinches the point. Our present consumption of electricity is well known to be about 2 trillion kilowatt-hours per year. Assuming a heat rate of 10,000 Btu/kilowatt-hour, the required fuel energy would be 2×10^{16} Btu or 20 quads. This is remarkably close to the figure of 20.1 quads in the Weinberg Study. Q.E.D.

127. Dr. Bradley's next criticism is that NSP is projecting a growth rate in economic product of 5% per year between 1976 and 1984. Bradley Testimony at 5. He further indicates that the Weinberg Study projects an economic growth rate of 2.5 to 3% per year which "is consistent with my estimate of minimum growth in the economic product." *Id.* at Exhibit VI, page 2. On examination he testified that he had, in a presentation to the Minnesota Energy Agency, made a low growth rate assumption of 3% per year and a high assumption of 5%. Asked the basis for these, he replied that the lower represented the average national historic growth rate since 1910 and the higher was selected because it was NSP's projection. Tr. 3770-72.

128. In actual fact, NSP's projected average growth rate for the period of 1976 to 1984, calculated from the economic product data in Table 1.1-11a of the ER is 4.6%, rather than 5%. *See also* Spore Testimony at 3. Further, the Weinberg report, in Table 10, shows a value of 3.6% as the average annual growth rate of GNP for 1975-1985 for both high- and low-growth case, rather than 2.5-3% as cited by the witness. The latter are the values for the period 2000-2010. Exhibit 39, Table 10; Tr. 3785-86. To this figure would have to be applied something representing the difference be-

tween average growth of GNP and regional growth of economic product. The record does not show a value for this correction factor, but if it is similar to the factor of 1.25 developed by the Staff for regional correction of peak demand, it would make the Weinberg Study figure squarely coincide with NSP's figure.

129. A final assertion of Dr. Bradley's that we address is that NSP presented an econometric analysis to the Minnesota Energy Agency during the period December 1976-January 1977 using a multiplicative regression analysis. Tr. 3698, 3751. This analysis, shown in Exhibit 38, results in a 1984 projected peak demand of 6,563 MW. Exhibit 38, Table 2; Tr. 3701. Subsequent examination by Applicants' counsel and by the Board established that was not an NSP prediction, but rather was a computation carried out by NSP solely to verify a calculation of Dr. Bradley's. Tr. 3752-55, 3820-22. This equation, which shows a 5.38% annual growth rate from the actual 1976 value to 1984, Tr. 3750-51, was rejected by the Minnesota Energy Agency because it substantially underestimated the 1976 peak. Tr. 3755. Under the circumstances, the Board can give no weight to this projection.

130. Reserve requirements established by the Mid-Continent Area Power Pool, to which all applicants belong, is 15%. ER at 1.1-53; FES at 8-4. Adding this increment to the predictions set forth earlier indicates predicted peak capacity obligations of 8,752 MW according to NSP, 8,004 MW according to NERA and 7,855 according to the Staff. The capacity available without Tyrone in 1984 will be 8,186 MW. Forest Testimony at 5. This results in a deficiency of 566 MW, using NSP's projection and a small excess using the other two projections. The excess, however, is less than one year's projected growth, so that even by the Staff's projection a deficit would exist in 1985. On this basis, we find that the projections of NSP's peak load demands requires additional capacity in 1984 or very soon thereafter.

131. We turn now to the other Applicants. Since, collectively, they will own only one-third of the plant and none of their projections were challenged, we can cover their needs very quickly. Cooperative Power Association, which will own 191 MW of the Tyrone output projects an annual peak demand in 1984 of 933 MW. ER at Table A1-2. CPA's projection of peak demand is confirmed by the independent forecast for the CPA service area performed by NERA, which used its own forecasting methodology. NERA forecasts CPA's 1984 peak load demand to range from a low of 716 MW to a high of 950 MW. Exhibit 31 at Table I-4. Given CPA's system generating capability and reserve generation requirement, a capacity deficit of roughly the size of CPA's share of TEP would occur in 1984 if the plant is not in operation. ER §§A1.1.2, A1.3; FES §8.4.1.

132. Dairyland Power Cooperative, which will own a 143 MW share of

the plant, projects an annual peak demand in 1984 of 952 MW. ER at Table B1-2. DPC's projection is confirmed by the NERA forecast, which projects DPC's 1984 peak load demand to range from a low of 849 MW to a high of 1,046 MW. Exhibit 31 at Table I-4. Given DPC's system generating capability and reserve generation requirement, a capacity deficit will occur in 1984 even if TEP is in operation. ER §§B1.1.1.2, B1.3.

133. Lake Superior District Power Company, which will own 22 MW, forecasts a 1984 annual peak demand of 165 MW. ER at Table C1-2. LSDP projects a capacity deficit after 1980, when its existing contract to purchase 50 MW of capacity from another utility will terminate. This deficit will continue to increase through 1984 and would be only partially met by the addition to its system of LSDP's 22 MW share of TEP. ER §§C1.1.1.3, C1, 1.2, C1.2.

134. One final point that we must consider, having found that the Applicants have need for additional capacity, is whether this needs to be base-load capacity. Although data for evaluating this for the other Applicants is not available in the evidence presented, the record with respect to NSP is complete. Its current load duration curve shows that the minimum load is about 31% of annual peak and that the load exceeds 35% of the peak over 97% of the time. For the predicted 1984 load duration curve, these figures are almost identical. ER Figures 1.1-2, 1.1-3; Forest Testimony at 8-9. On this basis, one might consider NSP's baseload capacity requirement in 1984 as at least 2,660 MW. Without Tyrone, NSP estimates that its 1984 baseload capacity, consisting of three nuclear units, a small amount of baseload hydro capacity, and the minimum output of two coal-fired units, will total 1,944 MW. They then reduce this by one-fourth on the basis of an anticipated availability factor of 75%, arriving at an equivalent baseload capacity having a 100% availability of approximately 1,458 MW.⁶⁴ *Id.* at 7-8. The above data indicate that NSP's need is for additional baseload capacity. The Staff reaches a similar conclusion, finding that a baseload deficit will exist at an energy sales growth rate as low as 4.5% per year (to be compared with the Staff's growth rate forecast of 6.1 to 8%).⁶⁵ FES at 8-20 —8-21. The Staff also found that the other Applicants would also need baseload capacity. *Id.* at 8-19.

⁶⁴In the Board's view, the propriety of reducing the availability by the total anticipated outage time, rather than the scheduled outage time, is questionable. It does not, however, alter our conclusions.

⁶⁵The Staff's baseload requirement is calculated on the basis of Table 1.1-20 in the ER which shows a 1984 baseload capacity of 2,408 MW instead of the 1,944 shown above. The principal difference is that the entire capacity (788 MW) of the two coal-fired units referred to above is included rather than the minimum output (350 MW).

135. The Board, on the basis of the extensive record presented, finds that the forecasts of peak load demand and energy consumption in the Applicants' service areas are reasonable and establish that Northern States Power and the other Applicants will need the generating capacity of Tyrone Energy Park on the schedule proposed. We further find that the allegation set forth in the several parts of Contention 10 do not alter this conclusion.

Contention 11.A: The Applicants have not adequately considered the following measures which could eliminate or reduce the need for additional generating capacity:

- (1) Conservation efforts (NT-1).
- (2) Retrofitting of existing buildings to reduce energy needs.
- (3) Onsite use of solar energy for heating, cooling, and large agricultural uses (NT-2).
- (4) Alterations of the rate structures, including inverted or equalized rate structures and peak load pricing (NT-1).
- (5) Increased use of interruptible load service (NT-1).
- (6) Use of peak shifting strategies (NT-1).
- (7) Use of peaking plants for baseload generation (NT-1).
- (8) Postponement of construction to allow further development or study of alternatives (NT-1).

136. Northern Thunder's Proposed Finding 47 criticizes NSP's discussion of conservation and retrofitting as "minimal" and "inadequate" on the premise that it is based on voluntary rather than mandatory efforts. Since mandatory measures are an unknown quantity at this time, we must rely upon the adequacy of NSP's analysis of conservation and retrofitting in the real-world situation.

137. Applicants presented witnesses who discussed NSP's conservation efforts, including retrofit of existing buildings, and included estimates of the impact of conservation on its forecast for electricity. Schutz Testimony;⁶⁶ Kolkmann Testimony. The forecast is predicated upon the attainment of the projected level of conservation. NSP accounts for price-responsive conservation of energy basically through its selection of an additive econometric forecasting equation which, by its very structure, produces a projection which offsets the historic trend of increasing energy intensiveness and thereby accounts for the impact of nonaltruistic conservation. NSP calculates that its forecast of 1984 peak demand will be 570 MW lower than it would have been if historic trends had continued. Kolkmann

⁶⁶Applicants' Testimony of Jack J. Schutz in Response to Contention 11.A (1, 2, 5, and 6), following Tr. 3883 (hereinafter "Schutz Testimony").

Testimony at pp. 24, 25, 27, 28. NSP adjusts its energy forecast to reflect the reemergence of the altruistic conservation experienced during the period following the oil embargo. NSP estimates that the maximum impact of that altruistic conservation was to reduce energy requirements by 2.9 percent during the spring of 1974, and that by 1975 the impact had been lost. NSP has assumed that a reduction in energy requirements due to altruistic conservation will begin to be experienced again in 1978, and that the 2.9 percent level will be recaptured by 1981 and maintained throughout the forecast period. *Id.* at pp. 25, 26. The forecast is further reduced to reflect the impact of improvements in the efficiency and utilization of consuming devices, including, but not limited to, higher efficiency motors, new lighting techniques and new building techniques. The assumed efficiency improvement begins at a level of 5 percent in 1977 and reaches 22 percent in 1984. These efficiency improvements were applied to both new growth and to a 20-year replacement program. NSP has projected that by 1984 efficiency improvements will have reduced peak load requirements by nearly 640 MW. *Id.* at pp. 26-28. This allowance for efficiency improvements includes the effects of retrofitting existing buildings with improved insulation.⁶⁷ *Id.* at p. 28.

138. The NERA forecast for NSP, DPC and CPA accounts for conservation as a price-related phenomenon through the inclusion in its econometric forecasting mode of explicit consideration of the price elasticity of demand for electricity. Ex. 31. The NRC Staff has considered conservation efforts, including improved insulation in existing buildings, through its use of the FEA Project Independence forecast, which includes a conservation scenario in its range of load growth projections. Spore-Clifford Testimony⁶⁸ at pp. 3, 4; FES §§8.3.3.1, 8.3.3.2, 8.3.3.5.

139. The Board finds that Applicants and the Staff have given adequate consideration to the effects of conservation efforts, including the retrofit of existing buildings, and that such effects have already been included in the forecasts in the record. As a result, these measures do not constitute an alternative which could eliminate or reduce the need for additional generating capacity.

140. Onsite use of solar energy as a means for reducing the need for additional generating capacity was discussed extensively by Applicants'

⁶⁷NSP-Minnesota has, among other programs to promote energy conservation by its customers, an insulation finance program for single-family homeowner customers, begun in 1974, which has resulted in the resinsulation of an estimated 105,000 home attics through the year 1976. Schutz Testimony at pp. 4, 5, 8, 9.

⁶⁸Testimony of NRC Staff on Contention 11.A by Robert L. Spore and Timothy J. Clifford, following Tr. 2546 (hereinafter "Spore-Clifford Testimony").

witness. Raffel Testimony.⁶⁹ It was concluded that solar energy would be more costly in terms of materials and labor than conventional alternatives, and would thus displace only a very small portion of requirements for additional electric generating capacity in Applicants' service areas by the time TEP is needed. Applicants' witness Guth also noted that even considering the tax incentives sought by the Administration in the President's Energy Plan, the goal for solar installations by 1985 was perhaps 3 percent of heating requirements, and that even this modest goal had been revised downward. Tr. 2488. The testimony in this proceeding also indicates that the potential for any significant reduction of energy requirements of the Applicants by substitution of solar energy for heating and cooling is limited by the fact that only about 10 percent of Applicants' total energy demand is weather sensitive.⁷⁰ The potential for substitution of solar installations for electrical requirements by 1985 is estimated by Applicants to be 1,733 million kilowatt-hours, or 26 percent of the total annual energy expected to be generated by TEP. Raffel Testimony at p. 148. If solar energy captured 3 percent of this market, or even 6 percent (twice the Administration's goal for solar installations), it would have a negligible effect on the need for TEP.

141. Applicants' witness analyzed solar insulation data which was collected in, or in the vicinity of, Applicants' service areas to determine the usable energy available from the sun. Raffel Testimony at pp. 123-137. He then calculated the solar collector area required to provide most of the winter season heating on a typical residence in Applicants' service areas.⁷¹ The resource of the sun is obviously large enough to supply energy for residence heating and cooling; the technology for solar heating exists and is presently commercially available.⁷² Raffel Testimony at p. 122. However, Applicants found that the present and likely future costs of solar installations were too high for solar heating and cooling to be attractive to a substantial number of commercial enterprises, home contractors or owners

⁶⁹Applicants' Testimony of David N. Raffel in Response to Contention 11.A(3), 11.B(1)-(6), and 11.C, following Tr. 3367 (hereinafter "Raffel Testimony").

⁷⁰Heating season and cooling season weather-sensitive portions of the total electric energy loads *each* account for about 5 percent of the total annual electric requirements of Applicants. Raffel Testimony at p. 147. For example, NSP estimates that the percentage of their energy requirements which is consumed in space heating related activities is 4.7 percent, with air-conditioning consuming an additional 2.4 percent. Spore-Clifford Testimony at p. 5.

⁷¹Mr. Raffel based his analysis on a 1,200 square foot residence with a typical annual heat load of 95 million Btu. Raffel Testimony at p. 135. He found that most of the winter season heating could be furnished with about 954 square feet of collector, if ample storage could be provided, and if a space could be found for the collector panels. *Id.* at p. 140.

⁷²The technology for solar cooling is not now commercially available. Raffel Testimony at p. 144. However, the technology for reliable solar cooling could be developed for commercial availability by 1984. *Id.* at p. 122.

to impact significantly on Applicants' anticipated electrical demand in 1985. Raffel Testimony at pp. 142, 150. The Staff also concluded that there were insufficient economic incentives for the use of solar heating to anticipate a rapid incorporation of solar technology. Spore-Clifford Testimony at p.5; FES §9.1.2.7.

142. Most large-scale agricultural energy needs that are able to be met with solar energy are probably currently being met by natural gas due to its obvious cost advantage. Spore-Clifford Testimony at p. 5. The Board agrees with the NRC Staff that any application of solar energy to agricultural energy needs will not have any major impact on electrical energy demand. *Id.*

143. Northern Thunder's witnesses (McCormick Testimony;⁷³ Levins Testimony)⁷⁴ were more optimistic concerning solar energy. However, they were unable to estimate the number of solar installations they had reason to believe would be constructed in Applicants' service areas by the mid-1980's. Tr. 3267; 3448. Similarly, they were unable to estimate the electrical demand in Applicants' service areas that could be replaced or displaced by solar installations by the mid-1980's. Tr. 3268; 3449, 3450. Both Mrs. McCormick and Mr. Levins relied on a study prepared for the Joint Economic Committee of Congress by the Resource Economics Group, Department of Economics, the University of New Mexico, Albuquerque, dated January 1977, and entitled "The Economics of Solar Home Heating." Ex. 34.⁷⁵ Mrs. McCormick and Mr. Levins cited the conclusions of Exhibit 34 in asserting that solar space heating will be economically feasible in Minnesota and Wisconsin by 1980.^{76 77}

⁷³Testimony on Contention 2, Section A Capitol (3) Onsite Use of Solar Energy for Heating, Cooling and Agricultural Uses, following Tr. 3266 (hereinafter "McCormick Testimony").

⁷⁴Professional Qualifications and Testimony of Richard Levins on Contentions 11 and 12, following Tr. 3393 (hereinafter "Levins Testimony").

⁷⁵The Board received Exhibit 34 into evidence as the Board's exhibit, recognizing that the study was not the product of the Committee and that the Chairman and Vice Chairman of the Joint Economic Committee disclaimed any representation that the study reflected the views of the Committee or the staff of the Committee. Further, it was recognized that the authors of the report were not available at the hearing for cross-examination. Thus, the weight afforded Exhibit 34 by the Board is affected by these observations. Tr. 3285.

⁷⁶Mrs. McCormick stated: "It [Exhibit 34] makes the strongest positive statement about the feasibility of solar applications. This statement could most accurately be summarized by saying that solar energy will be the cheapest form of energy for space heating in the northern states of Minnesota, Wisconsin, North Dakota and South Dakota by the year 1980." McCormick Testimony p. 3. Mr. Levins stated: "A recent government study, THE ECONOMICS OF SOLAR HOME HEATING [Exhibit 34], stated that the solar space heating will be economically feasible in both Minnesota and Wisconsin by 1980 (five years before Tyrone will be fired up), and it will be cheaper than either gas or oil." Levins Testimony at p. 11.

⁷⁷Neither Mrs. McCormick nor Mr. Levins provided any independent analysis or informa-

Continued on next page

144. Applicants' witness reviewed Exhibit 34. Raffel Rebuttal Testimony.⁷⁸ He asserted that the characterizations of Mrs. McCormick and Mr. Levins with respect to the conclusions of Exhibit 34 were inaccurate. *Id.* at p. 1. The 1980 date referred to by Mrs. McCormick and Mr. Levins is based on an "idealized situation" which would promote the use of solar heating.⁷⁹ Also, the solar heating installation costs used in Exhibit 34 (\$1,100 fixed cost and collector dependent costs of \$9.50 per square foot in 1976 decreasing to \$8.00 per square foot by 1990) were found to be unreasonably low. *Id.* at p. 4. In addition, the cost estimates in Exhibit 34 probably do not provide adequately for the cost of storage and controls. *Id.* at p. 5.

145. Applicants' witness also found what he believed were two major errors in the analysis presented in Exhibit 34. The first error was later claimed to be a typographical error. Ex. 41. The second error, when corrected, significantly affects the validity of the conclusions of Exhibit 34. *Id.* at pp. 9, 10. Estimates for the cost of solar heating were compared with the next-to-highest rate charged for electric resistance heating, and did not allow for lower rates charged for off-peak heating. *Id.* at pp. 7-9. Thus, an overly optimistic cost for solar energy⁸⁰ was compared with an unreasonably high cost for electricity. *Id.* at p. 10.

146. Northern Thunder, in Proposed Finding 48, indicates that onsite use of solar energy will be increasing substantially before Tyrone is operational. The record, however, fails to show that a substantial amount of Tyrone capacity could be replaced by this means. Notwithstanding Northern Thunder's statement in NT Proposed Finding 51, Applicant's witness Raffel discussed passive solar systems. Tr. 3586-3590; 3601. Passive

Continued from previous page

tion concerning the economic feasibility of solar space heating. Nor did they claim to be experts in the field of solar heating. They relied entirely on the conclusions, as they interpreted them, in other documents, and in particular on Exhibit 34. Tr. 3278-3282; 3421, 3422; 3447-3451.

⁷⁸Applicants' Rebuttal Testimony of David N. Raffel with Respect to The Economics of Solar Home Heating, following Tr. 3456 (hereinafter "Raffel Rebuttal Testimony").

⁷⁹The assumptions which would promote the use of solar heating include (a) complete deregulation of prices for natural gas and petroleum, allowing prices to rise; (b) a real interest rate of 2.5 percent (that is 2.5 percent higher than the rate of inflation); (c) life cycle costing over 20 and 30 years, without consideration of initial capital requirements or credit problems; (d) a fixed installation cost of \$1,100, regardless of the number of square feet of solar collector and amount of piping required; and (e) collector dependent costs of \$9.50 per square foot of single-pane collector, decreasing to \$8.00 per square foot by 1990. Raffel Rebuttal Testimony at pp. 1, 2. See Ex. 34 at pp. 6, 40, 41.

⁸⁰We note that the major finding of an interim report prepared by Arthur D. Little, Inc., concerning the New England Electric Residential Solar Water Heating Experiment, cited by Applicants, was that solar energy is a victim of *unreasonably high expectations*. Raffel Rebuttal Testimony at p. 11.

solar heating systems might substantially increase cooling needs in the summer. Tr. 3587. Taking into consideration a passive solar heating system would not affect a comparison of the relative economics of active solar heating with electric heating. Tr. 3589, 3590; 3601, 3602. While Northern Thunder's witness Levins did suggest the alternative of utilizing the capital investment necessary to construct Tyrone Energy Park for installing active solar devices, as suggested in NT Proposed Finding 53, he was unable to suggest how this alternative might be accomplished. Tr. 3450, 3451. Northern Thunder asks the Board, in paragraph 54 of its Proposed Findings, to "note" the publication following the evidentiary hearing of two reports dealing with building heating and other solar applications. They are identified only as "The Office of Technology Assessment report and a Federal Energy Agency [sic] report." The Board cannot, of course, consider as evidence any document which was not introduced into the evidentiary record.

147. The Board finds that there does not presently exist a sufficient economic incentive for widespread incorporation of solar technology for residential and commercial heating, considering the considerably long payback period. In any event, the potential for a significant solar impact is limited by the relatively small proportion of the Applicants' total demand which is weather sensitive. The Board finds that Applicants are reasonable in forecasting that solar installations will have a negligible impact on the need for TEP.

148. Contentions 11.A, 4, 5, and 6, address alternatives aimed at load management. Proposals to restructure rates fall into two categories; first, those which will impact the level of overall rates and the level of rates between various levels of consumption and second, those in which the rate varies during the day. The impact of the first category has been considered by NSP in its forecast through the use of the marginal price variable in the econometric equation. Kolkman Testimony at pp. 29, 30. Inverted rate structures, however, have not been examined in detail because they are not cost justified, it is not clear that they reduce overall demand, and they may discourage efficiencies of utilization in some businesses. *Id.* at pp. 30, 31. NSP's program of rate flattening does not hold much additional potential for further savings. Tr. 2455-2457.

149. Rates which vary during the day would tend to improve system load factor as consumers facing an increased price during peak consumption hours reduce consumption during these hours and, in response to offsetting reduced rates during off-peak hours, increase use during that period. Weiss Testimony¹¹ at p. 4. Thus, the imposition of time-of-day rates could be expected to suppress peak demand and to increase off-peak demand. *Id.* at p.

¹¹Applicants' Rebuttal Testimony of Moshe Weiss, The Impact of Rate Structure Reform on Electrical Energy Demand, following Tr. 2241 (hereinafter "Weiss Testimony").

5. Applicants presented a rough analysis by NERA of the outside or boundary effects of time-of-day pricing on the pattern of electric use by various customer classes and of the combined effect on system peak demand. *Id.* at pp. 5-15. The NERA analysis shows that time-of-day pricing would change the pattern of electric use in the following ways: peak consumption would be reduced, off-peak consumption would be increased, and overall consumption would be increased. *Id.* at p. 19. Thus, the effects of time-of-day rates would be to flatten the system load curve and increase overall electricity consumption, thereby increasing the year-round minimum of baseload, and the need for additional baseload capacity would not be affected. Weiss Testimony at p. 5.

150. Interruptible load service is typically provided under contracts which permit the interruption of electric service with little or no prior notice in return for reduced rates to the customer. FES §8.3.3.4. This interruptible service load may then be excluded from the forecasted peak load used for capacity planning. While NSP currently has only two interruptible customers, such rates are available and NSP projects 180 MW of interruptible load in 1985. Schutz Testimony at p. 6; Kolkmann Testimony at p. 32.

151. Peak shifting strategies are already in use as part of NSP's load management program. Most large commercial and industrial customers have rates that have both a commodity energy charge and a charge for peak demands. Since a reduction in peak demands will lower a customer's monthly charge, there is an incentive for load management through peak load reduction. Schutz Testimony at p. 7; Tr. 3902. Ex. 31 at V-7, 8. Such load management strategies have been considered by Applicants in their forecasts. Kolkmann Testimony at p. 33.

152. The Staff assessed inverted or equalized rate structure and peak load pricing and concluded that the impact of such pricing schemes is uncertain and may increase the need for baseload facilities. Spore-Clifford Testimony at pp. 5, 6. Even if utility rate structure reform were undertaken, it is difficult to predict whether there would be any impact on electrical demand until 1990 or later. Potential impacts of changes in rate structures are reflected in the FEA Project Independence Forecast. FES §8.3.3.3, Spore-Clifford Testimony at p. 6. The Staff does not consider increased use of interruptible load contracts to be a viable alternative to construction of TEP. FES §8.3.3.4. Contrary to Contention 11.A(6), peak shifting strategies would increase, rather than decrease, the need for baseload capacity.

153. The Board finds that Applicants and the Staff have given adequate consideration in their forecasts to the measures addressed in Contentions 11.A(4, 5, and 6), and that these alternatives would not eliminate or significantly reduce the need for additional generating capacity.

154. Applicants addressed the contention of utilization of peaking plants for baseload generation in terms of hydroelectric facilities.

Hydroelectric generation sites¹² in Minnesota and Wisconsin are relatively small and the number of potential sites is limited because the amount of water available and the elevation drop along the course of the area's rivers are small. While some of the currently operating hydro facilities are considered to be baseload, the bulk of capacity¹³ is used during daily peak periods to replace higher cost, usually oil-fired, generation. It is not feasible to operate the hydro facilities in a baseload mode or to convert them for such operation because of the unavailability of an adequate water supply.¹⁴ River flows are not high enough to operate these units at their maximum output on a continuous basis. A reduction in facility output (and total energy produced) would be required to obtain a constant level of output. Forest Testimony at pp. 11-13. Consequently, the use of hydroelectric peaking plants for baseload generation could not eliminate or reduce the need for additional generating capacity.

155. The Board has already found that the generating capacity represented by the proposed Tyrone Energy Park will be needed on the schedule proposed by Applicants and that this need will not be eliminated or reduced in any significant way by the alternative measures listed in Contentions 11.A(1-7). The postponement of construction would not eliminate or reduce the need for the capacity. In our findings below on alternative methods of electric power generation, the Board finds that none of the alternatives are available for large-scale implementation in the needed time frame. The Board finds that, contrary to the contentions and Northern Thunder's Proposed Finding 55, the postponement of construction, to allow for further development and study of alternatives is not a reasonable alternative to the proposed issuance of a construction permit for Tyrone Energy Park.

Contention 11.B: The Applicants have not adequately considered the following alternative method[s] of electric power generation:

- (1) Wind generation (NT-2).
- (2) Bio-gas from human and animal wastes and other organic material (NT-2).
- (3) Burning of garbage (NT-2).
- (4) Burning of wood (NT-2).
- (5) Solar power generation from photovoltaic cells (NT-2).

¹²Northern Thunder Contention 1, in its original form, addressed the use of hydroelectric peaking plants for baseload generation.

¹³NSP currently operates hydroelectric facilities with a total capacity of 203.6 MW. Forest Testimony at p. 11.

¹⁴The Staff's independent evaluation also concluded that it is not feasible to use hydroelectric peaking plants for baseload operation. Spore-Clifford Testimony at p.7.

- (6) Use of magnetohydrodynamics to increase power generation efficiency (NT-2).
- (7) Use of coal-burning facility which would be less expensive and less dangerous.

156. If an energy source is to be a reasonable option to a utility for central station generation of electricity to meet the needs of its customers, the technology utilizing that energy source must be demonstrated to be both technically and economically feasible on a scale applicable for utility utilization. Clifford Testimony⁴⁵ at p. 2. Four criteria must be satisfied: (1) the energy resource must be large enough so that an adequate quantity of the fuel or energy source is expected to be available throughout the economic life of the intended use; (2) the technology must be sufficiently advanced that reliable, working equipment could be available at the time the intended work begins; (3) the cost of the alternative must be competitive with other available energy sources; and (4) there must be assurances of commercial availability of the technology with normal manufacturer's warranties of reliability and performance in the required time frame. Raffel Testimony at pp. 6, 7.

157. It is technically practical to generate electricity with small windmills. Raffel Testimony at p. 9; Clifford Testimony at p. 2. However, wind power is intermittent and, in Applicants' service areas, during winter and summer months when energy needs are the highest, the wind velocities are too low to produce any useful power 20 to 40 percent of the time. Raffel Testimony at p. 52. Therefore, wind is unsuitable as a source of baseload power⁴⁶ unless coupled with low-cost energy storage facilities which have not yet been developed.⁴⁷ FES §9.1.2.8.

158. Because of engineering design problems with large wind machine blades, wind generators have been utilized only at capacities less than 100 kWe.⁴⁸ Raffel Testimony at p. 15. However, the Energy Research and Development Administration will test single unit programs of 1.5 MWe in 1978 and 1979, followed by testing of multi-unit wind generator systems of 10 MWe in August 1980, and a 100 MWe system in May 1981. Clifford Testimony at p. 3. On ERDA's most optimistic schedule, the 100 MWe

⁴⁵Testimony of NRC Staff on Contentions 11.B(1)-(6) and 11.C, by Timothy J. Clifford, following Tr. 2762 (hereinafter "Clifford Testimony").

⁴⁶The record also indicates that use of onsite residential wind machines would not significantly decrease the need for TEP. Tr. 2783.

⁴⁷See Raffel Testimony at pp. 39-42 for costs of energy storage and retrieval.

⁴⁸One experimental wind machine, the Smith-Putnam wind generator, was constructed in the early 1940's on Grandpa's Knob near Rutland, Vermont. It had a rated capacity of 1.25 MWe and operated intermittently until 1945 when one blade failed and the project was abandoned.

system would not complete testing until 1983. Tr. 2775, 2776. Applicants could not reasonably plan to meet their system needs in 1985 with a technology that will not complete testing before 1983. Tr. 2772.

159. Wind-generated energy will be more expensive in 1985 than energy from TEP even when the energy from a wind generator is used, as available, as a fuel replacement. Raffel Testimony at p. 43. With storage and generation from storage to firm up the capacity from a wind machine, the wind-generated energy compares even less favorably with energy from TEP. *Id.* at pp. 42, 43. Applicants demonstrated that wind energy will continue to be more expensive than energy from TEP based on a 35-year economic comparison. *Ibid.*

160. The Board finds that wind power is still an unproven technology for supplying large amounts of baseload capacity. Clifford Testimony at p. 3. Wind generators capable of generating more than 10kWe from the wind are not now commercially available. Raffel Testimony at p. 53. The cost of wind-generated energy is higher, and will continue to be higher, than nuclear power-generated energy. *Id.* at p. 43. Contrary to the findings by Northern Thunder, the Board finds that the probably impact of both small- and large-scale wind units on the need for TEP is negligible.

161. Methane gas can be produced by anaerobic digestion of organic wastes by microorganisms. Clifford Testimony at p. 4; Raffel Testimony at p. 56; Abeles Testimony.⁸⁹ Several small-scale experimental projects to produce methane gas from animal wastes are being conducted in the United States. Clifford Testimony at p. 4. However, Northern Thunder's witness Dr. Abeles, admitted that 100-head dairy farm digester systems, which use the methane gas produced to generate electricity, are not capable of supplying all of the electrical needs of the dairy farm itself. Tr. 3331. His most optimistic estimate of the number of digesters which could be placed into operation by 1985 in the Applicants' service areas was 500 to 600 dairy farm systems, each rated at from 15 to 20 kWe. Tr. 3349, 3350. Thus, the potential for the use of methane gas from digesters to generate electricity by 1985 may be as high as 10 MWe generating capacity, or less than one percent of TEP. Tr. 3350, 3351.

162. The technology for central station digester/generator plants has not been developed.⁹⁰ The major disincentive to the development and use of methane digesters on a large or small scale for energy production has been an economic one. Clifford Testimony at p. 4; FES §11.9.3; Raffel

⁸⁹Professional Qualifications and Testimony of Dr. Tom P. Abeles on Contention 11.B, following Tr. 3288 (hereinafter "Abeles Testimony").

⁹⁰ERDA plans to continue research and development into methane digesters which utilize feedlot wastes and, later, plants which utilize agricultural wastes and energy crops. Demonstration facilities are not scheduled for construction before 1981. Clifford Testimony at p. 5.

Testimony at pp. 54, 64. Applicants estimated the cost of electricity generated from a central station using methane gas produced in a digester to be 3.5 times the cost of energy from TEP. Raffel Testimony at pp. 61, 65. The cost for on-farm, smaller digester/generator systems would be even greater.⁹¹ *Id.* at p. 60. The Board finds that the technology of methane digesters is not sufficiently developed nor is the cost competitive enough to be considered as an alternative to TEP. Northern Thunder's findings to the contrary are rejected.

163. The technology exists to utilize garbage as an energy resource. Raffel Testimony at p. 67. The potential magnitude of this resource in Applicants' service areas in 1990 is from 10 to 34 percent of the output of TEP,⁹² depending on the amount of paper recycled and assuming that steam produced from garbage combustion is used to generate electricity. Raffel Testimony at p. 73. This represents the potential energy value of all of the wastes that are expected to be generated in the 7-county Twin Cities metropolitan area in 1990. *Id.* at p. 71. Collection costs and transportation costs would prohibit the utilization of wastes in less densely populated areas of Applicants' service areas. *Ibid.*; Tr. 3547.

164. While the technology exists for generating electricity from combustion of garbage, significant problems persist. Problems may arise from bacteria and viruses at the site and from its emissions, the presence of unacceptable levels of trace metals and hazardous chemicals in emissions, the presence of higher-than-expected particulate emissions, and contaminants in the aqueous effluents from the ash pond. FES §9.1.2.5.

165. The costs of burning garbage for generation of electricity in Applicants' service areas are uncertain, due to the lack of information on the cost of such processed wastes to be used for fuel. Raffel Testimony at p. 78. The Tennessee Valley Authority has carried out a feasibility study on the conversion of municipal refuse into a fuel for electrical generating facilities and concluded that such a process is not yet economically feasible. FES §9.1.2.5.

166. While it is likely that a substantial portion of the Twin Cities' wastes may be combusted for use as fuel by 1985 or by 1990, the most valuable end use would be as fuel for large central steam production plants. Raffel Testimony at pp. 75-77. Northern Thunder is correct in their contention in Proposed Finding 68 that burning garbage to produce electricity may

⁹¹Dr. Abeles estimated the cost of a 100-head dairy farm digester/electric generator system to be \$50,000. However, in determining the cost of energy to a farm utilizing such a system, Dr. Abeles failed to include the cost of supplemental purchase power, interest costs on the capital investment and maintenance costs. Tr. 3351, 3352.

⁹²NRC Staff found the maximum potential energy output of burning municipal refuse to be 30 percent of TEP in 1985. FES §9.1.2.5.

be technically feasible but the Board rejects the likelihood of its becoming a substantial alternative by 1985.

167. The technology has not been developed for the use of wood for fuel in a baseload electric generating station.⁹³ FES §11.9.5. The managed forest area required for each kWe of installed capacity for wood-fueled baseload plant is estimated to be 0.5 acres, or 575,000 acres for an 1,150 MWe plant. Clifford Testimony at p. 6. The environmental impacts of harvesting daily 400 acres of dense deciduous saplings, or 80 acres of mature trees, would most likely rule out wood burning as an alternative to TEP. *Ibid.*

168. Applicants analyzed the economics of generating electricity from a managed agricultural crop by determining the cost of electricity produced by burning sugar cane. Raffel Testimony at pp. 82-89. Sugar cane is the crop with the maximum energy producing potential and is, therefore, the extreme limit of what may be economically feasible for a managed agricultural crop, including forests. *Id.* at p. 83. Yet, energy generated from TEP is shown to be more economical than electricity generated by combusting sugar cane. *Id.* at p. 88. Because of the unfavorable costs and the environmental impacts of dedicating so much land area for cultivating wood crops for energy production, the Board finds that burning wood is not a viable alternative to TEP. There is no support in the record for Northern Thunder's assertion, Proposed Finding 71, that use of wood for space heating will have an impact on electricity use so as to replace part of the demand expected to be met by TEP. Contrary to Northern Thunder's statement in Proposed Finding 70, the use of wood in fireplaces and other wood-burning devices for space heating was addressed by Applicants and the NRC Staff. Tr. 2784; 3558. It was found that wood burning would not appreciably decrease the need for TEP.

169. The use of photovoltaic cells has found many applications in the U.S. space program. Clifford Testimony at p. 6. However, the technology has not found widespread commercial adaptation because of the cost of production of the cells.⁹⁴ Even if ERDA cost goals for photovoltaic cells are met, photovoltaic electricity will probably cost at least 40 times as much as electricity from TEP. Raffel Testimony at p. 109. The Board finds that photovoltaic cells have been adequately considered as an alternative to TEP, contrary to Northern Thunder's contention, but that the technology

⁹³The record also indicates that the use of fireplaces or other wood-burning devices for residential space heating would not appreciably decrease the need for TEP. Tr. 2784; 3558.

⁹⁴The total market in 1975 for photoelectric generation of electricity was 100 peak kWe (20 to 25 average kWe). Raffel Testimony at p. 91. This is less than the power output of one automobile engine. See Raffel Testimony at pp. 90-116 for a discussion of photovoltaic feasibility and the cost. Note that Raffel Testimony was corrected at Tr. 3645-3652, and at an affidavit following Tr. 3832. Citations to Raffel Testimony are to the testimony as corrected.

has not developed to a point where it is commercially available for central station baseload electric plants and where it will be economically competitive with TEP.

170. A magnetohydrodynamic (MHD) generator produces a large direct current by forcing ionized gases at high temperatures and velocities through a duct passing through a strong magnetic field. Clifford Testimony at p. 7. The technical problems remaining before MHD can be considered a reliable source of generating electricity are formidable.⁹⁵ The MHD technology is not yet at a stage where total costs can be compared with total benefits. Raffel Testimony at p. 119. The Board finds that, while a fuel resource is available for producing electricity in MHD plants, there is not yet a technology developed for assuring that reliable, working equipment could be available by 1985 and, therefore, rejects Northern Thunder's Proposed Finding 75. Costs cannot yet be estimated, so it is not known if they will be competitive with other alternatives. It is not likely that MHD equipment will be available commercially in time to substitute for any part of TEP.

171. Applicants and the Staff have each presented an economic comparison of Tyrone Energy Park and an equivalent alternative coal-fired generating plant installed in 1984 at a site along the Mississippi River in Wisconsin. Forest Testimony at pp. 19-31; FES at 9-2 to 9-5. While several aspects of the estimates of nuclear generation costs are challenged in Contention 12 and its subparts, *infra*, the Board will address here, in the context of Contention 11.B(7), the costs of coal-fired generation and our conclusions on the costs of generating electricity from the nuclear plant.⁹⁶ In addi-

⁹⁵The high temperature, high velocity gas streams utilized in a MHD generator are highly corrosive. To date, researchers have been unable to develop materials that can withstand this corrosive environment for significant lengths of time. Additionally, large-scale MHD applications will require advances in developing a superconducting electromagnet if the full potential of this technology is to be realized. Clifford Testimony at pp. 7, 8. Serious environmental problems would have to be overcome due to the emission of oxides and nitrogen from the generating plant. Raffel Testimony at p. 119.

⁹⁶Northern Thunder witness Richard Levins challenged the cost estimates for the nuclear plant on two grounds which were not addressed by Contentions 12.A through 12.F: (1) that in light of a decision by the U.S. District Court in the Western District of North Carolina holding the Price-Anderson Act to be unconstitutional, Applicants' cost estimates should include the insurance cost of fully protecting all property surrounding the plant which may be adversely affected by an accident; and (2) the costs of meeting the Commission's new physical security requirements should be included in the estimate. Levins Testimony at pp. 8-10. The court decision referenced, *Carolina Environmental Study Group v. United States*, 431 F. Supp. 203 (W.D.N.C. 1977), which currently applies only in that judicial district, holds that the limitation on liability imposed by the Price-Anderson Act is unconstitutional. 431 F. Supp. at 222-226. Applicants' witness testified that this decision would not affect the insurance cost estimates. Tr. 2731-2733. Applicants' witness also testified that costs of meeting the Commission's new security requirements (stipulated by the parties to be \$1 to \$2 million per year, Tr. 3407) have been included in Applicants' cost estimates. Tr. 2597.

tion, Applicants and the Staff have each presented analyses comparing the health effects of generating electricity by coal and nuclear fuels. Goldman Testimony;" FES at 9-5 to 9-15.

172. Applicants examined the cost of owning and operating Tyrone Energy Park and a comparable coal-fired generating plant over a 35-year period."⁹ Forest Testimony, Table 2 (at pp. 26-31). Total annual revenue requirements are compared for capacity factors of 50, 55, 60, 65, 70 and 75 percent."⁹ Applicants' "base case" comparison shows that, at a capacity factor of 70 percent, TEP will generate electricity at a cost of approximately 7 mills per kilowatt-hour less than the coal-fired alternative. The nuclear plant maintains an economic advantage over coal for capacity factors as low as 50 percent. Forest Testimony at pp. 24, 26. The nuclear plant estimate includes a U_3O_8 price of approximately \$28 per pound (in 1976 dollars), and assumes the reprocessing of spent fuel and the utilization of recovered uranium. Peterson Testimony at pp. 11, 15. The higher cost estimate for TEP includes the "worst case" fuel cycle costs of \$40 per pound U_3O_8 (in 1976 dollars) and a "throwaway" fuel cycle. *Ibid.*; Forest Testimony at p. 24. Applicants' "base case" cost estimate for the coal-fired plant includes a coal cost of \$8.75 per ton (in 1976 dollars) at the mine. A high cost estimate includes a coal cost of \$10 per ton (in 1976 dollars) at the mine, reflecting the cost of new storage and train loadout facilities at the mine. Peterson Testimony at pp. 12-14. A comparison of Applicants' estimated generation costs under the high fuel cost cases shows TEP to be less expensive than the coal-fired plant at each capacity factor shown. Even when comparing the nuclear plant using high fuel cost assumptions with the base case coal estimate, the nuclear plant maintains its economic advantage over the coal-fired plant at all capacity factors from 50 to 75 percent. Forest Testimony at pp. 24, 26.

173. The Staff has analyzed the annual generation costs, levelized over 30 years, of Tyrone Energy Park and the alternative coal-fired plant using high and low cost estimates over a range of capacity factors (50, 60 and 70 percent). The low cost estimate for coal is based on the assumption that no

⁹Applicants' Testimony of Morton I. Goldman in Response to Contention 11.B(7), following Tr. 3193 (hereinafter "Goldman Testimony").

⁹Applicants' estimates of the installation costs, fixed operating and variable maintenance costs, and the basis for their projected escalation rates, are explained in Applicants' Testimony of Kenneth E. Gelle and William D. Musolf in Response to Contentions 12.A, 13.C and 13.D, following Tr. 2587. Estimates of coal costs, uranium and other nuclear fuel cycle costs, are explained elsewhere. Peterson Testimony at pp. 6-10.

⁹Based upon our findings on Contention 12.D, we hold that this range of capacity factors is both reasonable and conservative for this evaluation, and that it is appropriate to compare the nuclear and coal-fired plants at equivalent capacity factors.

SO₂ removal equipment will be required, while the high cost estimate includes the costs associated with SO₂ removal.¹⁰⁰ For the nuclear plant, the low cost estimate contains a plutonium credit in the fuel cost, while the high cost estimate assumes that there will be no plutonium recycle program. FES at 9-2. The Staff's analysis shows the nuclear plant to be less expensive than the coal-fired plant under both high and low cost estimates for each of the capacity factors chosen. In addition, the nuclear plant under the high cost estimate is more economical than the coal-fired plant under the low cost case at capacity factors of 60 percent and 70 percent. FES at Table 9.1.

174. Applicants presented an analysis of the comparative health effects of generating electricity at Tyrone Energy Park (and its supporting fuel cycle) and at an alternative coal-fired plant burning Montana coal at a Mississippi River site in Wisconsin (including the fuel supply, transport and waste disposal facilities). Goldman Testimony at pp. 1-3. Applicants found that the single most important contribution to public fatalities from the nuclear plant operation derives from the assumption that the electricity needed for the nuclear fuel enrichment process is provided by a coal-fired plant. If that electricity were to be provided by a nuclear plant, public deaths would drop from 0.36 to less than 0.1 per year. *Id.* at p. 3. Applicants' analysis for the coal plant shows that the major cause of public mortality is the predicted effect of gaseous effluents, even though the best currently available technology is applied to their treatment prior to discharge through a tall chimney. *Id.* at p. 4. Applicants conclude that the use of nuclear power is estimated to be one and one-half times safer than coal for workers, and between one and two orders of magnitude safer than coal for members of the public. *Ibid.*

175. The Staff presented a generic analysis of the health effects associated with the coal and nuclear fuel cycle alternative. In making his evaluation, Staff witness Dr. R. L. Gotchy considered the entire fuel cycle associated with each alternative. For coal, the cycle consists of mining, processing, fuel transportation, power generation, and waste disposal. The nuclear fuel cycle includes mining, milling, uranium enrichment, fuel preparation, fuel transportation, power generation, irradiated fuel transportation and reprocessing, and waste disposal. FES at 9-6; Testimony of R. Gotchy following Tr. 3222. For each 0.8 gigawatt year (GWyr) (a

¹⁰⁰The Staff's estimate of coal costs was based on information supplied by the Applicant to the Federal Power Commission. Because these data are based on contracts presently enforced and include coal deliveries with lower transportation costs due to shorter hauling distances, the Staff believed that the data would result in an underestimation of the actual cost of coal. FES §9.1.2.1. The Staff attempted to confirm whether its assumption was correct. Using up-to-date information, the Staff concluded that its estimate of coal in the FES was probably lower than what the actual cost would be. *Ibid.*

1,000-megawatt nuclear power plant operating at 80 percent capacity factor for a year), the Staff estimates 1.1 to 5.4 associated deaths and 17-24 injuries and diseases. FES at 9-7, 9-10. The bulk of this total (0.62 to 4.9 deaths) is attributable to coal-fueled power used in the nuclear fuel cycle principally for uranium enrichment. *Id.* at 9-13, 17. The Staff estimates a range of 15 to 120 mortalities per 0.8 GWyr for the coal fuel cycle, with an additional 57-210 per 0.8 GWyr disease and injury estimate (morbidity). *Id.* at 9-7, 9-10. The Staff's analysis concludes that the nuclear fuel cycle is considerably less harmful to man than the coal fuel cycle and, assuming all of the electricity consumed by the nuclear fuel cycle is produced by coal-fired plants, the coal fuel cycle would be more harmful to man than nuclear fuel cycle by factors of 3 to 22. *Id.* at 9-17.

176. Given the uncertainties in these estimates as a result of inadequate data bases for certain areas of each fuel cycle,¹⁰¹ the estimates by Applicants and the Staff of the comparative health effects from generating electricity from nuclear and coal-fired power plants are in general agreement. Tr. 3218-3220. It should be noted that, under both Applicants' and the Staff's assessments, the increased risk of health effects from either fuel cycle represents a minute increase in the normal expectation of mortality from other causes. FES at 9-17; Goldman Testimony at p. 4.

177. The Board finds that, contrary to Contention 11.B(7), Applicants and the Staff have adequately considered the alternative of a coal-fired plant and that the coal alternative is neither less expensive nor less dangerous than the proposed nuclear plant. Based upon its assessment of the extensive record developed on these alternatives, the Board finds that, from the standpoint of both economic and environmental costs, the proposed Tyrone Energy Park is the preferred alternative under a wide variety of assumptions.

Contention 11.C: Applicants have not adequately considered eliminating the need for the plant by combinations of the above alternatives (NT-1, 2, 3).

178. The Board has found that the generating capacity represented by Tyrone Energy Park will be needed on the schedule proposed by Applicants and that this need will not be eliminated or reduced in any significant way by the alternative measures listed in Contention 11.A. The Board has evaluated each of the alternative methods of electric power generation listed in Contention 11.B and found that only the coal alternative (which was rejected as inferior to the proposed plant on a cost-benefit basis) was a viable

¹⁰¹FES at 9-6; Goldman Testimony at p. 4. See also Addendum to this Initial Decision.

replacement. In addition, Applicants have explicitly considered whether a combination of onsite use of solar energy and alternative electric power generation from wind, bio-gas, burning of garbage, burning of wood, generation from solar photovoltaic cells and use of MHD might eliminate the need for the proposed plant. Raffel Testimony at pp. 151, 152. The results show that the combination of these energy sources could account for less than 5 percent of TEP's capacity by 1985. *Id.* at p. 152. The Board finds, therefore, that the alternatives listed in Contentions 11.A and 11.B(1-6) have been adequately considered and that no combinations of those alternatives would eliminate the need for Tyrone Energy Park. Northern Thunder's Proposed Finding 76 is contrary to the above findings and is, therefore, rejected by the Board.

Contention 12: The Applicants have failed to provide adequate information on the capital and operating costs of the facility in the following respect[s]:

- A. They have failed to provide information on the extent to which the projected interest rate is dependent on issuance of pollution control bonds and the effect of disapproval of such bond issues (NT-5).

179. At the time of the preparation of the original estimates of the comparative generation costs of nuclear and coal-fired generating plants, presented at ER Table 9.2-4, Applicants assumed that about 20 percent of the plant costs would be eligible for pollution control financing. The estimates presented in Applicants' testimony at the hearing, however, reflect no pollution control financing for Tyrone Energy Park, but continue to reflect an assumption that about 25 percent of the alternative coal-fired plant costs would be financed through pollution control bonds. As a result, interest rates and interest costs during the construction and subsequent operation of Tyrone Energy Park, included in Applicants' cost estimates for the nuclear plant, do not reflect the sale of any pollution control bonds related to Tyrone Energy Park. Gelle-Musolf Testimony¹⁰² at 1. The Staff also ignored, when calculating the interest rate for the capital cost estimates, any reduction in interest rate due to availability of pollution control bonds. Nash *et al.* Testimony¹⁰³ at 2.

¹⁰²Applicants' Testimony of Kenneth E. Gelle and William D. Musolf in Response to Contentions 12.A, 13.C and 13.D, following Tr. 2587 (hereinafter "Gelle-Musolf Testimony").

¹⁰³NRC Staff Testimony in Response to Contentions 12.A, 12.B, 12.C, 12.D, 13.F, 12.F, and 13.D, following Tr. 3090 (hereinafter "Nash *et al.* Testimony").

B. Projections concerning recent and future increases in uranium prices (NT-5).

180. In estimating fuel cycle costs for Tyrone Energy Park, Applicants have examined the recent upward movement in uranium prices. Peterson Testimony at 6-9. Increased exploration and production activity in the uranium industry, combined with a concurrent decrease in demand brought about by nuclear power plant delays and cancellations, lead Applicants to foresee reduced market pressure and a stabilization of uranium prices at levels which more nearly reflect the actual costs of production than have the prices of recent years. *Id.* at 10. This forecasted stabilization of prices has already been confirmed to some extent by the spot market prices during 1976 and 1977, which have been relatively stable compared to the sharp spiral of 1973 to 1975. *Ibid.* (as corrected at Tr. 2623).

181. Applicants' estimate of the cost of U_3O_8 for TEP is approximately \$28 per pound (in 1976 dollars), which is based upon \$15 forward cost reserves and resources, and upon Applicants' expectation that currently expanding uranium exploration will uncover additional \$15 reserves and resources. In order to consider the impact of a failure to discover additional low-cost reserves, Applicants have also presented, for the purpose of comparison with a coal-fired plant, TEP generation costs using a U_3O_8 price of \$40 per pound (in 1976 dollars). *Id.* at 11. The Board has found in considering Contention 11.B that the nuclear plant retains its economic advantage over coal under this higher fuel cost assumption.

182. The Staff has also found that events in the past three to four years have caused some uranium sales to occur at prices considerably higher than recovery costs—creating a false impression of costs. The Staff has developed its long-term uranium price forecasts for TEP on the basis of long-term cost of recovery, rather than relying on short-term price fluctuations. Nash *et al.* Testimony at 3; Tr. 3094-95. Assessing the supply of uranium and the rate of growth of demand (as represented by the installed capacity of nuclear power plants), the Staff derived for TEP a weighted average cost of \$28 per pound (in 1975 dollars) for U_3O_8 over the period 1975 to 2000. Nash *et al.* Testimony at 4; Tr. 3100-01.

183. Northern Thunder points out, in Proposed Finding 79, that after stating the average price for uranium delivered in 1977 would be \$15 per pound the Staff also testified that the price ranged from \$6 to \$43 per pound, Tr. 3103-04, that some of these contracts were quite old contracts, Tr. 3104, 3106, and that 11% of the deliveries were at prices above \$25 per pound. Tr. 3104-05 as corrected at Tr. 3121. From this, Northern Thunder would have us find (Proposed Finding 80) that the record does not contain sufficient information to determine the likely actual cost for uranium for

Tyrone and that accurate economic costs for Tyrone cannot, therefore, be determined. Based on the record before us, we cannot make such a finding. Although the future fuel costs cannot be ascertained with certainty, the record is ample to allow us to find that the forecasts of such prices used in the cost estimates for the facility and in the cost comparisons with coal-fired plants are reasonable, and we do so find.

- C. The costs of handling, storage, and disposal of wastes (NT-5).
- F. Failure to consider plans for dealing with the likely lack of reprocessing facilities in early 1980's resulting in increased cost of storing spent fuel and deferred realization of the recovery of uranium and plutonium values (NT-24).

184. Contrary to the assertion in Contention 12.F, Applicants (and the Staff) have estimated the costs of generating electricity from Tyrone Energy Park under the assumption that spent fuel will not be reprocessed. Applicants investigated two scenarios for the closing of the nuclear fuel cycle. The first scenario includes the reprocessing of spent fuel and the utilization of the recovered uranium. Plutonium was assumed to have no value and was not recycled in this scenario. The second scenario was the "throw-away" fuel cycle, where the spent fuel would be stored at the TEP site for some period of time and then shipped to a Federal repository for ultimate disposal. Both scenarios were considered in Applicants' economic comparison of nuclear and alternative coal-fired generation. Peterson Testimony at 15, 16. The Staff's alternative scenarios reflecting high and low cost estimates for TEP are (1) no-recycle of plutonium and uranium, and (2) prompt recycle of uranium and plutonium. Nash *et al.* Testimony at 5, 11, 12; FES at 9-3, Table 9.2. The analyses by both Applicants and the Staff show that Tyrone Energy Park retains an economic advantage over the alternative coal-fired plant in the case of no-recycle of uranium and plutonium. Forest Testimony at 24, Table 2; Nash *et al.* Testimony at 11, 12; FES at Table 9.2.

185. Applicants' estimate for either scenario, is about \$100 per kilogram. Peterson Testimony at 16. The Staff's estimate for waste disposal in the no-recycle case is also \$100 per kilogram¹⁰⁴ and in the recycle case is \$50 per kilogram for disposal and \$20 per kilogram for temporary storage and transportation. Nash *et al.* Testimony at 5-8. A consultant for the Applicant estimated transportation and storage costs of \$55 per kilogram for the throwaway cycle and \$22 per kilogram handling, storage, transportation

¹⁰⁴The Staff in addition estimated costs for interim onsite storage and transportation to be \$40 per kilogram. Nash *et al.* Testimony at 8.

and disposal of reprocessing waste. Applicants' Testimony of E. R. Johnson in Response to Contentions 12.C and 12.F, following Tr. 2626 at 10-13. The Board also notes that recent press reports indicate that the Department of Energy estimates that transportation and disposal costs for spent fuel under the President's recently proposed program would be about three million dollars per year per reactor. With a normal reactor refueling schedule of about 30,000 kilograms per year, this would be about \$100 per kilogram, consistent with the above estimates.

186. Northern Thunder's witness on this contention testified that the present lack of long-term safe waste disposal facilities is currently putting NSP in a difficult situation where they must either shut down their existing nuclear plants in the near future or spend millions of dollars to expand on-site storage facilities, either of which will result in unexpected financial burdens on the company and its customers.¹⁹ Under these circumstances, he considered it ill-advised that NSP should build another nuclear plant before the waste storage question is resolved. Levins Testimony at 7. He bases this conclusion on three possible scenarios: first, that adequate, permanent storage will not be available by the time the plant becomes operational; second, that storage charges, which he alleges NSP has neglected, may be quite high; or, third, that the "waste disposal controversy" will lead to an abandonment of the nuclear power program. *Id.* at 7-8. The first scenario appears unlikely, since NSP will not need additional storage at Tyrone until 1995-1996 and ERDA's planned date for the availability of a Federal repository is 1985. Tr. 2627-29. The matters involved in the second scenario we have discussed above. The third scenario is too speculative to warrant consideration.

187. The Board finds that, contrary to Contentions 12.C and 12.F, Applicants (and the Staff) have provided adequate information on, and have reasonably estimated, the costs of the handling, storage, and disposal of wastes, and the costs of a nuclear fuel cycle without reprocessing.

D. The use of unrealistic capacity factors in projecting costs (NT-5).

188. This contention arose primarily in the context of the cost comparison of nuclear and coal-fired plants and the appropriate capacity factors to be used for each. The Applicants' testimony was primarily directed towards availability factors rather than capacity factors on the basis that

¹⁹We note that since this testimony was given, NSP has been authorized to increase its storage capacity at Prairie Island. *Northern States Power Company* (Prairie Island Nuclear Generating Plant, Units 1 and 2), 6 NRC 265 (1977).

they set upper limits for capacity factors and that, for economic reasons, nuclear were likely to have their capacity factors closer to the availability factors than were coal-fired plants. Forest Testimony at 32-35. The Applicants' review of historical performance of nuclear plants leads them to conclude that Tyrone should perform at a capacity factor of 70 percent or better. *Id.* at 36-39. They also conclude, based on their own coal-fired plant experience and their observation of overall historical coal plant operation, that the availability of a new large coal-fired plant will be about the same. *Id.* at 39-40.

189. The Staff also performed an evaluation of historical capacity factors of coal and nuclear plants larger than 500 MW. On the basis of this statistical analysis, the Staff concluded that the economics of baseload fossil and nuclear units should be compared using the same capacity factors. Nash *et al.* Testimony at 9; FES at 9-5.

190. The Staff believes that the appropriate capacity factor range to use for making the comparisons is 50% to 70%. Nash *et al.* Testimony at 9. The Applicants have proposed using 70%. The Board finds that the record shows that it is reasonable to use the same capacity factor for both coal and nuclear plants and that having reached this result the issues in the case do not require us to further define the anticipated capacity factor for Tyrone. We note, however, that a majority of this Board has previously reviewed the other plants included in the SNUPPS program. In one of these reviews, the author of the report cited in the Staff Testimony, page 9, footnote 1, testified on the report and was examined in detail. The Board in that case concluded that the witness's results (the same results as those cited by the Staff here) were on the low side. Based on that conclusion and on a detailed examination by the Applicant's consultant of the historical reasons for unavailability and the corrective measures taken, that Board concluded that an appropriate range for the anticipated capacity factor was 65 to 75%.¹⁰⁶ We can see no reason why the capacity factor of this facility should be lower than that of the other SNUPPS facilities.

191. Northern Thunder's witness presented an average capacity factor for ten reactors of 1,000 MW or larger for 1976. Levins Testimony at 4-5. For a number of reasons brought out in the examination of the witness, the Board does not consider this to be an appropriate sample for establishing expectations for Tyrone. Because of his failure to read the FES, his lack of professional background in the area in which he was testifying and his total failure to consider capacity factors of coal-fired plant, Tr. 3418, 3432, 3433, the Board cannot give any weight to his testimony on this contention.

¹⁰⁶See *Rochester Gas and Electric Corporation* (Sterling Nuclear Unit No. 1), 6 NRC 398-402 (1977).

E. Failure to include costs of decommissioning (NT-12).

192. Applicants presented an exhaustive study of the estimated costs of the three principal methods available for the eventual decommissioning of Tyrone Energy Park.¹⁰⁷ These costs range from \$6 million to \$100 million (1984 dollars), depending upon the decommissioning scheme selected. Applicants' Testimony of Albert A. Weinstein in Response to Contentions 6.C and 12.E, following Tr. 2924, at 1-61. Applicants included decommissioning in their cost estimates for TEP by including a negative 10 percent salvage for TEP in the determination of annual depreciation. Forest Testimony at 41.

193. The Staff presented estimates of decommissioning costs ranging from \$1 million plus an annual maintenance expense of \$100,000, to a cost of \$70 million (1975 dollars). The Staff used the highest decommissioning cost estimate for inclusion in its cost estimate for Tyrone Energy Park. It also presented information on a cost estimate found in another study which confirmed that the Staff estimate appeared to be conservative. FES at 10-4; NRC Staff Testimony in Response to Contention 12.E, following Tr. 3054. The Staff concluded, and the Board agrees, that the Applicants will more than likely choose the mothballing method for decommissioning because it has the lowest economic cost and least environmental impact among the alternatives. *Ibid.*

194. The Board finds that the record contains adequate information on the cost of decommissioning Tyrone Energy Park, and that such costs have been included in the cost estimates for the plant.

Contention 13.B: The cost-benefit balance incorrectly assumes that the facility will provide inexpensive electricity at acceptable environmental costs (NT-6).

195. The language of Contention 13.B literally disputes whether the environmental costs of the facility will be balanced or outweighed by its benefits. This is, of course, the ultimate issue to be determined under NEPA upon the entire record. In its proposed findings, however, Northern Thunder limits the contention to the issue of whether TEP would generate electricity at a lower economic or environmental cost than coal, and whether the relative economic and environmental prospects of "...solar, methane, conservation, and various pricing mechanisms ..." have been suf-

¹⁰⁷As we noted, in our findings on the environmental effects of decommissioning, it is not feasible to develop, at the time of proposed construction of a nuclear power plant, a specific plan for decommissioning that plant.

ficiently examined so as to allow an adequate comparison with TEP (NT Proposed Finding 91).

196. In the Board's findings, ¶¶136-178, *supra*, under Contentions 11.A and B the Board has considered each of these alternatives, several others, and all of them in combination. We have found that TEP will generate electricity at a lower cost than any alternative source or sources, and that other forms of energy, pricing and conservation will not eliminate the need for TEP. *Ibid*.

Contention 13.C: The cost-benefit balance does not include a quantification of the costs of the emergency plans (NT-23).

197. The testimony presented by the Applicants and the Staff in response to this contention by Northern Thunder indicates that the contention is literally true — that there is little quantification of emergency plan costs. Nevertheless the cost-benefit balance remains undisturbed. The incremental costs of TEP associated with emergency plans are slight.

198. Applicants' witnesses Gelle and Musolf (following Tr. 2587, pp. 6 and 7, and at Tr. 2592) stated that equipment, supplies, and personnel allocated to emergency response plans by NSP are part of fixed costs which must be expended for the normal operation of the plant in any event. Costs related solely to emergency plans are very minor. Emergency plan costs expended by Applicant have for this reason already been included in the cost-benefit balance. *Ibid*.

199. Similarly, with respect to local government emergency response plans, radiological emergency plans are expected to be parts of existing general emergency plans. The additional costs to prepare local medical facilities, and police and firefighting units would be small, about \$5,000 per affected county initially, with a similar small amount annually for maintaining preparedness. Collins Testimony following Tr. 3014, pp. 3-6.

200. Emergency response planning by the Federal government is mainly general in nature, expenditures for which would continue without TEP. Therefore no incremental Federal costs for radiological emergency planning can be identified for this facility. NRC staff expenditures for radiological emergency response reviewing are largely covered by Applicants' license fees which have already been included in the cost-benefit balance. Jackson Testimony, Tr. 3150-51.

201. Northern Thunder presented neither evidence nor proposed findings on Contention 13.C.

IV. CONCLUSIONS OF LAW

202. Based upon a review of the entire record in this proceeding and the foregoing findings of fact, the Board has concluded as follows:

a. The requirements of Section 102(2)(A), (C) and (E)¹⁰⁰ of the National Environmental Policy Act, 10 CFR Part 51, and Section 401 of the Federal Water Pollution Control Act have been complied with in this proceeding.

b. Having considered and decided those matters in controversy among the parties within the scope of NEPA and 10 CFR Part 51; having independently considered the final balance among conflicting factors contained in the record of the proceeding with a view to determining the appropriate action to be taken; having weighed the environmental and other costs; and having considered available alternatives; in accordance with 10 CFR Part 51, a construction permit for Tyrone Energy Park, Unit 1, should be issued as proposed, subject to the following conditions for the protection of the environment:

- (1) Applicants shall take the necessary mitigating actions, including those summarized in Section 4.5 of the Final Environmental Statement, during construction of the plant, associated transmission lines, and the railroad spur, to avoid unnecessary adverse environmental impacts from construction activities.
- (2) In addition to the preoperational monitoring program described in Section 6.1 of the Environmental Report, with amendments, the Staff recommendations in Section 6.1 of the Final Environmental Statement shall be followed, except for the recommended monitoring of eagles and waterfowl at the Mississippi River (Section 6.2.2.1).
- (3) Applicants shall monitor waterfowl and/or eagles (depending on final crossing selection) in the area of the transmission line crossing of the Mississippi River.

Applicants should develop and submit to the Staff for approval a detailed plan for monitoring. The plan should reflect consultation with appropriate agencies. Monitoring should commence two years prior to erection of structures (foundations may be constructed before monitoring is completed) or as soon as possible after final route determination, but in no case less than one year unless a shorter time would appear to be appropriate after NRC consultation with appropriate state agencies. Monitoring should continue for two years after completion of line construction or

¹⁰⁰Subsequent to the issuance of the Commission's Notice of Hearing and the adoption of the most recent amendment to 10 CFR §51.52, Congress enacted certain amendments to NEPA which, among other things, redesignated subsection 102(2)(D) as 102(2)(E). Pub.L. No. 94-83, 89 Stat. 424 (1975). Accordingly, we addressed our conclusion of law to the redesignated subsection 102(2)(E). See 42 U.S.C. §4332(2)(E).

for some other length of time as determined from data gathered during the first postconstruction year(s) of the program.

The scope, observation points, timing and data collected shall be guided by the outline of the Preliminary Scope of an Eagle/Waterfowl Monitoring Program submitted to A. Dienhart (Applicants) by G. Knighton (NRC Staff) by letter dated September 6, 1977.

If any changes in transmission line routing or design plans addressed in "Applicants' Supplemental Testimony of Richard L. Prestin and Robert Grosshans with Respect to Nuclear Regulatory Commission Staff's Proposed Condition c to the Construction Permit" (following Tr. 4005) are made, Applicants should report these changes to the Staff and obtain Staff approval prior to initiation of construction involving these changes.

- (4) Applicants shall establish a control program that shall include written procedures and instructions to control all construction activities as prescribed in the Final Environmental Statement and shall provide for periodic management audits to determine the adequacy of implementation of environmental conditions. Applicants shall maintain sufficient records to furnish evidence of compliance with all the environmental conditions in the Final Environmental Statement.
- (5) Before engaging in a construction activity not evaluated by the Commission, Applicants will prepare and record an environmental evaluation of such activity. When the evaluation indicates that such activity may result in a significant adverse environmental impact that was not evaluated, or that is significantly greater than that evaluated in the Final Environmental Statement, Applicants shall provide a written evaluation of such activities and obtain prior approval of the Director of Nuclear Reactor Regulation for the activities.
- (6) If unexpected harmful effects or evidence of serious damage is detected during facility construction, Applicants shall provide to the Staff an acceptable analysis of the problem and a plan of action to eliminate or significantly reduce the harmful effects or damage.
- (7) Applicants shall submit to the Staff copies of REA loan commitment notices to Cooperative Power Association and Dairyland Power Cooperative no later than 60 days following the issuance of a construction permit for Tyrone Energy Park. See 5 NRC 1243, 1244.

- (8) Applicants shall submit a copy of an executed joint ownership agreement to the NRC Staff no later than 60 days following the issuance of a construction permit for Tyrone Energy Park.

V. ORDER

203. WHEREFORE, IT IS ORDERED, in accordance with the Atomic Energy Act of 1954, as amended, the rules and regulations of the Commission, that the Director of Nuclear Reactor Regulation is authorized to issue to Applicants a permit to construct Tyrone Energy Park, Unit 1, consistent with the terms of this Initial Decision including the conditions set forth above.

204. IT IS FURTHER ORDERED, in accordance with 10 CFR §§2.760, 2.762, and 2.764, that this Initial Decision shall be effective immediately and shall constitute the final action of the Commission forty-five (45) days after the date of issuance hereof, subject to any review pursuant to the above cited rules. Exceptions to this Initial Decision must be filed within seven (7) days after service of the decision. A brief in support of the exceptions must be filed within fifteen (15) days thereafter (twenty (20) days in the case of the NRC Staff). Within fifteen (15) days of the filing and service of the brief by the appellant (twenty (20) days in the case of the NRC Staff), any other party may file a brief in support of, or in opposition to, the exceptions.

IT IS SO ORDERED.

THE ATOMIC SAFETY AND LICENSING BOARD

Dr. George C. Anderson, Member
Lester Kornblith, Jr., Member
Ivan W. Smith, Chairman

Dated at Bethesda, Maryland,
this 23rd day of December 1977.

ADDENDUM

On December 21, 1977, during the final drafting of this initial decision, the Board received the following letter dated December 20, 1977, from the Staff of the Nuclear Regulatory Commission:

By letter dated November 9, 1977, the NRC Staff advised the Board and parties of concerns raised by Dr. Walter Jordan, a member of the

Atomic Safety and Licensing Board Panel, regarding the contribution and significance of radon as one of the radiological components of the environmental impacts of the uranium fuel cycle reflected in 10 CFR §51.20(e), Table S-3, as revised. We indicated that the Staff would provide the Board with its analysis of Dr. Jordan's memorandum. The purpose of this letter is to inform the Board and parties of the status of the Staff's analysis.

The concerns raised by Dr. Jordan's memorandum would be significant in this proceeding if they were to put into substantial question any major factual premise or conclusion of the Staff's evidentiary presentations. The appropriate remedy might vary depending on whether the concern is with a value contained in Table S-3 itself or with the Staff's application of the S-3 values.

It is expected that the Staff's assessment will be completed in several weeks and that we will be able to submit our evaluation to the Board and parties in the latter part of January 1978.

Apparently in anticipation of this, counsel for Applicants wrote to the Board on December 16, 1977, referring to the Commission's statement in adopting the interim rule amending Table S-3 that "'... any operating license, construction permit, or limited work authorization (LWA) that may hereafter be issued must take into account the revised values contained in this rule.' 42 Fed. Reg. 13806 (March 14, 1977)."

The Board of course has been aware of the concerns expressed by our colleague Dr. Jordan and the fact that the Staff has been charged by the Commission with the responsibility for evaluating the matter. We have not, however, been aware of the fact that the Staff's analysis may be available in January 1978. The Board has decided to proceed with this Initial Decision without awaiting the results of the Staff's analysis because:

1. We are bound by the interim rule amending Table S-3.
2. The Commission is now aware, and because of a rulemaking proceeding, has been aware of the subject matter of Dr. Jordan's memorandum and, we presume, the logic evidenced in his reasoning. The Commission however has not ordered a moratorium on construction permits.
3. A delay pending the Staff's S-3 analysis would postpone this initial decision no less than 30 days, probably longer. Considering our findings that the power to be generated by Tyrone is needed in the Applicants' service area, we cannot justify such a delay.
4. Jurisdiction over this proceeding will continue to be with this Board

or with the Appeal Board at the time the Staff's analysis is reported. Either Board can, and we are confident that it will, take any action required to protect the public health and safety if the Staff's analysis indicates the need.

**THE ATOMIC SAFETY AND
LICENSING BOARD**

**Dr. George C. Anderson, Member
Lester Kornblith, Jr., Member
Ivan W. Smith, Chairman**

**Dated at Bethesda, Maryland,
this 23rd day of December 1977.**

**[Attachment A has been omitted from this publication but is available in the
NRC Public Document Room, 1717 H Street, N.W., Washington, D.C.]**

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Samuel W. Jensch, Chairman

Frank F. Hooper

Gustave A. Linenberger

In the Matter of

**Docket Nos. STN 50-522
STN 50-523**

**PUGET SOUND POWER AND
LIGHT COMPANY, et al.**

**(Skagit Nuclear Power Project,
Units 1 and 2)**

December 23, 1977

Pursuant to the reversal and remand by the Appeal Board in ALAB-446, 6 NRC 870, the Licensing Board vacates so much of its September 15, 1977, order, LBP-77-56, 6 NRC 478, as denied pre-LWA authority for certain roadway construction.

ORDER FOLLOWING REMAND

The Nuclear Regulatory Commission Atomic Safety and Licensing Appeal Board, by its decision ALAB-446, provided that the Atomic Safety and Licensing Board should enter a "further order consistent herewith."

The Atomic Safety and Licensing Board herewith Orders that the Appeal Board decision ALAB-446 is now in effect. The Licensing Board attaches a copy of the Appeal Board Order for the guidance of the parties.

In the Order denying the Applicants' (Puget Sound Power and Light Company, *et al.*) request for authority to remove trees and widen a roadway, the Licensing Board requested guidance or elucidation of the Appeal Board's standard for pre-LWA authority which is that the authority is to be granted if the damage to the environment is:

. . . so trivial an impact that it can be safely said that no conceivable harm would have been done to any of the interests sought to be protected by NEPA should the eventual outcome of this proceeding be a denial of the . . . application.

The Licensing Board request embraced the problem of equating “. . . so trivial an impact” with “. . .no conceivable harm.” ALAB-446 refers in its discussion only to “trivial impact” and states that it does not mean zero impact.¹ The Licensing Board sought a definition of “no conceivable harm,” which in dictionary definition means no possible harm. ALAB-446 states that “no additional refinement of the standard would appear to be possible.” The net result appears to be that the Appeal Board has now eliminated “no conceivable harm” from its standard,² which, if so, will make for more logical determinations of the measurement of environmental harm. ALAB-446, however, does not indicate at what level tree or forestry damage is trivial, except to imply that in this *ad hoc* determination, Applicants may proceed as they have requested. It is understood that no more trees may be removed than as counted for destruction as reflected in the evidence offered to support the Applicants’ request.

Consistent with ALAB-446, the Order of the Licensing Board is vacated in reference to requested roadway construction and the Applicants are ordered to proceed accordingly.

ATOMIC SAFETY AND LICENSING BOARD

Frank F. Hooper

Gustave A. Linenberger

Samuel W. Jensch, Chairman

Issued:
December 23, 1977
Bethesda, Maryland

[ALAB-446 can be found on p. 870 of this publication.]

¹In the brief in support of exceptions filed by the Regulatory Staff, its position was that the Licensing Board had adopted the view of zero impact, and that the destruction of only one tree would be prohibited by the Licensing Board. The Staff argument is a misrepresentation of the Order of the Licensing Board.

²The Licensing Board had applied both parts of the standard previously announced by the Appeal Board.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Edward Luton, Chairman

Ernest E. Hill

Dr. Oscar H. Paris

In the Matter of

Docket Nos. 50-354
50-355

**PUBLIC SERVICE AND GAS
COMPANY
ATLANTIC CITY ELECTRIC
COMPANY**

**(Hope Creek Generating Station,
(Unit Nos. 1 and 2)**

December 23, 1977

On the basis of information provided by the applicants, as verified and supplemented by the staff, the Licensing Board concludes that applicants have shown good cause why construction should not be suspended after December 24, 1977, pending issuance of the Board's decision on the necessity for protection at the plant against fire from a gas cloud that could be released in a tanker accident. The Board agrees with the staff's conclusions that (1) continuation of construction will neither adversely affect the public health and safety nor cause irreparable injury to any party, (2) suspension of construction will result in economic loss to workers and their families and communities, and (3) design modifications to protect against gas cloud fires will not be foreclosed or made prohibitively expensive if construction is allowed to continue.

ORDER

In ALAB-429, the Atomic Safety and Licensing Appeal Board (Appeal Board) remanded this proceeding for further evidentiary hearings on the matter of whether the plant need be designed to protect it against fire from a methane, propane, or butane cloud which might be released in an accident

involving a tanker carrying such cargo on the Delaware River.¹ In that decision, the Appeal Board directed the Licensing Board to arrive at a decision in this matter within a four-month period.² Should the Licensing Board be unable to do an adequate job in arriving at a decision within the stipulated time period, the Appeal Board directed that the Applicant would be required to show cause why construction should not be suspended pending issuance of our decision. The Appeal Board said, "In so doing, applicant will have to make a showing that it will be feasible to adapt the plant design so as to protect against gas cloud fires and that continued construction will not prevent it from doing so or make such adaptation prohibitively expensive."³

In an Order dated December 6, 1977, we found that the need for meticulous study of the evidence, coupled with our current workload, makes it impossible for us to render a decision by December 24, 1977. We indicated, further, that we would issue a decision by January 20, 1978. Accordingly, we directed the Applicant to demonstrate, by written submission, that plant construction, if permitted to continue beyond December 24, 1977, and until January 20, 1978, will not proceed to such a point as will prevent the Applicant from making changes in the plant to protect it against fires from flammable gas clouds, should we decide that the probability of such a fire is great enough to require such protection.

Applicant responded to our Order with a submittal dated December 9, 1977. The response incorporated by reference the affidavit of John R. Boetger, Project Manager of the Hope Creek Generating Station for the Public Service Electric & Gas Company. The affidavit says that between December 24, 1977, and January 20, 1978, construction activities will involve pouring concrete in the foundation of the plant and in one wall each of the reactor area and the turbine area, plus placing the forms, rebars, and inbedments required for the concrete pours. The amount of concrete to be poured during the stipulated period is approximately 12,000 cubic yards, compared with 55,000 cubic yards already poured and with a total of 450,000 cubic yards required for the entire plant. Applicant indicated, further, that construction will not proceed to a point that would prevent making such changes as might be required to protect the plant against fires from flammable gas clouds, should it be our decision that such protection is necessary. In addition, Applicant indicated that suspension of construction during the period from December 24, 1977, through January 20, 1978, would result in approximately 1,500 workers being laid off and a loss of ap-

¹ALAB-429, 6 NRC 229, 247 (1977).

²The four-month period stipulated by the Appeal Board elapses December 24, 1977.

³ALAB-429 at 38.

proximately \$3,400,000 in wages. An additional wage loss of approximately \$1,700,000 would result during the month following resumption of work, as the work force is gradually built up to normal. Thus, says the Applicant, suspension of construction would cause economic hardship to workers and their families.

The NRC Staff replied to Applicant's response in a submittal dated December 19, 1977. They indicated that an unannounced inspection of the Hope Creek facility had been carried out on December 14, 1977, by the U.S. Nuclear Regulatory Commission, Office of Inspection and Enforcement, Region I, to verify statements contained in the Applicant's submittal of December 9, 1977. The inspection verified the Applicant's statements concerning (1) the location and amount of concrete to be poured during the period December 24, 1977, through January 20, 1978; (2) the amount of concrete that had been poured by December 8, 1977, the date of preparation of the information contained in the Applicant's response; and (3) the average daily work force that would be affected by a suspension of construction. The inspection determined, further, that approximately 11,000 more cubic yards of concrete would be poured between December 9, 1977, and December 24, 1977. Finally, the inspection found that no work had been done on the intake structure, the part of the plant which Staff considers most vulnerable to river accidents, and none is planned during the period December 24, 1977, through January 20, 1978. The Staff concludes that design modifications, if required by the Board's decision, will not be foreclosed nor made more expensive if construction is allowed to continue. They also conclude that economic hardship to workers and their families, and economic loss to the community would result if construction is suspended. Staff therefore submits that there will be no adverse effect on public health and safety and no party will be irreparably injured if construction is allowed to proceed. Conversely, they say that direct and indirect economic loss will be suffered by "many members of the public" if construction is suspended. Therefore, Staff recommends that construction not be suspended. Intervenors made no response to the Applicant's submittal of December 9, 1977.

On the basis of the information provided by the Applicants, which has been verified and supplemented by the Staff, we find that less than 15 percent of the total concrete required in the construction of the plant will have been poured by December 24, 1977, and only an additional 2.6 percent will be poured between that date and January 20, 1978, if construction continues. These placements will be located in the foundation of the plant and in two walls. No substantial work above grade will have been carried out by January 20, 1978. We find, therefore, that if construction is allowed to continue after December 24, 1977, and until we issue our decision on or before

January 20, 1978, it will not be unfeasible nor prohibitively expensive for the Applicant to adapt the plant design to protect against gas cloud fires, should we decide such protection is required. We agree with the Staff's conclusion that public health and safety will not be adversely affected, nor will any party suffer irreparable injury if construction is allowed to continue and, further, that workers and their families and communities would suffer economic loss if construction is suspended.

In view of these findings we conclude that the Applicant has shown good cause why construction should not be suspended pending issuance of our decision. Construction may, therefore, be continued after December 24, 1977.

IT IS SO ORDERED.

**FOR THE ATOMIC SAFETY AND
LICENSING BOARD**

Edward Luton, Chairman

**Dated at Bethesda, Maryland,
this 23rd day of December 1977.**

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Frederic J. Coufal, Chairman

Dr. Walter H. Jordan

Dr. Donald P. deSylva

In the Matter of

Docket Nos. STN 50-491

STN 50-492

STN 50-493

DUKE POWER COMPANY

(Cherokee Nuclear Station,
Units 1, 2 and 3)

December 30, 1977

Upon application for construction permits for Cherokee Nuclear Station, Units 1, 2 and 3, the Licensing Board reviews radiological health and safety questions and concludes that the applicant has complied with all necessary statutory and regulatory requirements and that the permits should be issued, subject to environmental protection conditions set forth in earlier decisions.

TECHNICAL ISSUES DISCUSSED: anticipated transients without scram (ATWS); atmospheric diffusion; unresolved safety questions; accident dose estimates; bypass leakage; safe shutdown earthquake; financial qualifications; Table S-3 (radon emissions).

**PARTIAL INITIAL DECISION
(Construction Permits)**

Appearances

J. Michael McGarry, Esq., and Joseph B. Knotts, Jr., Esq., Debevoise & Liberman, 806 16th Street, N.W., Washington, D.C. 20005, and **William L. Porter, Esq.,** Associate General Counsel, 422 S. Church Street,

Charlotte, N.C. 28242, for the Applicant, Duke Power Company

M. Richbourg Roberson, Esq., Assistant Attorney General, State of South Carolina, Columbia, S.C. 29211, for the State of South Carolina

Charles A. Barth, Esq., U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, for the NRC Regulatory Staff

I. BACKGROUND

1. This Partial Initial Decision concerns the application to the United States Nuclear Regulatory Commission (NRC or Commission) by Duke Power Company (Duke or Applicant) for construction permits for Cherokee Nuclear Station, Units 1, 2 and 3. In particular, this decision involves NRC review of the radiological health and safety considerations specified in the Notice of Hearing published in the *Federal Register* on July 19, 1974 (39 Fed. Reg. 26470), and several environmental matters.

2. The general background of this proceeding is set forth in the Partial Initial Decision as to Environmental and Site Suitability Issues decided by this Atomic Safety and Licensing Board (Board) on May 21, 1976 [3 NRC 627 (1976)]; Amendment of Partial Initial Decision issued on March 17, 1977 [5 NRC 676 (1977)]; Supplemental Partial Initial Decision of July 26, 1977 [6 NRC 191 (1977)]; and in our unpublished Order of June 23, 1976, which will be subsequently addressed. In those Decisions, the Board held that the appropriate action to be taken from an environmental and site suitability point of view is the issuance of construction permits subject to the outcome of the radiological health and safety phase of the proceeding. These Partial Initial Decisions are affirmed and incorporated herein by reference. The three Partial Initial Decisions, the Order of June 23, 1976, and this Partial Initial Decision together constitute the Initial Decision on this proceeding.

3. Subsequent to the issuance of the Partial Initial Decision as to Environmental and Site Suitability Issues, and based upon the Board's findings and determinations therein, the Commission's Office of Nuclear Reactor Regulation authorized the Applicant to conduct certain limited work activities (LWA-1) at the site pursuant to 10 CFR §50.10(e)(1) (41 Fed. Reg. 23489 on June 10, 1976).

4. Subsequent to the issuance of the Supplemental Partial Initial Decision, and based upon the Board's favorable findings and determinations

therein, the Commission's Office of Nuclear Reactor Regulation authorized the Applicant to conduct certain limited work activities (LWA-2) at the site pursuant to 10 CFR §50.10(e)(3) (42 Fed. Reg. 40059 on August 8, 1977).

5. Because our June 23, 1976, Order has not been published, we restate here that part of it that modified our Partial Initial Decision of May 21, 1976. That unpublished Order deleted two conditions which were adopted verbatim from the FES, page iii, paragraphs 7c and d, by amending the Partial Initial Decision dated May 21, 1976, to state at paragraph (i), page 651 of 3 NRC:

Those conditions set forth by the Staff in the FES at page iii, paragraphs 7a, b, e, f and g;

The Order further deleted paragraphs 84, 85 and 86 of that Partial Initial Decision and substituted therefor:

At the time of the hearing Applicant owned about 87% of the exclusion area. Since then it has virtually completed condemnation of the remaining 13% (Staff Ex. 12). Therefore, the Board finds that with regard to Applicant's ability to control the exclusion area, the site is suitable for location of reactors of the general size and type proposed.

II. PUBLIC HEARINGS

6. Public hearings were conducted in this proceeding on environmental matters on June 12, 1975, November 5 and 6, 1975, January 13, 1977, and April 26 and 27, 1977. The Board, in its Order of July 6, 1977, convening the health and safety phase of the proceeding, stated that issues relating to Applicant's Perkins and Cherokee Nuclear Stations would be "heard in a proceeding combining both stations."¹ Hearings on health and safety were held on July 18 and 19, 1977, in Gaffney, South Carolina.² The Staff and Applicant appeared at all hearings and were represented by counsel. The State was present during most of the hearings and was represented by counsel. During the course of the public hearings, 67 limited appearance statements were presented and are set forth in the transcript.

¹This approach is consistent with the review of standard designs under the duplicate design option advanced by the Commission in 10 CFR Part 50, Appendix N and 10 CFR §§2.715 and 2.716, and is applicable to this case by virtue of the fact that the three-unit Cherokee plant and the three-unit Perkins plant are essentially duplicates, the design of which has been standardized by applicants to the extent permitted by site characteristics.

²Though the hearings held on July 20 and 21, 1977, in Mocksville, North Carolina, are captioned with the title of the Perkins proceeding, they also are a part of the Cherokee record.

III. RECORD

7. The record in this proceeding consists of the Notice of Receipt of Application, Notice of Hearing on Application for Construction Permits and all subsequent public notices published in the *Federal Register* which pertain to this proceeding, the Application, Preliminary Safety Analysis Report, and Environmental Report as amended as of April 29, 1977, the Final Environmental Statement, the Safety Evaluation Report and its Supplement No. 1, the Site Suitability Report (SSR), all Orders and Decisions of the Board and the Atomic Safety and Licensing Appeal Board and all pleadings filed herein, the transcripts of all hearings and all exhibits received by the Board.

IV. RADIOLOGICAL HEALTH AND SAFETY FINDINGS

A. Basic Findings

8. On May 24, 1974, the Commission docketed the Applicant's Preliminary Safety Analysis Report (PSAR). This document and its amendments were received into evidence as Applicant's Exhibits 2, 2A and 2B; it describes the site and the balance of plant structures and systems important to the safety of the plant. The nuclear steam supply system, which will be purchased from Combustion Engineering Corp., was described in the CESSAR and, although not a part of the record of this hearing, was incorporated by reference in the PSAR in accordance with Appendix O to 10 CFR Part 50. The PSAR includes a discussion of the compliance with the Commission criteria (10 CFR Parts 20, 50, and 100) of those portions of the plant for which the Applicant is directly responsible. It also describes the Applicant's proposed organization, technical and financial qualifications, and preliminary plans for training of personnel and conduct of operations.

9. The Staff performed a technical review and evaluation of the information and data submitted by the Applicant in the PSAR and subsequent amendments, the CESSAR, and the interface requirements between the CESSAR and the PSAR. As a result of this review and its own independent analysis, the Staff prepared a Safety Evaluation Report (SER), issued in March of 1977, and Supplement No. 1 to the SER (SER Supp.), issued in July of 1977.³ The Staff concluded in the SER that, assuming favorable resolution of the then outstanding matters discussed therein, the facilities

³The SER was received into evidence as Staff Exhibit 14 at the hearing held on April 26, 1977 (Tr. 711). The Supplement to the SER was received into evidence as Staff Exhibit 16 at the July 18, 1977, hearing (Tr. 951).

can be constructed and operated at the proposed site without undue risk to the health and safety of the public (SER §21). In the SER Supp. No. 1, the Staff addressed these outstanding matters and concluded that all were resolved (SER Supp. §21) (Tr. 2011).

10. In the SER and the Supplement, the Staff independently reviewed the distribution of population and land use offsite, and the physical characteristics of the site including seismology, geology, hydrology, and meteorology. It reviewed and evaluated the design, fabrication, construction, testing and expected performance of the plant structures, systems and components important to safety, and the response of the facilities to various operating transients and to a broad spectrum of postulated accidents, including design basis accidents. The Staff reviewed and evaluated the Applicant's plans for the conduct of plant operations and plans for actions to be taken in the event of an accident which might affect the general public, Applicant's organization structure and the technical qualifications of operating and technical support personnel, and measures to be taken for industrial security. The supplement also contains an analysis and evaluation of the financial qualifications of the Applicant to design and construct the facilities.

11. The Board has independently considered the License Application, the PSAR and amendments thereto, and the SER and its Supplement. The Board finds that the Staff's technical review and safety evaluation is adequate and comprehensive. Accordingly, the Board hereby adopts the conclusions reached by the Staff in the SER and Supplement No. 1, except insofar as they may be modified by the finding made by the Board in this Initial Decision.

12. The Advisory Committee on Reactor Safeguards (ACRS) has reviewed the application for Cherokee and Perkins and has concluded in its letter dated April 14, 1977, that both stations can be constructed with reasonable assurance that they can be operated without undue risk to the health and safety of the public (SER Supp., Appendix D). The Applicant and the Staff have duly considered and are taking appropriate action to implement recommendations of the ACRS (SER Supp. §18).

V. DESIGN DESCRIPTION, PRINCIPAL ARCHITECTURAL AND ENGINEERING CRITERIA

13. Each Cherokee unit will be designed for a power level of approximately 3,817 megawatts thermal and a net electrical output of 1,280 megawatts electric (SER, Appendix A, §1.2). Water will serve as both moderator and coolant, and will be circulated through each reactor vessel and core by four reactor coolant pumps (SER §1.2.2). Each reactor has 241

fuel assemblies in its core with a 16 x 16 fuel rod array (SER §4.3). Fuel pellets of 95% density uranium dioxide will be sealed in Zircaloy-4 tubing and pressurized with helium to form the fuel rods. Neutron absorber rods (boron carbide) will be provided in place of fuel rods at selected locations in the fuel assemblies. Each fuel assembly will be provided with a threaded joint to allow the attachment of upper and lower end fittings to the guide tubes so they may be removed to allow replacement of individual fuel rods (SER §4.2.1).

14. Each unit will be housed in a spherical steel containment vessel surrounded by a reinforced concrete shield building that is a cylindrical shell with a domed upper closure. The vessel and the spherical portion of the shield building will be separated by an annular air space. The containment will be designed for an internal pressure of 46.8 pounds per square inch gauge (psig) and a temperature of 280°F (SER §6.2.1). The highest containment pressure following a design basis accident was calculated by the Applicant to be about 43 pounds per square inch gauge (SER §6.2.1).

15. The containment houses the reactor, steam generators, reactor coolant pumps and pressurizer. The shield building (also called the reactor building in the PSAR) contains certain components of the engineered safety feature systems for the facilities including the emergency core cooling system equipment, containment spray system equipment and shutdown cooling system equipment (SER §§1.2.2 and 3.8.1 and Fig. 1.1; PSAR Figures 1.2.1). An auxiliary building immediately adjacent to the shield building includes areas for fuel handling, auxiliary systems equipment, and the control room (SER §§1.2.3). Other major structures for each unit include the two individual buildings for the diesel generators (SER §8.3.1), the turbine building, and the three circular mechanical cooling towers. Each of two nuclear service water pump structures, and each of two nuclear service water cooling tower structures are shared by the three units (SER §1.2.3).

16. The steam and power conversion system for each unit will be designed to remove heat from the nuclear steam supply and convert it into electrical energy by means of a steam turbine generator (SER §10.1). Waste heat rejected to turbine condensers will be discharged from the closed-cycle circulating water system to the atmosphere through mechanical-draft cooling towers (SER §1.2.3).

17. Cherokee will have a number of engineered safety features designed for limiting the consequences of postulated accidents. The principal engineered safety features include the redundant emergency core cooling systems, the reactor containment systems (including the containment heat removal system), the control room filtration systems, the ultimate heat

sinks, the hydrogen control system, and the redundant onsite power systems (SER Sec. 6).

18. A major portion of the Applicant's description of the proposed design of the facilities, including the principal architectural and engineering criteria for the design appears in the CESSAR which is not a part of the record in this hearing. However, the Staff has testified as to the adequacy of the Applicant's description (SER §21.0) and the Board will adopt their testimony in that respect.

VI. QUALITY ASSURANCE

19. The Applicant has testified that it has formulated a comprehensive Quality Assurance Program which is incorporated by reference into the PSAR (J. R. Wills following Tr. 646). The QA Program has been reviewed by the Staff for compliance with Appendix B to 10 CFR Part 50 (SER 17.5).

VII. TECHNICAL QUALIFICATIONS

20. Duke Power Co. is responsible for the design, construction and operation of the Cherokee Nuclear Station. Duke Power Co. will act as its own architect-engineer and be responsible for all site construction activities. Combustion Engineering, Inc., will design and manufacture the nuclear steam supply systems.

21. The Applicant's proposed organization and training program have been reviewed by the Staff (SER 13.1). They questioned the Applicant's proposal to reduce the required experience of the Radiation Protection Manager from nine to seven years. This matter has been resolved to the satisfaction of the Staff (Tr. 948-949).

22. The Staff has concluded that the Applicant has an acceptable organization to design and construct the facility and that the proposed plant organization, their qualifications, and the plans for offsite technical support of plant operations are acceptable (SER 13.1). The Board relies on the Staff testimony in concluding that the Applicant is technically qualified to design and construct the Cherokee plant.

VIII. COMMON DEFENSE AND SECURITY

23. The Applicant states that the activities to be conducted will be within the jurisdiction of the United States and that all of the directors and principal staff officers are citizens of the United States. The Applicant is not owned, dominated, or controlled by an alien, foreign corporation, or a foreign government. The activities to be conducted do not involve any

restricted data, but the Applicant has agreed to safeguard any such data that might become involved in accordance with the requirements of 10 CFR Part 50. The Applicant will obtain fuel as it is needed from sources of supply available for civilian purposes, so that no diversion of special nuclear material from military purposes is involved (SER §19). The Board finds that the issuance of construction permits for the Cherokee units will not be inimical to the common defense and security.

IX. RESEARCH AND DEVELOPMENT

24. No new research and development programs have been identified as necessary to reach a final design. There are however a number of test programs which Combustion Engineering, Inc., will conduct to demonstrate the safety of the CESSAR System 80 design to the satisfaction of the Staff including design test of 16 x 16 fuel assembly, verification of in-reactor fuel densification, loss-of-coolant accident refill tests, blowdown heat transfer test, verification of reflood heat transfer coefficients, verification of assumed iodine partition factors, development of a realistic and conservative model for the iodine spiking phenomenon, verification of models used to predict transient and accident loads on the steam generator, and demonstration of performance of the proposed core protection calculator system software and hardware (SER §1.4). In addition, the Staff's generic evaluation of anticipated transients without scram is not yet complete (SER §15.6).

25. The Staff has evaluated these requirements needed to complete the safety analysis and concluded there is reasonable assurance that they will be resolved and the final design will be acceptable (SER §1.4 and 19.0). The Advisory Committee on Reactor Safeguards has also concluded that the items left to be accomplished can be resolved during construction and, when resolved, will allow the Cherokee Units 1, 2 and 3 to be operated without undue risk to the health and safety of the public (SER, Supp. 1, App. C). The Board finds that the Staff has made an adequate analysis of the research and development requirements that remain to be done prior to the operation of the facility and that the Applicant has complied with the requirements of 10 CFR §50.35(a) with respect to required research and development programs.

X. BOARD QUESTIONS

26. On July 7, 1977, the Board addressed several written questions to the

parties concerning health and safety aspects of Cherokee.⁴ These questions dealt with anticipated transients without scram (ATWS), atmospheric diffusion, unresolved safety questions, compliance with Regulatory Guide 1.4, percentage of bypass leakage and magnitude of the safe shutdown earthquake. Both the Applicant and Staff presented written testimony in this regard (see Applicant's Response following Tr. 940 and NRC Staff Response following Tr. 954, respectively). Each topic will be addressed separately below.

27. In addition to the written responses, further clarification was sought by the Board of both Applicant and Staff witnesses.

Question 1: Anticipated Transients Without Scram (ATWS)

28. ATWS. Does the Project 81 design meet the requirements of WASH-1270? Has the Applicant agreed to the design changes listed on page 15-16 of SER App. A? Does the Applicant agree that (a) loss of all a.c. power and (b) loss of feedwater flow are anticipated transients (PSAR Am 31, p. Q 21-4)? When will the Preliminary Design approval referred to on page 15-16 of SER App. A be issued? What is the present position of the ACRS concerning the adequacy of the CESSAR design with respect to ATWS? Provide copies of any recent ACRS communications with the Staff on the adequacy of the System 80 design.

SER, App. A page 7-5 states that Staff review of computer protection system for Arkansas One will be issued in mid-1976. What did that review conclude about the reliability of the system?

Is this an unresolved safety issue?

29. With regard to ATWS and compliance with WASH-1270, the Staff pointed out that it has not yet adopted a final position on the criteria for minimizing the risk from failure of the protection system. The Staff hoped

⁴The questions were also directed to the health and safety aspects of Perkins. Question 3, involving the evacuation of the Forest Lake Camping Resort, relates solely to Perkins and will not be discussed in these findings (Tr. 1007-08); Question 5, involving the passage of bypass water for the dilution of liquid waste was limited by the Board to Perkins (Tr. 1008) and thus will likewise be discussed no further in these findings except to note that the Board is cognizant of the Applicant and Staff responses to this question as it applies to Cherokee and finds such to be satisfactory (see Applicant's Response at p. 8 following Tr. 940 and Staff's Response at pp. 11 and 12 following Tr. 954).

to be able to issue a document in late 1977 that would summarize the final NRC position. The Staff considers ATWS to be a generic issue which can be left to resolution at the operating license stage and point out that the System 80 system must comply with the Staff position (Staff following Tr. 954 and Perkins Tr. pp. 2034-2043).

30. The Applicant has proposed changes in the System 80 protection system which will improve its reliability. Such changes are subject to final Commission approval (App. testimony following Tr. 940 and Tr. pp. 956-992).

31. The Board agrees that the final ATWS criteria and the compliance with those criteria is a matter that can be left to the operating license stage. The design has not yet been frozen and can accommodate changed criteria.

32. With respect to the Board's concern with loss of all a.c. power, the Applicant's position is that a combination of reliable onsite diesel supplies plus redundant steam-driven feedwater pumps provides adequate protection (Tr. 984; Perkins Tr. 1985).

33. With respect to loss of power, the Staff testified that Applicant's a.c. power sources were acceptable for the issuance of construction permits (Tr. 2020). The Staff is performing a generic study of the probability of loss of all a.c. power pursuant to an ACRS request and the Applicant has committed to participate (SER Supp. §18). The Staff will pursue this matter at the operating license stage which is consistent with the ACRS view (Tr. 2020-22). With respect to the computer protection system, the Staff noted that its review of a generally similar system in another application was not complete; however, it found no reason at this time for rejecting the approach (Staff Response at p. 5 following Tr. 954; Tr. 2043). As stated in Section 7.2 of the SER, the Applicant in Amendment 23 committed that an alternate design similar to those previously reviewed and approved by the Staff will be implemented in the final design in the event that the development program for the core protection calculator system described in the CESSAR proves to be unacceptable to the Staff.

Question 2: Atmospheric Diffusion

34. Atmospheric Diffusion. On page 15-9 of the SER, the Staff estimated that the two-hour relative concentration using Regulatory Guide 1.5 (1.4?) becomes 1.8×10^{-3} cubic meters per second (seconds per cubic meter?). Show how that figure was obtained using the assumed values for distance and wind speed. What wake factor was assumed? On pages 15-5 and 2-11, a value of 2.5×10^{-3} seconds per cubic meters is listed. Why are the numbers different? Which is correct? If the leakage rate between primary and secondary is

limited to 0.55 gal/min, what would be the thyroid dose at the LPZ for inclusion in Table 15.1?

Why are the distances to the exclusion area boundary (594 meters) identical for Perkins and Cherokee? What is the basis for the 2,500-foot exclusion circle?

Why would the leakage rate be limited at the operating license stage (SER page 15-9) to a value that would limit thyroid dose to 150 rem? Is not 300 rem permitted at that stage?

35. Both Applicant and Staff pointed out that there is no discrepancy concerning values of X/Q; one value is appropriately calculated using Regulatory Guide 1.4 for elevated releases, the other is based on Regulatory Guide 1.5 for ground releases (Applicant's Response, p. 4; Staff's Response, p. 6).

36. Under questioning by an Intervenor in the Perkins proceeding, Applicant acknowledged that the NRC had characterized the meteorology of the Cherokee and Perkins sites as not being in the highly favorable range (Perkins Tr. 1953). The Applicant further acknowledged that the NRC took the position that special precautions should be taken into account because of the meteorological conditions. In this regard, Applicant used site specific meteorology as measured and developed at the Perkins and Cherokee sites and in every case found it to be within the prescribed limits utilizing the equipment that has been described (Perkins Tr. 1953).

37. If the leakage rate is limited to 0.55 gal/min, the thyroid dose at the LPZ for inclusion in Table 15.1 would be 9 rem (the whole body dose would be less than one rem).

38. Applicant chose the 2,500-foot exclusion area radius (from the center of the reactor in the middle unit) for reasons of land availability, economics, accident analysis, and engineered safeguards capabilities as required by 10 CFR Part 100. The radii are the same for the two stations because the respective designs and layouts are identical and the exclusion area meteorologies are similar (Applicant's Response at p. 5 following Tr. 940; Tr. 990-1000). Applicant noted that it owns all the land within the exclusion area (Tr. 1000) and that in case of an accident it has obtained the agreement of the Sheriff of Cherokee County to the effect that that office will cooperate and assist in removing persons from the exclusion area (Tr. 1002, 1057; Perkins Tr. 1962).

39. Finally, as to the 150 rem thyroid dose limit, Applicant stated that such was to be applied only at the construction permit stage. The Applicant further stated that the accepted criteria in the appendix to the Standard

Review Plan Section 15.4.8 currently states the NRC position as a dose of less than 300 rem to the thyroid at the operating license stage; therefore, it is the Applicant's understanding that 300 rem to the thyroid applies to the operating license stage (Applicant's Response at p. 5 following Tr. 940).¹ At the hearing, Applicant stated that it hopes to keep the thyroid dose within the 150 rem range despite the fact that the 300 rem dose is permitted at the operating license stage (Tr. 1005).

40. The Staff's testimony in this regard was similar to that of the Applicant (see Staff Response following Tr. 954). Specifically, the Staff acknowledged that the meteorology of the Perkins area was not highly favorable but that compensating engineered safety features could be provided in the plant design (Perkins Tr. 2104). The Staff testified that the Cherokee plant has more engineered safety features to mitigate the consequences of an accident than would be required of a plant located in a region with more favorable meteorology (Perkins Tr. 2105). The Staff also stated that with respect to the probabilistic estimates of accidents the meteorology used in the accident analysis is associated with a 5% probability; that is, 95% of the time the meteorology will be more favorable (Perkins Tr. 2108). With respect to the exclusion area, the Staff stated that there was no standard procedure for selecting such area with respect to its shape and that Applicant's selection in this regard was adequate (Staff's Response at pp. 6-7 following Tr. 954; Perkins Tr. 2043). The Staff also stated that the 150 rem thyroid dose limitation at the construction permit stage is imposed chiefly to take into account uncertainties in meteorological diffusion characteristics. At the operating license stage more detailed meteorological information is available and the system designs have been finalized, thus permitting the full use of the 300 rem reference value specified in the regulations (Perkins Tr. 2047).

41. The Board finds the Applicant and Staff responses to its inquiry in this regard are satisfactory.

Question 3: Emergency Procedures

42. Applies only to Perkins.

Question 4: Unresolved Safety Issues

43. The Staff throughout the SER discusses a number of issues that are unresolved but will be covered in a supplement prior to granting

¹A total radiation dose to the thyroid from iodine exposure of 300 rem is the reference value set forth in 10 CFR §100.11(a)(1) to be used with respect to potential accidents in determining exclusion area and low population zone sizes.

a CP (SER Sec. 1.9). However, many issues will not be resolved until the FSAR is approved (SER App. A Sec. 15.7). Some of the issues that remain unresolved involve design basis accidents such as the steam line break. Does the Staff have any criteria for deciding which issues must be resolved prior to granting a CP? For example, does the Staff require that the final design of any of the engineered safety features be approved prior to the start of construction? One of the outstanding items listed under SER Sec. 1.9 (e.g., No. 3) was considered as an "unresolved safety issue" by the Staff at the start of the LWA-2 hearing in Gaffney. At that time, the Staff's position was that no LWA-2 could be granted until the issue was resolved. Are the requirements for an LWA-2 more stringent than for a CP?

44. The Applicant was of the view that this question was exclusively directed to the Staff and made only a general observation that the NRC Staff must make certain conclusions regarding an application in accordance with 10 CFR §50.35(a) (Applicant's Response at p. 7 following Tr. 940). The Board agreed that the question was a Staff matter (Tr. 1008).

45. The Staff stated that at the construction permit review stage it is charged with the responsibility of reviewing criteria and design bases in order to make a determination that, in fact, the plant can be designed and constructed to operate in accordance with the design objectives (Perkins Tr. 2051). The Staff stated that it requires a description of the proposed design, including, but not limited to, the principal architectural and engineering criteria for the design and the major features or components incorporated therein for the protection of the health and safety of the public. It further requires that features such as thickness of engineered safety feature charcoal filters, containment conceptual design, and containment design leak rates be specified in the PSAR so that calculations of doses due to postulated design basis accidents can be completed with sufficient accuracy to assure that the facility can be constructed and operated without undue risk to the health and safety of the public. In this regard the Staff testified at the safety hearing that it must proceed well along the way in establishing the basic design criteria at the construction permit stage (Perkins Tr. 2057). The Staff also noted that at the construction permit review, the regulations require specific items but that the Staff goes beyond these and this serves as a conservatism in its review (Perkins Tr. 2065).

46. The Staff maintained that matters which are unresolved at this stage must be resolved prior to issuance of a construction permit and in the instant case they have been (Tr. 2011, 2064-66; SER Supp. §1.9). Since the operating license review is conducted well before the plant goes into operation, an opportunity still exists for modifications to the design to be made

(Perkins Tr. 2063). In this regard, the Staff noted that if during subsequent review the Staff determines that modifications must be made, the Staff will not approve the final design until such modifications are indeed made (Perkins Tr. 2063).

47. With respect to the requirements for an LWA-2, the Staff stated that such are equally stringent to those for a construction permit. The only difference is that for a construction permit all unresolved issues must be resolved, while for an LWA-2 only those issues applicable to the requested work may need to be resolved (Staff Response at p. 10 following Tr. 954).

48. The Board has reviewed the Staff's response to its inquiry and finds it to be adequate.

Question 5: Pumping Bypass Water

49. The Applicant stated that the pumping of bypass water for dilution of liquid wastes is no longer proposed for Cherokee so the question is not applicable for this facility.

Question 6: Compliance With Regulatory Guide 1.4

50. Table 1.7-1 of the PSAR indicates partial compliance by the Applicant with Regulatory Guide 1.4. Sec. 15.4 of the PSAR lists exceptions to the guide in calculating realistic doses but only conservative estimates are given in Table 15.1-1. Is that the exception the Staff refers to in SER Sec. 1.11.1? What were the major differences between the Staff and Applicant in either source terms or atmospheric diffusion constraints?

51. The Applicant stated that it took an alternate position on Regulatory Guide 1.4 to the effect that it chose to use its site specific meteorological data rather than the assumptions in the Regulatory Guide to calculate the 0-8 hour X/Q diffusion constant (Applicant's Response at p. 9 following Tr. 940). Applicant testified that the exception it took to Regulatory Guide 1.4 was not related to the realistic versus conservative assessment of doses (Tr. 1019); however, in this instance the data Applicant used was more conservative with respect to dose estimates than Regulatory Guide 1.4 criteria (Tr. 1019; Perkins Tr. 1969).

52. With respect to the Board's concern about the list set forth in PSAR Section 15.4, the Applicant stated that the exception to Regulatory Guide 1.4 set forth in such list is not related to the exception discussed above. Rather, the instant exception indicates assumptions which are utilized in

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realistic accident dose estimates (Applicant's Response at p. 9 following Tr. 940).

53. The NRC Staff utilized the same methods as Applicant with respect to Applicant's compliance with Regulatory Guide 1.4, and no major differences exist between Staff and Applicant's use of either source terms or diffusion constants (Staff Response at p. 12; Applicant's Response at p. 9).

54. The Board finds that the Applicant and Staff's treatment of the Board's question has been satisfactory.

Question 7: Amount of Bypass Leakage

55. In Sec. 15.5.6 of the SER, the Staff notes that the Applicant has determined that the bypass leakage will amount to only one percent of the total leakage. What is the basis for that determination and has it been questioned by the Staff. References to questions and answers in the PSAR would be helpful.

56. Applicant stated that the 1% bypass leakage referred to by the Staff is actually a Technical Specification value and is used in accident analyses pursuant to Regulatory Guide 1.4. As a Technical Specification, Applicant stated that it will be required to perform periodic tests throughout the life of the plant to assure that this leakage will not be exceeded. Applicant's design calculations, based on experience at Oconee, indicate bypass leakage may be half this value. These calculations are considered conservative since valves at Cherokee will have lower leak rates than those at Oconee (Tr. 1021). The design basis for the bypass leakage rate was questioned extensively by the NRC Staff. These questions and a reference to the response are contained in Volume VII of the PSAR. The issue of bypass leakage and containment leakage was also extensively questioned by the Board. The Applicant stated that the leakage rate of the containment vessel would be no more than .2% per day and that only 1% of that will bypass the cleanup in the annulus. Both values were considered in the offsite doses that have been calculated (Tr. 1026).

57. The Staff has found that the Applicant has satisfactorily identified bypass leak paths using Branch Technical Position CSB 6-3, "Determination of Bypass Leakage Paths in Dual Containment." The Board has reviewed the responses of the Applicant and is satisfied that the materials presented adequately resolve the Board's question.

Question 8: Magnitude of the Safe Shutdown Earthquake

58. Our questions at the LWA-2 were directed to the magnitude of the

safe shutdown earthquake and whether there was an unresolved safety issue. Please provide the Board with any documentation establishing the SSE at 0.15g and any written material that addresses the reservations of ACRS member Okrent.

59. At the hearing, the Applicant testified as to the conservatism of the 0.15g figure for the SSE. This figure was based on historical records and applies at the ground level (Tr. 1034-35). Since in this region an amplification factor of 2 between bedrock and ground level is anticipated, the corresponding acceleration at bedrock would be 0.075g. However, the reactor building is anchored to bedrock, and it and the steam supply system is designed to withstand 0.15g, an acceleration double the maximum expected figure. The Applicant went on to testify that even if a 0.15g were to be experienced at the top of bedrock, the calculated stresses would not cause a LOCA.

60. The Staff's witness discussed the seismic evaluation (Tr. 2070) and agreed that the .15g is the appropriate SSE based on its compliance with Appendix A to Part 100 (Tr. 2073).

61. The Staff supplied the documentation requested by the Board (Staff Response to Question 8, following Tr. 954). The Board agrees that 0.15g is a conservative estimate of the SSE.

XI. FINANCIAL QUALIFICATIONS

62. In addition to the written questions discussed above, the Board had orally advised the Staff that it wished to explore the Staff's evaluation of the Applicant's financial qualifications. The Staff presented a witness who testified that he is satisfied that Applicant is financially qualified to design and construct the proposed Perkins and Cherokee facilities (Perkins Tr. 2127).

63. The Commission's regulations relating to the determination of an applicant's financial qualifications appear in Section 50.33(f) and Appendix C to 10 CFR Part 50. These regulations state that there must be reasonable assurance that an applicant can obtain the necessary funds to cover the estimated construction costs of a proposed nuclear power plant and its related fuel cycle costs. This standard of reasonable assurance, however, must be viewed in light of the extended period of time from the start of construction to the date of commercial operation. The earliest dates for commercial operation of the Cherokee and Perkins plants are estimated to be January 1984 for Cherokee Unit No. 1, January 1985 for Perkins Unit No. 1, July 1986 for Cherokee Unit No. 2, July 1987 for Perkins Unit No. 2, January 1989 for Cherokee Unit No. 3 and January 1990 for Perkins Unit

No. 3. Consequently, one must necessarily make certain assumptions about future conditions. Two basic assumptions the Staff has made in its analysis are that there will be rational regulatory policies with respect to the setting of rates and that viable capital markets will exist. The former assumption implies that rates will be set to at least cover the cost of service, including the cost of capital; the latter assumption implies that capital will be available at some price. Given these assumptions, the Staff then focused on the reasonableness of the applicant's financial planning.

64. The Staff witness further testified as to the reasonableness of the Applicant's financial assumptions (Perkins Tr. 2129, 2218). He stated that the policy to internally generate 40% of capital requirements projected by Applicant is reasonable and attainable (Perkins Tr. 2224; SER Supp. §20.4) and that Applicant's assumptions of 51% long-term debt, 13% preferred stock, and 36% common stock is in line with other utilities (Perkins Tr. 2147; SER Supp. §§20.3.2, 20.4).

65. The Board inquired as to Applicant's experience with interest coverage (Perkins Tr. 2148-54). The Staff testified that the past experience of the Company is that they have been able to maintain a reasonable interest coverage figure (Perkins Tr. 2156). Further, it also testified that the Company has been in an improving position over the past two years with respect to interest coverage (Perkins Tr. 2156). In response to a specific question, the Staff stated that the increase in the Applicant's construction project due to Cherokee should not worsen the Company financially, for as long-term debt increases, items that make up the coverage of interest would also be increasing (Perkins Tr. 2157).

66. The Staff evaluated Duke's plant growth rates to determine if the Applicant was attempting to undertake a program beyond that which it achieved in the past ten years and found that the proposed construction program was not beyond what they had achieved in the past (Perkins Tr. 2180). Applicant's annual compound growth rate was 15% in terms of gross plant for the period 1966-1976; for the period 1976-1986 it will be 11-1/2% (Perkins Tr. 2179, 2202). In the event growth does not meet projections of the Applicant, the Staff stated such would not have a serious effect on the financial condition of the Company inasmuch as the Company has several alternatives available, such as slowing construction and selling power outside (Perkins Tr. 2162, 2185-89; see also Tr. 2146).

67. The Staff stated that it had received all the information it needed from the Applicant to make a determination as to financial qualifications (Perkins Tr. 2166) and that it will continue to keep abreast of the current financial situation of the Applicant (Perkins Tr. 2165).

68. The Staff has reviewed the financial information presented in the application, and amendments thereto, and has concluded that there is

reasonable assurance that the Applicant can raise the necessary funds to design and construct the Cherokee facility. Accordingly, the Staff found Applicant financially qualified to carry out the activities for which the construction permits are sought. This conclusion was based on detailed analyses and the Staff's determination that the Applicant's projected financing plans and underlying assumptions are reasonable. The conclusion was also based on the assumption of rational regulatory policies and viable capital markets. These assumptions were necessary because of the lengthy future period involved and the expected heavy dependence on external financing. The Board finds that the Staff's review was adequate.

XII. CONCLUSIONS OF LAW

69. The Board has reviewed the entire record of this proceeding, including the proposed findings of fact and conclusions of law submitted by the parties. All of the proposed findings and conclusions submitted which are not incorporated directly or inferentially in this Initial Decision are herewith rejected as being unnecessary to the rendering of this Initial Decision.

70. In the Partial Initial Decision issued on May 21, 1976, the Board made findings of fact and determinations and reached conclusions of law regarding environmental and site suitability matters. Thereafter in its Amendment of Partial Initial Decision and its Supplemental Partial Initial Decision issued on March 17, 1977, and July 26, 1977, respectively, the Board made additional findings regarding certain activities at the site. The Board has considered these earlier findings, determinations, and conclusions, as well as all of the documentary and oral evidence of record in this proceeding. This consideration and a review of the entire record, including that portion of the record created since the issuance of the Partial Initial Decision, the Amendment thereto and the Supplemental Partial Initial Decision, have led the Board to the foregoing discussion and findings of fact, and to the conclusions of law stated hereinafter. After the Partial Initial Decisions referenced above were issued, one of the members of this Board made a study of Table S-3 of 10 CFR §51.20(e) and concluded that, in his opinion, the value contained therein for emissions of radon from mill tailings was understated by a substantial amount. This conclusion was transmitted to the Chairman of the ASLBP and then to the Commission in a memorandum (Jordan to Yore dated September 21, 1977).⁶ If Table S-3 is wrong, then the testimony offered by Dr. Gotchy on the Health Effects Attributable to Coal and Nuclear Fuel Cycle Alternatives (following Tr. 739) is based on a wrong assumption, and the conclusions he made may be in

⁶The memorandum is not of record in this case but has been filed by the Commission in the Public Document Room.

serious error. Dr. Gotchy was bound by the values in Table S-3 under 10 CFR §2.758, as is this Board. The Board, while unanimously of the opinion that Table S-3 may need revision and that such revision might well effect the cost-benefit balance on NEPA matters earlier considered in this proceeding, is bound to let stand the findings of fact and conclusions of law previously made by virtue of the regulation cited.

71. The Board concludes that the review of the application by the Staff has been adequate and that the application and the record of the proceeding contain sufficient information to support findings by the duly authorized official of the Regulatory Staff (and the issuance of construction permits based thereon for Cherokee Nuclear Station, Units 1, 2 and 3) to the same effect as the conclusions of law of the Board, as follows:

A. In accordance with 10 CFR §50.35(a):

(1) The Applicant has described the proposed design of the facilities, including but not limited to the principal architectural and engineering criteria for the design, and has identified the major features or components incorporated therein for the protection of the health and safety of the public.

(2) Such further technical or design information as may be required to complete the safety analysis, and which can reasonably be left for later consideration, will be supplied in the Final Safety Analysis Report.

(3) Safety features and components, if any, which require research and development have been described by the Applicant and the Applicant has identified, and there will be conducted, a research and development program reasonably designed to resolve any safety questions associated with such features or components.

(4) On the basis of the foregoing, there is reasonable assurance that (i) such safety questions will be satisfactorily resolved at or before the latest date stated in the application for completion of construction of the proposed facilities, and (ii) taking into consideration the site criteria contained in 10 CFR Part 100, the proposed facilities can be constructed and operated at the proposed location without undue risk to the health and safety of the public.

B. The Applicant is technically qualified to design and construct the proposed facilities.

C. The Applicant is financially qualified to design and construct the proposed facilities.

D. The issuance of permits for construction of the facilities will not be inimical to the common defense and security or to the health and safety of the public.

72. As we concluded in our Partial Initial Decision dated May 21, 1976, in accordance with 10 CFR Part 51 of the Commission's regulations, the Board concludes:

a. The environmental review conducted by the Staff pursuant to the National Environmental Policy Act of 1969 (NEPA) as further augmented and modified herein is adequate.

b. The requirements of Sections 102(2)(C) and (D) of NEPA and 10 CFR Part 51 of the Commission's regulations have been complied with in this proceeding.

c. The Board has independently considered the final balance among conflicting factors contained in the record of the proceeding, and has determined that the appropriate action to be taken is issuance of construction permits for Cherokee, subject to the conditions for the protection of the environment set forth in the Partial Initial Decision, as modified by the Amendment of Partial Initial Decision and the Supplemental Partial Initial Decision.

ORDER

73. Based upon the Board's findings and conclusions, and pursuant to the Atomic Energy Act of 1954, as amended, and the Commission's regulations, IT IS ORDERED that the Director of the Division of Nuclear Reactor Regulation is authorized to issue to the Duke Power Company permits to construct Cherokee Nuclear Station, Units 1, 2 and 3, consistent with the terms of this Initial Decision.

IT IS FURTHER ORDERED, in accordance with 10 CFR §2.760, §2.762, §2.764, §2.785 and §2.786 that this Initial Decision shall become effective immediately and shall constitute with respect to the matters covered therein the final action of the Commission forty-five (45) days after the date of issuance hereof, subject to any review pursuant to the Commission's Rules of Practice. Exceptions to this Initial Decision may be filed by any party within seven (7) days after service of this Initial Decision. Within fifteen (15) days thereafter [twenty (20) days in the case of the Staff] any party filing such exceptions shall file a brief in support thereof. Within fifteen (15) days of the filing of the brief of the appellant [twenty (20) days in the case of the Staff], any other party may file a brief in support of, or in opposition to, the exceptions.

Drs. de Sylva and Jordan have authorized Mr. Coufal to sign this Decision on behalf of the Board.

**FOR THE ATOMIC SAFETY AND
LICENSING BOARD**

Frederic J. Coufal, Chairman

Issued at Bethesda, Maryland,
this 30th day of December 1977.



CASE NAME INDEX

ATLANTIC RESEARCH CORPORATION
Byproduct Material License, Compliance; Order Affirming Imposition of Civil Penalties; Docket: BML 45-02808-04; ALJ-77-002 (6 NRC 702 (1977))

BOSTON EDISON COMPANY
Construction Permit; Partial Initial Decision; Dockets: 50471;50472; LBP-77-066 (6 NRC 839 (1977))

CLEVELAND ELECTRIC ILLUMINATING COMPANY, et al.
Antitrust; Memorandum and Order; Dockets: 50346A;50500A;50501A/50440A;50441A; ALAB-430 (6 NRC 457 (1977))
Construction Permit; Decision; Dockets: 50440;50441; ALAB-443 (6 NRC 741 (1977))
Construction Permit; Decision; Dockets: 50440;50441; ALAB-449 (6 NRC 884 (1977))

CONSOLIDATED EDISON COMPANY OF NEW YORK
Construction Permit; Order; Docket: 50247; LBP-77-063 (6 NRC 799 (1977))

CONSOLIDATED EDISON COMPANY OF NEW YORK; POWER AUTHORITY OF THE STATE OF NEW YORK
Operating License; Decision; Dockets: 50003;50247;50286; ALAB-436 (6 NRC 547 (1977))

CONSUMERS POWER COMPANY
Antitrust; Decision; Dockets: 50329A;50330A; ALAB-452 (6 NRC 892 (1977))
Construction Permit; Memorandum and Order; Dockets: 50329;50330; ALAB-438 (6 NRC 638 (1977))
Construction Permit, Compliance; Memorandum; Dockets: 50329;50330; ALAB-450 (6 NRC 887 (1977))
Construction Permit; Order; Dockets: 50329;50330; LBP-77-057 (6 NRC 482 (1977))

DUKE POWER COMPANY
Construction Permit; Decision; Dockets: STN 50488;STN 50489;STN 50490; ALAB-431 (6 NRC 460 (1977))
Construction Permit; Decision; Dockets: STN 50491;STN 50492;STN 50493; ALAB-440 (6 NRC 642 (1977))
Construction Permit; Memorandum and Order; Dockets: STN 50488;STN 50489;STN 50490; ALAB-433 (6 NRC 469 (1977))
Construction Permit; Partial Initial Decision, Supplemental; Dockets: STN 50491;STN 50492;STN 50493; LBP-77-047 (6 NRC 191 (1977))
Construction Permit; Partial Initial Decision; Dockets: STN 50491;STN 50492;STN 50493; LBP-77-074 (6 NRC 1314 (1977))
Licensing-(uranium fuel cycle effects); Memorandum and Order; Dockets: 50272; 50311/50277;50278/50289;50320/50334;50412/50352;50353/50354;50355/50387; 50388/50413;50414/50424;50425/STN 50483;STN 50486/STN 50518;STN 50519;STN 50520;STN 50521; ALAB-426 (6 NRC 206 (1977))

DUQUESNE LIGHT COMPANY, et al.
Licensing-(uranium fuel cycle effects); Memorandum and Order; Dockets: 50272; 50311/50277;50278/50289;50320/50334;50412/50352;50353/50354;50355/50387; 50388/50413;50414/50424;50425/STN 50483;STN 50486/STN 50518;STN 50519;STN 50520;STN 50521; ALAB-426 (6 NRC 206 (1977))

EXXON NUCLEAR COMPANY, INC.
Special Nuclear Materials, Export Licenses; Memorandum and Order; Dockets: 702566;702568;702608;702647;702657;702667;702674;702675;702614; CLI-77-031 (6 NRC 849 (1977))

EXXON NUCLEAR COMPANY, INC.

CASE NAME INDEX

CASE NAME INDEX

Construction Permit; Decision; Docket 50564; ALAB-447 (6 NRC 873 (1977))
Construction Permit; Memorandum and Order; Docket 50564; ALAB-425 (6 NRC 199 (1977))
Construction Permit; Order; 50564; LBP-77-059 (6 NRC 518 (1977))
Special Nuclear Materials, Export Licenses; Memorandum and Order; Dockets 702614/702561;702566;702568;702647;702657;702667;702674;702675;702608; CLI-77-024 (6 NRC 525 (1977))
FLORIDA POWER AND LIGHT COMPANY
Antitrust; Order; Dockets 50335A;50389A;50250A;50251A; CLI-77-030 (6 NRC 847 (1977))
Construction Permit; Decision; Docket 50389A; ALAB-420 (6 NRC 8 (1977))
Construction Permit; Decision; Docket 50389; ALAB-435 (6 NRC 541 (1978))
Licensing, Compliance; Order; Docket 50389; CLI-77-028 (6 NRC 717 (1977))
Operating License, Antitrust Review; Decision; Dockets 50335A/50250A/50251A; ALAB-428 (6 NRC 221 (1977))
Operating License, Antitrust Review; Decision; Dockets 50335A/50250A/50251A; ALAB-428 (6 NRC 221 (1977))
Operating License, Compliance; Order; Dockets 50335A/50250A;50251A; CLI-77-026 (6 NRC 538 (1977))
GEORGIA POWER COMPANY
Licensing-(uranium fuel cycle effects); Memorandum and Order; Dockets 50272; 50311/50277;50278/50289;50320/50334;50412/50352;50353/50354;50355/50387; 50388/50413;50414/50424;50425/STN 50483;STN 50486/STN 50518;STN 50519;STN 50520;STN 50521; ALAB-426 (6 NRC 206 (1977))
GULF STATES UTILITIES COMPANY
Construction Permit; Decision; Dockets 50458;50459; ALAB-444 (6 NRC 760 (1977))
JERSEY CENTRAL POWER AND LIGHT COMPANY
Operating License; Memorandum and Order; 50219; LBP-77-058 (6 NRC 500 (1977))
KANSAS GAS AND ELECTRIC COMPANY;KANSAS CITY POWER AND LIGHT COMPANY
Construction Permit; Memorandum and Order; Docket STN 50482; ALAB-424 (6 NRC 122 (1977))
LONG ISLAND LIGHTING COMPANY
Operating License; Memorandum and Order; Docket 50322; LBP-77-050 (6 NRC 261 (1977))
METROPOLITAN EDISON COMPANY, et al.
Licensing-(uranium fuel cycle effects); Memorandum and Order; Dockets 50272; 50311/50277;50278/50289;50320/50334;50412/50352;50353/50354;50355/50387; 50388/50413;50414/50424;50425/STN 50483;STN 50486/STN 50518;STN 50519;STN 50520;STN 50521; ALAB-426 (6 NRC 206 (1977))
METROPOLITAN EDISON COMPANY;JERSEY CENTRAL POWER AND LIGHT COMPANY;PENNSYLVANIA ELECTRIC COMPANY
Operating License; Initial Decision; Docket 50320; LBP-77-070 (6 NRC 1185 (1977))
MIXED FUEL OXIDE
Rulemaking; Order; Dockets RM 505/50201/50332;701327;701821/701432/50201; CLI-77-033 (6 NRC 861 (1977))
NORTHERN STATES POWER COMPANY
Operating License, Amendments; Dockets 50282;50306; LBP-77-042 (6 NRC 131 (1977))
Operating License; Initial Decision; Dockets 50282;50306; LBP-77-051 (6 NRC 265 (1977))
Operating License; Memorandum and Order; Dockets 50282;50306; ALAB-419 (6 NRC 3 (1977))
Operating License; Memorandum; Dockets 50282;50306; ALAB-427 (6 NRC 212 (1977))
Operating License (Spent Fuel Pool Modification); Order; Dockets 50282;50306; LBP-77-055 (6 NRC 473 (1977))
NORTHERN STATES POWER COMPANY (MINNESOTA);NORTHERN STATES POWER COMPANY(WISCONSIN), et al.
Construction Permit; Initial Decision; Docket 50484; LBP-77-071 (6 NRC 1232 (1977))
OFFSHORE POWER SYSTEMS
Manufacturing License; Memorandum and Order; Docket STN 50437; LBP-77-048 (6 NRC 249 (1977))

CASE NAME INDEX

PACIFIC GAS AND ELECTRIC COMPANY
Construction Permit, Antitrust; Order; Docket 50564A; LBP-77-045 (6 NRC 159 (1977))
Operating License; Order; Dockets 50275 OL;50323 OL; CLI-77-023 (6 NRC 455 (1977))

PENNSYLVANIA POWER AND LIGHT COMPANY
Licensing-(uranium fuel cycle effects); Memorandum and Order; Dockets 50272; 50311/50277;50278/50289;50320/50334;50412/50352;50353/50354;50355/50387; 50388/50413;50414/50424;50425/STN 50483;STN 50486/STN 50518;STN 50519;STN 50520;STN 50521; ALAB-426 (6 NRC 206 (1977))

PHILADELPHIA ELECTRIC COMPANY
Construction Permit, Operating License; Initial Decision-Remanded cost-benefit analysis issues; Dockets 50277;50278; LBP-77-062 (6 NRC 680 (1977))
Licensing-(uranium fuel cycle effects); Memorandum and Order; Dockets 50272; 50311/50277;50278/50289;50320/50334;50412/50352;50353/50354;50355/50387; 50388/50413;50414/50424;50425/STN 50483;STN 50486/STN 50518;STN 50519;STN 50520;STN 50521; ALAB-426 (6 NRC 206 (1977))
Licensing-(uranium fuel cycle effects); Memorandum and Order; Dockets 50272; 50311/50277;50278/50289;50320/50334;50412/50352;50353/50354;50355/50387; 50388/50413;50414/50424;50425/STN 50483;STN 50486/STN 50518;STN 50519;STN 50520;STN 50521; ALAB-426 (6 NRC 206 (1977))

PHILADELPHIA ELECTRIC COMPANY;PUBLIC SERVICE ELECTRIC AND GAS COMPANY;DELMARVA POWER AND LIGHT COMPANY;ATLANTIC CITY ELECTRIC COMPANY
Operating License; Decision; Dockets 50277;50278; ALAB-448 (6 NRC 882 (1977))

PITTSBURGH-DES MOINES STEEL COMPANY
Byproduct Material License, Compliance; Order Affirming Imposition of Civil Penalties; BML 37-02607-02; ALJ-77-001 (6 NRC 693 (1977))
Special Nuclear Materials License; Memorandum and Order; Docket BML-37-02607-02; ALAB-441 (6 NRC 725 (1977))

PORTLAND GENERAL ELECTRIC COMPANY
Operating License, Amendments (Spent Fuel Pool Modification); Memorandum and Order; Docket 50344; LBP-77-069 (6 NRC 1179 (1977))

PORTLAND GENERAL ELECTRIC COMPANY, et al.
Operating License; Memorandum and Order; Docket 50344; ALAB-451 (6 NRC 889 (1977))

POWER AUTHORITY OF THE STATE OF NEW YORK
Construction Permit; Memorandum and Order; Docket 50549; ALAB-434 (6 NRC 471 (1977))
Construction Permit; Memorandum and Order; Docket 50549; ALAB-439 (6 NRC 640 (1977))

PUBLIC SERVICE COMPANY OF INDIANA
Construction Permit; Memorandum and Order; Dockets STN 50546;STN 50547; ALAB-437 (6 NRC 630 (1977))
Construction Permit; Partial Initial Decision, LWA; Dockets STN 50546;STN 50547; LBP-77-052 (6 NRC 294 (1977))
Construction Permit; Partial Initial Decision, LWA-2; Dockets STN 50546;STN 50547; LBP-77-067 (6 NRC 1101 (1977))

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE;UNITED ILLUMINATING COMPANY
Construction Permit; Decision; Dockets 50443;50444; ALAB-422 (6 NRC 33 (1977))
Construction Permit; Initial Decision, Supplemental; Dockets 50443;50444; LBP-77-043 (6 NRC 134 (1977))
Construction Permit; Initial Decision, Supplemental; Dockets 50443;50444; LBP-77-065 (6 NRC 816 (1977))
Construction Permit; Memorandum and Order; Dockets 50443;50444; ALAB-423 (6 NRC 115 (1977))
Construction Permit; Memorandum and Order; Dockets 50443;50444; ALAB-442 (6 NRC 728 (1977))
Construction Permit; Order; Dockets 50443;50444; CLI-77-022 (6 NRC 451 (1977))
Construction Permit; Order; Dockets 50443;50444; CLI-77-025 (6 NRC 535 (1977))
Construction Permit; Order; Dockets 50443;50444; CLI-77-027 (6 NRC 715 (1977))

CASE NAME INDEX

Uranium-Fuel-Cycle-Rule Effects; Memorandum and Order; Dockets 50271/50443; 50444; ALAB-421 (6 NRC 25 (1977))

PUBLIC SERVICE COMPANY OF OKLAHOMA; ASSOCIATED ELECTRIC COOPERATIVE, INC.; WESTERN FARMERS ELECTRIC COOPERATIVE, INC.
Construction Permit; Order; Dockets STN 50556; STN 50557; LBP-77-046 (6 NRC 167 (1977))

PUBLIC SERVICE ELECTRIC AND GAS COMPANY
Licensing-(uranium fuel cycle effects); Memorandum and Order; Dockets 50272; 50311/50277; 50278/50289; 50320/50334; 50412/50352; 50353/50354; 50355/50387; 50388/50413; 50414/50424; 50425/STN 50483; STN 50486/STN 50518; STN 50519; STN 50520; STN 50521; ALAB-426 (6 NRC 206 (1977))

PUBLIC SERVICE ELECTRIC AND GAS COMPANY; ATLANTIC CITY ELECTRIC COMPANY
Construction Permit; Compliance; Order; Dockets 50354; 50355; LBP-77-073 (6 NRC 1310 (1977))

PUBLIC SERVICE ELECTRIC AND GAS COMPANY; ATLANTIC CITY ELECTRIC COMPANY
Construction Permit; Decision; Dockets 50354; 50355; ALAB-429 (6 NRC 229 (1977))

Licensing-(uranium fuel cycle effects); Memorandum and Order; Dockets 50272; 50311/50277; 50278/50289; 50320/50334; 50412/50352; 50353/50354; 50355/50387; 50388/50413; 50414/50424; 50425/STN 50483; STN 50486/STN 50518; STN 50519; STN 50520; STN 50521; ALAB-426 (6 NRC 206 (1977))

FUGET SOUND POWER AND LIGHT COMPANY, et al.
Construction Permit; Order; Dockets STN 50522; STN 50523; LBP-77-061 (6 NRC 674 (1977))

Construction Permit (Pre-LWA Authority); Order Following Remand; Dockets STN 50522; STN 50523; LBP-77-072 (6 NRC 1308 (1977))

FUGET SOUND POWER AND LIGHT COMPANY; PACIFIC POWER AND LIGHT COMPANY; PORTLAND GENERAL ELECTRIC COMPANY
Construction Permit; Decision; Dockets STN 50522; STN 50523; ALAB-446 (6 NRC 870 (1977))

Construction Permit; Order; Dockets STN 50522; STN 50523; LBP-77-056 (6 NRC 478 (1977))

FUGET SOUND POWER AND LIGHT COMPANY; PORTLAND GENERAL ELECTRIC COMPANY; PACIFIC POWER AND LIGHT COMPANY; WASHINGTON WATER POWER COMPANY
Construction Permit; Initial Decision, Pre-LWA Authority for Road Construction; Dockets STN 50522; STN 50523; LBP-77-044 (6 NRC 141 (1977))

ROCHESTER GAS AND ELECTRIC CORPORATION
Construction Permit; Initial Decision; Docket 50485; LBP-77-053 (6 NRC 350 (1977))

SOUTHERN CALIFORNIA EDISON COMPANY; SAN DIEGO GAS AND ELECTRIC COMPANY
Construction Permit; Decision; Dockets 50361; 50362; ALAB-432 (6 NRC 465 (1977))

TENNESSEE VALLEY AUTHORITY
Construction Permit; Memorandum and Order; Dockets STN 50518; STN 50519; STN 50520; STN 50521; ALAB-418 (6 NRC 1 (1977))

Construction Permit; Memorandum and Order; Dockets STN 50566; STN 50567; ALAB-445 (6 NRC 865 (1977))

Construction Permit; Partial Initial Decision-Nepa and site suitability; Dockets 50553; 50554; LBP-77-050 (6 NRC 647 (1977))

Licensing-(uranium fuel cycle effects); Memorandum and Order; Dockets 50272; 50311/50277; 50278/50289; 50320/50334; 50412/50352; 50353/50354; 50355/50387; 50388/50413; 50414/50424; 50425/STN 50483; STN 50486/STN 50518; STN 50519; STN 50520; STN 50521; ALAB-426 (6 NRC 206 (1977))

TOLEDO EDISON COMPANY; CLEVELAND ELECTRIC ILLUMINATING COMPANY
Antitrust; Memorandum and Order; Dockets 50346A; 50500A; 50501A/50440A; 50441A; ALAB-430 (6 NRC 457 (1977))

TRANSNUCLEAR, INC.
Special Nuclear Materials, Export Licenses; Memorandum and Order; Dockets 702614/702561; 702566; 702568; 702647; 702657; 702667; 702674; 702675; 702608; CLI-77-024 (6 NRC 525 (1977))

Special Nuclear Materials, Export Licenses; Memorandum and Order; Dockets 702566; 702568; 702608; 702647; 702657; 702667; 702674; 702675/702614; CLI-77-031 (6 NRC 849 (1977))

Special Nuclear Materials, Export Licenses; Memorandum and Order; Dockets 702421; 702600; 702694; CLI-77-032 (6 NRC 854 (1977))

TRANSNUCLEAR, INC. (WURGASSEN)

CASE NAME INDEX

Special Nuclear Materials Export License; Memorandum and Order; Docket
70-2561; CLI-77-029 (6 NRC 719 (1977))

UNION ELECTRIC COMPANY
Licensing-(uranium fuel cycle effects); Memorandum and Order; Dockets 50272;
50311/50277;50278/50289;50320/50334;50412/50352;50353/50354;50355/50387;
50388/50413;50414/50424;50425/STN 50483;STN 50486/STN 50518;STN 50519;STN
50520;STN 50521; ALAB-426 (6 NRC 206 (1977))

VERMONT YANKEE NUCLEAR POWER CORPORATION
Operating License; Initial Decision; Docket 50271; LBP-77-054 (6 NRC 436
(1977))
Uranium-Fuel-Cycle-Rule Effects; Memorandum and Order; Dockets 50271/50443;
50444; ALAB-421 (6 NRC 25 (1977))

VIRGINIA ELECTRIC AND POWER COMPANY
Operating License; Initial Decision; Dockets 50338 OL;50339 OL; LBP-77-064
(6 NRC 808 (1977))
Operating License; Initial Decision; Dockets 50338 OL;50339 OL; LBP-77-068
(6 NRC 1127 (1977))

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
Construction Permit; Memorandum and Order; Dockets STN 50508;STN 50509;
LBP-77-049 (6 NRC 257 (1977))

LEGAL CITATIONS INDEX

CASES

- A.G. Spelding and Bros., Inc. v. F.T.C., 301 F.2d 525 (3rd Cir. 1962)
relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- Acme Precision Products, Inc. v. American Alleys Corp., 484 F.2d 1237, 1241
(8th Cir. 1973)
antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC
892, 918 (1977))
- Adickes v. Kress and Co., 398 U.S. 144, 157 (1970)
burden of proof for summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))
weight of counsel arguments as evidence; ALAB-420, E, (6 NRC 8, 14 (1977))
- Aeschliman v. N.R.C., 547 F.2d 622 (D.C. Cir. 1976)
intervention standing, contentions adequacy; LBP-77-048, B, (6 NRC 249, 250
(1977))
Midland construction permit continuance pending court-ordered remand;
LBP-77-057, A, (6 NRC 482 (1977))
- Aeschliman v. N.R.C., 547 F.2d 622 (D.C. Cir. 1976), cert. granted sub nom.
Consumers Power Co. v. Aeschliman, 429 U.S. 1090 (1977)
contention requirements for generic safety issues; ALAB-444, F, (6 NRC 760,
761, 771-74 (1977))
Entire ASLAB Panel recusal involving attorney misconduct charges; ALAB-450,
(6 NRC 887 (1977))
- Aeschliman v. N.R.C., 547 F.2d 622 (D.C. Cir. 1976), cert. granted sub nom.,
Consumers Power Co. v. Aeschliman, 45 U.S.L.W. 3570 (February 22, 1977)
NEPA evaluation of alternatives, energy conservation; ALAB-422, U, (6 NRC
33, 100 (1977))
- Alabama Power Co. (Farley 1 and 2), ALAB-182, 7 AEC 210, 217 (1974)
evidentiary status of affidavits; ALAB-443, H, (6 NRC 741, 752 (1977))
rules of practice for summary disposition; LBP-77-045, B, (6 NRC 159, 162
(1977))
- Alabama Power Co. (Farley 1 and 2), LBP-77-024, 5 NRC 804, 885 (1977)(appeal
pending)
relevant wholesale markets for antitrust; ALAB-452, H, (6 NRC 892, 994
(1977))
- Alabama Power Co. (Farley 1 and 2), LBP-77-024, 5 NRC 804, 890 (1977)
vertical integration in relevant market determination; ALAB-452, H, (6 NRC
892, 994 (1977))
- Alabama Power Co. (Farley 1 and 2), LBP-77-024, 5 NRC 804, 890 (1977)(appeal
pending)
antitrust relevant market principle; ALAB-452, E, (6 NRC 892, 921 (1977))
- Alabama Power Co. (Farley 1 and 2), LBP-77-024, 5 NRC 804, 899 (1977)(appeal
pending)
monopoly power considerations; ALAB-452, J, (6 NRC 892, 1012 (1977))
- Alabama Power Co. (Farley 1 and 2), LBP-77-041, 5 NRC 1482, 1491 (1977)(appeal
pending)
antitrust standards for coordination; ALAB-452, P, (6 NRC 892, 1046 (1977))
- Alabama Power Co. v. Ickes, 302 U.S. 464, 58 S.Ct. 300, 82 L.Ed. 374 (1938)
relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- Alexandria v. F.P.C., 555 F.2d 1020 (D.C. Cir. 1977)
monopoly power considerations; ALAB-452, J, (6 NRC 892, 1012 (1977))
- Allied-General Nuclear Services (Barnwell), ALAB-296, 2 NRC 671, 680 (1975)
stay pending appeal denied for Marble Hill construction permit; ALAB-437, A,
(6 NRC 630 (1977))
- Allison v. U.S., 301 F.2d 670, 673, cert. denied, 371 U.S. 901 (1962)

LEGAL CITATIONS INDEX

LEGAL CITATIONS INDEX

CASES

- weight accorded Agency interpretation of statutes; LBP-77-069, F, (6 NRC 1179, 1183 (1977))
- Almeda Mall, Inc. v. Houston Lighting and Power Co., -F.Supp.-, Trade Reg. Rep. par. 61,485 at p.71,880 (S.D. Tex. 1977)
- antitrust review standards, applicant's conduct; ALAB-452, B, (6 NRC 892, 913 (1977))
- American Federation of Tobacco Growers v. Neal, 183 F.2d 869, 872 (4th Cir. 1950)
- monopoly power finding; ALAB-452, J, (6 NRC 892, 1012 (1977))
- American Manufacturers Mutual v. American Broadcasting-Paramount Theaters, 388 F.2d 272, 280 (2nd Cir. 1967)
- rules of practice for summary disposition; LBP-77-045, E, (6 NRC 159, 162 (1977))
- American Tobacco Co. v. U.S., 328 U.S. 781, 809 (1946)
- antitrust immunity for electric utilities; ALAB-452, C, (6 NRC 892, 915 (1977))
- American Tobacco Co. v. U.S., 328 U.S. 781, 812 (1946)
- antitrust review standards, applicant's conduct; ALAB-452, B, (6 NRC 892, 913 (1977))
- Appalachian Coals, Inc. v. U.S., 288 U.S. 344, 372 (1933)
- antitrust, acquisition of other utilities; ALAB-452, N, (6 NRC 892, 1031 (1977))
- Appalachian Power Co. v. Train, 545 F.2d 1351 (4th Cir. 1976)
- untimely intervention denial affirmed for Perkins; ALAB-431, A, (6 NRC 460 (1977))
- Arkansas Power and Light Co. (Arkansas Nuclear 2), ALAB-94, 6 AEC 25, 32 (1973)
- ACRS role in reactor licensing; ALAB-444, C, (6 NRC 760, 766 n. 8 (1977))
- Associated Press v. U.S., 326 U.S. 1 (1945)
- antitrust standards for coordination; ALAB-452, P, (6 NRC 892, 1046 (1977))
- Avnet, Inc., 82 FTC 391, 541, affirmed
- vertical integration in relevant market determination; ALAB-452, H, (6 NRC 892, 994 (1977))
- Babcock and Wilcox, CLI-77-018, 5 NRC 1332 (1977)
- export license granted without public hearings; CLI-77-029, A, (6 NRC 719 (1977))
- Eader v. Balfour, 440 F.2d 469 (7th Cir., March 22, 1971)
- antitrust regulations and jurisdiction; ALAB-452, F, (6 NRC 892, 924 (1977))
- Eargans Farm Dairy Co. v. Sanitary Milk Producers, 241 F.Supp. 476, 478 (E.D. Mo. 1965), affirmed, 368 F.2d 679 (8th Cir. 1966)
- relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- EPI v. A.E.C., 502 F.2d 424, 429 (D.C. Cir. 1974)
- intervention standing, contentions adequacy; LBP-77-048, B, (6 NRC 249, 250 (1977))
- rules of practice for state intervention; ALAB-444, D, (6 NRC 760, 768 (1977))
- Braniff Airways v. C.A.B., 379 F.2d 453 (1967)
- rules of practice for pre-LWA activity; LBP-77-044, E, (6 NRC 141, 145 (1977))
- Ereyer and McAvoy, The Federal Power Commission and the Coordination Problem in the Electrical Power Industry, 46 S. Cal. L. Rev. 661, 682 (1973)
- monopoly power finding; ALAB-452, I, (6 NRC 892, 997 (1977))
- British Oxygen Co., 3 CCH Trade Reg. Rep. par. 21,063 (FTC 1975)
- vertical integration in relevant market determination; ALAB-452, H, (6 NRC 892, 994 (1977))
- Brown Shoe Co. v. U.S. 370 U.S. 294, 325, 82 S.Ct. 1502, 8 L.Ed.2d 510 (1962)
- vertical integration in relevant market determination; ALAB-452, H, (6 NRC 892, 994 (1977))
- Erunswick Corp. v. Pueblo Bowl-O-Mat, Inc., 429 U.S. 477 (1971)
- antitrust, refusal to wheel; ALAB-452, O, (6 NRC 852, 1036 (1977))
- Eurlington Trucklines v. U.S., 371 U.S. 156 (1962)
- rules of practice for pre-LWA activity; LBP-77-044, B, (6 NRC 141, 145 (1977))
- Bushie v. Stanocord Corp., 460 F.2d 116, 120 (5th Cir. 1972)
- antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
- Cal Distributing Co. v. Bay Distributors, Inc., 337 F.Supp. 1154, 1157 (M.D. Fla. 1971)

LEGAL CITATIONS INDEX

CASES

- antitrust, refusal to deal; ALAB-452, L, (6 NRC 852, 1025 (1977))
- California v. F.P.C., 369 U.S. 462 (1962)
- nexus considerations in antitrust; ALAB-452, C, (6 NRC 892, 915 (1977))
- California v. F.P.C., 369 U.S. 482, 484 (1962)
- national antitrust policy; ALAB-451, A, (6 NRC 889 (1977))
- California v. F.P.C., 369 U.S. 482, 485 (1962)
- monopoly power finding, coordination; ALAB-452, I, (6 NRC 892, 997 (1977))
- Calvert Cliffs Coordinating Committee v. A.E.C., 449 F.2d 1109 (1972)
- NEPA review scope for spent fuel pool modification; LBP-77-051, B, (6 NRC 265, 267 (1977))
- Cantor v. Detroit Edison Co., 428 U.S. 579 (1976)
- antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 518 (1977))
- Cantor v. Detroit Edison Co., 428 U.S. 579, 596 (1977)
- monopoly power finding, coordination; ALAB-452, I, (6 NRC 892, 997 (1977))
- Cantor v. Detroit Edison Co., 428 U.S. 579, 596 n. 3E (1976)
- national antitrust policy; ALAB-451, A, (6 NRC 889 (1977))
- Carlson v. Coca-Cola Co., 483 F.2d 279 (9th Cir. 1973)
- untimely antitrust intervention affirmed for St. Lucie 2; ALAB-420, A, (6 NRC 8 (1977))
- Carnation Co. v. Pacific Westbound Conference, 383 U.S. 213, 218 (1966)
- national antitrust policy; ALAB-451, A, (6 NRC 889 (1977))
- Case-Swayne Co. v. Sunkist Growers, Inc., 369 F.2d 445, 457 (9th Cir. 1966), reversed on other grounds, 385 U.S. 384 (1967)
- relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- Case Student Adv. v. National Ed. Adv. Service, 407 F.Supp. 520, 522 (N.D. Ill.), affirmed, 537 F.2d 282 (7th Cir. 1976)
- intent to monopolize; ALAB-452, E, (6 NRC 892, 921 (1977))
- Case Student Adv., Inc. v. National Adv. Serv. Inc., 516 F.2d 1092 (7th Cir. 1975)
- antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 518 (1977))
- Cement Mfg. Assn. v. U.S., 268 U.S. 588 (1925)
- intent to monopolize; ALAB-452, E, (6 NRC 892, 921 (1977))
- Chisholm Eros. Farm Equipment Co. v. International Harvester Co., 498 F.2d 1137, 1144 (9th Cir. 1974), cert. denied, 419 U.S. 1023 (1974)
- antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
- Cities of Statesville v. A.E.C., 441 F.2d 962 (D.C. Cir. 1969)
- national antitrust policy; ALAB-451, A, (6 NRC 889 (1977))
- NRC antitrust jurisdiction; ALAB-428, C, (6 NRC 221, 224 (1977))
- City of Detroit v. Detroit United Railway, 172 Mich. 136, 137 N.W. 645 (1936)
- antitrust regulations and jurisdiction; ALAB-452, F, (6 NRC 892, 924 (1977))
- City of Lansing v. Michigan Power Co., 183 Mich. 400, 150 N.W. 250 (1914)
- antitrust regulations and jurisdiction; ALAB-452, F, (6 NRC 892, 924 (1977))
- City of Mishawaka v. Indiana and Michigan Electric Co., 560 F.2d 1314 (7th Cir. 1977)
- monopoly power considerations; ALAB-452, J, (6 NRC 892, 1012 (1977))
- City of Mishawaka v. Indiana and Michigan Electric Co., 560 F.2d 1314, 1321 (7th Cir. 1977)
- national antitrust policy; ALAB-451, A, (6 NRC 889 (1977))
- City of Paris, Kentucky v. Kentucky Utilities Co., 41 F.P.C. 45 (1969)
- monopoly power finding; ALAB-452, I, (6 NRC 892, 997 (1977))
- Coalition for Safe Nuclear Power v. A.E.C., 463 F.2d 954, 956 (D.C. Cir. 1972)
- interlocutory stay denied for Seabrook site review; CLI-77-027, A, (6 NRC 715 (1977))
- rules of practice for stay pending appeal; CLI-77-027, B, (6 NRC 715 (1977))
- Cole v. Hughes Tool Co., 215 F.2d 524 (1954), cert. denied, 348 U.S. 927 (1955)
- monopoly power finding; ALAB-452, J, (6 NRC 892, 1012 (1977))
- Commonwealth Edison Co. (Zion 1 and 2), ALAB-116, 6 AEC 258 (1973)
- ASL referral of discovery order declined; ALAB-438, (6 NRC 638 (1977))
- Commonwealth Edison Co. (Zion 1 and 2), ALAB-196, 7 AEC 457, 469 (1974)
- rules of practice for proprietary data review; ALAB-435, C, (6 NRC 541, 545 (1977))
- Commonwealth Edison Co. (Zion Station 1 and 2), ALAB-226, 8 AEC 381, 382-83 (1974)
- wavier of unbriefed exceptions, rules of practice; ALAB-443, B, (6 NRC 741,

LEGAL CITATIONS INDEX

CASES

- 744 n. 8 (1977))
Commonwealth Edison Co. (Zion Station), ALAB-226, 8 AEC 381, 406 (1974)
intervention standing, contentions adequacy; LBP-77-048, B, (6 NRC 249, 250 (1977))
Concerned Citizens of Rhode Island v. N.R.C., 430 F.Supp. 627 (1977)
standing for intervention; LBP-77-059, A, (6 NRC 518 (1977))
Consolidated Edison Co. of New York (Indian Point 2), ALAB-186, 7 AEC 245, 246 (1974)
appellate practice for certification issues; ALAB-421, B, (6 NRC 25, 27 (1977))
Consolidated Edison Co. of New York (Indian Point 2), ALAB-399, 5 NRC 1156 (1977)
federal preemption for state zoning approval; LBP-77-063, (6 NRC 799 (1977))
Consolidated Edison Co. of New York (Indian Point 2), CLI-74-023, 7 AEC 947 (1974)
disclosure of physical security plans for nuclear facilities; CLI-77-023, A, (6 NRC 455 (1977))
Consumers Power Co. (Midland 1 and 2), ALAB-123, 6 AEC 331, 335 (1973)
ASLB role in safety review; ALAB-444, H, (6 NRC 760, 766, 774 (1977))
Consumers Power Co. (Midland 1 and 2), ALAB-123, 6 AEC 331, 349 (1973),
reversed on other grounds sub nom Aeschliman v. N.R.C., 547 F.2d 622 (D.C. Cir. 1976)
safety findings for unresolved generic issues; ALAB-444, G, (6 NRC 760, 784 (1977))
Consumers Power Co. (Midland 1 and 2), ALAB-283, 2 NRC 11, 17 (1975)
burden of proof for summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))
Consumers Power Co. (Midland 1 and 2), ALAB-315, 3 NRC 101 (1976)
burden of proof for summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))
Cooper, Attempts and Monopolization: A Mildly Expansionary Answer to the Prophylactic Riddle of Section Two, 72 Mich. L. Rev. 375, 392 (1974)
antitrust, refusal to deal; ALAB-452, L, (6 NRC 852, 1025 (1977))
Credit Bureau Reports, Inc. v. Retail Credit Co., 358 F.Supp. 780, 789 (S.D. Tex. 1971), affirmed, 476 F.2d 589 (5th Cir. 1973)
relevant market for antitrust; ALAB-452, G, (6 NRC 892, 545 (1977))
Dahl, Inc. v. Roy Cooper Co., 448 F.2d 17 (9th Cir. 1971)
antitrust, refusal to wheel; ALAB-452, D, (6 NRC 852, 1036 (1977))
Dahl, Inc. v. Roy Cooper Co., 448 F.2d 17, 19 (9th Cir. 1971)
antitrust, acquisition of other utilities; ALAB-452, N, (6 NRC 892, 1031 (1977))
Daiflon, Inc. v. Allied Chemical Corp., 534 F.2d 221, 226 (10th Cir. 1976)
weight of counsel arguments as evidence; ALAB-420, E, (6 NRC 8, 14 (1977))
Daily Press v. United Press International, 412 F.2d 126 (6th Cir. 1969)
antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
Davis v. Morton, 469 F.2d 593 (1972)
NEPA review scope for spent fuel pool modification; LBP-77-051, B, (6 NRC 265, 267 (1977))
Denver and Rio Grande W. RR. Co. v. U.S., 387 U.S. 485 (1967)
national antitrust policy; ALAB-451, A, (6 NRC 885 (1977))
Denver Petroleum Corp. v. Shell Oil Co., 306 F.2d 289, 304 (D. Col. 1969)
monopoly power finding; ALAB-452, I, (6 NRC 892, 997 (1977))
Denver Petroleum Corp. v. Shell Oil Co., 306 F.Supp. 289, 304 (D. Colo. 1969)
relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
Department of Water and Power of the City of Los Angeles (Malibu 1), CLI-67-002, 3 AEC 175 (1967)
ASLB role in safety review; ALAB-444, H, (6 NRC 760, 766, 774 (1977))
Detroit Edison Co. (Greenwood), ALAB-247, 8 AEC 936 (1974)
NRC jurisdiction over offsite transmission lines; ALAB-422, C, (6 NRC 33, 82 (1977))
Douglas v. Beneficial Finance Co., 324 F.Supp. 1166, 1169 (D. Alaska 1971)
burden of proof for summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))
Duke Power Co. (Catauba 1 and 2), ALAB-355, 4 NRC 357, 403 (1976)
role of ASLAB; ALAB-452, K, (6 NRC 892, 1022 (1977))
Duke Power Co. (Catauba 1 and 2), ALAB-355, 4 NRC 357, 410 (1976)
reopening of proceedings, need for power; ALAB-443, E, (6 NRC 741, 748 (1977))
Duke Power Co. (Catauba 1 and 2), ALAB-355, 4 NRC 397, 413-14 (1976)

LEGAL CITATIONS INDEX

CASES

- waiver of unbriefed exceptions, rules of practice; ALAB-443, B, (6 NRC 741, 744 n. 8 (1977))
- Duke Power Co. (Catawba 1 and 2), ALAB-359, 4 NRC 615, 620 (1976)
reopening of proceedings, need for power; ALAB-443, E, (6 NRC 741, 748 (1977))
- Duke Power Co. (Catawba), ALAB-355, 4 NRC 397, 402 (1976)
scope of ASLAB review of initial decision, resolution of new issues;
ALAB-422, D, (6 NRC 33, 41 (1977))
- Duke Power Co. (Catawba), ALAB-355, 4 NRC 397, 405 (1976)
need-for-power considerations; ALAB-422, R, (6 NRC 33, 90 (1977))
- Duke Power Co. (Catawba), ALAB-355, 4 NRC 397, 417 (1976)
fuel-cycle jurisdiction terminated and construction permit affirmed in
totality; ALAB-426, E, (6 NRC 206, 210 (1977))
- Duke Power Co. (Cherokee 1, 2 and 3), ALAB-440, 6 NRC 642, 645 (1977)
rules of practice for good cause finding in untimely intervention petition;
ALAB-444, K, (6 NRC 760, 756 (1977))
- Duke Power Co. (Perkins 1, 2 and 3), ALAB-431, 6 NRC 460, 462 (1977)
rules of practice for good cause finding in untimely intervention petition;
ALAB-444, K, (6 NRC 760, 756 (1977))
untimely intervention rules of practice; ALAB-440, B, (6 NRC 642 (1977))
- Eastern R.R. Presidents Conference v. Noerr Motor Freight, Inc., 365 U.S. 127 (1961)
antitrust standards for refusal to coordinate; ALAB-452, P, (6 NRC 892, 1046 (1977))
- Eastman Kodak Co. v. Southern Photo Materials Co., 273 U.S. 359 (1927)
antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
- Easton Utilities Commission v. A.E.C., 424 F.2d 847, 852 (1970)
rules of practice for good cause finding in untimely intervention petition;
ALAB-444, K, (6 NRC 760, 756 (1977))
- Edlow International Co., CLI-76-006, 3 NRC 563 (1976)
intervention standing in export licensing; CLI-77-032, A, (6 NRC 854 (1977))
standing for intervention in export licensing matters; CLI-77-024, B, (6 NRC 525 (1977))
- Edlow International Co., CLI-76-006, 3 NRC 563 (1976), sub judice in N.R.D.C. v. N.R.C., 547 F.2d 633 (D.C. Cir. 1976)
NRC jurisdiction over foreign health and safety issues in export licensing;
CLI-77-029, E, (6 NRC 719, 721 (1977))
- Edlow International Co., CLI-76-006, 3 NRC 563, 580 (1976)
NRC authority to hold discretionary export licensing hearings; CLI-77-032, C, (6 NRC 854, 858 (1977))
- Edlow International Co., CLI-76-006, 3 NRC 563, 585 (1976)
export license status under NEPA; CLI-77-032, E, (6 NRC 854, 859 (1977))
- Edlow International Co., CLI-77-020, 5 NRC 1358 (1977)
export license granted without public hearings; CLI-77-029, A, (6 NRC 719 (1977))
NRC jurisdiction over foreign health and safety issues in export licensing;
CLI-77-029, E, (6 NRC 719, 721 (1977))
- Elco Corp. v. Microdot, Inc., 360 F.Supp. 741 (D. Del. 1973)
vertical integration in relevant market determination; ALAB-452, H, (6 NRC 892, 954 (1977))
- Energy Research and Development Administration (Clinch River Breeder), CLI-76-013, 4 NRC 67, 76 (1976)
need-for-power considerations; ALAB-422, R, (6 NRC 33, 90 (1977))
- Environmental Defense Fund v. T.V.A., 468 F.2d 1164, 1184 (6th Cir. 1972)
stay pending appeal denied for Marble Hill construction permit; ALAB-437, A, (6 NRC 630 (1977))
- Environmental Effects of the Uranium Fuel Cycle, Docket RM-503, 41 F.R. 34707 (August 16, 1976)
Midland construction permit continuance pending court-ordered resand;
LBF-77-057, A, (6 NRC 482 (1977))
- F.M.C. v. Seastrain Lines, Inc., 411 U.S. 726, 733 (1973)
national antitrust policy; ALAB-451, A, (6 NRC 885 (1977))
- F.P.C. v. Hope Natural Gas Co., 320 U.S. 591, 603 (1944)
financial qualifications, ability to raise money for potential capital expenditures; LBP-77-068, G, (6 NRC 1127, 1163 (1977))
- F.P.C. v. Southern California Edison Co., 376 U.S. 205 (1964)

LEGAL CITATIONS INDEX

CASES

- antitrust regulations and jurisdiction; ALAB-452, F, (6 NRC 892, 924 (1977))
- Federal Power Commission v. Hope Natural Gas Co., 320 U.S. 591, 603 (1944)
financial qualifications may rely on potential future rate increases;
ALAB-422, D, (6 NRC 22, 77 (1977))
- Florida Power and Light Co. (St. Lucie 2), ALAB-335, 3 NRC 830, 838 (1976)
alternative site review scope for LWA; LBP-77-066, (6 NRC 839 (1977))
- Florida Power and Light Co. (St. Lucie 2), ALAB-404, 5 NRC 1185, 1188 (1977)
stay pending appeal denied for Marble Hill construction permit; ALAB-437, A,
(6 NRC 630 (1977))
- Florida Power and Light Co. (St. Lucie 2), ALAB-415, 5 NRC 1435, 1436 (1977)
reinstatement of Seabrook construction permits; ALAB-423, A, (6 NRC 115
(1977))
- Florida Power and Light Co. (St. Lucie 2), ALAB-435, 6 NRC 541 (1977)
alternative site review scope for LWA; LBP-77-066, (6 NRC 835 (1977))
- Florida Power and Light Co. (St. Lucie 2), LBP-77-027, 5 NRC 1038 (1977)
alternative site review scope for LWA; LBP-77-066, (6 NRC 835 (1977))
- Ford Motor Co. v. U.S., 405 U.S. 562, 92 S.Ct. 1142, 31 L.Ed.2d 492 (1972)
vertical integration in relevant market determination; ALAB-452, H, (6 NRC
892, 594 (1977))
- Fortner Enterprises v. U.S., 394 U.S. 495 (1969)
rules of practice for summary disposition; LBP-77-045, B, (6 NRC 159, 162
(1977))
- Frank Iray, Jr., Inc. v. Occupational Safety and Health Review Commission, 519
F.2d 120C (1975)
NRC authority to impose civil penalties for license violations; ALJ-77-001,
B, (6 NRC 693 (1977))
NRC authority to impose civil penalties for license violations; ALJ-77-002,
B, (6 NRC 702, 707 (1977))
- Frothingham v. Mellon, 262 U.S. 447 (1923)
standing for intervention as taxpayer; LBP-77-056, A, (6 NRC 518 (1977))
- FIC v. Cement Institute, 323 U.S. 683 (1974)
intent to monopolize; ALAB-452, E, (6 NRC 892, 921 (1977))
- Gainesville Utilities v. Florida Power Corp., 40 FPC 1227 (1968), 41 FPC 4
(1969), reversed, 425 F.2d 1196 (5th Cir. 1970), reversed, 402 U.S. 515
(1971)
monopoly power finding; ALAB-452, I, (6 NRC 892, 557 (1977))
- Gainesville Utilities v. Florida Power Corp., 40 FPC 1227 (1968), reversed sub
nom. Florida Power Corp. v. F.P.C., 425 F.2d 1196 (5th Cir. 1970), reversed
and remanded for entry of a judgment enforcing the Commission's order sub
nom. Gainesville Utilities v. Florida Power Corp., 402 U.S. 515 (1971)
antitrust standards for refusal to coordinate; ALAB-452, P, (6 NRC 892, 1046
(1977))
- Gainesville Utilities v. Florida Power Corp., 402 U.S. 515 (1971)
antitrust standards for refusal to coordinate; ALAB-452, P, (6 NRC 892, 1046
(1977))
- Gainesville Utilities v. Florida Power Corp., 402 U.S. 515, 517 (1971)
relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- Genco, Inc. v. Providence Fruit and Produce Building, 194 F.2d 484 (1st Cir.),
cert. denied, 344 U.S. 817 (1952)
antitrust standards for coordination; ALAB-452, P, (6 NRC 892, 1046 (1977))
- Generic Environmental Statement-Mixed Oxide Fuel (GESMO), 40 Fed. Reg. 53056,
November 14, 1975, modified at 40 Fed. Reg. 59497 (December 24, 1975)
construction permit proceedings continuation pending NRC reassessment of
policy statement; ALAB-425, A, (6 NRC 195 (1977))
- Geo. R. Whitten, Jr., Inc. v. Paddock Pool Builders, Inc., 424 F.2d 25, 31 (1st
Cir.), cert. denied, 404 U.S. 850 (1970)
antitrust, acquisition of other utilities; ALAB-452, N, (6 NRC 892, 1031
(1977))
- George C. Frey Ready-Mixed Concrete Co. v. Pine Hill Concrete Mix Corp., No.
75-7658 (2nd Cir. May 6, 1977), Antitrust and Trade Reg. Rep. (BNA) No. 814,
pp A-6,7.
LBP-77-045, B, (6 NRC 155, 162 (1977))
- Georgia Power Co. (Vogtle 1 and 2), ALAB-291, 2 NRC 404, 412-13 (1975)
safety findings for unresolved generic issues; ALAB-444, G, (6 NRC 760, 784
(1977))
- Georgia Power Co. (Vogtle), ALAB-285, 2 NRC 209 (1975)

LEGAL CITATIONS INDEX

CASES

- scope of inquiry for financial qualifications; ALAB-422, P, (6 NRC 33, 79 (1977))
- Georgia Power Co. (Vogtle), ALAB-291, 2 NRC 404, 411 (1975)
- Midland construction permit continuance pending court-ordered rerand; LBF-77-057, A, (6 NRC 482 (1977))
- Georgia Power Co. (Vogtle), ALAB-375, 5 NRC 423, 424 (1977)
- fuel-cycle jurisdiction terminated and construction permit affirmed in totality; ALAB-426, B, (6 NRC 206, 210 (1977))
- Golden Grain Macaroni Co., 78 F.T.C. 157 (1971), affirmed 472 F.2d 882 (9th Cir. 1972), cert. denied, 412 U.S. 918 (1973)
- antitrust regulations and jurisdiction; ALAB-452, F, (6 NRC 892, 924 (1977))
- Golden Macaroni Co. v. F.T.C., 472 F.2d 882 (9th Cir. 1972), cert. denied, 412 U.S. 918 (1973)
- monopoly power finding; ALAB-452, J, (6 NRC 892, 1012 (1977))
- Goldfarb v. Virginia State Bar, 421 U.S. 773, 788 (1976)
- monopoly power finding, coordination; ALAB-452, I, (6 NRC 892, 957 (1977))
- Greater Ecstac Television Corp. v. F.C.C., 444 F.2d 841, 851 (D.C. Cir. 1970)
- ASLB responsibilities for decision format; ALAB-422, B, (6 NRC 33, 41 (1977))
- Green v. Benson, 271 F.Supp. 90, 95 (E.D. Pa. 1967)
- scope of ASLB authority in reopening of proceedings, evidence introduction; ALAB-443, G, (6 NRC 741, 752 (1977))
- Greene Co. Planning Board v. F.P.C., 455 F.2d 412 (1972)
- NEPA review scope for spent fuel pool modification; LBP-77-051, B, (6 NRC 265, 267 (1977))
- Greene Co. Planning Board v. F.P.C., Docket Nos. 1516, 1517 (2nd Cir., June 30, 1977), petition for cert filed, 46 U.S.L.W. 3243 (U.S. December 27, 1977)(No. 77-481)
- rules of practice for consolidation of export license applications; CLI-77-031, E, (6 NRC 849 (1977))
- Gulf States Utilities Co. (River Bend 1 and 2), ALAB-317, 3 NRC 175, 180 n. 7 (1976)
- certiorari rules of practice; CLI-77-025, C, (6 NRC 535 (1977))
- Gulf States Utilities Co. (River Bend), ALAB-317, 3 NRC 175, 176-180 (1976)
- nonparty standing to appeal; ALAB-433, B, (6 NRC 469 (1977))
- Gulf States Utilities Co. v. F.P.C., 411 U.S. 747, 759 (1973)
- national antitrust policy; ALAB-451, A, (6 NRC 889 (1977))
- NRC antitrust jurisdiction; ALAB-428, C, (6 NRC 221, 224 (1977))
- Hale and Hale, The Otter Tail Power Case, Regulation by Commission or Antitrust Laws, the Supreme Court Review, 99, 104 (1973)
- monopoly power considerations; ALAB-452, J, (6 NRC 892, 1012 (1977))
- Hamilton Street Corp. v. Columbia Pictures Corp., 244 F.Supp. 193 (E.D. Pa. 1965)
- antitrust, refusal to wheel; ALAB-452, D, (6 NRC 852, 1036 (1977))
- Hanly v. Kleindienst, 471 F.2d 823, 830 (1972)
- NEPA review scope for spent fuel pool modification; LBP-77-051, E, (6 NRC 265, 267 (1977))
- Hanover Shoe v. United Shoe Mach. Corp., 392 U.S. 481, 495 (1968)
- antitrust, refusal to deal; ALAB-452, M, (6 NRC 892, 1025 (1977))
- Hanover Shoe v. United Shoe Mach. Corp., 392 U.S. 481, 496 (1968)
- antitrust immunity for electric utilities; ALAB-452, C, (6 NRC 892, 915 (1977))
- Heattransfer Corp. v. Volkswagenwerk, A.G., -F.2d-, Trade Reg. Rep. 61,473
- antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 518 (1977))
- Hecht v. Pro-Football, Inc., 444 F.2d 931, 940 (D.C. Cir. 1971), cert. denied, 404 U.S. 1047 (1972)
- antitrust, acquisition of other utilities; ALAB-452, N, (6 NRC 892, 1031 (1977))
- Hiland Dairy, Inc. v. Kroger Co., 402 F.2d 968, 975 (8th Cir. 1968), cert. denied, 395 U.S. 961 (1969)
- antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
- Holloway v. Bristol-Myers Corp., 485 F.2d 986 (D.C. Cir. 1973)
- untimely antitrust intervention affirmed for St. Lucie 2; ALAB-420, A, (6 NRC 8 (1977))
- Hood v. Burnett, 51 F.R.D. 477, 479 (N.D. Ga. 1971)

LEGAL CITATIONS INDEX

CASES

- burden of proof for summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))
scope of ASLB authority in reopening of proceedings, evidence introduction;
ALAB-443, G, (6 NRC 741, 752 (1977))
- Houston Lighting and Power Co. (South Texas 1 and 2), CLI-77-013, 5 NRC 1303 (1977)
- NRC antitrust responsibilities; CLI-77-026, (6 NRC 538 (1977))
- Houston Lighting and Power Co. (South Texas 1 and 2), CLI-77-013, 5 NRC 1303, 1312 fn. 8, 1316 (1977)(appeal pending)
- Midland antitrust reversal, nexus issue; ALAB-452, A, (6 NRC 892 (1977))
- Houston Lighting and Power Co. (South Texas), ALAB-381, 5 NRC 582, 592 (1977)
- antitrust intervention denial affirmed for three fully licensed plants;
ALAB-428, A, (6 NRC 221 (1977))
- Houston Lighting and Power Co. (South Texas), ALAB-381, 5 NRC 582, review declined, Houston Lighting and Power Co. (South Texas), March 31, 1977 (unpublished)
- rules of practice for untimely antitrust intervention petitions; ALAB-420, C, (6 NRC 8, 11 (1977))
- Houston Lighting and Power Co. (South Texas), CLI-77-013, 5 NRC 1303 (1977)
- NRC antitrust jurisdiction; ALAB-428, C, (6 NRC 221, 224 (1977))
- I.C.C. v. Jersey City, 322 U.S. 503, 514 (1944)
- reopening of proceedings, need for; ALAB-443, E, (6 NRC 741, 748 (1977))
- Illinois Power Co. (Clinton), ALAB-346, 4 NRC 27, 36 (1976)
- NEPA evaluation of alternatives, energy conservation; ALAB-422, U, (6 NRC 33, 100 (1977))
- Indiana and Michigan Electric Co. v. F.P.C., 502 F.2d 336, 342 (D.C. Cir. 1974), cert. denied, 420 U.S. 946 (1975)
- monopoly power considerations; ALAB-452, J, (6 NRC 892, 1012 (1977))
- Indiana v. Kentucky, 136 U.S. 479, 508 (1890)
- stay pending appeal denied for Marble Hill construction permit; ALAB-437, A, (6 NRC 630 (1977))
- Indiana's Farmer's Guide Publishing Co. v. Prairie Farmer Publishing Co., 293 U.S. 268, 279 (1934)
- antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 518 (1977))
- International Railways v. United Brands, 532 F.2d 231, 239, cert. denied, 50 L.Ed.2d 100 (1967)
- antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
- International Tel. and Tel. Corp. v. General Telephone and Electronic Corp., 518 F.2d 913, 935 (1975)
- antitrust review standards, applicant's conduct; ALAB-452, B, (6 NRC 892, 913 (1977))
- International Telephone and Telegraph Corp. v. General Telephone and Electronics Corp., 351 F.Supp. 1153 (D. Haw. 1972), reversed, 518 F.2d 913 (9th Cir. 1975)
- vertical integration in relevant market determination; ALAB-452, H, (6 NRC 892, 594 (1977))
- International Telephone and Telegraph Corp. v. General Telephone and Electronics Corp., 518 F.2d 913, 935 (9th Cir. 1975)
- monopoly power finding, coordination; ALAB-452, I, (6 NRC 892, 997 (1977))
- Interstate Circuit, Inc. v. U.S., 306 U.S. 208 (1939)
- antitrust, acquisition of other utilities; ALAB-452, N, (6 NRC 892, 1031 (1977))
- Jones v. D.C. Redevelopment Land Agency, 499 F.2d 502, 512 (D.C. Cir. 1974)
- rules of practice for stay pending appeal; ALAB-437, B, (6 NRC 630 (1977))
- Kansas Gas and Electric Co. (Wolf Creek 1), ALAB-279, 1 NRC 559, 564 (1965)(Wolf Creek I)
- national antitrust policy; ALAB-451, A, (6 NRC 889 (1977))
- Kansas Gas and Electric Co. (Wolf Creek 1), ALAB-279, 1 NRC 559, 568 (1975)
- NRC antitrust jurisdiction; ALAB-428, C, (6 NRC 221, 224 (1977))
- Kansas Gas and Electric Co. (Wolf Creek 1), ALAB-299, 2 NRC 740, 747 (1975)(Wolf Creek II)
- antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 518 (1977))
- Kansas Gas and Electric Co. (Wolf Creek 1), ALAB-327, 3 NRC 408, 413 (1976)
- ASLB referral of discovery order declined; ALAB-438, (6 NRC 638 (1977))

LEGAL CITATIONS INDEX

CASES

- Kansas Gas and Electric Co. (Wolf Creek 1), ALAB-331, 3 NRC 771, 777 (1976)
pre-LWA authority for sewer line activity; LBP-77-061, B, (6 NRC 674, 677
(1977))
- Kansas Gas and Electric Co. (Wolf Creek 1), ALAB-331, 3 NRC 771, 777 (1976),
affirmed, CLI-77-001, 5 NRC 1 (1977)
- ASLB scope of review for pre-LWA activity; ALAB-446, B, (6 NRC 870 (1977))
scope of review, for ASLB findings and limited-scope pre-LWA road work;
ALAB-446, C, (6 NRC 870, 871 fn. 3(1977))
- Kansas Gas and Electric Co. (Wolf Creek), ALAB-279, 1 NRC 559 (1975)
NRC antitrust jurisdiction; ALAB-420, B, (6 NRC 8, 10 (1977))
- Kansas Gas and Electric Co. (Wolf Creek), ALAB-331, 3 NRC 771, 777, affirmed, 8
NRC 1 (1977)
rules of practice for pre-LWA activity; LBP-77-044, B, (6 NRC 141, 145
(1977))
- Kansas Gas and Electric Co. (Wolf Creek), ALAB-331, 3 NRC 771, affirmed,
CLI-77-001, 5 NRC 1, 12 (1977)
pre-LWA activity restrictions; LBP-77-056, (6 NRC 478 (1977))
- Kansas Gas and Electric Co. (Wolf Creek), ALAB-379, 1 NRC 559, 565 (1975)
NRC antitrust jurisdiction; LBP-77-045, C, (6 NRC 159, 166 (1977))
summary disposition denied for Stanislaus antitrust allegations; LBP-77-045,
A, (6 NRC 159 (1977))
- Kansas Gas and Electric Co. (Wolf Creek), CLI-77-001, 5 NRC 1 (1977)
NRC jurisdiction over offsite transmission lines; ALAB-422, Q, (6 NRC 33, 82
(1977))
- Kennicott Copper Corp., 78 FTC 744 (1971)
monopoly power considerations; ALAB-452, J, (6 NRC 892, 1012 (1977))
- Kieppe v. Sierra Club, 427 U.S. 390 (1976)
generic issue resolve prior to case-by-case licensing on fuel pool
modification; LBP-77-069, B, (6 NRC 1179, 1181 (1977))
- L.G. Balfour Co. v. F.T.C., 442 F.2d 1, 19 (7th Cir. 1971)
monopoly power finding; ALAB-452, J, (6 NRC 892, 1012 (1977))
- L.G. Balfour Co., 74 FTC 494, 497 (1968), 442 F.2d 1, 12 (7th Cir. 1971)
antitrust regulations and jurisdiction; ALAB-452, F, (6 NRC 892, 924 (1977))
- Lamb Enterprises, Inc. v. Toledo Blade Co., 461 F.2d 506, 515 (6th Cir.), cert.
denied, 409 U.S. 1001 (1972)
antitrust, refusal to deal; ALAB-452, M, (6 NRC 892, 1025 (1977))
- Linda R.S. v. Richard D., 410 U.S. 614, 617 (1973)
standing for intervention in export licensing matters; CLI-77-024, B, (6 NRC
525 (1977))
standing for intervention in uranium export proceedings; CLI-77-032, B, (6
NRC 854, 857 (1977))
- Litton Systems, Inc. v. Southwestern Bell Tel. Co., 539 F.2d 418 (5th Cir.
1976)
antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC
892, 918 (1977))
- Litton Systems, Inc. v. Southwestern Bell Tel. Co., 539 F.2d 418, 422 (5th Cir.
1976)
monopoly power finding, coordination; ALAB-452, I, (6 NRC 892, 997 (1977))
- Long Island Lighting Co. (Jamesport 1 and 2), ALAB-353, 4 NRC 381 (1976)
status of interlocutory order to adduce evidence for certification;
ALAB-439, (6 NRC 640 (1977))
- Long Island Lighting Co. (Jamesport), ALAB-292, 2 NRC 631 (1975)
untimely intervention denial for Oyster Creek; LBP-77-058, (6 NRC 500
(1977))
- Long Island Lighting Co. (Jamesport), ALAB-292, 2 NRC 631, 647 (1975)
adequacy of Federal Register notice of hearing; LBP-77-058, (6 NRC 500
(1977))
- Long Island Lighting Co. (Shoreham), ALAB-156, 6 AEC 831, 832-33 (1973)
waiver of unbriefed exceptions, rules of practice; ALAB-443, B, (6 NRC 741,
744 n. 8 (1977))
- Long Island Lighting Co. (Shoreham), ALAB-156, 6 AEC 831, 844-45 (1973)
safety findings for unresolved generic issues; ALAB-444, G, (6 NRC 760, 784
(1977))
- Long Island Lighting Co. (Shoreham), ALAB-156, 6 AEC 831, 847 (1973)
flexibility of rules for population center evaluation; ALAB-422, J, (6 NRC
33, 51 (1977))

LEGAL CITATIONS INDEX

CASES

- Long Island Lighting Co. (Shoreham), ALAB-156, 6 AEC 831, 848 (1973)
population growth forecasts, rules of practice for exclusion area
determinations: ALAB-422, I, (6 NRC 33, 46 (1977))
- Lorain Journal Co. v. U.S., 342 U.S. 143 (1951)
antitrust, refusal to deal: ALAB-4E2, L, (6 NRC 892, 1025 (1977))
- Louisiana Power and Light Co. (Waterford 3), CLI-73-007, 6 AEC 48, 49
(Waterford I)
national antitrust policy: ALAB-451, A, (6 NRC 889 (1977))
- Louisiana Power and Light Co. (Waterford 3), CLI-73-025, 6 AEC 619, 620
(1973)(Waterford II)
national antitrust policy: ALAB-451, A, (6 NRC 889 (1977))
- Louisiana Power and Light Co. (Waterford), CLI-73-007, 6 AEC 48, 50 fn. 2
(1973)
pending antitrust completion, construction permit may be issued by party
agreement: ALAB-420, E, (6 NRC 8, 10 (1977))
- Machinery Dealers National Association v. Lockheed Aircraft Corporation, et al.
(D.C. Cir. No. 74-525, August 25, 1977)
standing for intervention in export licensing matters: CLI-77-024, B, (6 NRC
525 (1977))
- Maine Yankee Atomic Power Co. (Maine Yankee), ALAB-1c1, 6 AEC 1003, 1006
(1973), remanded on other grounds, CLI-74-002, 7 AEC 2 (1974), further
statement of Appeal Board views, ALAB-175, 7 AEC 62 (1974), affirmed sub
nom., Citizens for Safe Power v. N.R.C., 524 F.2d 1251 (D.C. Cir. 1975)
adequacy of NRC safety standards for construction licensing: ALAB-422, E, (6
NRC 33, 42 (1977))
- Markham v. Cabell, 326 U.S. 404 (1945)
NRC authority to impose civil penalties for license violations: ALJ-77-002,
E, (6 NRC 702, 707 (1977))
NRC authority to impose civil penalties for license violations: ALJ-77-001,
B, (6 NRC 693 (1977))
- Peaks, Concentration in the Electric Power Industry, the Impact of Antitrust
Policy, 72 Columbia Law Rev. 64, 81-100 (1972)
antitrust relevant market principle: ALAB-452, E, (6 NRC 892, 921 (1977))
- Metropolitan Edison Co. (Three Mile Island), ALAB-384, 5 NRC 612, 615 (1977)
untimely intervention petition rules of practice: ALAB-431, E, (6 NRC 460
(1977))
untimely intervention rules of practice: ALAB-440, E, (6 NRC 642 (1977))
- Metropolitan Edison Co. (Three Mile Island), ALAB-384, 5 NRC 612, 616 (1977)
untimely antitrust intervention affirmed for St. Lucie 2: ALAB-420, A, (6
NRC 8 (1977))
- Metropolitan Edison Co. (Three Mile Island), ALAB-384, 5 NRC 612, 617 (1977)
NEFA evaluation of alternatives, energy conservation: ALAB-422, U, (6 NRC
33, 100 (1977))
- Metropolitan Edison Co. (Three Mile Island), ALAB-384, 5 NRC 612, 618 (1977)
intervention standing, contentions adequacy: LBP-77-048, E, (6 NRC 249, 250
(1977))
- Michigan Public Service Co. v. City of Cheboygan, 324 Mich. 309, 37 N.W.2d 116,
122 (1945)
antitrust regulations and jurisdiction: ALAB-452, F, (6 NRC 892, 924 (1977))
- Milwaukee Towns Corp. v. Loew's, Inc., 190 F.2d 561 (7th Cir. 1951), cert.
denied, 342 U.S. 905 (1952)
antitrust, refusal to wheel: ALAB-452, O, (6 NRC 852, 1036 (1977))
- Mississippi Power and Light Co. (Grand Gulf), ALAB-130, 6 AEC 423, 426 (1976)
standing for intervention: LBP-77-059, A, (6 NRC 518 (1977))
- Morton Bldgs. of Nebraska, Inc. v. Morton Bldgs., Inc., 531 F.2d 910, 918 (8th
Cir. 1976)
antitrust consideration of federally regulated industry: ALAB-452, D, (6 NRC
892, 518 (1977))
- Pt. Hood Stages, Inc. v. Greyhound Corp., 555 F.2d 687, 691 (9th Cir. 1977)
monopoly power finding: ALAB-452, I, (6 NRC 892, 997 (1977))
- Pullis v. Arco Petroleum Corp., 502 F.2d 250 (7th Cir. 1974)
antitrust, refusal to deal: ALAB-4E2, L, (6 NRC 892, 1025 (1977))
- Pullis v. Arco Petroleum Corp., 502 F.2d 250, 258 n. 23 (7th Cir. 1974)(per
Stevens, C.J.)
antitrust consideration of federally regulated industry: ALAB-452, D, (6 NRC
892, 518 (1977))

LEGAL CITATIONS INDEX

CASES

- Multidistrict Vehicle Air Pollution M.D.L. No. 31, 421 F.2d 122 (9th Cir.), cert. denied, 414 U.S. 1045 (1973)
antitrust, refusal to wheel; ALAB-452, D, (6 NRC 852, 1036 (1977))
- Municipal Electric Assn. v. S.E.C., 413 F.2d 1052, 1057 (D.C. Cir. 1969)
antitrust standards for coordination; ALAB-452, P, (6 NRC 892, 1046 (1977))
- Municipal Electric Assoc. v. S.E.C., 413 F.2d 1052 and 419 F.2d 757 (D.C. Cir. 1969)
national antitrust policy; ALAB-451, A, (6 NRC 885 (1977))
- Municipal Electric Utility Assn. of Alabama v. F.P.C., 485 F.2d 967, 969 (D.C. Cir. 1973)
antitrust regulations and jurisdiction; ALAB-452, F, (6 NRC 892, 924 (1977))
- N.R.D.C. v. Merton, 458 F.2d 827 (D.C. Cir. 1972)
alternate site review scope for Regulatory Staff; LBP-77-060, B, (6 NRC 647, 656 (1977))
- N.R.D.C. v. N.R.C., 525 F.2d 824 (1976), cert. granted, 430 U.S. 944 (1977)
fuel cycle rulemaking terminated; CLI-77-033, (6 NRC 861 (1977))
- N.R.D.C. v. N.R.C., 539 F.2d 824, 845 (2d Cir. 1976)
construction permit proceedings continuation pending NRC reassessment of policy statement; ALAB-425, A, (6 NRC 199 (1977))
- N.R.D.C. v. N.R.C., 547 F.2d 633 (D.C. Cir. 1976)
Midland construction permit continuance pending court-ordered resand; LBP-77-057, A, (6 NRC 482 (1977))
uranium fuel cycle effects for River Bend; ALAB-444, A, (6 NRC 760 (1977))
- National Bureau of Standards, 2 AEC 323, 324 (196)
scope of ASLB authority in reopening of proceedings, evidence introduction; ALAE-443, G, (6 NRC 741, 752 (1977))
- New England Power Agreement (NEPCOL), Opinion No. 77E, Docket No. E-7690 (FPC, September 10, 1976) slip op. at 17
antitrust standards for refusal to coordinate; ALAB-452, P, (6 NRC 892, 1046 (1977))
- New England Power Co. (NEP 1 and 2), ALAB-390, 5 NRC 733, 747 (1977)
emergency plans; LBP-77-067, C, (6 NRC 1101, 1119 (1977))
- Niagara Mohawk Power Corp. (Nine Mile Point 2), ALAB-264, 1 NRC 346, 357 (1975)
role of ASLAB; ALAB-452, K, (6 NRC 892, 1022 (1977))
- Niagara Mohawk Power Corp. (Nine Mile Point 2), ALAB-264, 1 NRC 347, 354 (1975)
relevant market for entitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- Niagara Mohawk Power Corp. (Nine Mile Point), ALAB-264, 1 NRC 347, 352 (1975)
need-for-power considerations; ALAB-422, R, (6 NRC 33, 90 (1977))
- Niagara Mohawk Power Corp. (Nine Mile Point), ALAB-264, 1 NRC 347, 354 (1975)
scope of ASLAB review of initial decision, resolution of new issues; ALAB-422, D, (6 NRC 33, 41 (1977))
- North States Power Co. (Prairie Island), ALAB-104, 6 AEC 175 (1973)
ASLB responsibilities for decision format; ALAB-422, E, (6 NRC 33, 41 (1977))
- Northeast Nuclear Energy Co. (Millstone 3), LBP-74-058, 8 AEC 187, 193, affirmed, ALAB-234, 8 AEC 643 (1974)
need-for-power considerations; ALAB-422, R, (6 NRC 33, 90 (1977))
- Northern California Power Agency v. F.P.C., 514 F.2d 184 (D.C. Cir.), cert. denied, 423 U.S. 863 (1975)
untimely antitrust intervention affirmed for St. Lucie 2; ALAB-420, A, (6 NRC 8 (1977))
- Northern California Power Agency v. F.P.C., 514 F.2d 184, 186 (D.C. Cir.), cert. denied, 423 U.S. 863 (1975)
monopoly power finding; ALAB-452, I, (6 NRC 892, 997 (1977))
- Northern Indiana Public Service Co. (Baillly 1), ALAB-207, 7 AEC 957 (1974)
waiver of unbriefed exceptions, rules of practice; ALAB-443, E, (6 NRC 741, 744 n. 8 (1977))
- Northern Indiana Public Service Co. (Baillly 1), ALAB-227, 8 AEC 416, 418 n. 4 (1974)
reopening of proceedings, need for power; ALAB-443, E, (6 NRC 741, 748 (1977))
- Northern Indiana Public Service Co. (Baillly 1), ALAB-241, 8 AEC 841, 843 (1974)
licensing participation by state outside reactor site; ALAB-447, B, (6 NRC 873 (1977))
- Northern Indiana Public Service Co. (Baillly 1), ALAB-303, 2 NRC 858, 866 (1975)
role of ASLAB; ALAB-452, K, (6 NRC 892, 1022 (1977))

LEGAL CITATIONS INDEX

CASES

- Northern Indiana Public Service Co. v. Porter Co. Chapter of Izaak Walton League, 423 U.S. 12, 13-14 (1975)
licensing participation affirmed for distant state; ALAB-447, A, (6 NRC 873 (1977))
- Northern States Power Co. (Prairie Island 1 and 2), ALAB-107, 6 AEC 188, 191, affirmed
rules of practice for state intervention; ALAB-444, D, (6 NRC 760, 768 (1977))
- Northern States Power Co. (Prairie Island 1 and 2), ALAB-284, 2 NRC 197 (1975)
trial authority of ASLAB; ALAB-443, A, (6 NRC 741 (1977))
- Northern States Power Co. (Prairie Island 1 and 2), ALAB-343, 4 NRC 169 (1976)
ASLAB sua sponte review of uncontested issues; ALAB-435, A, (6 NRC 541 (1978))
- Northern States Power Co. (Prairie Island 1 and 2), ALAB-427, 6 NRC 212 (1977)
ASLAB sua sponte review of uncontested issues; ALAB-435, A, (6 NRC 541 (1978))
- Northern States Power Co. (Prairie Island 1 and 2), ALAB-427, 6 NRC 212, supplementing ALAB-343, 4 NRC 169 (1976)
steam generator tube integrity considerations for Seabrook; ALAB-442, (6 NRC 728 (1977))
- Northern States Power Co. (Prairie Island), ALAB-343, 4 NRC 169 (1976)
steam generator tube integrity, ASLAB jurisdiction retained for Seabrook; ALAB-422, A, (6 NRC 33 (1977))
- Northern States Power Co. v. Minnesota, 447 F.2d 1143 (8th Cir. 1971), affd. 405 U.S. 1035 (1972)
State authority under FWPCA relative to health and safety matters; LBP-77-052, D, (6 NRC 254, 339 (1977))
- Nuclear Fuel Services, Inc. (West Valley Reprocessing), CLI-75-004, 1 NRC 273 (1975)
rules of practice for good cause finding in untimely intervention petition; ALAB-444, K, (6 NRC 76C, 756 (1977))
rules of practice for untimely intervention petitions; ALAB-444, J, (6 NRC 760, 754 (1977))
untimely intervention denial; LBP-77-050, (6 NRC 261 (1977))
untimely intervention petition rules of practice; ALAB-431, B, (6 NRC 460 (1977))
untimely intervention rules of practice; ALAB-440, E, (6 NRC 642 (1977))
- Nuclear Fuel Services, Inc. (West Valley Reprocessing), CLI-75-004, 1 NRC 273 (1975), reversing ALAB-263, 1 NRC 208 (1975)
untimely intervention denial for Oyster Creek; LBP-77-058, (6 NRC 500 (1977))
- Nuclear Fuel Services, Inc. (West Valley Reprocessing), CLI-75-004, 1 NRC 273, 275 (1975)
rules of practice for untimely antitrust intervention petitions; ALAB-420, C, (6 NRC 8, 11 (1977))
- Otter Tail Power Co. v. U.S., 410 U.S. 363 (1973)
untimely antitrust intervention affirmed for St. Lucie 2; ALAB-420, A, (6 NRC 8 (1977))
- Otter Tail Power Co. v. U.S., 410 U.S. 366, (1973)
antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 518 (1977))
- Otter Tail Power Co. v. U.S., 410 U.S. 366, 372 (1973)
national antitrust policy; ALAB-451, A, (6 NRC 889 (1977))
- Otter Tail Power Co. v. U.S., 410 U.S. 579, Justice's opening brief on appeal, p 27 ff and Reply Brief on Appeal, p 37 ff (1976)
antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
- P.R.D.C. v. Electrical Workers, 367 U.S. 396 (1961)
scope of inquiry for financial qualifications; ALAB-422, P, (6 NRC 33, 79 (1977))
weight accorded agency's interpretation of its Act; LBP-77-044, C, (6 NRC 141, 152 (1977))
- P.R.D.C. v. International Union, 367 U.S. 396, 407 (1961)
safety findings required by NRC licensing process; ALAB-444, I, (6 NRC 760, 766 (1977))
- Pacific Gas and Electric Co. (Diablo Canyon), ALAB-410, 5 NRC 1398 (1977)
disclosure of physical security plans for nuclear facilities; CLI-77-023, A,

LEGAL CITATIONS INDEX

CASES

- (6 NRC 455 (1977))
Pacific Gas and Electric Co. (Stanislaus), LBP-77-026, 5 NRC 1017, affirmed, ALAB-400, 5 NRC 1175 (1977)
rules of practice for untimely antitrust intervention petitions; ALAB-420, C, (6 NRC 8, 11 (1977))
Packaged Programs, Inc. v. Westinghouse Broadcasting, 255 F.2d 708 (3rd Cir. 1958)
antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
Pan American World Airways, Inc. v. U.S., 371 U.S. 296 (1963)
nexus considerations in antitrust; ALAB-452, C, (6 NRC 892, 915 (1977))
Permian Basin Area Rate Cases, 390 U.S. 747, 773 (1968)
rules of practice for stay pending appeal; ALAB-437, E, (6 NRC 630 (1977))
Permian Basin Area Rate Cases, 390 U.S. 747, 792 (1968)
ASLB responsibilities for decision format; ALAB-422, B, (6 NRC 33, 41 (1977))
Philadelphia Electric Co. (Peach Bottom 2 and 3), CLI-68-007, 4 AEC 151, 152-53 (1968)
rules of practice for good cause finding in untimely intervention petition; ALAB-444, K, (6 NRC 760, 796 (1977))
Philadelphia Electric Co. (Peach Bottom 2 and 3), CLI-74-032, 8 AEC 217, 218 (1974)
licensing participation by state outside reactor site; ALAB-447, B, (6 NRC 873 (1977))
Philadelphia Electric Co. (Peach Bottom), CLI-74-032, 8 AEC 217 (1974)
applicability of adjoining state laws over NRC proceedings and licenses; LBP-77-052, B, (6 NRC 294, 337 (1977))
Phoenix Savings and Loan v. Aetna Casualty and Surety Co., 381 F.2d 245, 249 (4th Cir. 1967)
summary disposition denied for Stanislaus antitrust allegations; LBP-77-045, A, (6 NRC 155 (1977))
Poller v. C.B.S., 368 U.S. 464, 473 (1962)
rules of practice for summary disposition; LBP-77-045, B, (6 NRC 159, 162 (1977))
Poller v. Columbia Broadcasting System, Inc., 368 U.S. 464, 468 (1962)
antitrust immunity for electric utilities; ALAB-452, C, (6 NRC 892, 915 (1977))
Portland General Electric Co. (Pebble Springs 1 and 2), CLI-76-027, 4 NRC 610 (1976)
rules of practice for untimely intervention petitions; ALAB-444, J, (6 NRC 760, 794 (1977))
Portland General Electric Co. (Pebble Springs 1 and 2), LEP-76-037, 4 NRC 428, 432 (1976)
NRC nuclear promotion policy; LBP-77-069, C, (6 NRC 1179, 1182 (1977))
Portland General Electric Co. (Pebble Springs), CLI-76-027, 4 NRC 610, 613 (1976)
intervention matters for Exxon Reprocessing construction permit; LBP-77-059, A, (6 NRC 518 (1977))
Portland General Electric Co. (Pebble Springs), CLI-76-027, 4 NRC 610, 614 (1976)
standing for intervention on ratepayer status; ALAB-424, A, (6 NRC 122 (1977))
Fosner, Natural Monopoly and Its Regulation, 21 Stanford L. Rev. 548, 592 (1969)
monopoly power considerations; ALAB-452, J, (6 NRC 892, 1012 (1977))
Poster Exchange, Inc. v. National Screen Serv., 431 F.2d 334 (5th Cir. 1970), cert. denied, 401 U.S. 912 (1971)
antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
Power Reactor Development Co., 1 AEC 128, 153 (1959)
scope of inquiry for financial qualifications; ALAB-422, P, (6 NRC 33, 79 (1977))
Project Management Corp. (Clinch River Breeder), ALAB-354, 4 NRC 383, 389 (1976)
untimely intervention petition rules of practice; ALAB-431, E, (6 NRC 460 (1977))
Project Management Corp. (Clinch River Breeder), ALAB-354, 4 NRC 383, 392-93 (1976)

LEGAL CITATIONS INDEX

CASES

- rules of practice for state intervention; ALAB-444, D, (6 NRC 760, 768 (1977))
- Project Management Corp. (Clinch River Breeder), ALAE-354, 4 NRC 393, 394 (1976)
- rules of practice for good cause finding in untimely intervention petition; ALAE-444, K, (6 NRC 760, 796 (1977))
- Project Management Corporation (Clinch River Breeder), CLI-76-013, 4 NRC 67, 75 (1976)
- interlocutory stay denied for Seabrook site review; CLI-77-027, A, (6 NRC 715 (1977))
- Public Service Co. of Indiana (Marble Hill 1 and 2), ALAE-393, 5 NRC 767 (1977)
- status of interlocutory order to adduce evidence for certification; ALAE-439, (6 NRC 640 (1977))
- Public Service Co. of Indiana (Marble Hill 1 and 2), ALAB-437, 6 NRC 632 (1977)
- rules of practice for stay pending appeal; CLI-77-027, B, (6 NRC 715 (1977))
- Public Service Co. of Indiana (Marble Hill 1 and 2), ASLE Order of March 12, 1976 (unpublished)
- licensing participation by state outside reactor site; ALAB-447, B, (6 NRC 873 (1977))
- Public Service Co. of Indiana (Marble Hill), ALAB-316, 3 NRC 167, 170 (1976)
- NRC antitrust jurisdiction; ALAB-426, B, (6 NRC 8, 10 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), ALAE-271, 1 NRC 478 (1975)
- timing of appeal from licensee's liability for violations; ALAB-441, (6 NRC 725 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), ALAB-338, 4 NRC 10, 14 (1976)
- rules of practice for stay pending appeal; ALAB-437, B, (6 NRC 630 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), ALAE-350, 5 NRC 733, 747 (1977)
- emergency plans; LBP-77-067, C, (6 NRC 1101, 1119 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), ALAB-422, 6 NRC 33, 105 (1977)
- ASLAE sua sponte review of uncontested issues; ALAB-435, A, (6 NRC 541 (1978))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), ALAB-422, 6 NRC 33, 42 (1977)
- relevant market for antitrust; ALAB-452, G, (6 NRC 852, 845 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), ALAE-422, 6 NRC 33, 77 (1977)
- financial qualifications, ability to raise money for potential capital expenditures; LEP-77-068, G, (6 NRC 1127, 1163 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), ALAE-422, 6 NRC 33, 94-5 (1977)
- contention requirements for generic safety issues; ALAE-444, F, (6 NRC 760, 761, 771-74 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), ASLE Order of March 15, 1974 (unpublished)
- licensing participation by state outside reactor site; ALAB-447, B, (6 NRC 873 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), CLI-77-008, 5 NRC 503 (1977)
- alternate site review scope for Regulatory Staff; LEP-77-060, E, (6 NRC 647, 656 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), CLI-77-008, 5 NRC 503, 522 (1977)
- alternative site review scope for LWA; LBP-77-066, (6 NRC 835 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), CLI-77-008, 5 NRC 503, 524-36 (1977)
- standards for alternative site comparison; ALAB-435, B, (6 NRC 541, 542 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), CLI-77-008, 5 NRC 503, 532 (1977)
- stay pending appeal denied for Marble Hill construction permit; ALAB-437, A, (6 NRC 620 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), CLI-77-025, 6 NRC 535

LEGAL CITATIONS INDEX

CASES

- (October 14, 1977)
licensing participation by state outside reactor site; ALAB-447, B, (6 NRC 873 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), CLI-77-025, 6 NRC 535, 537 n. 1 (1977)
rules of practice for state intervention; ALAB-444, D, (6 NRC 760, 768 (1977))
- Public Service Co. of New Hampshire (Seabrook 1 and 2), Docket 50443 and 50444, unpublished order (August 19, 1977)
ASLAB sua sponte review of uncontested issues; ALAB-435, A, (6 NRC 541 (1977))
- Public Service Co. of New Hampshire (Seabrook), ALAB-271, 1 NRC 478 (1975)
ASLAB authority to direct certification of interlocutory legal rulings; ALAE-419, E, (6 NPC 3 (1977))
- Public Service Co. of New Hampshire (Seabrook), ALAE-293, 2 NRC 660 (1975)
standing for intervention; LEP-77-055, A, (6 NRC 518 (1977))
- Public Service Co. of New Hampshire (Seabrook), ALAE-390, 5 NRC 733, 736 (1977)
rules of practice for LPZ evaluation; ALAB-422, G, (6 NRC 33, 43 (1977))
- Public Service Co. of New Hampshire (Seabrook), ALAB-422, 6 NRC 33, 102, 113 (1977)
interim fuel-cycle-rule effects on pending license applications; ALAB-426, A, (6 NRC 206 (1977))
- Public Service Co. of New Hampshire (Seabrook), ALAE-422, 6 NRC 33, 104 (1977)
cost-benefit balance weights assigned to revised Table S-3; ALAB-426, C, (6 NRC 206, 208 (1977))
- Public Service Co. of New Hampshire (Seabrook), ALAB-422, 6 NRC 33, 41, 76 (1977)
ASLB resolution of contested issues; ALAB-425, D, (6 NRC 229, 237 (1977))
- Public Service Co. of New Hampshire (Seabrook), CLI-77-008, 5 NRC 503, 514 (1977)
alternate site considerations; ALAB-422, R, (6 NRC 33, 90 (1977))
- Public Service Co. of New Hampshire (Seabrook), CLI-77-008, 5 NRC 503, 521 (1977)
standard for granting construction permit suspension during remand proceeding; LBP-77-057, B, (6 NRC 482 (1977))
- Public Service Co. of New Hampshire (Seabrook), CLI-77-008, 5 NRC 503, 540 (1977)
NEPA evaluation of alternatives, energy conservation; ALAB-422, U, (6 NRC 33, 100 (1977))
- Public Service Co. of New Hampshire (Seabrook), LBP-74-036, 7 AEC 877, 878 (1974)
rules of practice for summary disposition; LBP-77-045, B, (6 NRC 159, 162 (1977))
- Public Service Co. of Oklahoma (Black Fox), ALAB-370, 5 NRC 131 (1977)
rules of practice for interlocutory appeals; ALAB-433, C, (6 NRC 469 (1977))
- Public Service Electric and Gas Co. (Hope Creek 1 and 2), ALAB-429, 6 NRC 229, 237 (1977)
scope of ASLE authority in reopening of proceedings, evidence introduction; ALAE-443, G, (6 NRC 741, 752 (1977))
- Public Service Electric and Gas Co. (Hope Creek 1 and 2), ALAB-429, 6 NRC 229, 246 (1977)
status of construction permit pending appellate evidentiary hearing on unresolved issues; ALAB-443, A, (6 NRC 741 (1977))
- Public Service Electric and Gas Co. (Hope Creek 1 and 2), ASLB Order of April 3, 1974 (unpublished)
licensing participation by state outside reactor site; ALAE-447, B, (6 NRC 873 (1977))
- Public Service Electric and Gas Co. (Salem 1 and 2), ALAB-426, 6 NRC 206 (1977)
environmental impact from uranium fuel cycle; ALAE-444, A, (6 NRC 760 (1977))
- Puerto Rico Water Resources Authority (North Coast 1), ALAB-313, 3 NRC 94, 96 (1976)
timing of appeal from licensee's liability for violations; ALAB-441, (6 NRC 725 (1977))
- Puerto Rico Water Resources Authority (North Coast), ALAB-286, 2 NRC 213 (1975)
interlocutory appeals from ASLE rulings on contentions; ALAB-434, A, (6 NRC

LEGAL CITATIONS INDEX

CASES

- 471 (1977))
- Fugot Sound Power and Light Co. (Skegit 1 and 2), ALAB-446, 6 NRC 478 (1977)
 reversal of pre-LWA road work denial; ALAB-446, A, (6 NRC 870 (1977))
- Fea Trucking Co. v. N.L.R.B., 439 F.2d 1065, 1066 (5th Cir. 1971)
 monopoly power finding; ALAB-452, J, (6 NRC 892, 1012 (1977))
- Reynolds Metals Co. v. F.T.C., 309 F.2d 223, 229 (D.C. Cir. 1962)
 relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- Richardson v. Perales, 402 U.S. 389 (1971)
 evidentiary status of affidavits; ALAB-443, A, (6 NRC 741 (1977))
- Rodale Press, Inc. v. F.T.C., 407 F.2d 1252, 1256 (D.C. Cir. 1968)
 monopoly power finding; ALAB-452, J, (6 NRC 892, 1012 (1977))
- Rogers Mfg. Co. v. N.L.R.B., 486 F.2d 644 (6th Cir. 1973)
 monopoly power finding; ALAB-452, J, (6 NRC 892, 1012 (1977))
- Royster Drive-In Theatre, Inc. v. American Broadcasting Paramount Theatres, Inc., 268 F.2d 246 (2nd Cir.), cert. denied, 361 U.S. 885 (1959)
 antitrust, refusal to wheel; ALAB-452, D, (6 NRC 892, 1036 (1977))
- S.E.C. v. Capital Gains Research Bureau, 375 U.S. 180 (1963)
 NRC authority to impose civil penalties for license violations; ALJ-77-001, B, (6 NRC 693 (1977))
 NRC authority to impose civil penalties for license violations; ALJ-77-002, B, (6 NRC 702, 707 (1977))
- S.E.C. v. Chenery Corp., 318 U.S. 80, 84 (1943)
 ASLB responsibilities for decision format; ALAB-422, B, (6 NRC 33, 41 (1977))
- Safir C. Gibson, 432 F.2d 137, 143 (2nd Cir.), cert. denied, 400 U.S. 942 (1970)
 antitrust regulations and jurisdiction; ALAB-452, F, (6 NRC 892, 924 (1977))
- Salt River Project Agr. Dist. v. F.P.C., 391 F.2d 470 (D.C. Cir.), cert. denied, 353 U.S. 857 (1968)
 antitrust regulations and jurisdiction; ALAB-452, F, (6 NRC 892, 924 (1977))
- Sartor v. Arkansas Natural Gas Co., 321 U.S. 620, 627 (1944)
 rules of practice for summary disposition; LBP-77-045, B, (6 NRC 159, 162 (1977))
- Scenic Hudson Preservation Conference v. F.P.C., 354 F.2d 608, 620 (2d Cir. 1965)
 scope of ASLB authority in reopening of proceedings, evidence introduction; ALAB-443, G, (6 NRC 741, 752 (1977))
- Echerr v. Volpe, 466 F.2d 1027, 1034 (7th Cir. 1972)
 stay pending appeal denied for Marble Hill construction permit; ALAB-437, A, (6 NRC 630 (1977))
- Schnee Chain Theatres v. U.S., 334 U.S. 110, 119 (1948)
 antitrust review standards, applicant's conduct; ALAB-452, B, (6 NRC 892, 913 (1977))
- SCM Corporation v. R.C.A., 407 F.2d 166 (2nd Cir. 1968), cert. denied, 395 U.S. 943 (1965)
 antitrust, refusal to wheel; ALAB-452, D, (6 NRC 892, 1036 (1977))
- Scott Publishing Co. v. Columbia Basin Publishers, Inc., 293 F.2d 15, 21 (9th Cir.), cert. denied, 368 U.S. 940 (1961)
 antitrust, acquisition of other utilities; ALAB-452, N, (6 NRC 892, 1031 (1977))
- Silver v. New York Stock Exchange, 373 U.S. 341 (1963)
 antitrust standards for coordination; ALAB-452, P, (6 NRC 892, 1046 (1977))
 nexus considerations in antitrust; ALAB-452, C, (6 NRC 892, 915 (1977))
- Simon v. Eastern Kentucky Welfare Rights Organization, 426 U.S. 26 (1976)
 standing for intervention in export licensing matters; CLI-77-024, B, (6 NRC 525 (1977))
 standing for intervention in uranium export proceedings; CLI-77-032, B, (6 NRC 854, 857 (1977))
- Six Twenty Nine Productions v. Rollins Telecasting, Inc., 365 F.2d 478 (5th Cir. 1966)
 antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
- Smuck v. Hobson, 408 F.2d 175, 178-82 (D.C. Cir. 1969)
 rules of practice for good cause finding in untimely intervention petition; ALAB-444, K, (6 NRC 760, 756 (1977))
- South End Oil Co. v. Texaco, Inc., 237 F.Supp. 650, 655 (N.D. Ill. 1965)
 antitrust, acquisition of other utilities; ALAB-452, N, (6 NRC 892, 1031

LEGAL CITATIONS INDEX

CASES

- (1977))
antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
Southern California Edison Co. (San Onofre 2 and 3), ALAB-171, 7 AEC 37, 39 (1974)
state v. federal laws in NRC hearings; ALAB-443, C, (6 NRC 741, 747 (1977))
Southern California Edison Co. (San Onofre 2 and 3), ALAB-189, 7 AEC 410, 412 (1974)
effects from concurrent state proceedings on NRC proceedings; ALAB-443, D, (6 NRC 741, 748 (1977))
Southern California Edison Co. (San Onofre 2 and 3), ALAB-268, 1 NRC 383, 401 (1975)
status of construction permit pending appellate evidentiary hearing on unresolved issues; ALAB-443, A, (6 NRC 741 (1977))
Southern California Edison Co. (San Onofre), ALAB 171, 7 AEC 37, 39 (1974)
applicability of adjoining state laws over NRC proceedings and licenses; LBP-77-052, B, (6 NRC 294, 337 (1977))
Southern California Edison Co. (San Onofre), ALAB-248, 8 AEC 957, 959 (1974)
population growth forecasts, rules of practice for exclusion area determinations; ALAB-422, I, (6 NRC 33, 45 (1977))
Southern California Edison Co. (San Onofre), ALAB-248, 8 AEC 957, 960 fn. 7 (1974)
flexibility of rules for population center evaluation; ALAB-422, J, (6 NRC 33, 51 (1977))
Southern California Edison Co. (San Onofre), ALAB-248, 8 AEC 957, 961 (1974)
rules of practice for LPZ evaluation; ALAB-422, G, (6 NRC 33, 43 (1977))
Southern California Edison Co. (San Onofre), ALAB-268, 1 NRC 383 (1975)
rules of practice for LPZ evaluation; ALAB-422, G, (6 NRC 33, 43 (1977))
Southern California Edison Co. (San Onofre), ALAB-268, 1 NRC 383, 400 (1975)
validity of Commission regulations may not be challenged in adjudicatory hearings; LBP-77-046, A, (6 NRC 167 (1977))
Southern California Edison Co. (San Onofre), ALAB-308, 3 NRC 20 (1976)
rules of practice for LPZ evaluation; ALAB-422, G, (6 NRC 33, 43 (1977))
Southern California Edison Co. (San Onofre), ALAB-308, 3 NRC 20, 28 n. 9 (1976)
operational maintenance costs for Black Fox; LBP-77-046, A, (6 NRC 167 (1977))
Swift and Company v. U.S., 196 U.S. 375, 396 (1905)(Holmes, J.)
intent to monopolize; ALAB-452, E, (6 NRC 892, 921 (1977))
Tampa Electric Co. v. Nashville Coal Co., 365 U.S. 320, 327 (1961)
relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
Telax Corp. v. I.B.M. Corp., 519 F.2d 894, 915 (10th Cir. 1975)
antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 918 (1977))
Telax Corp. v. International Business Machines Corp., 510 F.2d 894, 919 (10th Cir. 1975), cert. denied, 423 U.S. 802 (1975)
antitrust, refusal to deal; ALAB-452, M, (6 NRC 892, 1025 (1977))
Ten Applications for Low-Enriched Uranium Exports to EURATOM Member Nations, CLI-77-024, 6 NRC 525 (1977)
export license granted without public hearings; CLI-77-029, A, (6 NRC 719 (1977))
intervention standing in export licensing; CLI-77-032, A, (6 NRC 854 (1977))
Tennessee Valley Authority (Bellefonte), ALAB-237, 8 AEC 654 (1974)
nonparty standing to appeal; ALAB-433, B, (6 NRC 469 (1977))
Tennessee Valley Authority (Browns Ferry), LBP-76-010, 3 NRC 209, 212 (1976)
intervention standing, contentions adequacy; LBP-77-048, B, (6 NRC 249, 250 (1977))
Tennessee Valley Authority (Hartsville 1A, 2A, 1B and 2B), ALAB-367, 5 NRC 92, 104 n. 59 (1977)
waiver of unbriefed exceptions, rules of practice; ALAB-443, B, (6 NRC 741, 744 n. 8 (1977))
Tennessee Valley Authority (Hartsville 1A, 2A, 1B and 2B), ALAB-409, 5 NRC 1391, 1397 (1977)
waiver of unbriefed exceptions, rules of practice; ALAB-443, B, (6 NRC 741, 744 n. 8 (1977))
Tennessee Valley Authority (Hartsville), ALAB-367, 5 NRC 92, 105 (1977)
fuel-cycle jurisdiction terminated and construction permit affirmed in totality; ALAB-426, B, (6 NRC 206, 210 (1977))

LEGAL CITATIONS INDEX

CASES

- Tennessee Valley Authority (Hartsville), ALAB-367, 5 NRC 92, 94 (1977)
need-for-power considerations; ALAB-422, R, (6 NRC 33, 90 (1977))
- Tennessee Valley Authority (Hartsville), ALAB-409, 5 NRC 1391, 1397, fn. 8 (1977)
rules of practice for motion to strike exceptions, substantial compliance standard; ALAB-424, D, (6 NRC 122, 125 (1977))
- Tennessee Valley Authority (Watts Bar 1 and 2), ALAB-413, 5 NRC 1418 (1977)
rules of practice for untimely intervention petitions; ALAB-444, J, (6 NRC 760, 794 (1977))
- Tennessee Valley Authority (Watts Bar), ALAB-413, 5 NRC 1418, 1420 (1977)
standing for intervention on ratepayer status; ALAB-424, A, (6 NRC 122 (1977))
- Tennessee Valley Authority (Watts Bar), LBP-77-036, 5 NRC 1292, 1297 (1977)
standing for intervention; LBP-77-059, A, (6 NRC 518 (1977))
- Times-Picayune Pub. Co. v. U.S., 345 U.S. 594 (1953)
antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
- Times-Picayune Pub. Co. v. U.S., 345 U.S. 594, 612 (1953)
monopoly power finding, coordination; ALAB-452, I, (6 NRC 892, 997 (1977))
- Toledo Edison Co. (Davis-Besse 1), ALAB-323, 3 NRC 331 (1976)
national antitrust policy; ALAB-451, A, (6 NRC 889 (1977))
- Toledo Edison Co. (Davis-Besse 1, 2 and 3), ALAB-332, 3 NRC 785 (1976)
Entire ASLAB Panel recusal involving attorney misconduct charges; ALAB-450, (6 NRC 887 (1977))
- Toledo Edison Co. (Davis-Besse 1, 2 and 3), ALAB-378, 5 NRC 557 (1977)
Entire ASLAB Panel recusal involving attorney misconduct charges; ALAB-450, (6 NRC 887 (1977))
- Toledo Edison Co. (Davis-Besse 1, 2 and 3), ALAB-385, 5 NRC 621, 628 (1977)
antitrust standards for coordination; ALAB-452, P, (6 NRC 892, 1046 (1977))
- Toledo Edison Co. (Davis-Besse 1, 2 and 3), LBP-77-001, 5 NRC 133, 160 (1977)(appeal pending)
relevant wholesale markets for antitrust; ALAB-452, H, (6 NRC 892, 994 (1977))
- Toledo Edison Co. (Davis-Besse), ALAB-323, 3 NRC 331 (1976)
NRC antitrust jurisdiction; ALAB-428, C, (6 NRC 221, 224 (1977))
pending antitrust completion, construction permit may be issued by party agreement; ALAB-420, B, (6 NRC 8, 10 (1977))
- Toledo Edison Co. (Davis-Besse), ALAB-378, 5 NRC 557, 561 (1977)
res judicata policy for disputed jurisdiction; ALAB-422, M, (6 NRC 33, 70 (1977))
- Toledo Edison Co. (Davis-Besse), CLP-77-001, 5 NRC 133, 160 (1977) (appeal pending)
antitrust relevant market principle; ALAB-452, E, (6 NRC 892, 921 (1977))
- Train v. Colorado PIRG, 426 U.S. 1 (1976)
State authority under FWPCA relative to health and safety matters;
LBP-77-052, D, (6 NRC 294, 339 (1977))
- Travelers Insurance Co. v. Blue Cross of Western Pennsylvania, 481 F.2d 80, 85 (3rd Cir.), cert. denied, 414 U.S. 1093 (1973)
antitrust, refusal to deal; ALAB-452, M, (6 NRC 892, 1025 (1977))
- Trustees of Columbia University, 4 AEC 680, 681-82 (1971), aff'd sub nom Horningside Renewal Council v. A.E.C., 482 F.2d 234, 239 (2d Cir. 1973), cert denied, 417 U.S. 951 (1974)
trial authority of ASLB; ALAB-443, A, (6 NRC 741 (1977))
- Trustees of Columbia University in the City of New York, ALAB-662, 5 AEC 266, 267 (1972)
ASLB responsibility for resolution of contentions in initial decision;
ALAB-422, C, (6 NRC 33, 41 (1977))
- Turner, The Scope of Antitrust and Other Economic Regulatory Policies, 82 Harvard L. Rev. 1207, 1231 (1969)
monopoly power considerations; ALAB-452, J, (6 NRC 892, 1012 (1977))
- Twin City Sportservice, Inc. v. Charles O. Finley, 512 F.2d 1264, 1270 (9th Cir. 1975)
intent to monopolize; ALAB-452, E, (6 NRC 892, 921 (1977))
- U.S. ERDA (Clinch River Breeder), CLI-76-013, 4 NRC 67, 75 (1976)
interlocutory stay denied for Seabrook site review; CLI-77-027, A, (6 NRC 715 (1977))
- U.S. Steel Corp. v. Fortner Enterprises, -U.S.-, 51 L.Ed.2d 80, 85 fn. 1 (1977)

LEGAL CITATIONS INDEX

CASES

- antitrust review standards, applicant's conduct; ALAB-452, B, (6 NRC 892, 913 (1977))
- U.S. v. A.L.C.D.A., 148 F.2d 416 (2nd Cir. 1945)
antitrust review standards, applicant's conduct; ALAB-452, B, (6 NRC 892, 913 (1977))
- U.S. v. A.L.C.D.A., 148 F.2d 416, 429 (2nd Cir. 1945)
antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 918 (1977))
- U.S. v. A.L.C.D.A., 148 F.2d 416, 431 (1945)
antitrust immunity for electric utilities; ALAB-452, C, (6 NRC 892, 915 (1977))
- U.S. v. Associated Press, 52 F.Supp. 362 (S.D.N.Y. 1943)
vertical integration in relevant market determination; ALAB-452, H, (6 NRC 892, 994 (1977))
- U.S. v. Blue Bell, Inc., 305 F.Supp. 538 (M.D. Tenn. 1975)
vertical integration in relevant market determination; ALAB-452, H, (6 NRC 892, 994 (1977))
- U.S. v. Borden Co., 308 U.S. 188 (1939)
nexus considerations in antitrust; ALAB-452, C, (6 NRC 892, 915 (1977))
- U.S. v. Citizens National Bank, 422 U.S. 86 (1975)
antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 918 (1977))
monopoly power finding, coordination; ALAB-452, I, (6 NRC 892, 997 (1977))
- U.S. v. Colgate and Company, 250 U.S. 300 (1919)
antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
- U.S. v. Columbia Steel Co., 334 U.S. 495, 528 (1948)
monopoly power finding, coordination; ALAB-452, I, (6 NRC 892, 997 (1977))
- U.S. v. Connecticut National Bank, 418 U.S. 656, 669 (1974)
antitrust relevant market principle; ALAB-452, E, (6 NRC 892, 921 (1977))
- U.S. v. Dibble, 429 F.2d 558, 601 (9th Cir. 1970)
burden of proof for summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))
- U.S. v. Diebold, 369 U.S. 654 (1962)
rules of practice for summary disposition; LBP-77-045, B, (6 NRC 159, 162 (1977))
- U.S. v. DuPont, 351 U.S. 377, 389 (1956)
antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 918 (1977))
- U.S. v. E.I. du Pont de Nemours and Co., 353 U.S. 586, 589 (1957)
antitrust, acquisition of other utilities; ALAB-452, N, (6 NRC 892, 1031 (1977))
- U.S. v. Empire Gas Corp., 537 F.2d 296, 299 (8th Cir. 1976), cert. denied, -U.S.-, (1977)
antitrust review standards, applicant's conduct; ALAB-452, B, (6 NRC 892, 913 (1977))
- U.S. v. Falstaff Brewing Corp., 410 U.S. 526 (1973)
monopoly power considerations; ALAB-452, J, (6 NRC 892, 1012 (1977))
- U.S. v. First National Bank and Trust Co. of Lexington, 376 U.S. 665 (1964)
antitrust, acquisition of other utilities; ALAB-452, N, (6 NRC 892, 1031 (1977))
- U.S. v. Gazda, 499 F.2d 161, 164 (3rd Cir. 1974)
weight of counsel arguments as evidence; ALAB-420, E, (6 NRC 8, 14 (1977))
- U.S. v. General Dynamics Corp., 415 U.S. 486 (1974)
monopoly power finding, coordination; ALAB-452, I, (6 NRC 892, 997 (1977))
- U.S. v. Greater Buffalo Press, 402 U.S. 549 (1971)
vertical integration in relevant market determination; ALAB-452, H, (6 NRC 892, 994 (1977))
- U.S. v. Greater Buffalo Press, 402 U.S. 549, 553 (1971)
relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- U.S. v. Grinnell Corp., 384 U.S. 563, 570 (1966)
antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 918 (1977))
- U.S. v. H.H. Prince Textiles, Inc., 262 F.Supp. 383 (1966)
management involvement in compliance responsibilities; ALJ-77-001, C, (6 NRC 693, 698 (1977))
management involvement in compliance responsibilities; ALJ-77-002, C, (6 NRC 702, 711 (1977))

LEGAL CITATIONS INDEX

CASES

- U.S. v. Hughes Tool Co., 415 F.Supp. 637 (C.D. Cal. 1976)
relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- U.S. v. I.B.M., Trade Cases (CCH) par. 60,495 at p. 67,176 (S.D.N.Y. 1975)
antitrust review standards, applicant's conduct; ALAB-452, B, (6 NRC 892, 913 (1977))
- U.S. v. I.C.C., 396 U.S. 491, 521 (1970)
reopening of proceedings, need for power; ALAB-443, E, (6 NRC 741, 748 (1977))
- U.S. v. J.B. Williams Co., 498 F.2d 414 (1974) (Friendly, CA-J)
factors for consideration in civil penalty mitigation hearings; ALJ-77-001, A, (6 NRC 693 (1977))
- U.S. v. J.B. Williams Co., 498 F.2d 414 (1974) (Friendly, CA-J)
factors for determining civil penalty mitigation; ALJ-77-002, D, (6 NRC 702 (1977))
- U.S. v. Jerrold Electronics Corp., 187 F.Supp. 545, 566, 568 (E.D. Pa. 1960),
affirmed per curiam, 365 U.S. 567 (1961)
antitrust, acquisition of other utilities; ALAB-452, N, (6 NRC 892, 1031 (1977))
- U.S. v. Johnson, 541 F.2d 710 (1976)
management involvement in compliance responsibilities; ALJ-77-001, C, (6 NRC 693, 698 (1977))
management involvement in compliance responsibilities; ALJ-77-002, C, (6 NRC 702, 711 (1977))
- U.S. v. Kimberly-Clark Corp., 264 F.Supp. 439, 455 (N.D. Cal. 1967)
relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- U.S. v. Klearflax Linen Looms, 63 F.Supp. 32 (D.Minn. 1945)
antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
- U.S. v. Loew's, Inc., 189 F.Supp. 373 (S.D.N.Y. 1960), modified on other grounds, 371 U.S. 38 (1962)
antitrust, refusal to wheel; ALAB-452, O, (6 NRC 892, 1036 (1977))
- U.S. v. Marine Bancorporation, 418 U.S. 602 (1974)
antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 918 (1977))
monopoly power finding, coordination; ALAB-452, I, (6 NRC 892, 997 (1977))
- U.S. v. McKesson and Robbins, Inc., 351 U.S. 305, 316 (1956)
nexus considerations in antitrust; ALAB-452, C, (6 NRC 892, 915 (1977))
- U.S. v. Pabst Brewing Co., 384 U.S. 546, 551 (1966)
relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- U.S. v. Park, 421 U.S. 658, 44 L.Ed.2d 489 (1975)
management involvement in compliance responsibilities; ALJ-77-001, C, (6 NRC 693, 698 (1977))
management involvement in compliance responsibilities; ALJ-77-002, C, (6 NRC 702, 711 (1977))
- U.S. v. Philadelphia National Bank, 374 U.S. 321, 350 (1963)
nexus considerations in antitrust; ALAB-452, C, (6 NRC 892, 915 (1977))
- U.S. v. Phillipsburg National Bank, 399 U.S. 350, 360 (1970)
relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- U.S. v. R.C.A., 358 U.S. 334, 350 (1959)
nexus considerations in antitrust; ALAB-452, C, (6 NRC 892, 915 (1977))
- U.S. v. Radio Corp. of America, 358 U.S. 334, 350 (1951)
monopoly power finding, coordination; ALAB-452, I, (6 NRC 892, 997 (1977))
- U.S. v. Richardson, 418 U.S. 166 (1974)
standing for intervention as taxpayer; LBP-77-059, A, (6 NRC 518 (1977))
- U.S. v. S.C.R.A.P., 412 U.S. 669 (1973)
standing for intervention in export licensing matters; CLI-77-024, B, (6 NRC 525 (1977))
- U.S. v. Standard Oil Co., 221 U.S. 1, 62 (1911)
antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 918 (1977))
- U.S. v. Swift and Co., 286 U.S. 106, 116 (1932)(Cardozo)
Midland antitrust reversal, nexus issue; ALAB-452, A, (6 NRC 892 (1977))
- U.S. v. Terminal Railroad Assn., 224 U.S. 383 (1912)
antitrust standards for coordination; ALAB-452, P, (6 NRC 892, 1046 (1977))
- U.S. v. Tidewater Marine Service, Inc., 284 F.Supp. 324, 328 (E.D. La. 1968)
relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- U.S. v. Topco Associates, 405 U.S. 596, 610 (1972)

LEGAL CITATIONS INDEX

CASES

- national antitrust policy; ALAB-451, A, (6 NRC 889 (1977))
- U.S. v. United Shoe Machinery Corp., 110 F.Supp. 295, 342 (D. Mass. 1953), affirmed per curiam, 347 U.S. 521 (1954)
antitrust review standards, applicant's conduct; ALAB-452, B, (6 NRC 892, 913 (1977))
- U.S. v. United Shoe Machinery Corp., 110 F.Supp. 295, 344 (D.Mass. 1953), affirmed per curiam, 347 U.S. 521 (1954)
antitrust review standards, applicant's conduct; ALAB-452, B, (6 NRC 892, 913 (1977))
- U.S. v. United Shoe Machinery Corp., 89 F.Supp. 349, 354 (D. Mass. 1950)
antitrust, acquisition of other utilities; ALAB-452, N, (6 NRC 892, 1031 (1977))
- U.S. v. Utah Construction and Mining Co., 384 U.S. 394, 421 (1966)
res judicata policy for disputed jurisdiction; ALAB-422, M, (6 NRC 33, 70 (1977))
- U.S. v. Vitasafe Corp., 212 F.Supp. 397 (1962)
management involvement in compliance responsibilities; ALJ-77-001, C, (6 NRC 693, 698 (1977))
management involvement in compliance responsibilities; ALJ-77-002, C, (6 NRC 702, 711 (1977))
- Udall v. Tallman, 380 U.S. 1, 16, 17 (1965)
weight accorded Agency interpretation of regulations; LBP-77-069, F, (6 NRC 1179, 1183 (1977))
- Union Carbide and Carbon Corp. v. Nisley, 300 F.2d 561, 585 (10th Cir. 1961)
relevant market for antitrust; ALAB-452, G, (6 NRC 892, 945 (1977))
- Union Electric Co. (Callaway 1 and 2), ALAB-347, 4 NRC 216 (1976)
status of unbriefed exceptions; ALAB-435, A, (6 NRC 541 (1978))
- Union Electric Co. (Callaway 1 and 2), ALAB-347, 4 NRC 216, 223 n. 15 (1976)
waiver of unbriefed exceptions, rules of practice; ALAB-443, B, (6 NRC 741, 744 n. 8 (1977))
- Union Electric Co. (Callaway), ALAB-347, 4 NRC 216, 219 (1976)
fuel-cycle jurisdiction terminated and construction permit affirmed in totality; ALAB-426, B, (6 NRC 206, 210 (1977))
- Union Leader Corp. v. Newspaper of New Eng., Inc., 284 F.2d 582 (1st Cir. 1960), cert. denied, 365 U.S. 833 (1961)
antitrust, refusal to deal; ALAB-452, M, (6 NRC 892, 1025 (1977))
- Union of Concerned Scientists v. A.E.C., 499 F.2d 1069, 1094 (D.C. Cir. 1974), affirming this point, Boston Edison Co. (Pilgrim), ALAB-083, 5 AEC 354, 371 (1972)
ASLB responsibility for resolution of contentions in initial decision; ALAB-422, C, (6 NRC 33, 41 (1977))
- United Church of Christ v. F.C.C., 359 F.2d 94 (D.C. Cir. 1966), opinion after remand, 425 F.2d 543 (D.C. Cir. 1969)
cross-examination reliance for factual support of contentions; LBP-77-054, (6 NRC 436 (1977))
- United Mine Workers v. Pennington, 381 U.S. 557 (1965)
antitrust standards for refusal to coordinate; ALAB-452, P, (6 NRC 892, 1046 (1977))
- Utah Pie Co. v. Continental Baking Co., 386 U.S. 685, 696, fn 12 (1967)
antitrust, acquisition of other utilities; ALAB-452, N, (6 NRC 892, 1031 (1977))
- Vermont Yankee Nuclear Power Corp. (Vermont Yankee), ALAB-073, 5 AEC 297, 298 (1972)
scope of ASLB review of initial decision, resolution of new issues; ALAB-422, D, (6 NRC 33, 41 (1977))
- Vermont Yankee Nuclear Power Corp. (Vermont Yankee), ALAB-124, 6 AEC 358, 362 (1973)
ASLB resolution of contested issues; ALAB-429, D, (6 NRC 229, 237 (1977))
scope of ASLB authority in reopening of proceedings, evidence introduction; ALAB-443, G, (6 NRC 741, 752 (1977))
- Vermont Yankee Nuclear Power Corp. (Vermont Yankee), ALAB-138, 6 AEC 520, 523 (1973)
rules of practice for reopening proceedings; ALAB-422, L, (6 NRC 33, 64 fn. 35 (1977))
- Vermont Yankee Nuclear Power Corp. (Vermont Yankee), ALAB-179, 7 AEC 159, 174 n. 27 (1974)

LEGAL CITATIONS INDEX

CASES

- status of Regulatory Guides; ALAB-444, B, (6 NRC 760, 767, 772 (1977))
Vermont Yankee Nuclear Power Corp. (Vermont Yankee), ALAB-194, 7 AEC 431, 448 (1974)
trial authority of ASLAB; ALAB-443, A, (6 NRC 741 (1977))
Vermont Yankee Nuclear Power Corp. (Vermont Yankee), ALAB-211, 7 AEC 982, 984 (1974)
appellate practice for certification issues; ALAB-421, B, (6 NRC 25, 27 (1977))
Vermont Yankee Nuclear Power Corp. (Vermont Yankee), ALAB-392, 5 NRC 759 (1977)
environmental impact from uranium fuel cycle; ALAB-444, A, (6 NRC 760 (1977))
Vermont Yankee Nuclear Power Corp. (Vermont Yankee), ALAB-421, 6 NRC 25, 28 (1977)
interim fuel-cycle-rule effects on pending license applications; ALAB-426, A, (6 NRC 206 (1977))
Vermont Yankee Nuclear Power Corp. (Vermont Yankee), CLI-77-010, 5 NRC 717, 717b (1977)
environmental impact from uranium fuel cycle; ALAB-444, A, (6 NRC 760 (1977))
Vermont Yankee Nuclear Power Corp. (Vermont Yankee), LBP 73-008, 6 AEC 130 (1973)
intervention standing of non-site specific states; LBP-77-059, B, (6 NRC 518, 521 (1977))
Vermont Yankee Nuclear Power Corp. v. N.R.D.C., 429 U.S. 1090 (1977)
uranium fuel cycle effects for River Bend; ALAB-444, A, (6 NRC 760 (1977))
Village of Elbow Lake v. Otter Tail Power Co., 46 FPC 675, 678 (1971), affirmed as modified sub nom. Otter Tail Power Co. v. F.P.C., 473 F.2d 1253 (8th Cir. 1973)
antitrust standards for refusal to coordinate; ALAB-452, P, (6 NRC 892, 1046 (1977))
Virginia Electric and Power Co. (North Anna 1 and 2), ALAB-324, 3 NRC 347 (1976), affirmed in part and reversed in part; CLI-76-022, 4 NRC 480 (1976)
timing of appeal from licensee's liability for violations; ALAB-441, (6 NRC 725 (1977))
Virginia Electric and Power Co. (North Anna 1 and 2), CLI-76-022, 4 NRC 480 (1976)
management involvement in compliance responsibilities; ALJ-77-001, C, (6 NRC 693, 698 (1977))
management involvement in compliance responsibilities; ALJ-77-002, C, (6 NRC 702, 711 (1977))
NRC authority to impose civil penalties for license violations; ALJ-77-001, B, (6 NRC 693 (1977))
Virginia Electric and Power Co. (North Anna), ALAB-289, 2 NRC 395 (1975)
untimely intervention denial for Oyster Creek; LBP-77-058, (6 NRC 500 (1977))
Virginia Electric Power Co. (North Anna 1 and 2), CLI-76-022, 4 NRC 480 (1976)
NRC authority to impose civil penalties for license violations; ALJ-77-002, B, (6 NRC 702, 707 (1977))
Virginia Petroleum Jobbers Assn. v. F.P.C., 259 F.2d 921, 525 (D.C. Cir. 1958)
interlocutory stay denied for Seabrook site review; CLI-77-027, A, (6 NRC 715 (1977))
rules of practice for stay pending appeal; ALAB-424, F, (6 NRC 122, 127 (1977))
rules of practice for stay pending appeal; ALAB-437, B, (6 NRC 630 (1977))
rules of practice for stay pending appeal; CLI-77-027, B, (6 NRC 715 (1977))
standard for granting construction permit suspension during remand proceeding; LBP-77-057, B, (6 NRC 482 (1977))
WAIT Radio v. F.C.C., 418 F.2d 1153 (D.C. Cir. 1969)
scope of ASLAB review of initial decision, resolution of new issues; ALAB-422, D, (6 NRC 33, 41 (1977))
WAIT Radio v. F.C.C., 418 F.2d 1153, 1156 (D.C. Cir. 1969)
ASLB responsibilities for decision format; ALAB-422, B, (6 NRC 33, 41 (1977))
Walker Process Equipment, Inc. v. Food Mech. and Chem. Corp., 382 U.S. 172, 177 (1965)
antitrust review standards, applicant's conduct; ALAB-452, B, (6 NRC 892,

LEGAL CITATIONS INDEX

CASES

- 913 (1977))
Walpert v. Bart, 280 F.Supp. 1006, 1010 (D. Md. 1967), affd 390 F.2d 877 (4th Cir. 1968)
burden of proof for summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))
Warth v. Seldin, 422 U.S. 490, 499 (1975)
standing for intervention in export licensing matters; CLI-77-024, B, (6 NRC 525 (1977))
standing for intervention in uranium export proceedings; CLI-77-032, B, (6 NRC 854, 857 (1977))
Washington Metropolitan Area Transit Commission v. Holiday Tours, -F.2d- (D.C. Cir. July 5, 1977, No. 77-1379)
rules of practice for stay pending appeal; ALAB-437, B, (6 NRC 630 (1977))
Weber v. Wynne, 431 F.Supp. 1048, 1054 (D.N.J. 1977)
monopoly power considerations; ALAB-452, J, (6 NRC 892, 1012 (1977))
Westinghouse Electric Co. (ASCO II), CLI-76-009, 3 NRC 739 (1976)
export license granted without public hearings; CLI-77-029, A, (6 NRC 719 (1977))
Whitten v. Paddock Pool Bldrs., Inc., 508 F.2d 547, 553 (1st Cir. 1974), cert. denied, 421 U.S. 1004 (1975)
antitrust consideration; ALAB-452, D, (6 NRC 892, 918 (1977))
Wingo v. Washington, 395 F.2d 633, 636 (D.C. Cir. 1968)
ASLB resolution of contested issues; ALAB-429, D, (6 NRC 229, 237 (1977))
ASLB responsibilities for decision format; ALAB-422, B, (6 NRC 33, 41 (1977))
Wisconsin Electric Power Co. (Koshkonong), CLI-74-045, 8 AEC 928, 930 (1975)
applicability of adjoining state laws over NRC proceedings and licenses; LBP-77-052, B, (6 NRC 294, 337 (1977))
Wisconsin Electric Power Co. (Point Beach 2), ALAB-078, 5 AEC 319, 329 (1972)
safety findings for unresolved generic issues; ALAB-444, G, (6 NRC 760, 784 (1977))
Wisconsin Electric Power Co. (Point Beach 2), ALAB-137, 6 AEC 491, 507-08 (1973)
safety findings for unresolved generic issues; ALAB-444, G, (6 NRC 760, 784 (1977))
Wisconsin Electric Power Co. (Point Beach), ALAB-078, 5 AEC 319, 321 (1972)
ASLB responsibility for resolution of contentions in initial decision; ALAB-422, C, (6 NRC 33, 41 (1977))
Wisconsin Electric Power Co. (Point Beach), ALAB-078, 5 AEC 319, 322 fn. 14 (1972)
scope of ASLAB review of initial decision, resolution of new issues; ALAB-422, D, (6 NRC 33, 41 (1977))
Wolfson v. Artisans Savings Bank, No. 76-179 (D.Del., filed March 24, 1977)(slip op. at 16)
antitrust consideration of federally regulated industry; ALAB-452, D, (6 NRC 892, 918 (1977))
Woods Exploration and Producing Co. v. A.L.C.O.A., 438 F.2d 1286, 1305 (5th Cir. 1971), cert. denied, 404 U.S. 1047 (1972)
monopoly power finding; ALAB-452, I, (6 NRC 892, 997 (1977))
Woods Exploration and Producing Co. v. A.L.C.O.A., 438 F.2d 1286, 1307 (5th Cir. 1971)
intent to monopolize; ALAB-452, E, (6 NRC 892, 921 (1977))
Woods Exploration and Producing Co. v. A.L.C.O.A., 438 F.2d 1286, 1307 (5th Cir. 1971), cert. denied, 404 U.S. 1047 (1972)
monopoly power finding; ALAB-452, I, (6 NRC 892, 997 (1977))
Woods Exploration and Producing Co. v. A.L.C.O.A., 438 F.2d 1286, 1308 fn. 9 (5th Cir. 1971), cert. denied, 404 U.S. 1047 (1972)
antitrust, refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
York Committee for a Safe Environment v. N.R.C., 527 F.2d 812 (1975)
adequacy of radioactive emission controls for Peach Bottom 2 and 3; ALAB-448, (6 NRC 882 (1977))
York Committee for a Safe Environment v. U.S. N.R.C., 527 F.2d 812 (D.C. Cir. 1975)
remand cost-benefit analysis for Peach Bottom radioactive effluent control; LBP-77-062, (6 NRC 680 (1977))



LEGAL CITATIONS INDEX
REGULATIONS

- 6 Moore's Federal Practice 56.01 (13) at 56-21 (2d ed. 1976)
- burden of proof for summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))
- 6 Moore's Federal Practice 56.22 (2), pp 2824-2825 (2d ed. 1966)
- burden of proof for summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))
- 10 CFR 1.20
- role of staff and ACRS for safety evaluation for licensing; LBP-77-068, B,
(6 NRC 1127, 1132 (1977))
- 10 CFR 1.61
- role of staff and ACRS for safety evaluation for licensing; LBP-77-068, B,
(6 NRC 1127, 1132 (1977))
- 10 CFR 2.104(a)
- affirmation of scheduling for Yellow Creek construction permit proceeding;
ALAB-445, A, (6 NRC 865 (1977))
- rules of practice for Federal Register publication of notice of hearing for
construction permit commencement; ALAB-445, D, (6 NRC 865, 867 (1977))
- 10 CFR 2.104(d)
- NRC antitrust jurisdiction; ALAB-420, B, (6 NRC 8, 10 (1977))
- 10 CFR 2.205
- appeal from civil penalty prior to hearing dismissed as premature; ALAB-441,
(6 NRC 725 (1977))
- civil penalties imposed for license violations by Atlantic Research Corp.;
- ALJ-77-002, A, (6 NRC 702 (1977))
- 10 CFR 2.700
- licensee's liability for violations, appeal dismissal; ALAB-441, (6 NRC 725
(1977))
- 10 CFR 2.704(d)
- presiding officer resignation, administrative effects; ALAB-422, V, (6 NRC
33, 101 (1977))
- 10 CFR 2.710
- reopening to consider alternatives, briefs requested; ALAB-424, A, (6 NRC
122 (1977))
- 10 CFR 2.713(a)
- waiver of attorney requirements for pro se party; ALAB-440, A, (6 NRC 642
(1977))
- 10 CFR 2.713(c)
- attorney conduct charges, recusal of entire Appeal Panel; ALAB-450, (6 NRC
887 (1977))
- 10 CFR 2.714
- intervention grant for Exxon Reprocessing; LBP-77-059, A, (6 NRC 518 (1977))
- issue delineation for licensing floating nuclear power plants; LBP-77-048,
A, (6 NRC 249 (1977))
- specificity and particularization requirements for contentions; LBP-77-048,
B, (6 NRC 249, 250 (1977))
- standing to intervene late for dissatisfaction with existing representation
of interests; ALAB-440, B, (6 NRC 642 (1977))
- untimely intervention petition for appeal, rules of practice; ALAB-429, B,
(6 NRC 229, 233 fn. 20 (1977))
- 10 CFR 2.714a
- antitrust intervention denial affirmed for three fully licensed plants;
ALAB-428, A, (6 NRC 221 (1977))
- 10 CFR 2.714(a)
- appellate review policy for untimely intervention grant, quantum of proof;

LEGAL CITATIONS INDEX
REGULATIONS

- ALAB-420, D, (6 NRC 8, 13 (1977))
good cause finding for untimely intervention petition; ALAB-444, K, (6 NRC 760, 796 (1977))
intervention denial upheld for 3-year late petition; ALAB-440, A, (6 NRC 642 (1977))
intervention requirements and obligations for state participation; ALAB-444, D, (6 NRC 760, 768 (1977))
rules of practice for untimely intervention petitions; ALAB-431, B, (6 NRC 460 (1977))
rules of practice for untimely intervention petitions; ALAB-444, J, (6 NRC 760, 794 (1977))
specificity and particularization requirements for intervention contentions; LBP-77-050, (6 NRC 261 (1977))
untimely antitrust intervention grant affirmed for St. Lucie 2; ALAB-420, A, (6 NRC 8 (1977))
untimely intervention considerations for Shoreham operating proceeding; LBP-77-050, (6 NRC 261 (1977))
- 10 CFR 2.714a
untimely intervention denial affirmed for Parkins; ALAB-431, A, (6 NRC 460 (1977))
- 10 CFR 2.714(a)
untimely intervention denial for Oyster Creek full-term operating license proceeding; LBP-77-058, (6 NRC 500 (1977))
untimely intervention denied for River Bend 1 and 2 construction permits; ALAB-444, A, (6 NRC 760 (1977))
- 10 CFR 2.715
adequacy of participation for County petitioner; LBP-77-050, (6 NRC 261 (1977))
- 10 CFR 2.715(c)
cross-examination rights by intervenor states; ALAB-444, E, (6 NRC 760, 770 (1977))
intervention grant affirmed for distant state; ALAB-447, A, (6 NRC 873 (1977))
intervention grant for Exxon Reprocessing; LBP-77-059, A, (6 NRC 518 (1977))
intervention requirements and obligations for state participation; ALAB-444, D, (6 NRC 760, 768 (1977))
intervention standing of states other than site specific; LBP-77-059, B, (6 NRC 518, 521 (1977))
standing for private intervention where state has withdrawn participation; ALAB-444, J, (6 NRC 760, 794 (1977))
states responsibilities toward individual's v. public interest; ALAB-440, B, (6 NRC 642 (1977))
- 10 CFR 2.717(a)
applicability to granting late antitrust petition for fully licensed facility; ALAB-428, A, (6 NRC 221 (1977))
- 10 CFR 2.718
rules of practice for distant state participation; ALAB-447, B, (6 NRC 873 (1977))
- 10 CFR 2.718(i)
appellate authority to direct certification of legal interlocutory matters; ALAB-419, B, (6 NRC 3 (1977))
appellate procedure for directed certification of academic issue; ALAB-419, C, (6 NRC 3 (1977))
ASLAB authority on NRC policy questions; ALAB-425, B, (6 NRC 199, 204 (1977))
authority of ASLAB for discretionary review of interlocutory orders; ALAB-445, C, (6 NRC 865, 867 (1977))
certification request denial for cease and desist order for spent fuel pool modification activity; LBP-77-069, A, (6 NRC 1179 (1977))
denial of petition for interlocutory review of Trojan spent fuel pool size; ALAB-451, A, (6 NRC 889 (1977))
discretionary review of interlocutory scheduling orders; ALAB-445, C, (6 NRC 865, 867 (1977))
licensee's liability for violations, appeal dismissal; ALAB-441, (6 NRC 725 (1977))
- 10 CFR 2.720(a)

LEGAL CITATIONS INDEX
REGULATIONS

- rules of practice for declining subpoena issuance; ALAB-422, S, (6 NRC 33, 93 (1977))
- 10 CFR 2.730(f)
ASLB referral of discovery order declined as interlocutory; ALAB-438, (6 NRC 638 (1977))
- licensee's liability for violations, appeal dismissal; ALAB-441, (6 NRC 725 (1977))
- rules of practice for appeals from partial contentions' denial; ALAB-434, B, (6 NRC 471 (1977))
- rules of practice for interlocutory ASLB appeals; ALAB-433, C, (6 NRC 469 (1977))
- 10 CFR 2.732
burden of proof for summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))
- 10 CFR 2.743(a)
rules of practice for intervenors' cross-examination rights; ALAB-422, T, (6 NRC 33, 94 (1977))
- 10 CFR 2.749
rules of practice for antitrust summary disposition; LBP-77-045, B, (6 NRC 159, 162 (1977))
- summary disposition of Stanislaus antitrust matters denied; LBP-77-045, A, (6 NRC 159 (1977))
- 10 CFR 2.749(b)
burden of proof for summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))
- 10 CFR 2.752
delineation of issues for Black Fox 1 and 2; LBP-77-046, A, (6 NRC 167 (1977))
- 10 CFR 2.760(a)
ASLB authority to consider and resolve non-controversial matters; LBP-77-068, C, (6 NRC 1127, 1132 (1977))
- 10 CFR 2.760a
full-term operating license authorization for Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))
- 10 CFR 2.760(a)
spent fuel pool modification for Prairie Island; LBP-77-051, A, (6 NRC 265 (1977))
- 10 CFR 2.762
licensee's liability for violations, appeal dismissal; ALAB-441, (6 NRC 725 (1977))
- 10 CFR 2.762(a)
briefing of exceptions, record references filed with ASLB; ALAB-424, E, (6 NRC 122, 126 (1977))
- nonparty standing to appeal; ALAB-433, B, (6 NRC 469 (1977))
- reconsideration denied for motion to strike exceptions to initial decision; ALAB-418, (6 NRC 1 (1977))
- reopening to consider alternatives, briefs requested; ALAB-424, A, (6 NRC 122 (1977))
- rules of practice for untimely briefs submission; ALAB-424, C, (6 NRC 122, 125 (1977))
- rules of practice, time limits on supporting briefs for exceptions; ALAB-424, B, (6 NRC 122, 125 (1977))
- 10 CFR 2.762(e)
standard for substantial compliance, motion to strike exceptions; ALAB-424, D, (6 NRC 122, 125 (1977))
- 10 CFR 2.785(a)
attorney conduct charges, recusal of entire Appeal Panel; ALAB-450, (6 NRC 887 (1977))
- 10 CFR 2.785(b)(1)
ASLB authority on NRC policy questions; ALAB-425, B, (6 NRC 199, 204 (1977))
- 10 CFR 2.785(d)
rules of practice for Commission certification of appellate issues; ALAB-421, B, (6 NRC 25, 27 (1977))
- 10 CFR 2.786(b)
scope of review of ALAB certified questions; CLI-77-023, B, (6 NRC 455 (1977))
- 10 CFR 2.786(b)(1)

LEGAL CITATIONS INDEX
REGULATIONS

- rules of practice for interested state's participation in certiorari;
CLI-77-025, C, (6 NRC 535 (1977))
- 10 CFR 2.786(b)(6)
CLI-77-022, (6 NRC 451 (1977))
- interested state accepted as belated party to Commission review; CLI-77-025,
A, (6 NRC 535 (1977))
- selection of parties for Commission review; CLI-77-025, B, (6 NRC 535
(1977))
- 10 CFR 2.787(b)
appeal dismissal by ASLAB Chairmen; ALAB-441, (6 NRC 725 (1977))
- 10 CFR 2.788
standard for granting construction permit suspension during remand
proceeding; LBP-77-057, B, (6 NRC 482 (1977))
- 10 CFR 2.788(e)
interlocutory stay denied for Seabrook; CLI-77-027, A, (6 NRC 715 (1977))
reinstatement of Seabrook construction permits; ALAB-423, A, (6 NRC 115
(1977))
- rules of practice for stay pending appeal; ALAB-424, F, (6 NRC 122, 127
(1977))
- rules of practice, immediate effectiveness of decisions; ALAB-423, B, (6 NRC
115 (1977))
- stay pending appeal, effective date of appellate decisions; ALAB-423, B, (6
NRC 115 (1977))
- 10 CFR 2.790(b)(6)
rules of practice for proprietary data review; ALAB-435, C, (6 NRC 541, 545
(1977))
- 10 CFR 2 App. A(X)(e)
NRC antitrust jurisdiction; ALAB-420, B, (6 NRC 8, 10 (1977))
- 10 CFR 2 App A(V)(d)(1)
burden of proof for summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))
- 10 CFR 2 App A(V)(f)(2)
ASLB role in safety review; ALAB-444, H, (6 NRC 760, 766, 774 (1977))
- 10 CFR 2E
civil fine assessment for Marble Hill LWA violation; LBP-77-052, E, (6 NRC
294, 301 (1977))
- 10 CFR 20
rules of practice for occupational radiation-dose protection; LBP-77-055, B,
(6 NRC 473, 476 (1977))
spent fuel pool modification for Prairie Island; LBP-77-055, A, (6 NRC 473
(1977))
- 10 CFR 20.1
remand cost-benefit analysis for Peach Bottom radioactive effluent control;
LBP-77-062, (6 NRC 680 (1977))
spent fuel pool modification for Prairie Island; LBP-77-051, A, (6 NRC 265
(1977))
- 10 CFR 20.10(a)
violations, civil penalties assessment by summary judgment; ALJ-77-001, A,
(6 NRC 693 (1977))
- 10 CFR 20.101(a)
civil penalties imposed for license violations by Atlantic Research Corp.;
ALJ-77-002, A, (6 NRC 702 (1977))
- 10 CFR 34.27
civil penalties imposed for license violations by Atlantic Research Corp.;
ALJ-77-002, A, (6 NRC 702 (1977))
- 10 CFR 34.33(a)
civil penalties imposed for license violations by Atlantic Research Corp.;
ALJ-77-002, A, (6 NRC 702 (1977))
- 10 CFR 34.43(b)
civil penalties imposed for license violations by Atlantic Research Corp.;
ALJ-77-002, A, (6 NRC 702 (1977))
violations, civil penalties assessment by summary judgment; ALJ-77-001, A,
(6 NRC 693 (1977))
- 10 CFR 34.43(d)
civil penalties imposed for license violations by Atlantic Research Corp.;
ALJ-77-002, A, (6 NRC 702 (1977))
- 10 CFR 50

LEGAL CITATIONS INDEX
REGULATIONS

- ASLB role in safety review; ALAB-444, H, (6 NRC 760, 766, 774 (1977))
- construction permit issuance for Cherokees 1, 2 and 3; LBP-77-074, (6 NRC 1314 (1977))
- full-term operating license authorization for Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))
- 10 CFR 50.2(n)
- ASLB role in safety review; ALAB-444, H, (6 NRC 760, 766, 774 (1977))
- 10 CFR 50.10
- pre-LWA authority for tree damage; LBP-77-061, C, (6 NRC 674, 677 (1977))
- 10 CFR 50.10(c)
- LWA issuance after civil fine for violation; LBP-77-052, A, (6 NRC 294 (1977))
- violation, effect on subsequent LWA issuance; LBP-77-052, E, (6 NRC 294, 301 (1977))
- 10 CFR 50.10(e)
- LWA denied without prejudice for inadequate alternate site review; LBP-77-066, (6 NRC 839 (1977))
- LWA findings for Phipps Bend; LBP-77-060, A, (6 NRC 647 (1977))
- 10 CFR 50.10(e)(1)
- LWA issuance for Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))
- 10 CFR 50.10(e)(3)
- LWA-2 findings for Marble Hill 1 and 2; LBP-77-067, A, (6 NRC 1101 (1977))
- 10 CFR 50.10(e)(3)(i)
- LWA-2 grant for Cherokees; LBP-77-047, A, (6 NRC 191 (1977))
- subsurface work only may be authorized by LWA-2; LBP-77-047, B, (6 NRC 191, 194 (1977))
- 10 CFR 50.20(e)
- uranium fuel cycle effects on Seabrook; ALAB-422, W, (6 NRC 33, 102 (1977))
- 10 CFR 50.23
- operating license amendments, construction permit requirements; LBP-77-069, E, (6 NRC 1179, 1182 (1977))
- 10 CFR 50.33(f)
- financial qualifications required of applicant; ALAB-422, N, (6 NRC 33, 73 (1977))
- 10 CFR 50.34a
- full-term operating license authorization for Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))
- remand cost-benefit analysis for Peach Bottom radioactive effluent control; LBP-77-062, (6 NRC 680 (1977))
- 10 CFR 50.34(a)(8)
- ASLB role in safety review; ALAB-444, H, (6 NRC 760, 766, 774 (1977))
- 10 CFR 50.34(a)
- standards for radiation protection, spent fuel storage; LBP-77-055, B, (6 NRC 473, 476 (1977))
- 10 CFR 50.34(c)
- disclosure of physical security plans for nuclear facilities; CLI-77-023, A, (6 NRC 455 (1977))
- 10 CFR 50.35(a)
- construction permit issuance for Sterling; LBP-77-053, (6 NRC 350 (1977))
- 10 CFR 50.36a
- remand cost-benefit analysis for Peach Bottom radioactive effluent control; LBP-77-062, (6 NRC 680 (1977))
- 10 CFR 50.45
- operating license amendments, construction permit requirements; LBP-77-069, E, (6 NRC 1179, 1182 (1977))
- 10 CFR 50.54(n)
- operating license amendments, construction permit requirements; LBP-77-069, E, (6 NRC 1179, 1182 (1977))
- 10 CFR 50.55
- operating license amendments, construction permit requirements; LBP-77-069, E, (6 NRC 1179, 1182 (1977))
- 10 CFR 50.56
- operating license amendments, construction permit requirements; LBP-77-069, E, (6 NRC 1179, 1182 (1977))
- 10 CFR 50.57(a)(2)
- spent fuel pool modification for Prairie Island; LBP-77-051, A, (6 NRC 265

LEGAL CITATIONS INDEX

REGULATIONS

- (1977))
- 10 CFR 50.57(c)
temporary fuel-loading license for North Anna 1; LBP-77-064, (6 NRC 808 (1977))
- 10 CFR 50.90
operating license amendments, construction permit requirements; LBP-77-069, E, (6 NRC 1179, 1182 (1977))
- 10 CFR 50.91
operating license amendments, construction permit requirements; LBP-77-069, E, (6 NRC 1179, 1182 (1977))
spent fuel pool modification for Prairie Island; LBP-77-051, A, (6 NRC 265 (1977))
- 10 CFR 50 App. C
financial qualifications required of applicant; ALAB-422, N, (6 NRC 33, 73 (1977))
- 10 CFR 50 App. I
NEPA cost benefit must include somatic and genetic effects from low-level releases; LBP-77-046, B, (6 NRC 167, 170 (1977))
radiation exposures to general public, \$1000 per man-rem value; LBP-77-055, B, (6 NRC 473, 476 (1977))
spent fuel pool modification for Prairie Island; LBP-77-055, A, (6 NRC 473 (1977))
- 10 CFR 50 App A
compliance standards for nuclear facilities; LBP-77-068, E, (6 NRC 1127, 1133 (1977))
- 10 CFR 50 App B
co-applicant technical qualifications; LBP-77-067, B, (6 NRC 1101, 1117 (1977))
- 10 CFR 50 App D(C)
full-term operating license authorization for Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))
- 10 CFR 50 App E
emergency plan dissemination requirements for operating proceedings; LBP-77-068, F, (6 NRC 1127, 1155 (1977))
- 10 CFR 50 App I
full-term operating license authorization for Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))
remand cost-benefit analysis for Peach Bottom radioactive effluent control; LBP-77-062, (6 NRC 680 (1977))
- 10 CFR 51
construction permit issuance for Sterling; LBP-77-053, (6 NRC 350 (1977))
- 10 CFR 51.5(c)
negative NEPA determinations; LBP-77-069, D, (6 NRC 1179, 1182 (1977))
NEPA requirements for EIS of spent fuel pool modification; LBP-77-051, B, (6 NRC 265, 267 (1977))
- 10 CFR 51.7
negative NEPA determinations; LBP-77-069, D, (6 NRC 1179, 1182 (1977))
- 10 CFR 51.20(e)
construction permit issuance for River Bend 1 and 2; ALAB-444, A, (6 NRC 760 (1977))
Table S-3 values for Cherokee 1, 2 and 3; LBP-77-074, (6 NRC 1314 (1977))
- 10 CFR 51.52
LWA findings for Phipps Bend; LBP-77-060, A, (6 NRC 647 (1977))
- 10 CFR 51.52(b)
LWA denied without prejudice for inadequate alternate site review; LBP-77-066, (6 NRC 839 (1977))
- 10 CFR 51.52(c)
LWA denied without prejudice for inadequate alternate site review; LBP-77-066, (6 NRC 839 (1977))
- 10 CFR 73.55
disclosure of physical security plans for nuclear facilities; CLI-77-023, A, (6 NRC 455 (1977))
- 10 CFR 100
construction permit issuance for Sterling; LBP-77-053, (6 NRC 350 (1977))
flexibility for exclusion-area, LPZ, and population-center determinations; ALAB-422, J, (6 NRC 33, 51 (1977))

LEGAL CITATIONS INDEX
REGULATIONS

- site suitability, population-center determinations; ALAB-422, I, (6 NRC 33, 46 (1977))
- 10 CFR 100.3(a)
 - exclusion area size; ALAB-422, H, (6 NRC 33, 43 (1977))
- 10 CFR 100.3(b)
 - low-population-zone size for Seabrook; ALAB-422, G, (6 NRC 33, 43 (1977))
- 10 CFR 100.3(c)
 - low-population-zone size for Seabrook; ALAB-422, G, (6 NRC 33, 43 (1977))
- 10 CFR 100.10(c)
 - seismic and geological inquiry scope for construction licensing; ALAB-422, K, (6 NRC 33, 54 (1977))
- 10 CFR 100.11
 - delineation of issues for Black Fox 1 and 2; LBP-77-046, A, (6 NRC 167 (1977))
 - emergency plans for evacuation of persons outside exclusion area; ALAB-432, B, (6 NRC 465 (1977))
- 10 CFR 100.11(a)(1)
 - exclusion area size; ALAB-422, H, (6 NRC 33, 43 (1977))
- 10 CFR 100.11(a)(2)
 - low-population-zone size for Seabrook; ALAB-422, G, (6 NRC 33, 43 (1977))
- 10 CFR 100.11(a)(3)
 - low-population-zone for Seabrook; ALAB-422, G, (6 NRC 33, 43 (1977))
- 10 CFR 100.11(f)(2)
 - exclusion area size; ALAB-422, H, (6 NRC 33, 43 (1977))
- 10 CFR 100 App. A(III)(c)
 - seismic and geological inquiry scope for construction licensing; ALAB-422, K, (6 NRC 33, 54 (1977))
- 10 CFR 100 App. A(V)(a)
 - seismic and geological inquiry scope for construction licensing; ALAB-422, K, (6 NRC 33, 54 (1977))
- 10 CFR 100 App A
 - meaning and application of tectonic province concept; ALAB-436, (6 NRC 547 (1977))
- 10 CFR 100 App A(III)
 - seismic and geological findings for Indian Point 1, 2 and 3; ALAB-436, (6 NRC 547 (1977))
- 18 CFR 35.2(b)
 - antitrust regulations, state and federal; ALAB-452, F, (6 NRC 892, 924 (1977))
- 40 CFR 1500.6
 - NEPA requirements for EIS of spent fuel pool modification; LBP-77-051, B, (6 NRC 265, 267 (1977))
- 40 CFR 1500.6(e)
 - negative NEPA determinations; LBP-77-069, D, (6 NRC 1179, 1182 (1977))
- Federal Rules of Civil Procedure 56
 - relation to 10 CFR 2.749 for summary disposition in antitrust matters; LBP-77-045, B, (6 NRC 159, 162 (1977))
- Federal Rules of Civil Procedure 56(e)
 - burden of proof for summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))



LEGAL CITATIONS INDEX

STATUTES

- Atomic Energy Act, 42 U.S.C. 2232(b)
ALAB-444, C, (6 NRC 760, 766 n. 8 (1977))
- Administrative Procedure Act, 5 U.S.C. 554(d)
presiding officer resignation, administrative effects; ALAB-422, V, (6 NRC 33, 101 (1977))
- Atomic Energy Act
NRC safety regulations establish basic standard for construction permit;
ALAB-422, E, (6 NRC 33, 42 (1977))
safety findings on unresolved generic issues; ALAB-444, G, (6 NRC 760, 784 (1977))
safety findings required by NRC licensing process; ALAB-444, I, (6 NRC 760, 766 (1977))
scope of information required, financial qualifications; ALAB-422, N, (6 NRC 33, 73 (1977))
scope of information required, financial qualifications; ALAB-422, D, (6 NRC 33, 77 (1977))
scope of information required for financial qualifications findings;
ALAB-422, P, (6 NRC 33, 79 (1977))
scope of licensing review, financial qualifications; LBP-77-068, G, (6 NRC 1127, 1163 (1977))
- Atomic Energy Act, 42 U.S.C. 5843
status of regulatory guides in NRC licensing; ALAB-444, B, (6 NRC 760, 767, 772 (1977))
- Atomic Energy Act, 42 U.S.C. 5844
status of regulatory guides in NRC licensing; ALAB-444, B, (6 NRC 760, 767, 772 (1977))
- Atomic Energy Act, 42 U.S.C. 5845
status of regulatory guides in NRC licensing; ALAB-444, B, (6 NRC 760, 767, 772 (1977))
- Atomic Energy Act 103
NRC antitrust jurisdictional responsibilities; ALAB-428, C, (6 NRC 221, 224 (1977))
- Atomic Energy Act 103(d)
role of ACRS in NRC proceedings; ALAB-444, C, (6 NRC 760, 766 n. 8 (1977))
- Atomic Energy Act 104(b)
DWA issuance for Marble Hill 1 and 2 construction permits; LBP-77-052, A, (6 NRC 294 (1977))
NRC antitrust jurisdictional responsibilities; ALAB-428, C, (6 NRC 221, 224 (1977))
- Atomic Energy Act 105
antitrust intervention denial affirmed for three fully licensed plants;
ALAB-428, A, (6 NRC 221 (1977))
NRC antitrust responsibilities for fully-licensed plants; CLI-77-026, (6 NRC 538 (1977))
NRC jurisdictional scope over fully licensed facilities; ALAB-428, B, (6 NRC 221, 223 (1977))
- Atomic Energy Act 105(c)
Midland antitrust decision reversed and remanded for license conditions;
ALAB-452, A, (6 NRC 892 (1977))
NRC antitrust jurisdiction; ALAB-420, B, (6 NRC 8, 10 (1977))
NRC antitrust jurisdiction; LBP-77-045, C, (6 NRC 159, 166 (1977))
NRC antitrust jurisdictional responsibilities; ALAB-428, C, (6 NRC 221, 224

LEGAL CITATIONS INDEX

STATUTES

- (1977))
 - summary disposition of antitrust matters denied for Stanislaus; LBP-77-045, A, (6 NRC 159 (1977))
- Atomic Energy Act 105(c)(5)
 - untimely antitrust intervention petition considerations; ALAB-420, C, (6 NRC 8, 11 (1977))
- Atomic Energy Act 186
 - NRC antitrust jurisdictional responsibilities; ALAB-428, C, (6 NRC 221, 224 (1977))
- Atomic Energy Act 189
 - deferral of intervention consideration for export licensing matters and financial assistance request; CLI-77-024, A, (6 NRC 525 (1977))
 - discretionary hearing for export license applications, comments requested; CLI-77-031, A, (6 NRC 849 (1977))
 - NRC authority to hold discretionary hearings in export licensing; CLI-77-032, C, (6 NRC 854, 858 (1977))
 - standing to intervene in export licensing matters; CLI-77-024, B, (6 NRC 525 (1977))
- Atomic Energy Act 189(a)
 - intervention standing for export license proceedings; CLI-77-032, A, (6 NRC 854 (1977))
- Atomic Energy Act 234
 - appeal from civil penalty prior to hearing dismissed as premature; ALAB-441, (6 NRC 725 (1977))
 - civil penalties assessed for BML safety violations by Pittsburgh-Des Moines; ALJ-77-001, A, (6 NRC 693 (1977))
 - civil penalties imposed for license violations by Atlantic Research Corp.; ALJ-77-002, A, (6 NRC 702 (1977))
 - licensee responsibilities for operator's license compliance; ALJ-77-001, C, (6 NRC 693, 698 (1977))
 - licensee responsibilities for operator's license compliance; ALJ-77-002, C, (6 NRC 702, 711 (1977))
 - mitigation determinations for civil penalties; ALJ-77-002, D, (6 NRC 702 (1977))
 - NRC authority to impose civil penalties for license violations; ALJ-77-001, B, (6 NRC 693 (1977))
 - NRC authority to impose civil penalties for license violations; ALJ-77-002, B, (6 NRC 702, 707 (1977))
- Atomic Energy Act 274.1, 42 U.S.C. 2021(1)
 - participation by distant state; ALAB-447, B, (6 NRC 873 (1977))
- California Public Resources Code 25524.1(b)
 - intervention standing affirmed for distant state; ALAB-447, A, (6 NRC 873 (1977))
- Clayton Act 5
 - state and federal jurisdiction over antitrust situation; ALAB-452, F, (6 NRC 892, 924 (1977))
- Clayton Act 7
 - violations, acquisition of other utilities; ALAB-452, N, (6 NRC 892, 1031 (1977))
- Energy Reorganization Act
 - alternative fuel substitution, national energy policy; ALAB-422, R, (6 NRC 33, 90 (1977))
 - NRC nuclear promotion policy; LBP-77-069, C, (6 NRC 1179, 1182 (1977))
 - scope of NRC activities; LBP-77-069, C, (6 NRC 1179, 1182 (1977))
- Federal Non-Nuclear Energy Research and Development Act of 1974
 - alternative fuel substitution, national energy policy; ALAB-422, R, (6 NRC 33, 90 (1977))
- Federal Power Act 202(b)
 - ASLB role in antitrust scrutiny, interconnection principle; ALAB-452, P, (6 NRC 892, 1046 (1977))
 - authority to compel coordination by wheeling lacking for FPC; ALAB-452, I, (6 NRC 892, 997 (1977))
- Federal Trade Commission Act 5
 - state and federal jurisdiction over antitrust situation; ALAB-452, F, (6 NRC 892, 924 (1977))
- Federal Water Pollution Control Act

LEGAL CITATIONS INDEX

STATUTES

- State's authority under; LBP-77-052, B, (6 NRC 294, 337 (1977))
- Federal Water Pollution Control Act 401
 - full-term operating license authorization for Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))
 - jurisdictional dispute over water ownership of Ohio River; ALAB-437, A, (6 NRC 630 (1977))
 - LWA findings for Phipps Bend; LBP-77-060, A, (6 NRC 647 (1977))
- State authority under, relative to radiological health and safety matters; LBP-77-052, D, (6 NRC 294, 339 (1977))
- Federal Water Pollution Control Act 401(a)(1)
 - state's failure to grant public hearing prior to certification held unnecessary, reopening request denied; LBP-77-052, C, (6 NRC 294, 338 (1977))
- Federal Water Pollution Control Act 511(c)(2)(A)
 - state's failure to grant public hearing prior to certification held unnecessary, reopening request denied; LBP-77-052, C, (6 NRC 294, 338 (1977))
- Foots Act
 - state and federal jurisdiction over antitrust situation; ALAB-452, F, (6 NRC 892, 924 (1977))
- Geothermal Energy Research and Development and Demonstration Act of 1974
 - alternative fuel substitution, national energy policy; ALAB-422, R, (6 NRC 33, 90 (1977))
- National Environmental Policy Act 102(2)(C)
 - scope of review for spent fuel pool modification; LBP-77-051, B, (6 NRC 265, 267 (1977))
- National Environmental Policy Act (NEPA)
 - adequacy of St. Lucie alternate site review; ALAB-435, A, (6 NRC 541 (1978))
 - alternate site review methodology, LWA denied for inadequate; LBP-77-066, (6 NRC 839 (1977))
 - alternative site considerations; ALAB-422, R, (6 NRC 33, 90 (1977))
 - alternative site review standards; ALAB-435, B, (6 NRC 541, 542 (1977))
 - applicability to pre-LWA activities; LBP-77-044, C, (6 NRC 141, 152 (1977))
 - construction permit issuance for Sterling; LBP-77-053, (6 NRC 350 (1977))
 - federal preemption over local zoning laws for compliance with cooling tower restriction; LBP-77-063, (6 NRC 799 (1977))
 - full-term operating license authorization for Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))
 - LWA findings for Phipps Bend; LBP-77-060, A, (6 NRC 647 (1977))
 - minimal standards required by cost-benefit analysis; ALAB-422, F, (6 NRC 33, 43 (1977))
 - need-for-power considerations; ALAB-422, R, (6 NRC 33, 90 (1977))
 - NRC jurisdiction over offsite transmission line routes; ALAB-422, Q, (6 NRC 33, 82 (1977))
 - pre-LWA activity reconsideration denied for Skagit Wild and Scenic River Act; pre-LWA activity reconsideration denied for Skagit; LBP-77-056, (6 NRC 478 (1977))
 - pre-LWA authority for activities requiring tree damage; LBP-77-061, C, (6 NRC 674, 677 (1977))
 - pre-LWA authority for sewer line activity; LBP-77-061, B, (6 NRC 674, 677 (1977))
 - remand cost-benefit analysis for Peach Bottom radioactive effluent control; LBP-77-062, (6 NRC 680 (1977))
 - reversal of pre-LWA road work denial for Skagit; ALAB-446, A, (6 NRC 870 (1977))
 - standard for evaluation of alternatives, energy conservation; ALAB-422, U, (6 NRC 33, 100 (1977))
 - sunken-costs consideration in remand cost-benefit; LBP-77-057, C, (6 NRC 482, 485 (1977))
- Ohio Revised Code 4905.48
 - applicability to NRC licensing process; ALAB-443, C, (6 NRC 741, 747 (1977))
- Public Holding Company Act, 15 U.S.C. 79-79z
 - ASLB role in antitrust scrutiny, interconnection principle; ALAB-452, P, (6 NRC 892, 1046 (1977))
- Robinson-Patman Act
 - state and federal jurisdiction over antitrust situation; ALAB-452, F, (6 NRC

LEGAL CITATIONS INDEX
STATUTES

- 892, 924 (1977))
Rural Electrification Act of 1936, 7 USC 901
state and federal jurisdiction over antitrust situation; ALAB-452, F, (6 NRC
892, 924 (1977))
Sherman Act 2
antitrust decision reversed and remanded for Midland license conditions;
ALAB-452, A, (6 NRC 892 (1977))
violations by refusal to deal; ALAB-452, L, (6 NRC 892, 1025 (1977))
Sherman Antitrust Act 2
state and federal jurisdiction over antitrust situation; ALAB-452, F, (6 NRC
892, 924 (1977))
Solar Energy Research, Development and Demonstration Act of 1974
alternative fuel substitution, national energy policy; ALAB-422, R, (6 NRC
33, 90 (1977))
Solar Heating and Cooling Demonstration Act of 1974
alternative fuel substitution, national energy policy; ALAB-422, R, (6 NRC
33, 90 (1977))
Wild and Scenic Rivers Act 7(b)
applicability to pre-LWA activities; LBP-77-044, C, (6 NRC 141, 152 (1977))
Wild and Scenic Rivers Act 17
pre-LWA authority prescribed for water projects (sewer line); LBP-77-061, D,
(6 NRC 674, 678 (1977))

SUBJECT INDEX

ACCESS ROADS

- construction commencement prior to LWA or CP requires ASLB approval; LBP-77-052, E, (6 NRC 294, 301 (1977))
- environmental impacts from pre-LWA limited scope wrk; ALAB-446, C, (6 NRC 870, 871 fn. 3(1977))
- pre-LWA activity allowable for Skagit 1 and 2; LBP-77-044, A, (6 NRC 141 (1977))
- pre-LWA activity not approved for Skagit; LBP-77-056, (6 NRC 478 (1977))
- pre-LWA issuance authority for Skagit 1 and 2; LBP-77-072, (6 NRC 1308 (1977))

ACCIDENT

- dose estimates for Cherokee 1, 2 and 3; LBP-77-074, (6 NRC 1314 (1977))
- probability assessment, validity of analogous data and theoretical analyses; ALAB-429, C, (6 NRC 229, 234 (1977))
- reportable occurrences for North Anna 1 and 2; LBP-77-068, A, (6 NRC 1127 (1977))

ACCIDENT, DESIGN BASIS

- ATWS postulates for Cherokee 1, 2 and 3; LBP-77-074, (6 NRC 1314 (1977))
- liquefied natural gas tanker findings remanded for Hope Creek; ALAB-429, A, (6 NRC 229 (1977))
- safe shutdown earthquake plans for Cherokee 1, 2 and 3; LBP-77-074, (6 NRC 1314 (1977))

ADMINISTRATIVE REVIEW

- sua sponte ASLAB review scope; ALAB-443, I, (6 NRC 741, 758 n. 56 (1977))

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

- Midland construction permit continuance during remand; LBP-77-057, A, (6 NRC 482 (1977))
- report subjectivity to cross examination; ALAB-444, C, (6 NRC 760, 766 n. 8 (1977))
- role in operating license hearings; LBP-77-068, B, (6 NRC 1127, 1132 (1977))
- role in ratcheting standards on licensed plants; LBP-77-068, E, (6 NRC 1127, 1133 (1977))
- role in reactor licensing; ALAB-444, C, (6 NRC 760, 766 n. 8 (1977))

AESTHETICS

- impacts from Seabrook cooling towers; LBP-77-065, (6 NRC 816 (1977))

AFFIDAVITS

- rules of practice for summary disposition support; ALAB-443, H, (6 NRC 741, 752 (1977))

AIR POLLUTION

- atmospheric diffusion for Cherokee 1, 2 and 3; LBP-77-074, (6 NRC 1314 (1977))
- issue delineation for Black Fox construction permit proceeding; LBP-77-046, A, (6 NRC 167 (1977))

ALTERNATE ENERGY SOURCES

- considerations for Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))

ALVIN W. VOGTLE NUCLEAR PLANT, Units 1 and 2

- construction permit authorization affirmed in totality; ALAB-426, B, (6 NRC 206, 210 (1977))
- construction permit, interim-fuel-cycle rule effects on NEPA balance; ALAB-426, A, (6 NRC 206 (1977))

ANTITRUST PROCEEDINGS

- construction permit issuance pending completion, must be by party consent;

SUBJECT INDEX

SUBJECT INDEX

- ALAB-420, B, (6 NRC 8, 10 (1977))
- Midland decision reversed and remanded for appropriate license conditions; ALAB-452, A, (6 NRC 892 (1977))
- NRC jurisdiction for initiating in absence of Attorney General's recommendations; LBP-77-045, C, (6 NRC 159, 166 (1977))
- NRC jurisdiction under Atomic Energy Act 105(c); ALAB-420, B, (6 NRC 8, 10 (1977))
- summary disposition denied for Stanislaus; LBP-77-045, A, (6 NRC 159 (1977))
- summary disposition rules of practice; LBP-77-045, B, (6 NRC 159, 162 (1977))
- untimely initiation affirmed for St. Lucie; ALAB-420, A, (6 NRC 8 (1977))
- untimely intervention grant, appellate consideration; ALAB-420, D, (6 NRC 8, 13 (1977))
- ANTITRUST REVIEW
 - acquisition standards, smaller utilities; ALAB-452, N, (6 NRC 892, 1031 (1977))
 - Commission review of fully licensed St. Lucie and Turkey point denied with Attorney General referral; CLI-77-026, (6 NRC 538 (1977))
 - coordination agreement standards; ALAB-452, P, (6 NRC 892, 1046 (1977))
 - findings for Midland 1 and 2 remanded; ALAB-452, A, (6 NRC 892 (1977))
 - initiation for three fully licensed facilities denied for jurisdictional lack; ALAB-428, A, (6 NRC 221 (1977))
 - monopoly definition, FPC regulatory role; ALAB-452, I, (6 NRC 892, 997 (1977))
 - monopoly power considerations; ALAB-452, J, (6 NRC 892, 1012 (1977))
 - nexus application in electric power utilities; ALAB-452, C, (6 NRC 892, 915 (1977))
 - NRC jurisdiction over fully licensed facilities, role of Nuclear Reactor Regulation Director; ALAB-428, B, (6 NRC 221, 223 (1977))
 - NRC responsibilities and jurisdiction; ALAB-428, C, (6 NRC 221, 224 (1977))
 - public utilities' status in relation to judicial and FTC antitrust rulings; ALAB-452, B, (6 NRC 892, 913 (1977))
 - refusal to deal standards; ALAB-452, L, (6 NRC 892, 1025 (1977))
 - refusal to deal standards; ALAB-452, M, (6 NRC 892, 1025 (1977))
 - refusal to wheel standards; ALAB-452, D, (6 NRC 852, 1036 (1977))
 - relevant geographic market considerations; ALAB-452, E, (6 NRC 892, 921 (1977))
 - relevant market standards, submarkets; ALAB-452, G, (6 NRC 892, 945 (1977))
 - relevant market standards, wholesale and in-house products; ALAB-452, H, (6 NRC 852, 994 (1977))
 - rules of practice for appellate briefs; ALAB-430, (6 NRC 457 (1977))
 - situation inconsistent with laws, standard for determining; ALAB-452, D, (6 NRC 852, 918 (1977))
 - standard for review under multiple regulatory framework; ALAB-452, F, (6 NRC 892, 924 (1977))
- APPEAL BOARD
 - see Atomic Safety and Licensing Appeal Board
- APPEALS
 - nonparty standing in NRC proceedings; ALAB-433, B, (6 NRC 469 (1977))
- APPEALS, INTERLOCUTORY
 - appellate rules of practice for accepting, procedural rulings for spent fuel modifications; ALAB-451, B, (6 NRC 889 (1977))
 - authority of ASLAB to direct certification of legal rulings; ALAB-419, B, (6 NRC 3 (1977))
 - rules of practice for ASLB procedural rulings; ALAB-433, C, (6 NRC 469 (1977))
 - rules of practice for ASLB referral of routine (discovery) orders; ALAB-438, (6 NRC 638 (1977))
 - rules of practice for partial contentions' denial; ALAB-434, B, (6 NRC 471 (1977))
 - status of civil penalties prior to mitigation hearings; ALAB-441, (6 NRC 725 (1977))
 - status of evidentiary rulings of ASLB; ALAB-439, (6 NRC 640 (1977))
 - status of scheduling matters; ALAB-445, C, (6 NRC 865, 867 (1977))
- APPELLATE POLICY
 - substitution of own judgment for facts as well as law; ALAB-452, K, (6 NRC

SUBJECT INDEX

892, 1022 (1977))
summary dismissal of interlocutory evidentiary rulings; ALAB-439, (6 NRC 640 (1977))
waiver of unbriefed exceptions; ALAB-443, B, (6 NRC 741, 744 n. 8 (1977))

APPELLATE REVIEW
briefs format for record references filed with ASLE; ALAB-424, E, (6 NRC 122, 126 (1977))
certification to Commission, rules of practice for invoking; ALAB-421, B, (6 NRC 25, 27 (1977))
entire panel recusal in attorney misconduct charges; ALAB-450, (6 NRC 897 (1977))
policy for granting stay pending appeal from construction permit; ALAB-437, B, (6 NRC 630 (1977))
rules of practice for direct certification of issues rendered academic; ALAB-419, C, (6 NRC 3 (1977))
rules of practice for interlocutory appeals, spent fuel modification; ALAB-451, B, (6 NRC 889 (1977))
rules of practice for interlocutory legal rulings; ALAB-419, B, (6 NRC 3 (1977))
rules of practice for untimely petitions; ALAB-429, B, (6 NRC 229, 233 fn. 20 (1977))
scope of ASLAB authority over supplementary or different findings; ALAB-422, D, (6 NRC 33, 41 (1977))
untimely intervention grant, antitrust; ALAB-420, D, (6 NRC 8, 13 (1977))
weight accorded arguments of counsel; ALAB-420, E, (6 NRC 8, 14 (1977))

APPLICANT
see also Licensee
financial qualifications for Cherokees 1, 2 and 3; LBP-77-074, (6 NRC 1314 (1977))
financial qualifications for construction permit stage; ALAB-422, N, (6 NRC 33, 73 (1977))
financial qualifications, rules of practice for state-regulated bodies; ALAB-422, G, (6 NRC 33, 77 (1977))
technical qualifications for co-applicant; LBP-77-067, B, (6 NRC 1101, 1117 (1977))
technical qualifications for North Anna 1 and 2 operating licenses; LBP-77-068, A, (6 NRC 1127 (1977))

ASBESTOS
issue delineation for Black Fox construction permit proceeding; LBP-77-046, A, (6 NRC 167 (1977))

ATLANTIC RESEARCH CORPORATION
byproduct material license, civil penalties for license violations; ALJ-77-002, A, (6 NRC 702 (1977))

ATOMIC SAFETY AND LICENSING APPEAL BOARD
authority on policy decisions; ALAB-425, B, (6 NRC 199, 204 (1977))
authority over interlocutory scheduling matters; ALAB-445, C, (6 NRC 865, 867 (1977))
authority to direct certification of interlocutory legal rulings; ALAB-419, B, (6 NRC 3 (1977))
authority to substitute its judgment for ASLB facts; ALAB-452, K, (6 NRC 892, 1022 (1977))
discretionary review of interlocutory orders; ALAB-445, C, (6 NRC 865, 867 (1977))
effective date for decisions pending appeal, rules of practice; ALAB-423, B, (6 NRC 115 (1977))
entire panel recusal in attorney misconduct issues for Midland remand; ALAB-450, (6 NRC 887 (1977))
finality of decisions, rules of practice for Commission review of certified questions; CLI-77-023, B, (6 NRC 455 (1977))
jurisdiction retained over Seabrook steam generator tube integrity; ALAB-422, A, (6 NRC 33 (1977))
jurisdiction retention for St. Lucie steam generator tube integrity; ALAB-435, A, (6 NRC 541 (1978))
role in appellate hearings; ALAB-452, K, (6 NRC 892, 1022 (1977))
scope of initial decision review, supplementary or different findings; ALAB-422, D, (6 NRC 33, 41 (1977))

SUBJECT INDEX

- scope of review for ASLB pre-LWA findings on impacts from limited scope access road work; ALAB-446, C, (6 NRC 870, 871 fn. 3(1977))
- sua sponte review scope, procedural errors; ALAB-443, I, (6 NRC 741, 758 n. 56 (1977))
- termination of retained fuel-cycle jurisdiction over Callaway, Catawba, Hartsville and Vogtle construction permit proceedings; ALAB-426, B, (6 NRC 206, 210 (1977))
- ATOMIC SAFETY AND LICENSING APPEAL BOARD, JURISDICTION
 - terminated for Seabrook steam generator tube integrity; ALAB-442, (6 NRC 728 (1977))
- ATOMIC SAFETY AND LICENSING BOARD
 - accident risk assessment, validity of evidence; ALAB-429, C, (6 NRC 229, 234 (1977))
 - admissibility of evidence, scope of subpoena inquiry; ALAB-422, S, (6 NRC 33, 93 (1977))
 - appellate review scope for pre-LWA findings; ALAB-446, C, (6 NRC 870, 871 fn. 3(1977))
 - authority for resolve of uncontroverted issues in operating license proceedings; LBP-77-068, C, (6 NRC 1127, 1132 (1977))
 - discretionary authority to request additional evidence for reopening assessment; ALAB-443, G, (6 NRC 741, 752 (1977))
 - discretionary powers for granting untimely antitrust petitions; ALAB-420, C, (6 NRC 8, 11 (1977))
 - effective date for decisions pending appeal, rules of practice; ALAB-423, B, (6 NRC 115 (1977))
 - interlocutory appeals from rulings; ALAB-433, C, (6 NRC 469 (1977))
 - obligations for rationale of evidence rejection or acceptance; ALAB-429, D, (6 NRC 229, 237 (1977))
 - pre-LWA authority, standard for tree clearing impacts; ALAB-446, B, (6 NRC 870 (1977))
 - propriety of telephone conference calls for assessing reopening circumstances; ALAB-443, F, (6 NRC 741, 751 (1977))
 - responsibility for disposition of contested issues; ALAB-422, C, (6 NRC 33, 41 (1977))
 - responsibility for issuance of subpoenas; ALAB-422, S, (6 NRC 33, 93 (1977))
 - responsibility for resolution of issues; ALAB-422, B, (6 NRC 33, 41 (1977))
 - review rights for proprietary data; ALAB-435, C, (6 NRC 541, 545 (1977))
 - scheduling authority, rules of practice for challenge to; ALAB-445, B, (6 NRC 865, 867 (1977))
 - scope of NEPA review of site alternatives to; LBP-77-060, B, (6 NRC 647, 656 (1977))
 - scope of safety review; ALAB-444, H, (6 NRC 760, 766, 774 (1977))
 - status of evidentiary rulings for interlocutory appeal; ALAB-439, (6 NRC 640 (1977))
- ATTORNEY
 - conduct of IVA counsel, reconsideration denied; ALAB-418, (6 NRC 1 (1977))
 - misconduct hearings, entire ASLAB Panel recusal; ALAB-450, (6 NRC 887 (1977))
 - weight accorded arguments as evidence in appellate review; ALAB-420, E, (6 NRC 8, 14 (1977))
- EARNWELL NUCLEAR FUEL PLANT PLUTONIUM PRODUCT FACILITY
 - termination of GESMO proceedings; CLI-77-033, (6 NRC 861 (1977))
- EARNWELL NUCLEAR FUEL PLANT SEPARATIONS FACILITY
 - termination of GESMO proceedings; CLI-77-033, (6 NRC 861 (1977))
- EARNWELL NUCLEAR FUEL PLANT URANIUM HEXAFLUORIDE FACILITY
 - termination of GESMO proceedings; CLI-77-033, (6 NRC 861 (1977))
- BEACHES
 - exclusion area control requirements, San Onofre; ALAB-432, B, (6 NRC 465 (1977))
- BEAVER VALLEY POWER STATION, Units 1 and 2
 - construction permit, operating license, interim-fuel-cycle rule effects on NEPA balance; ALAB-426, A, (6 NRC 206 (1977))
- BELGIUM
 - export of special nuclear materials, discretionary intervention policy; CLI-77-031, A, (6 NRC 849 (1977))
 - export of special nuclear materials, intervention policy; CLI-77-024, A, (6

SUBJECT INDEX

- NRC 525 (1977))
BLACK FOX NUCLEAR GENERATING STATION, Units 1 and 2
construction permits, issues delineation; LBP-77-046, A, (6 NRC 167 (1977))
ECRSELLE NUCLEAR POWER STATION
XSNM-1119, discretionary hearings for export license applications, comments
requested; CLI-77-031, A, (6 NRC 849 (1977))
XSNM-1119, intervention standing for export license hearings; CLI-77-024, A,
(6 NRC 525 (1977))
- BRIEFS**
admissibility of appellate brief of Justice Department findings required for
initial antitrust hearing; ALAE-430, (6 NRC 457 (1977))
appellate forest, record references filed with ASLB; ALAB-424, E, (6 NRC
122, 126 (1977))
rules of practice for untimely submission; ALAB-424, C, (6 NRC 122, 125
(1977))
rules of practice, time limits for supporting exceptions; ALAB-424, B, (6
NRC 122, 125 (1977))
size limitation enforcement; ALAB-430, (6 NRC 457 (1977))
- EUGEY-1 NUCLEAR REACTOR**
XSNM-1176, discretionary hearings for export license applications, comments
requested; CLI-77-031, A, (6 NRC 849 (1977))
XSNM-1176, intervention standing for export licensing hearings; CLI-77-024,
A, (6 NRC 525 (1977))
- EUGEY-4 NUCLEAR REACTOR**
XSNM-1176, discretionary hearings for export license applications, comments
requested; CLI-77-031, A, (6 NRC 849 (1977))
XSNM-1176, intervention standing for export licensing hearings; CLI-77-024,
A, (6 NRC 525 (1977))
- EUGEY-5 NUCLEAR REACTOR**
XSNM-1176, discretionary hearings for export license applications, comments
requested; CLI-77-031, A, (6 NRC 849 (1977))
XSNM-1176, intervention standing for export licensing hearings; CLI-77-024,
A, (6 NRC 525 (1977))
- EYPRODUCT MATERIAL LICENSES**
civil penalties imposed for Atlantic Research Corp. safety violations;
ALJ-77-002, A, (6 NRC 702 (1977))
licensee's compliance responsibilities; ALJ-77-002, C, (6 NRC 702, 711
(1977))
violations of safety regulations, civil penalties assessed by summary
judgment; ALJ-77-001, A, (6 NRC 653 (1977))
- CALIFORNIA**
intervention grant affirmed for distant state (Tennessee) proceedings;
ALAE-447, A, (6 NRC 873 (1977))
- CALLAWAY PLANT, Units 1 and 2**
construction permit authorization affirmed in totality; ALAB-426, B, (6 NRC
206, 210 (1977))
construction permit, interim-fuel-cycle rule effects on NEPA balance;
ALAE-426, A, (6 NRC 206 (1977))
- CATAWBA NUCLEAR STATION, Units 1 and 2**
construction permit authorization affirmed in totality; ALAB-426, E, (6 NRC
206, 210 (1977))
construction permit, interim-fuel-cycle rule effects on NEPA balance;
ALAE-426, A, (6 NRC 206 (1977))
- CERTIFICATION**
appellate rules of practice for invoking; ALAB-421, B, (6 NRC 25, 27 (1977))
ASLB refusal to certify ruling allowing fuel pool redification activity
without a construction permit; LBP-77-065, A, (6 NRC 1175 (1977))
rules of practice for Commission review of ASLAE rulings; CLI-77-023, B, (6
NRC 455 (1977))
scope of Commission review of ALAB rulings on ASLB questions; CLI-77-023, B,
(6 NRC 455 (1977))
- CERTIORARI**
rules of practice for Commission; CLI-77-025, C, (6 NRC 535 (1977))
rules of practice for party selection for Commission; CLI-77-025, E, (6 NRC
535 (1977))
- CHEMICAL EFFLUENTS**

SUBJECT INDEX

- see Effluents, Chemical
- CHEROKEE NUCLEAR STATION, Units 1, 2 and 3
 - construction permit, untimely intervention denial affirmed; ALAB-440, A, (6 NRC 642 (1977))
 - construction permits LWA-2 activity plus health effects of alternative fuels and revised Table S-3; LBP-77-047, A, (6 NRC 191 (1977))
 - construction permits, issuance authorized; LBP-77-074, (6 NRC 1314 (1977))
- CIVIL PENALTIES
 - applicability to manager for subordinates violations of license provisions; ALJ-77-002, C, (6 NRC 702, 711 (1977))
 - assessment by summary judgment for Pittsburgh-Des Moines safety violations of byproduct material license; ALJ-77-001, A, (6 NRC 693 (1977))
 - licensee's liability for violations, timing of appeal; ALAB-441, (6 NRC 725 (1977))
 - NRC authority to impose for license violations; ALJ-77-001, B, (6 NRC 693 (1977))
 - NRC authority to impose for license violations; ALJ-77-002, B, (6 NRC 702, 707 (1977))
 - rules of practice for determining mitigation; ALJ-77-002, D, (6 NRC 702 (1977))
 - rules of practice for mitigation considerations; ALJ-77-001, A, (6 NRC 693 (1977))
- COLLATERAL ESTOPPEL
 - see Res Judicata
- COMMISSION
 - see Nuclear Regulatory Commission
- COMMISSION REVIEW
 - status for final decision; CLI-77-030, B, (6 NRC 847 (1977))
 - untimely intervention for St. Lucie 1 and 2 and Turkey Point 3 and 4, antitrust relevance; CLI-77-030, A, (6 NRC 847 (1977))
- CONSTRUCTION
 - commencement prior to LWA, CP or ASLB approvals; LEP-77-052, E, (6 NRC 294, 301 (1977))
- CONSTRUCTION PERMITS
 - activity continuation pending remand on safety issues; ALAB-429, E, (6 NRC 229, 247 (1977))
 - affirmation by sua sponte review for San Onofre; ALAB-432, A, (6 NRC 465 (1977))
 - affirmation for St. Lucie with jurisdiction retained over steam generator tube integrity; ALAB-435, A, (6 NRC 541 (1978))
 - affirmation in totality for Callaway, Catawba, Hartsville and Vogtle; ALAB-426, B, (6 NRC 206, 210 (1977))
 - affirmation of River Bend 1 and 2 issuance; ALAB-444, A, (6 NRC 760 (1977))
 - appellate review of Wolf Creek, procedural rulings; ALAB-424, A, (6 NRC 122 (1977))
 - continuance of Midland, pending court-ordered NEPA remand; LEP-77-057, A, (6 NRC 482 (1977))
 - issuance affirmed by sua sponte review for Seabrook 1 and 2; ALAB-422, A, (6 NRC 33 (1977))
 - issuance affirmed for Perry 1 and 2; ALAB-449, (6 NRC 884 (1977))
 - issuance authorized for Cherokee 1, 2 and 3; LBP-77-074, (6 NRC 1314 (1977))
 - issuance for Sterling 1; LBP-77-053, (6 NRC 350 (1977))
 - issuance for Tyrone Energy Park 1; LBP-77-071, (6 NRC 1232 (1977))
 - necessity prior to operating license amendments; LBP-77-069, E, (6 NRC 1179, 1182 (1977))
 - reinstatement of suspended Seabrook, by majority opinion; ALAB-423, A, (6 NRC 115 (1977))
 - status during remand, sunk cost considerations; LEP-77-057, C, (6 NRC 482, 485 (1977))
 - status pending court-ordered NEPA remand proceeding; LBP-77-057, B, (6 NRC 482 (1977))
 - stay pending appeal of Marble Hill 1 and 2 denied; ALAB-437, A, (6 NRC 636 (1977))
 - stay pending appeal of Seabrook site review denied; CLI-77-027, A, (6 NRC 715 (1977))
 - suspension of Hope Creek 1 and 2 on safety considerations relative to tanker

SUBJECT INDEX

accident unnecessary; LBP-77-073, (6 NRC 1310 (1977))
CONSTRUCTION PERMITS, PROCEEDINGS
alternate site evaluations for Seabrook 1 and 2; LBP-77-043, (6 NRC 134 (1977))
alternate site review, LWA denial for inadequate; LBP-77-066, (6 NRC 839 (1977))
appeal from ASLE contentions' denial dismissed for Greene County; ALAB-434, A, (6 NRC 471 (1977))
continuation of recycle-related license applications pending possible policy change; ALAB-425, C, (6 NRC 195, 204 (1977))
cost-benefit analysis of uranium fuel cycle effects, stage of proceeding on weight accorded; ALAB-426, C, (6 NRC 206, 209 (1977))
dismissal of interlocutory appeal questioning validity of Perkins proceedings for want of jurisdiction; ALAB-433, A, (6 NRC 469 (1977))
effects from concurrent state regulatory proceeding; ALAB-443, D, (6 NRC 741, 748 (1977))
effects of concurrent state proceedings; ALAB-443, C, (6 NRC 741, 747 (1977))
emergency planning for persons outside LPZ; CLI-77-022, (6 NRC 451 (1977))
exclusion area control requirements, tidal beaches; ALAB-432, B, (6 NRC 465 (1977))
interim fuel-cycle-rule effects on 11 pending license applications; ALAB-426, A, (6 NRC 206 (1977))
intervention grant for Nuclear Fuel Recovery; LBP-77-059, A, (6 NRC 518 (1977))
issues delineation for Black Fox 1 and 2; LBP-77-046, A, (6 NRC 167 (1977))
LNG tanker accident probability findings for Hope Creek remanded for technical findings; ALAB-429, A, (6 NRC 229 (1977))
LWA findings and issuance for Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))
LWA findings for Phipps Bend 1 and 2; LBP-77-060, A, (6 NRC 647 (1977))
LWA-2 authorization for Cherokee; LBP-77-047, A, (6 NRC 191 (1977))
LWA-2 authorization for Marble Hill 1 and 2; LBP-77-067, A, (6 NRC 1101 (1977))
party selection for Commission review involving utility ratesetting; CLI-77-025, A, (6 NRC 535 (1977))
pre-LWA reduced scope road work denial reversed for Skagit; ALAB-446, A, (6 NRC 870 (1977))
reconsideration denied for motion to strike exceptions to Hartsville initial decision; ALAB-418, (6 NRC 1 (1977))
reconsideration of pre-LWA authority denial for sewer line construction affirmed; LBP-77-061, A, (6 NRC 674 (1977))
reopening assessment by ASLB, role of unrepresented evidence; ALAB-443, G, (6 NRC 741, 752 (1977))
reopening of Wolf Creek for alternative considerations, briefs requested; ALAB-424, A, (6 NRC 122 (1977))
reopening of WPPSS 3 and 5 for safe shutdown earthquake fire protection; LBP-77-045, (6 NRC 257 (1977))
reopening, need for power; ALAB-443, E, (6 NRC 741, 748 (1977))
reopening, propriety of telephone conference calls; ALAB-443, F, (6 NRC 741, 751 (1977))
res judicata applicability for jurisdiction over disputed areas; ALAB-422, H, (6 NRC 33, 70 (1977))
rules of practice for determining permit status during court-ordered NEPA remand; LBP-77-057, B, (6 NRC 482 (1977))
rules of practice for Federal Register publication prior to commencement; ALAB-445, D, (6 NRC 665, 667 (1977))
safety findings for unresolved generic issues; ALAB-444, G, (6 NRC 760, 784 (1977))
scheduling affirmed for Yellow Creek 1 and 2; ALAB-445, A, (6 NRC 865 (1977))
scope of review for safety findings; ALAB-444, I, (6 NRC 760, 766 (1977))
status of permit issuance pending antitrust completion; ALAB-420, E, (6 NRC 8, 10 (1977))
stay pending appeal denied for Seabrook 1 and 2; CLI-77-027, A, (6 NRC 715 (1977))

SUBJECT INDEX

- sufficiency of NRC regulations for safety considerations; ALAB-422, E, (6 NRC 33, 42 (1977))
- suspension lifted for Nuclear Fuel Recovery and Recycling Center; ALAB-425, A, (6 NRC 199 (1977))
- untimely antitrust intervention affirmed for St. Lucie; ALAB-420, A, (6 NRC 8 (1977))
- untimely intervention denial affirmed for Cherokee; ALAB-440, A, (6 NRC 642 (1977))
- untimely intervention denial affirmed for Perkins; ALAB-431, A, (6 NRC 460 (1977))
- CONTENTIONS**
 - see also Exceptions
 - admissibility requirements for specificity and particularization; LBP-77-048, E, (6 NRC 249, 250 (1977))
 - denial of some intervention, held interlocutory; ALAB-434, B, (6 NRC 471 (1977))
 - leave to amend deficient, untimely intervention petition for Shoreham; LBP-77-050, (6 NRC 261 (1977))
 - rules of practice for adequacy of generic safety issues; ALAB-444, F, (6 NRC 760, 761, 771-74 (1977))
 - validity of unsupported, based on cross-examination facts; LEP-77-054, (6 NRC 436 (1977))
- COOLING TOWERS**
 - aesthetics of closed- vs. open-cycle system at Seabrook; LBP-77-065, (6 NRC 816 (1977))
 - design conditions for intake structures of Sterling 1; LBP-77-053, (6 NRC 350 (1977))
 - environmental effects on Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))
 - environmental impacts from Seabrook; LBP-77-065, (6 NRC 816 (1977))
 - environmental impacts from Three Mile Island 2; LEP-77-070, (6 NRC 1185 (1977))
 - environmental impacts from Tyrone Energy Park 1; LEP-77-071, (6 NRC 1232 (1977))
 - environmental impacts from Tyrone Energy Park 1; LEP-77-071, (6 NRC 1232 (1977))
 - federal preemption over local zoning regulations; LEP-77-063, (6 NRC 799 (1977))
- COORDINATION**
 - antitrust review standards; ALAB-422, P, (6 NRC 852, 1046 (1977))
- COUNCIL ON ENVIRONMENTAL QUALITY**
 - negative NEPA determinations; LBP-77-069, D, (6 NRC 1179, 1182 (1977))
- CRITICALITY**
 - excursions in spent fuel pools; LBP-77-051, A, (6 NRC 265 (1977))
- CROSS EXAMINATION**
 - intervenor's rights under rules of practice for reopened hearings; ALAB-422, T, (6 NRC 33, 94 (1977))
 - status participation rights; ALAB-444, E, (6 NRC 760, 770 (1977))
 - status of ACRS safety evaluation report; ALAB-444, C, (6 NRC 760, 766 n. 8 (1977))
 - validity for elicitation of facts supportive of contentions; LBP-77-054, (6 NRC 436 (1977))
- DAVIS-BESSE NUCLEAR POWER STATION, Units 1, 2 and 3**
 - antitrust, appendices to reply briefs struck; ALAB-430, (6 NRC 457 (1977))
- DECISIONS, FINAL**
 - Commission review status; CLI-77-030, B, (6 NRC 847 (1977))
 - rules of practice for immediate effectiveness pending appeal; ALAB-423, B, (6 NRC 115 (1977))
- DECISIONS, INITIAL**
 - appellate remedy for deficient; ALAB-422, D, (6 NRC 33, 41 (1977))
 - format must sufficiently inform a party of the disposition of contested issues; ALAB-422, C, (6 NRC 33, 41 (1977))
 - rules of practice for immediate effectiveness pending appeal; ALAB-423, B, (6 NRC 115 (1977))
- DESIGN BASIS ACCIDENT**
 - see Accident, Design Basis

SUBJECT INDEX

DIABLO CANYON NUCLEAR POWER PLANT, Units 1 and 2
operating license, access to physical security plans; CLI-77-023, A, (6 NRC 455 (1977))

DIRECTED CERTIFICATION
ASLAB authority for appellate consideration of interlocutory legal rulings; ALAE-419, B, (6 NRC 3 (1977))

DISCOVERY
appellate policy for acceptance of ASLB referral of routine (discovery) orders; ALAB-438, (6 NRC 638 (1977))

DCEL-1 NUCLEAR POWER REACTOR
XSNM-11E0, discretionary hearings for export license applications, comments requested; CLI-77-031, A, (6 NRC 849 (1977))
XSNM-11E0, intervention standing for export license hearings; CLI-77-024, A, (6 NRC 525 (1977))

EARTHQUAKES
fire protection for WPPSS 3 and 5 in safe shutdown; LBP-77-049, (6 NRC 257 (1977))
issue delineation for Black Fox construction permit proceeding; LBP-77-046, A, (6 NRC 167 (1977))
safe shutdown plans for Cherokee 1, 2 and 3; LBP-77-074, (6 NRC 1314 (1977))
safe shutdown plans, intensity and resulting vibratory ground motion for Seabrook; ALAE-422, A, (6 NRC 33 (1977))
safe-shutdown plans for Indian Point 1, 2 and 3; ALAE-436, (6 NRC 547 (1977))
safe-shutdown plans for Seabrook; ALAB-422, K, (6 NRC 33, 54 (1977))
tectonic province concept meaning and application in NRC licensing; ALAE-436, (6 NRC 547 (1977))

ECONOMICS
sunk cost considerations in suspension during resand considerations; LBP-77-057, C, (6 NRC 482, 485 (1977))

EFFLUENTS, CHEMICAL
chlorine impacts from Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))
impacts of chlorinated organics and heavy metals from Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 254 (1977))
issue delineation for Black Fox construction permit proceeding; LBP-77-046, A, (6 NRC 167 (1977))
sonetic and genetic effects of low-level chronic exposures as construction permit issues; LBP-77-C46, B, (6 NRC 167, 170 (1977))

EFFLUENTS, RADIOACTIVE
adequacy of emission control equipment affirmed for Peach Bottom 2 and 3; ALAE-448, (6 NRC 882 (1977))
agricultural impact from accidental Sterling releases; LBP-77-053, (6 NRC 350 (1977))
bioaccumulation in aquatic organisms from Sterling 1; LBP-77-053, (6 NRC 350 (1977))
control of Peach Bottom 2 and 3, resand cost-benefit analysis; LBP-77-062, (6 NRC 680 (1977))
deposition in aquatic sediments; LBP-77-053, (6 NRC 350 (1977))
findings for North Anna 1 and 2; LBP-77-068, A, (6 NRC 1127 (1977))
findings for Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))
issue delineation for Black Fox construction permit proceeding; LBP-77-046, A, (6 NRC 167 (1977))
LWA issuance on findings for Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))
occupational hazard from expansion of spent fuel pool capacity; LBP-77-051, A, (6 NRC 265 (1977))
radon emissions for Cherokee 1, 2 and 3; LBP-77-074, (6 NRC 1314 (1977))
rules of practice for occupational protection; LBP-77-055, B, (6 NRC 473, 476 (1977))
sonetic and genetic effects of low-level chronic exposures as construction permit issues; LBP-77-C46, B, (6 NRC 167, 170 (1977))

EFFLUENTS, THERMAL
cooling tower plumes, LWA issuances on findings for Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))
environmental impacts from Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))

SUBJECT INDEX

- findings for Tyrone Energy Park 1; LBP-77-071, (6 NRC 1232 (1977))
- simple and cumulative biological effects from Sterling 1; LBP-77-053, (6 NRC 350 (1977))
- ELECTRICITY**
 - see also Energy Conservation
 - denial of reopening of Perry record for need for power issue affirmed; ALAB-443, A, (6 NRC 741 (1977))
 - need for power findings for Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))
 - need for power findings for Tyrone 1; LBP-77-071, (6 NRC 1232 (1977))
 - need for power, reliability and substitution; ALAB-422, A, (6 NRC 33 (1977))
 - need for, LWA issuance on findings for Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 254 (1977))
 - need-for-power considerations, Seabrook; ALAB-422, R, (6 NRC 33, 90 (1977))
 - reopening on need for power, short-term changes; ALAB-443, E, (6 NRC 741, 748 (1977))
 - state resetting laws and practices, party selection for certiorari; CLI-77-025, A, (6 NRC 535 (1977))
- EMERGENCY PLANS**
 - evacuation of persons outside exclusion area (tidal beach); ALAB-432, B, (6 NRC 465 (1977))
 - evacuation planning for persons outside low-population zone; CLI-77-022, (6 NRC 451 (1977))
 - findings for Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))
 - operating licensing access to physical security plans; CLI-77-023, A, (6 NRC 455 (1977))
 - protection of persons outside low population zone; LBP-77-067, C, (6 NRC 1101, 1119 (1977))
 - rules of practice for persons outside LPZ; LBP-77-067, C, (6 NRC 1101, 1119 (1977))
 - scope of details necessary for operating license review; LBP-77-068, F, (6 NRC 1127, 1155 (1977))
 - technical findings for Marble Hill 1 and 2; LBP-77-067, A, (6 NRC 1101 (1977))
- ENERGY CONSERVATION**
 - fuel substitution policy in light of national energy policy; ALAB-422, R, (6 NRC 33, 90 (1977))
 - issue delineation for Black Fox construction permit proceeding; LBP-77-046, A, (6 NRC 167 (1977))
 - NEPA alternative consideration standards; ALAB-422, U, (6 NRC 33, 100 (1977))
- ENERGY POLICY**
 - fuel substitution considerations in light of national policy; ALAB-422, R, (6 NRC 33, 90 (1977))
- ENVIRONMENTAL CONSIDERATIONS**
 - alternate site evaluation standards under NEPA; ALAB-435, B, (6 NRC 541, 542 (1977))
 - alternative site review scope under NEPA not limited to applicant's selection; LBP-77-060, B, (6 NRC 647, 656 (1977))
 - alternatives standards under NEPA, energy conservation; ALAB-422, U, (6 NRC 33, 100 (1977))
 - conditions imposed for Sterling 1 construction; LBP-77-053, (6 NRC 350 (1977))
 - cost-benefit analysis reconsideration for Cherokee, effects of alternative fuels and revised Table S-3; LBP-77-047, A, (6 NRC 191 (1977))
 - cost-benefit analysis update for fuel cycle effects of Seabrook; ALAB-422, W, (6 NRC 33, 102 (1977))
 - court-ordered remand for Midland, cp continuance pending; LBP-77-057, A, (6 NRC 482 (1977))
 - generic issues need not be resolved prior to case appraisals; LBP-77-069, B, (6 NRC 1179, 1181 (1977))
 - impacts from clearing trees for access roads; ALAB-446, B, (6 NRC 870 (1977))
 - interim fuel cycle rule effect on Seabrook and Vermont Yankee; ALAB-421, A, (6 NRC 25 (1977))
 - issue delineation for Black Fox construction permit proceeding; LBP-77-046,

SUBJECT INDEX

- A, (6 NRC 167 (1977))
- LNG tanker accident probability, remand for technical findings; ALAB-429, A, (6 NRC 229 (1977))
- need-for-power considerations for Seabrook; ALAB-422, R, (6 NRC 33, 90 (1977))
- negative NEPA determinations by CEQ; LBP-77-069, D, (6 NRC 1179, 1182 (1977))
- NEPA and LWA findings for Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))
- NEPA cost benefit rebalance, fuel cycle effects on 11 pending license applications; ALAB-426, A, (6 NRC 206 (1977))
- NEPA cost-benefit analysis must consider somatic and genetic effects of low-level chemical and radioactive effluents; LBP-77-046, E, (6 NRC 167, 170 (1977))
- NEPA cost-benefit analysis, minimal standards; ALAB-422, F, (6 NRC 33, 43 (1977))
- NRC jurisdiction over offsite transmission routes; ALAB-422, Q, (6 NRC 33, 82 (1977))
- pre-LWA activity on sewer line construction; LBP-77-061, D, (6 NRC 674, 678 (1977))
- pre-LWA activity relation with Wild and Scenic Rivers Act and NEPA; LBP-77-044, C, (6 NRC 141, 152 (1977))
- pre-LWA activity, trivial impact; LBP-77-044, B, (6 NRC 141, 145 (1977))
- remand cost-benefit analysis for Peach Bottom 2 and 3 radioactive effluent control; LBP-77-062, (6 NRC 680 (1977))
- rules of practice for granting pre-LWA activity; LBP-77-061, E, (6 NRC 674, 677 (1977))
- scope of NEPA review for spent fuel pool modification; LBP-77-051, B, (6 NRC 265, 267 (1977))
- state's authority under FWPCA relative to radiological health and safety matters; LBP-77-052, D, (6 NRC 294, 339 (1977))
- sunk cost considerations in remand balancing; LBP-77-057, C, (6 NRC 482, 485 (1977))
- tree damage assessment for pre-LWA issuance; LBP-77-061, C, (6 NRC 674, 677 (1977))
- untimely allegations for Oyster Creek, shipworms and siltation; LBP-77-058, (6 NRC 500 (1977))
- uranium fuel cycle effects, revised Table S-3 considerations; ALAB-426, C, (6 NRC 206, 209 (1977))
- water quality monitoring stations deleted for Cherokee; LBP-77-047, A, (6 NRC 151 (1977))
- ENVIRONMENTAL IMPACT STATEMENT
 - status of export licenses for special nuclear materials; CLI-77-032, E, (6 NRC 854, 859 (1977))
- ENVIRONMENTAL STATEMENT
 - adequacy for floating nuclear power plants; LBP-77-048, A, (6 NRC 249 (1977))
 - completion unnecessary prior to case-by-case resolve; LBP-77-069, B, (6 NRC 1179, 1181 (1977))
- EVIDENCE
 - acceptance or rejection, ASLB obligation to give rationale; ALAB-429, D, (6 NRC 229, 237 (1977))
 - admissibility determination relative to subpoena request; ALAB-422, S, (6 NRC 33, 93 (1977))
 - analogous data and theoretical analyses; ALAB-429, C, (6 NRC 229, 234 (1977))
 - arguments of counsel, weight accorded in appellate review; ALAB-420, E, (6 NRC 8, 14 (1977))
 - ASLB orders for adducing, held to be interlocutory; ALAB-439, (6 NRC 640 (1977))
 - quantum of proof, untimely antitrust intervention; ALAB-420, D, (6 NRC 8, 13 (1977))
 - validity of ASLB request for additional, in reopening proceedings; ALAB-443, G, (6 NRC 741, 752 (1977))
- EXCEPTIONS
 - see also Contentions

SUBJECT INDEX

- rules of practice for briefing appellate; ALAB-443, E, (6 NRC 741, 744 n. 8 (1977))
- rules of practice for motion to strike; ALAB-424, D, (6 NRC 122, 125 (1977))
- supporting briefs, time limits in rules of practice; ALAB-424, B, (6 NRC 122, 125 (1977))
- EXCLUSIION AREA**
 - control requirements for licensing, tidal beach; ALAB-432, B, (6 NRC 465 (1977))
 - emergency plans for protection of persons outside low population zone; LBF-77-067, C, (6 NRC 1101, 1119 (1977))
 - flexibility of 10 CFR 100 for determination; ALAB-422, J, (6 NRC 33, 51 (1977))
 - safety consequence of tidal beach for San Onofre; ALAB-432, A, (6 NRC 465 (1977))
 - size considerations for Seabrook; ALAB-422, H, (6 NRC 33, 43 (1977))
- EXTENSION OF TIME**
 - see Time, Extension
- FACILITY**
 - see specific facilities
- FEDERAL POWER COMMISSION**
 - regulatory role for monopoly definition; ALAB-452, I, (6 NRC 892, 997 (1977))
- FEDERAL PREEMPTION**
 - see also Rules and Regulations
 - limitation of state's authority under FWPCA; LBP-77-052, D, (6 NRC 294, 339 (1977))
 - over local zoning laws for Indian Point cooling tower construction; LBP-77-063, (6 NRC 799 (1977))
 - scope of operation of local zoning laws in respect to nuclear power plants; LBF-77-063, (6 NRC 799 (1977))
 - state's authority over NRC licensing activity, FWPCA and LBA activity; LBF-77-052, E, (6 NRC 294, 337 (1977))
- FEDERAL REGISTER**
 - adequacy for notice of hearings; LBP-77-058, (6 NRC 500 (1977))
 - rules of practice for notice of hearing publication for construction permit initiation; ALAB-445, D, (6 NRC 865, 867 (1977))
- FEDERAL REPUBLIC OF GERMANY**
 - export license approval for Wurgassen fuel; CLI-77-029, A, (6 NRC 719 (1977))
 - export license applications, intervention standing; CLI-77-032, A, (6 NRC 854 (1977))
 - export of special nuclear materials, discretionary intervention policy; CLI-77-031, A, (6 NRC 849 (1977))
 - export of special nuclear materials, intervention policy; CLI-77-024, A, (6 NRC 525 (1977))
 - XSNM-102E, issuance for German Federal Republic; CLI-77-032, A, (6 NRC 854 (1977))
- FEDERAL TRADE COMMISSION**
 - jurisdiction over antitrust situation; ALAB-452, F, (6 NRC 892, 924 (1977))
- FINANCIAL ASSISTANCE**
 - rules of practice for intervention in special nuclear materials export licensing proceedings; CLI-77-024, B, (6 NRC 525 (1977))
 - rules of practice, denial for export license comments; CLI-77-031, A, (6 NRC 849 (1977))
- FINANCIAL QUALIFICATIONS**
 - findings for Cherokee 1, 2 and 3 applicants; LBP-77-074, (6 NRC 1314 (1977))
 - rules of practice for applicant; ALAB-422, N, (6 NRC 33, 73 (1977))
 - rules of practice for state-regulated bodies; ALAB-422, O, (6 NRC 33, 77 (1977))
 - scope of licensing information needed, funds availability; ALAB-422, P, (6 NRC 33, 79 (1977))
 - scope of review for operating license; LBP-77-068, G, (6 NRC 1127, 1163 (1977))
 - technical findings for Rural electric cooperative as co-applicant; LBF-77-067, A, (6 NRC 1101 (1977))
- FINDINGS OF FACT**

SUBJECT INDEX

- ASLB obligations to give rationale for resolution of evidence; ALAB-429, D, (6 NRC 225, 237 (1977))
- FIRES
 - protection plans for WPPES 3 and 5 safe shutdown earthquake design; LBF-77-049, (6 NRC 257 (1977))
- FISHES
 - population dynamics, issue delineation for Black Fox construction permit proceeding; LBP-77-046, A, (6 NRC 167 (1977))
- FLUATING NUCLEAR POWER PLANTS
 - manufacturing licensing, contentions admissibility; LBP-77-048, A, (6 NRC 249 (1977))
- FRANCE
 - export of special nuclear materials, discretionary intervention policy; CLI-77-031, A, (6 NRC 649 (1977))
 - export of special nuclear materials, intervention policy; CLI-77-024, A, (6 NRC 525 (1977))
- FUEL
 - see Reactor Fuels
- FUEL CYCLE
 - cost-benefit analysis update for Seabrook; ALAB-422, W, (6 NRC 33, 102 (1977))
- FUEL POOLS
 - see Reactor Fuel Pools
- GENERAL ENVIRONMENTAL STATEMENT ON FIXED OXIDE FUEL
 - rulemaking proceedings terminated; CLI-77-033, (6 NRC 861 (1977))
- GEOLOGIC ANOMALIES
 - summary disposition of issues for Perry 1 and 2 construction permit proceedings; ALAB-445, (6 NRC 884 (1977))
- GEOLOGICAL PROPERTIES
 - scope of ASLB inquiry for site suitability; ALAB-422, K, (6 NRC 33, 54 (1977))
- GOVERNMENT AGENCIES
 - see specific agencies
- GRAVELINES-3 NUCLEAR REACTOR
 - XSNN-1176, discretionary hearings for export license applications, comments requested; CLI-77-031, A, (6 NRC 849 (1977))
 - XSNN-1176, intervention standing for export licensing hearings; CLI-77-024, A, (6 NRC 525 (1977))
- GREENE COUNTY NUCLEAR POWER PLANT
 - construction permit, interlocutory appeal dismissal for denial of some contentions; ALAB-434, A, (6 NRC 471 (1977))
- GRUNDREHMINGEN ATOMIC POWER STATION
 - XSNN-1145, discretionary hearings for export license applications, comments requested; CLI-77-031, A, (6 NRC 849 (1977))
 - XSNN-1145, intervention standing for export licensing hearings; CLI-77-024, A, (6 NRC 525 (1977))
- HARTSVILLE NUCLEAR PLANT, Units 1A, 2A, 1B and 2B
 - construction permit authorization affirmed in totality; ALAB-426, E, (6 NRC 206, 210 (1977))
 - construction permit, interim-fuel-cycle rule effects on NEPA balance; ALAB-426, A, (6 NRC 206 (1977))
 - construction permit, reconsideration of motion to strike exceptions denied; ALAB-418, (6 NRC 1 (1977))
- HEALTH AND SAFETY
 - see also Emergency Plans
 - limitation of state's authority under FWPCA; LBP-77-052, D, (6 NRC 294, 339 (1977))
 - NRC jurisdiction does not cover foreign; CLI-77-029, B, (6 NRC 719, 721 (1977))
- HEARINGS
 - see also Construction Permits, Proceedings
 - see also Licensing Proceedings
 - see also Operating Licenses, Proceedings
 - comments requested for discretionary grant in export license applications; CLI-77-031, A, (6 NRC 649 (1977))
 - failure to grant public 401-certification, reopening of record request

SUBJECT INDEX

- denied for State's; LBP-77-052, C, (6 NRC 294, 338 (1977))
- foreign policy considerations in export licensing; CLI-77-029, A, (6 NRC 719 (1977))
- granted for mitigation of civil penalties assessed by summary judgment; ALJ-77-001, A, (6 NRC 693 (1977))
- scheduling controversies, interlocutory appeal status; ALAB-445, C, (6 NRC 865, 867 (1977))
- HEARINGS, NOTICE OF
 - adequacy of Federal Register announcement; LBP-77-058, (6 NRC 500 (1977))
 - rules of practice for Federal Register publication for construction permit initiation; ALAB-445, D, (6 NRC 865, 867 (1977))
- HERBICIDES
 - environmental impacts from Tyrone Energy Park 1; LBP-77-071, (6 NRC 1232 (1977))
 - impacts from Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 254 (1977))
- HOPE CREEK GENERATING STATION, Units 1 and 2
 - construction permit continuance during remand of LNG tanker accident findings; ALAB-429, A, (6 NRC 225 (1977))
 - construction permit, interim-fuel-cycle rule effects on NEPA balance; ALAB-426, A, (6 NRC 20E (1977))
 - construction permit, LNG tanker accident findings remanded for technical findings; ALAB-429, A, (6 NRC 225 (1977))
 - construction permits, suspension unnecessary pending tanker accident potential decision; LBP-77-073, (6 NRC 1310 (1977))
- INDIAN POINT, Unit 2
 - construction permit, federal preemption over local zoning laws for cooling tower construction; LBP-77-063, (6 NRC 799 (1977))
- INDIAN POINT, Units 1, 2 and 3
 - operating license amendment, deletion of requirement for expanded microseismic monitoring network; ALAB-436, (6 NRC 547 (1977))
 - operating licenses, seismic and geological considerations; ALAB-436, (6 NRC 547 (1977))
- INITIAL DECISION
 - see Decisions, Initial
- INTERLOCUTORY APPEALS
 - see Appeals, Interlocutory
- INTERVENERS
 - cross-examination rights in reopened hearings; ALAB-422, T, (6 NRC 33, 94 (1977))
 - potential value to remand proceedings, party status directed; ALAB-429, B, (6 NRC 229, 233 fn. 20 (1977))
 - review rights for proprietary data; ALAB-435, C, (6 NRC 541, 545 (1977))
 - right to have contested issues resolved in initial decision; ALAB-422, C, (6 NRC 32, 41 (1977))
 - Springer (David) untimely appeal denial affirmed for Perkins construction permit proceeding; ALAB-431, A, (6 NRC 460 (1977))
 - standing as state citizen where state has withdrawn from participation; ALAB-444, J, (6 NRC 760, 794 (1977))
 - technical expertise held necessary where unrepresented by counsel; LBP-77-059, A, (6 NRC 518 (1977))
- INTERVENTION
 - appellate consideration of untimely antitrust grant; ALAB-420, D, (6 NRC 8, 13 (1977))
 - contentions adequacy, rules of practice; ALAB-444, F, (6 NRC 760, 761, 771-74 (1977))
 - contentions requirements for specificity and particularization; LBP-77-048, B, (6 NRC 249, 250 (1977))
 - contentions requirements for specificity and particularization; LBP-77-050, (6 NRC 2E1 (1977))
 - denial affirmed for 3-year late petition; ALAB-440, A, (6 NRC 642 (1977))
 - denial of untimely, for Oyster Creek full-term operating license proceeding; LBP-77-058, (6 NRC 500 (1977))
 - denial of untimely, for River Bend 1 and 2; ALAB-444, A, (6 NRC 760 (1977))
 - distant state's standing to intervene, fuel recycling facility; ALAB-447, B, (6 NRC 873 (1977))
 - financial assistance request for special nuclear materials export licensing;

SUBJECT INDEX

- CLI-77-024, B, (6 NRC 525 (1977))
- good cause finding for untimely petition; ALAB-444, K, (6 NRC 760, 796 (1977))
- grant affirmed for distant state (California) participation in fuel recycling proceedings (Tennessee); ALAB-447, A, (6 NRC 873 (1977))
- grant for Nuclear Fuel Recovery construction permit proceeding; LBP-77-059, A, (6 NRC 518 (1977))
- nonparty standing to appeal; ALAB-433, B, (6 NRC 469 (1977))
- rights of states other than those in which activities under the license will occur; LBP-77-059, B, (6 NRC 518, 521 (1977))
- rules of practice for admitting states to proceedings; ALAB-447, B, (6 NRC 873 (1977))
- rules of practice for interested states; ALAB-444, D, (6 NRC 760, 768 (1977))
- rules of practice for special nuclear materials export; CLI-77-024, B, (6 NRC 525 (1977))
- rules of practice for standing in uranium export proceedings; CLI-77-032, B, (6 NRC 854, 857 (1977))
- rules of practice for untimely; ALAB-431, B, (6 NRC 460 (1977))
- rules of practice for untimely; ALAB-440, B, (6 NRC 642 (1977))
- rules of practice for untimely; ALAB-444, J, (6 NRC 760, 794 (1977))
- rules of practice for untimely appellate petitions; ALAB-429, B, (6 NRC 229, 233 in. 20 (1977))
- rules of practice for untimely petition considerations; LBP-77-050, (6 NRC 261 (1977))
- standing for, as taxpayer and resident near possible rail transport route; LBP-77-059, A, (6 NRC 518 (1977))
- standing of private petitioner where interested state has withdrawn; ALAB-444, J, (6 NRC 760, 794 (1977))
- standing on dissatisfaction with State's participation in proceedings; ALAB-440, B, (6 NRC 642 (1977))
- untimely petitions handling, ASLB broad discretion; ALAB-420, C, (6 NRC 8, 11 (1977))
- ISAR NUCLEAR POWER REACTOR
 - XSNM-1181, discretionary hearings for export license applications, comments requested; CLI-77-031, A, (6 NRC 849 (1977))
 - XSNM-1181, intervention standing for export license hearings; CLI-77-024, A, (6 NRC 525 (1977))
- ISSUES
 - ASLB responsibility for disposition of contested, in initial decision; ALAB-422, C, (6 NRC 33, 41 (1977))
 - ASLB responsibility for resolution of contested; ALAB-422, B, (6 NRC 33, 41 (1977))
 - delineation for floating nuclear power plants manufacturing license; LBP-77-048, A, (6 NRC 249 (1977))
 - non-controverted resolve authority of ASLB; LBP-77-068, C, (6 NRC 1127, 1132 (1977))
 - resolution of contested, ASLB obligation to give record rationale; ALAB-429, D, (6 NRC 229, 237 (1977))
- JURISDICTION
 - see Atomic Safety and Licensing Appeal Board, Jurisdiction
 - see Atomic Safety and Licensing Board, Jurisdiction
 - see Nuclear Regulatory Commission, Jurisdiction
 - division of responsibilities for entitrust situations; ALAB-452, F, (6 NRC 892, 524 (1977))
- LAND USE
 - environmental impacts from Tyrone Energy Park 1; LBP-77-071, (6 NRC 1232 (1977))
 - loss of farmland from Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))
- LICENSE TO OPERATE
 - see Operating Licenses
- LICENSEE
 - see also Applicant
 - liability for license violations; ALJ-77-001, C, (6 NRC 693, 698 (1977))
 - management responsibility for safety regulation compliance; ALJ-77-001, C, (6 NRC 693, 698 (1977))

SUBJECT INDEX

- responsibility for license compliance by subordinates; ALJ-77-002, C, (6 NRC 702, 711 (1977))
- LICENSING BOARD
 - see Atomic Safety and Licensing Board
- LICENSING PROCEDURE
 - see Atomic Safety and Licensing Board
- LICENSING PROCEEDINGS
 - see Atomic Safety and Licensing Board
- LIMITED APPEARANCE
 - standing to challenge scheduling order, rules of practice; ALAB-445, B, (6 NRC 865, 867 (1977))
- LIMITED WORK AUTHORIZATION
 - denial for Pilgrim 2 and 3 on inadequate alternate site review; LBP-77-066, (6 NRC 839 (1977))
 - findings for Phipps Bend 1 and 2; LBP-77-060, A, (6 NRC 647 (1977))
 - issuance for Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))
 - LWA-2 authorizes only subsurface activity; LBP-77-047, B, (6 NRC 191, 194 (1977))
 - NEPA standard for granting pre-LWA activity; LBP-77-061, B, (6 NRC 674, 677 (1977))
 - pre-issuance activity relationship with Wild and Scenic Rivers Act and NEPA; LBP-77-044, C, (6 NRC 141, 152 (1977))
 - pre-issuance activity requests for road and sewer preparation; LBP-77-044, A, (6 NRC 141 (1977))
 - pre-issuance activity rules of practice; LBP-77-044, B, (6 NRC 141, 145 (1977))
 - pre-issuance authority for limited scope road work for Skagit; ALAB-446, A, (6 NRC 870 (1977))
 - pre-issuance authority for Skagit access road construction; LBP-77-072, (6 NRC 1308 (1977))
 - pre-issuance standard for impact findings on tree clearing for access road work; ALAB-446, B, (6 NRC 870 (1977))
 - pre-LWA authority denial for sewer construction affirmed for Skagit 1 and 2; LBP-77-061, A, (6 NRC 674 (1977))
 - prescription of pre-LWA sewer line activity; LBP-77-061, D, (6 NRC 674, 678 (1977))
 - reconsideration denied for pre-LWA approval of land clearing for Skagit; LBP-77-056, (6 NRC 478 (1977))
 - reopening denied for lack of public hearing on FWPCA 401 certification; LBP-77-052, C, (6 NRC 294, 338 (1977))
 - rules of practice for issuance after violations; LBP-77-052, E, (6 NRC 294, 301 (1977))
 - sanctions for construction commencement prior to issuance; LBP-77-052, E, (6 NRC 254, 301 (1977))
 - scope of LWA-2; LBP-77-047, B, (6 NRC 191, 194 (1977))
 - state v. NRC authority over issuance; LBP-77-052, B, (6 NRC 294, 337 (1977))
 - tree damage considerations for pre-LWA activity; LBP-77-061, C, (6 NRC 674, 677 (1977))
 - trivial impacts, staff v. ASLB interpretations; LBP-77-044, B, (6 NRC 141, 145 (1977))
- LIQUEFIED NATURAL GAS
 - formation and dispersion of vapor clouds; ALAB-429, A, (6 NRC 229 (1977))
 - marine tanker accidents, probability and prevention; ALAB-425, A, (6 NRC 229 (1977))
- LOCAL GOVERNMENT SERVICES
 - impacts from Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))
- LCW POPULATION ZONE
 - emergency plans for protection of persons outside; LBP-77-067, C, (6 NRC

SUBJECT INDEX

- 1101, 1119 (1977))
- flexibility of 10 CFR 100 for determination; ALAB-422, J, (6 NRC 33, 51 (1977))
- population density projections must cover early operating years; ALAB-422, I, (6 NRC 33, 46 (1977))
- rules of practice for site evaluation; ALAB-422, G, (6 NRC 33, 43 (1977))
- site suitability evaluation for Seabrook; ALAB-422, G, (6 NRC 33, 43 (1977))
- MANUFACTURING LICENSES, PROCEEDINGS
 - delineation of issues for floating nuclear power plants; LBP-77-046, A, (6 NRC 249 (1977))
- PARBLE HILL NUCLEAR GENERATING STATION, Units 1 and 2
 - construction permit LWA, civil fines effects on issuance; LBP-77-052, E, (6 NRC 294, 301 (1977))
 - construction permit, stay pending appeal denied; ALAB-437, A, (6 NRC 630 (1977))
 - construction permits, LWA issuance on NEPA findings; LBP-77-052, A, (6 NRC 294 (1977))
 - construction permits, LWA-2 findings; LBP-77-067, A, (6 NRC 1101 (1977))
- MARITIME TRANSPORT
 - issue delineation for Black Fox construction permit proceeding; LBP-77-046, A, (6 NRC 167 (1977))
- MIDLAND PLANT, Units 1 and 2
 - antitrust decision reversed and remanded for appropriate license conditions; ALAB-452, A, (6 NRC 852 (1977))
 - construction permit suspension pending court-ordered remand on NEPA review; LBP-77-057, A, (6 NRC 482 (1977))
 - construction permits, ASLB procedural referral declined for discovery order; ALAB-438, (6 NRC 63e (1977))
- MOVING TO STRIKE
 - rules of practice, substantial compliance ruling; ALAB-424, D, (6 NRC 122, 125 (1977))
- NETHERLANDS
 - export of special nuclear materials, discretionary intervention policy; CLI-77-031, A, (6 NRC 649 (1977))
 - export of special nuclear materials, intervention policy; CLI-77-024, A, (6 NRC 525 (1977))
- NEXUS
 - antitrust context; ALAB-452, C, (6 NRC 892, 915 (1977))
- NOISE POLLUTION
 - issue delineation for Black Fox construction permit proceeding; LBP-77-046, A, (6 NRC 167 (1977))
- NORTH ANNA NUCLEAR POWER STATION, Unit 1
 - operating licenses, temporary fuel-loading license; LBP-77-064, (6 NRC 808 (1977))
- NORTH ANNA NUCLEAR POWER STATION, Units 1 and 2
 - operating licenses, issuance authorized; LBP-77-068, A, (6 NRC 1127 (1977))
- NRC REGULATIONS
 - see Nuclear Regulatory Commission
 - see Rules and Regulations
- NUCLEAR FUEL RECOVERY AND RECYCLING CENTER
 - construction permit proceedings, intervention considerations; LBP-77-059, A, (6 NRC 518 (1977))
 - construction permit suspension pending nuclear power policy reassessment lifted; ALAB-425, A, (6 NRC 199 (1977))
 - intervention grant affirmed for distant state; ALAB-447, A, (6 NRC 873 (1977))
 - termination of GESMD proceedings; CLI-77-033, (6 NRC 861 (1977))
- NUCLEAR POWER POLICY
 - NRC responsibilities under Energy Reorganization Act; LBP-77-069, C, (6 NRC 1176, 1182 (1977))
 - pending NRC reassessment, construction proceedings for fuel recovery and recycling continued; ALAB-425, A, (6 NRC 199 (1977))
 - pending possible policy change, recycle-related licensing hearings may continue; ALAB-425, C, (6 NRC 199, 204 (1977))
- NUCLEAR REACTOR REGULATION DIRECTOR
 - jurisdiction over antitrust review for fully licensed facilities; ALAB-428,

SUBJECT INDEX

- B, (6 NRC 221, 223 (1977))
- NUCLEAR REGULATORY COMMISSION
 - antitrust jurisdiction in absence of Attorney General's recommendations; LBP-77-045, C, (6 NRC 159, 166 (1977))
 - authority to condition transmission routes; ALAB-422, Q, (6 NRC 33, 82 (1977))
 - authority to impose civil penalties for license violations; ALJ-77-002, B, (6 NRC 702, 707 (1977))
 - authority to impose civil penalties for safety violations; ALJ-77-001, B, (6 NRC 653 (1977))
 - authority to reopen record for State's failure to hold public hearing on FWPCA 401 certification; LBP-77-052, C, (6 NRC 294, 338 (1977))
 - discretionary authority to direct public proceedings for export licenses; CLI-77-032, C, (6 NRC 854, 858 (1977))
 - jurisdiction and responsibilities under Atomic Energy Act 103, 104(b), 105(c), and 186 for antitrust review; ALAB-428, C, (6 NRC 221, 224 (1977))
 - jurisdiction over antitrust matters; ALAB-420, B, (6 NRC 8, 10 (1977))
 - jurisdiction over antitrust situation; ALAB-452, F, (6 NRC 852, 824 (1977))
 - jurisdiction over health and safety in foreign countries; CLI-77-029, B, (6 NRC 719, 721 (1977))
 - jurisdictional scope for antitrust review of fully licensed facilities; ALAB-428, B, (6 NRC 221, 223 (1977))
 - regulations governing operating licenses, financial qualification; LBP-77-068, C, (6 NRC 1127, 1133 (1977))
 - regulations governing pre-LWA activity, weight of Regulatory staff in interpreting; LBP-77-044, E, (6 NRC 141, 145 (1977))
 - res judicata policy over issues of disputed jurisdiction; ALAB-422, M, (6 NRC 33, 70 (1977))
 - role in operating license hearings; LBP-77-068, B, (6 NRC 1127, 1132 (1977))
 - role in ratcheting standards on licensed plants; LBP-77-068, E, (6 NRC 1127, 1132 (1977))
 - rules of practice for certiorari, selection of parties; CLI-77-025, B, (6 NRC 535 (1977))
 - scope of activities under Energy Reorganization Act, nuclear policy; LBP-77-065, C, (6 NRC 1179, 1182 (1977))
 - scope of NEPA review of site alternatives to; LBP-77-060, B, (6 NRC 647, 656 (1977))
- NUCLEAR REGULATORY COMMISSION, PERSONNEL
 - improper employee behavior referral to Justice department; CLI-77-028, (6 NRC 717 (1977))
 - responsibilities and methodology for alternate site review; LBP-77-066, (6 NRC 839 (1977))
 - responsibility for licensing integrity; CLI-77-028, (6 NRC 717 (1977))
 - staff role in operating license hearings; LBP-77-066, B, (6 NRC 1127, 1132 (1977))
- NUCLEAR REGULATORY STAFF
 - weight of regulations' interpretations, pre-LWA activity; LBP-77-044, B, (6 NRC 141, 145 (1977))
- OPERATING LICENSES
 - amendment to Prairie Island for fuel rack disposal alternative denied; LBP-77-055, A, (6 NRC 473 (1977))
 - amendments for spent fuel pool modification, interlocutory certification refused; ALAB-451, A, (6 NRC 889 (1977))
 - issuance authorized for North Anna 1 and 2; LBP-77-068, A, (6 NRC 1127 (1977))
 - issuance authorized for Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))
 - modification of Indian Point 1, 2 and 3 for seismic and geologic considerations; ALAB-436, (6 NRC 547 (1977))
 - temporary fuel-loading license for North Anna 1; LBP-77-064, (6 NRC 808 (1977))
- OPERATING LICENSES, AMENDMENTS
 - ASLB authority to approve uncontested portions of request, directed certification declined; ALAB-415, A, (6 NRC 3 (1977))
 - authorization for Prairie Island spent-fuel-pool modification; LBP-77-051, A, (6 NRC 265 (1977))
 - deletion of requirement for expanded microseismic monitoring network for

SUBJECT INDEX

- Indian Point; ALAB-436, (6 NRC 547 (1977))
- necessity for construction permits prior to issuance; LBP-77-069, E, (6 NRC 1179, 1182 (1977))
- spent fuel pool modification for Prairie Island, bifurcation of amendment denied; LBP-77-042, (6 NRC 131 (1977))
- spent fuel pool modification for Trojan affirmed; LBP-77-069, A, (6 NRC 1179 (1977))
- spent fuel storage modification for Vermont Yankee; LBP-77-054, (6 NRC 436 (1977))
- OPERATING LICENSES, PROCEEDINGS
 - access to physical security plans; CLI-77-023, A, (6 NRC 455 (1977))
 - compliance standards and regulations date from permit issuance; LBP-77-068, D, (6 NRC 1127, 1133 (1977))
 - cost-benefit analysis of uranium fuel cycle effects, stage of proceeding on weight accorded; ALAB-426, C, (6 NRC 206, 209 (1977))
 - finality of St. Lucie 1 and Turkey Point 3 and 4; CLI-77-030, A, (6 NRC 847 (1977))
 - interim fuel-cycle-rule effects on 11 pending license applications; ALAB-426, A, (6 NRC 206 (1977))
 - remand cost-benefit analysis of Peach Bottom 2 and 3 radioactive effluent control; LBP-77-062, (6 NRC 680 (1977))
 - reopening of Prairie Island on steam generator tube integrity unwarranted; ALAB-427, (6 NRC 212 (1977))
 - rules of practice for resolve of uncontroverted matters; LBP-77-068, C, (6 NRC 1127, 1132 (1977))
 - safety evaluation responsibilities of staff, ACRS and Commission; LBP-77-068, E, (6 NRC 1127, 1132 (1977))
 - safety standards compliance for licensing; LBP-77-068, E, (6 NRC 1127, 1133 (1977))
 - scope of review for financial qualifications, potential capital expenditures; LBP-77-068, G, (6 NRC 1127, 1163 (1977))
 - scope of review required for operating stage; LBP-77-068, F, (6 NRC 1127, 1155 (1977))
 - untimely intervention denial for Oyster Creek full-term; LBP-77-058, (6 NRC 500 (1977))
- CYSTER CREEK NUCLEAR GENERATING STATION, Unit 1
 - full-term operating license proceeding, untimely intervention denial; LBP-77-058, (6 NRC 500 (1977))
- PEACH BOTTOM ATOMIC POWER STATION, Units 2 and 3
 - construction permit, operating license, interim-fuel-cycle rule effects on NEPA balance; ALAB-426, A, (6 NRC 206 (1977))
 - operating license, radioactive effluent control equipment adequacy affirmed; ALAB-448, (6 NRC 882 (1977))
 - operating license, radioactive effluent control remand analysis; LBP-77-062, (6 NRC 680 (1977))
- FERKINS NUCLEAR STATION, Units 1, 2 and 3
 - construction permits, interlocutory appeal for proceeding dismissal dismissed; ALAB-433, A, (6 NRC 469 (1977))
 - construction permits, untimely intervention denial affirmed; ALAB-431, A, (6 NRC 460 (1977))
- FERRY NUCLEAR POWER PLANT, Units 1 and 2
 - antitrust, appendices to reply briefs struck; ALAB-430, (6 NRC 457 (1977))
 - construction permits, administrative affirmation of denial of proceedings reopening and reversal of summary disposition of geological anomalies issue; ALAB-443, A, (6 NRC 741 (1977))
 - construction permits, issuance affirmed after summary disposition of geologic anomalies issue; ALAB-449, (6 NRC 884 (1977))
- PHILLIPSBURG-1 REACTOR
 - XSNM-1117, discretionary hearings for export license applications, comments requested; CLI-77-031, A, (6 NRC 849 (1977))
 - XSNM-1117, intervention standing for export license hearings; CLI-77-024, A, (6 NRC 525 (1977))
- FHIPPS BEND NUCLEAR PLANT, Units 1 and 2
 - construction permit, LWA findings; LBP-77-060, A, (6 NRC 647 (1977))
- FILGRM NUCLEAR POWER STATION, Units 2 and 3
 - construction permits, LWA denial for inadequate alternate site review;

SUBJECT INDEX

- LBP-77-066, (6 NRC 839 (1977))
- PITTSBURGH-DES MOINES STEEL COMPANY
 - byproduct material license, civil penalties for safety violations; ALJ-77-001, A, (6 NRC 693 (1977))
- POLICY STATEMENTS
 - nuclear power policy, pending NRC reassessment construction permit proceedings may continue; ALAB-425, A, (6 NRC 199 (1977))
- POPULATION DENSITY
 - construction permit affirmed for Seabrook 1 and 2; ALAB-422, A, (6 NRC 33 (1977))
 - emergency planning for evacuation of persons outside LPZ; CLI-77-022, (6 NRC 451 (1977))
 - flexibility of 10 CFR 100 for determination; ALAB-422, J, (6 NRC 33, 51 (1977))
 - issue delineation for Black Fox construction permit proceeding; LBP-77-046, A, (6 NRC 167 (1977))
 - LPZ considerations for Seabrook; ALAB-422, G, (6 NRC 33, 43 (1977))
- POWER NEEDS
 - see Electricity
- PRAIRIE ISLAND NUCLEAR GENERATING PLANT, Units 1 and 2
 - operating license amendment, fuel rack disposal alternative denied; LBP-77-055, A, (6 NRC 473 (1977))
 - operating license amendments, authorization to increase spent fuel capacity from 198 to 687; LBP-77-051, A, (6 NRC 265 (1977))
 - operating license amendments, directed certification on ASLB authority declined; ALAB-419, A, (6 NRC 3 (1977))
 - operating license amendments, motion to divide application denied; LBP-77-042, (6 NRC 131 (1977))
 - operating license, reopening unwarranted on steam generator tube integrity; ALAB-427, (6 NRC 212 (1977))
- PREEMPTION POLICY
 - see Federal Preemption
- RESIDING OFFICER
 - resignation pending completion of hearing; ALAB-422, V, (6 NRC 33, 101 (1977))
- PROOF, BURDEN OF
 - reopening of proceeding, summary judgment; ALAB-443, H, (6 NRC 741, 752 (1977))
- PROPRIETARY INFORMATION
 - rules of practice for disclosure to ASLB or intervenor; ALAB-435, C, (6 NRC 541, 545 (1977))
- PUBLIC UTILITIES
 - standard for antitrust evaluation; ALAB-452, B, (6 NRC 892, 913 (1977))
- QUALITY ASSURANCE
 - findings for North Anna 1 and 2; LBP-77-068, A, (6 NRC 1127 (1977))
 - technical findings for Marble Hill 1 and 2; LBP-77-067, A, (6 NRC 1161 (1977))
- RADIATION DOSES
 - occupational hazard from expansion of spent fuel pool capacity; LBP-77-051, A, (6 NRC 265 (1977))
 - rules of practice for occupational consideration, monetary cost-benefit; LBP-77-055, B, (6 NRC 473, 476 (1977))
- RADIATION SAFETY
 - civil penalties assessment for BML violations; ALJ-77-001, A, (6 NRC 693 (1977))
 - civil penalties imposed for personnel exposure violations by Atlantic Research Corp.; ALJ-77-002, A, (6 NRC 702 (1977))
 - NRC authority to impose civil penalties for license violations; ALJ-77-001, B, (6 NRC 693 (1977))
 - NRC authority to impose civil penalties for license violations; ALJ-77-002, B, (6 NRC 702, 707 (1977))
- RADIOACTIVE EFFLUENTS
 - see Effluents, Radioactive
- RADIOACTIVE MATERIALS TRANSPORT
 - environmental impacts from Tyrone Energy Park 1; LBP-77-071, (6 NRC 1232 (1977))

SUBJECT INDEX

REACTOR COMPONENTS

steam generator tube integrity issue for Seabrook, ASLAE jurisdiction retained; ALAB-422, A, (6 NRC 33 (1977))

REACTOR FUEL CYCLE

environmental effects from interim rule on Seabrook and Vermont Yankee;

ALAB-421, A, (6 NRC 25 (1977))

environmental impacts from Tyrone Energy Park 1; LBP-77-071, (6 NRC 1232 (1977))

interim Table S-3 effects on NEPA cost-benefit balance for pending license applications; ALAB-426, A, (6 NRC 206 (1977))

numerical values of revised Table S-3, weight in cost-benefit analysis for various licensing stages; ALAB-426, C, (6 NRC 206, 209 (1977))

retained appellate jurisdiction terminated for Callaway, Catawba, Hartsville and Vogtle; ALAB-426, B, (6 NRC 206, 210 (1977))

REACTOR FUEL POOLS

modification of Trojan, interlocutory review for size rulings rejected;

ALAB-451, B, (6 NRC 885 (1977))

REACTOR FUELS

environmental effects from Seabrook, updated cost-benefit analysis;

ALAB-422, W, (6 NRC 33, 102 (1977))

fuel rack disposal, radiation dose limitations for personnel handling;

LBP-77-055, B, (6 NRC 473, 476 (1977))

reprocessing and waste disposal, interim fuel-cycle-rule effects on 11

pending licensing applications; ALAB-426, A, (6 NRC 206 (1977))

spent fuel pool modification for Prairie Island, bifurcation of amendment

application denied; LBP-77-042, (6 NRC 131 (1977))

spent fuel pool modification, fuel rack disposal for Prairie Island;

LBP-77-055, B, (6 NRC 473, 476 (1977))

spent pool modification, generic issue resolve status; LBP-77-069, B, (6 NRC

1179, 1181 (1977))

spent pool modification, scope of NEPA review for; LBP-77-051, B, (6 NRC

265, 267 (1977))

spent storage capacity increase authorized for Vermont Yankee; LBP-77-054,

(6 NRC 436 (1977))

spent-fuel-pool modification authorized for Prairie Island; LBP-77-051, A,

(6 NRC 265 (1977))

technical and health aspects of spent fuel pool expansion; LBP-77-051, A, (6

NRC 265 (1977))

XSNM-1142, discretionary hearings for export license applications, comments

requested; CLI-77-031, A, (6 NRC 849 (1977))

XSNM-1142, intervention standing for export licensing for working stock to

manufacture fuel assemblies; CLI-77-024, A, (6 NRC 525 (1977))

RECYCLE FUEL CENTER

termination of GESMO proceedings; CLI-77-033, (6 NRC 861 (1977))

REFUSAL TO DEAL

monopolistic standards; ALAB-452, L, (6 NRC 892, 1025 (1977))

monopolistic standards; ALAB-452, M, (6 NRC 892, 1025 (1977))

REFUSAL TO WHEEL

antitrust review standards; ALAB-452, O, (6 NRC 892, 1036 (1977))

REGULATORY GUIDES

status in licensing review; ALAB-444, B, (6 NRC 760, 767, 772 (1977))

REGULATORY STAFF

see Nuclear Regulatory Staff

RELEASES, LIQUID

see Effluents, Radioactive

see Effluents, Thermal

RELEVANT MARKET

antitrust review standards; ALAB-452, G, (6 NRC 892, 945 (1977))

antitrust standards, wholesale and in-house products; ALAB-452, H, (6 NRC

892, 994 (1977))

REMAND PROCEEDINGS

party status directed for unsuccessful appellate petitioner; ALAB-429, B, (6

NRC 229, 233 fn. 20 (1977))

permit status pending completion must include sunk costs; LBP-77-057, C, (6

NRC 482, 485 (1977))

REPROCESSING AND FUEL STORAGE FACILITIES

SUBJECT INDEX

- status of licensing activities pending possible policy change; ALAB-425, C, (6 NRC 199, 204 (1977))
- RES JUDICATA
 - applicability in Commission proceedings; ALAB-422, M, (6 NPC 33, 70 (1977))
- RIVER BEND STATION, Units 1 and 2
 - construction permits, issuance affirmed by appellate and sua sponte review; ALAB-444, A, (6 NRC 760 (1977))
- RULEMAKING
 - termination of GESMO proceedings; CLI-77-033, (6 NRC 861 (1977))
- RULES AND REGULATIONS
 - operating license compliance based on permit issuance date; LBP-77-068, D, (6 NRC 1127, 1133 (1977))
 - pre-LWA activity, weight of NRC staff interpretations; LBP-77-044, B, (6 NRC 141, 145 (1977))
 - status of regulatory guides as; ALAB-444, B, (6 NRC 760, 767, 772 (1977))
 - Three Mile Island 2 compliance with Federal and State; LBP-77-070, (6 NRC 1185 (1977))
 - weight accorded NRC interpretation; LBP-77-069, F, (6 NRC 1179, 1183 (1977))
- RULES OF PRACTICE
 - see also Federal Preemption
 - see also Licensing, Procedure
 - administrative criteria for export license issuance; CLI-77-032, D, (6 NRC 854, 858 (1977))
 - antitrust appellate briefs content and size; ALAB-430, (6 NRC 457 (1977))
 - appellate briefs, format for record references filed with ASLE; ALAB-424, E, (6 NRC 122, 126 (1977))
 - appellate policy for ASLE procedural referrals; ALAB-438, (6 NRC 638 (1977))
 - appellate policy for interlocutory review of procedural rulings on spent fuel pools; ALAB-451, E, (6 NRC 889 (1977))
 - appellate procedure for interlocutory review of legal rulings; ALAB-419, B, (6 NRC 3 (1977))
 - appellate review of special board's attorney misconduct charges; ALAB-450, (6 NRC 887 (1977))
 - appellate review weight accorded counsel arguments; ALAB-420, E, (6 NRC 8, 14 (1977))
 - appellate rules for invoking certification to Commission; ALAB-421, B, (6 NRC 25, 27 (1977))
 - ASLE authority to resolve uncontroverted matters in operating license proceeding; LBP-77-068, C, (6 NRC 1127, 1132 (1977))
 - authority of Appeal Board; ALAB-425, B, (6 NRC 199, 204 (1977))
 - burden of proof for summary disposition; ALAB-443, H, (6 NRC 741, 752 (1977))
 - certiorari by Commission; CLI-77-025, C, (6 NRC 535 (1977))
 - consolidation of export license applications; CLI-77-031, B, (6 NRC 849 (1977))
 - construction permit status pending court-ordered NEPA remand; LBP-77-057, B, (6 NRC 482 (1977))
 - contentions adequacy on generic safety items; ALAB-444, F, (6 NRC 760, 761, 771-74 (1977))
 - contentions requirements for specificity and particularization; LBP-77-048, B, (6 NRC 245, 250 (1977))
 - contentions validity based on cross-examination facts; LBP-77-054, (6 NRC 43E (1977))
 - criteria for determining mitigation of civil penalties; ALJ-77-002, D, (6 NRC 702 (1977))
 - cross examination rights of intervenor states; ALAB-444, E, (6 NRC 760, 770 (1977))
 - cross-examination rights of intervenors in reopened hearings; ALAB-422, T, (6 NRC 33, 54 (1977))
 - directed certification for academic issues; ALAB-415, C, (6 NRC 3 (1977))
 - emergency plans for persons outside LPZ; LBP-77-067, C, (6 NRC 1101, 1119 (1977))
 - environmental impact statement need for export licenses; CLI-77-032, E, (6 NRC 854, 859 (1977))
 - exclusion area size, Seabrook site suitability; ALAB-422, H, (6 NRC 33, 43 (1977))

SUBJECT INDEX

factors for consideration in penalty mitigation hearings; ALJ-77-001, A, (6 NRC 653 (1977))
federal preemption over local zoning regulations; LBP-77-063, (6 NRC 799 (1977))
finality of decisions; CLI-77-030, B, (6 NRC 847 (1977))
financial qualifications for construction permit applicant; ALAB-422, N, (6 NRC 33, 73 (1977))
good cause findings for untimely intervention petition; ALAB-444, K, (6 NRC 760, 756 (1977))
interlocutory appeals from ASLB rulings; ALAB-433, C, (6 NRC 469 (1977))
interlocutory nature of partial contentions' denial; ALAB-434, B, (6 NRC 471 (1977))
intervention by distant state; ALAB-447, B, (6 NRC 873 (1977))
intervention requirements for interested states; ALAB-444, D, (6 NRC 760, 768 (1977))
intervention standing for late entry where one party has withdrawn; ALAB-444, J, (6 NRC 760, 794 (1977))
intervention standing in uranium export proceedings; CLI-77-032, B, (6 NRC 654, 657 (1977))
intervention standing of states other than site specific; LBP-77-059, B, (6 NRC 518, 521 (1977))
issuance of LWA subsequent to civil fine for violations; LBP-77-052, E, (6 NRC 254, 301 (1977))
local government approvals, federal preemption over state and local zoning laws; LBP-77-063, (6 NRC 759 (1977))
low-population-zone evaluation; ALAB-422, G, (6 NRC 33, 43 (1977))
motion to strike exceptions; ALAB-424, D, (6 NRC 122, 125 (1977))
notice of hearing, Federal Register publication requirements for construction permit proceedings; ALAB-445, D, (6 NRC 865, 867 (1977))
NRC discretion to direct public proceedings in export licensing; CLI-77-032, C, (6 NRC 854, 858 (1977))
parties to Commission review; CLI-77-025, B, (6 NRC 535 (1977))
permit suspension pending remand; LBP-77-057, C, (6 NRC 482, 485 (1977))
population density projections for exclusion area consideration; ALAB-422, I, (6 NRC 33, 46 (1977))
pre-LWA activity; LBP-77-044, B, (6 NRC 141, 145 (1977))
presiding officer resignation pending completion of hearing; ALAB-422, V, (6 NRC 33, 101 (1977))
proprietary data review rights; ALAB-435, C, (6 NRC 541, 545 (1977))
reopening of proceedings; ALAB-422, L, (6 NRC 33, 64 fn. 35 (1977))
res judicata applicability in Commission proceedings; ALAB-422, M, (6 NRC 33, 70 (1977))
scheduling controversies, appeal status; ALAB-445, C, (6 NRC 865, 867 (1977))
scope of ASLB safety review; ALAB-444, H, (6 NRC 760, 766, 774 (1977))
scope of Commission review of ASLB rulings on certified questions; CLI-77-023, E, (6 NRC 455 (1977))
scope of inquiry required for financial qualifications; ALAB-422, P, (6 NRC 33, 75 (1977))
scope of LWA-2 under 10 CFR 50.10(e)(3)(i); LBP-77-047, B, (6 NRC 191, 194 (1977))
seismic and geological criteria for site suitability findings; ALAB-422, K, (6 NRC 33, 54 (1977))
standing for intervention in special nuclear materials export licensing; CLI-77-024, E, (6 NRC 525 (1977))
standing to appeal by nonparty; ALAB-433, B, (6 NRC 469 (1977))
standing to challenge scheduling order; ALAB-445, E, (6 NRC 865, 867 (1977))
stay pending appeal; ALAB-424, F, (6 NRC 122, 127 (1977))
stay pending appeal; CLI-77-027, B, (6 NRC 715 (1977))
stay pending appeal of construction permit; ALAB-437, B, (6 NRC 630 (1977))
stay pending appeal, effective date of challenged decisions; ALAB-423, B, (6 NRC 115 (1977))
subpoena issuance; ALAB-422, S, (6 NRC 33, 93 (1977))
summary disposition of antitrust matters; LBP-77-045, B, (6 NRC 159, 162 (1977))
technical qualification findings for co-applicant; LBP-77-067, B, (6 NRC

SUBJECT INDEX

- 1101, 1117 (1977))
- telephone conference calls for proceedings reopening; ALAB-443, F, (6 NRC 741, 751 (1977))
- time limits for filing support briefs; ALAB-424, C, (6 NRC 122, 125 (1977))
- time limits for supporting exceptions briefs; ALAB-424, E, (6 NRC 122, 125 (1977))
- untimely appellate intervention petitions; ALAB-429, B, (6 NRC 229, 233 fn. 20 (1977))
- untimely intervention petitions, antitrust; ALAB-420, C, (6 NRC 8, 11 (1977))
- untimely intervention petitions, appellate consideration; ALAB-420, D, (6 NRC 8, 13 (1977))
- untimely intervention substantiation; ALAB-431, E, (6 NRC 460 (1977))
- untimely intervention, good cause for 3-year late; ALAB-440, B, (6 NRC 642 (1977))
- waiver of unbriefed exceptions; ALAB-443, B, (6 NRC 741, 744 n. 8 (1977))
- SAFETY**
 - see Emergency Plans
 - see Environmental Considerations
 - see Health and Safety
 - construction permit activity continuation pending resolution of remanded issues; ALAB-429, E, (6 NRC 229, 247 (1977))
 - decommissioning findings for Tyrone Energy Park 1; LEP-77-071, (6 NRC 1232 (1977))
 - issue delineation for Black Fox construction permit proceeding; LBP-77-046, A, (6 NRC 167 (1977))
 - primary responsibilities for operating license evaluations; LEP-77-068, B, (6 NRC 1127, 1132 (1977))
 - sufficiency of NRC regulations for safety consideration prior to construction permit grant; ALAB-422, E, (6 NRC 33, 42 (1977))
 - unresolved questions for Cherokee 1, 2 and 3; LBP-77-074, (6 NRC 1314 (1977))
- SAFETY FINDINGS**
 - scope of ASLB review; ALAB-444, H, (6 NRC 760, 766, 774 (1977))
 - scope of review in NRC licensing process; ALAB-444, I, (6 NRC 760, 766 (1977))
 - unresolved generic issues in construction permit proceedings; ALAB-444, G, (6 NRC 760, 784 (1977))
- SAFETY STANDARDS**
 - compliance for operating licenses; LBP-77-068, E, (6 NRC 1127, 1133 (1977))
 - findings for Three Mile Island 2; LBP-77-070, (6 NRC 1165 (1977))
 - operating license compliance based on permit issuance date; LBP-77-068, D, (6 NRC 1127, 1133 (1977))
- SALEM NUCLEAR GENERATING STATION, Units 1 and 2**
 - construction permit, operating license, interim-fuel-cycle rule effects on NEPA balance; ALAB-426, A, (6 NRC 206 (1977))
- SAN ONOFRE NUCLEAR GENERATING STATION, Units 2 and 3**
 - construction permit affirmed by sua sponte review; ALAB-432, A, (6 NRC 465 (1977))
- SEABROOK NUCLEAR STATION, Units 1 and 2**
 - construction permits, alternate-sites evaluation; LEP-77-043, (6 NRC 134 (1977))
 - construction permits, emergency planning for persons outside LPZ; CLI-77-022, (6 NRC 451 (1977))
 - construction permits, environmental effects of interim fuel cycle rule; ALAB-421, A, (6 NRC 25 (1977))
 - construction permits, issuance affirmed by sua sponte review; ALAB-422, A, (6 NRC 33 (1977))
 - construction permits, party selection for certiorari; CLI-77-025, A, (6 NRC 535 (1977))
 - construction permits, reinstatement by majority opinion; ALAB-423, A, (6 NRC 115 (1977))
 - construction permits, stay pending appeal denied; CLI-77-027, A, (6 NRC 715 (1977))
 - construction permits, steam generator tube integrity jurisdiction terminated; ALAB-442, (6 NRC 728 (1977))

SUBJECT INDEX

- construction permits, supplemental findings on alternative site review; LBP-77-065, (6 NRC 816 (1977))
- SECURITY PLANS
 - operating licensing access to physical; CLI-77-023, A, (6 NRC 455 (1977))
- SEISMIC CONSIDERATIONS
 - deletion of operating license requirement for expanded microseismic monitoring network for Indian Point; ALAB-436, (6 NRC 547 (1977))
 - scope of ASLB inquiry for site suitability; ALAB-422, K, (6 NRC 33, 54 (1977))
 - summary disposition for Perry 1 and 2 design adequacy issue; ALAB-449, (6 NRC 884 (1977))
- SENA NUCLEAR POWER REACTOR
 - XSNM-1167, discretionary hearings for export license applications, comments requested; CLI-77-031, A, (6 NRC 849 (1977))
 - XSNM-1167, intervention standing for export licensing hearings; CLI-77-024, A, (6 NRC 525 (1977))
- SEWER LINES
 - pre-LWA activity allowable for Skagit 1 and 2; LBP-77-044, A, (6 NRC 141 (1977))
 - pre-LWA activity not approved for Skagit; LBP-77-056, (6 NRC 478 (1977))
 - pre-LWA proscription affirmed for Skagit 1 and 2; LBP-77-061, A, (6 NRC 674 (1977))
 - proscription of pre-LWA activity; LBP-77-061, D, (6 NRC 674, 678 (1977))
- SHIPWORPS
 - infestation damage, adequacy for untimely intervention for Oyster Creek; LBP-77-058, (6 NRC 500 (1977))
- SHOREHAM NUCLEAR POWER STATION, Unit 1
 - operating license, untimely intervention considerations with deficient contentions; LBP-77-050, (6 NRC 261 (1977))
- SILTATION
 - adequacy for untimely Oyster Creek intervention; LEP-77-058, (6 NRC 500 (1977))
- SITE EVALUATION
 - adequacy of St. Lucie alternatives affirmed; ALAB-435, A, (6 NRC 541 (1978))
 - alternate considerations for Marble Hill 1 and 2; LEP-77-052, A, (6 NRC 294 (1977))
 - alternate considerations for Seabrook 1 and 2; ALAB-422, A, (6 NRC 33 (1977))
 - alternatives for Seabrook ruled inferior; LBP-77-043, (6 NRC 134 (1977))
 - exclusion area size; ALAB-422, H, (6 NRC 33, 43 (1977))
 - flexibility of 10 CFR 100 for exclusion area, LP2, and population center distance; ALAB-422, J, (6 NRC 33, 51 (1977))
 - geologic anomalies and seismic design adequacy considerations for Perry 1 and 2; ALAB-449, (6 NRC 884 (1977))
 - geological anomalies issue for Perry, reversal of summary disposition; ALAB-443, A, (6 NRC 741 (1977))
 - local government approvals, federal preemption over local zoning laws; LBP-77-063, (6 NRC 799 (1977))
 - low-population-zone size for Seabrook; ALAB-422, G, (6 NRC 33, 43 (1977))
 - LWA denial for inadequate alternate site review methodology; LBP-77-066, (6 NRC 839 (1977))
 - NEPA alternative consideration standards; ALAB-435, B, (6 NRC 541, 542 (1977))
 - population center, projected density considerations; ALAB-422, I, (6 NRC 33, 46 (1977))
 - radiological health and safety findings for Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))
 - scope of alternate review by NRC staff and ASLB; LEP-77-060, B, (6 NRC 647, 656 (1977))
 - scope of seismic and geological inquiry for construction licensing; ALAB-422, K, (6 NRC 33, 54 (1977))
 - seismic and geological modifications for Indian Point 1, 2 and 3 operating licenses; ALAB-436, (6 NRC 547 (1977))
 - superiority of Seabrook over alternative sites; LEP-77-065, (6 NRC 816 (1977))
- SKAGIT NUCLEAR POWER PROJECT, Units 1 and 2

SUBJECT INDEX

construction permit, denial of pre-LWA authority for sewer construction affirmed; LBP-77-061, A, (6 NRC 674 (1977))
construction permits, pre-LWA activity requests for road and sewer preparation; LBP-77-044, A, (6 NRC 141 (1977))
construction permits, pre-LWA authority for roadway construction; LBP-77-072, (6 NRC 130E (1977))
construction permits, pre-LWA reconsideration denied for tree clearing, roadwork, and sewers; LBP-77-056, (6 NRC 478 (1977))
construction permits, pre-LWA road work denial reversed on appeal; ALAB-446, A, (6 NRC 870 (1977))

SPECIAL NUCLEAR MATERIALS LICENSE
violations, licensee's liability and appeal rights; ALAB-441, (6 NRC 725 (1977))

SPECIAL NUCLEAR MATERIALS, EXPORT LICENSE
XSNM-1116 issuance without public hearings; CLI-77-029, A, (6 NRC 719 (1977))

SPECIAL NUCLEAR MATERIALS, EXPORT LICENSE PROCEEDINGS
scope of NRC jurisdiction, foreign health and safety; CLI-77-029, B, (6 NRC 719, 721 (1977))

SPECIAL NUCLEAR MATERIALS, EXPORT LICENSES
consolidation of applications, rules of practice; CLI-77-031, B, (6 NRC 849 (1977))
discretionary hearings, comments requested; CLI-77-031, A, (6 NRC 849 (1977))
intervention standing as matter of right denied, comments requested; CLI-77-032, A, (6 NRC 854 (1977))
intervention standing, rules of practice; CLI-77-024, B, (6 NRC 525 (1977))
intervention standing, rules of practice; CLI-77-032, B, (6 NRC 854, 857 (1977))
need for environmental impact statement; CLI-77-032, E, (6 NRC 854, 859 (1977))

SPECIAL NUCLEAR MATERIALS, EXPORT LICENSES PROCEEDINGS
rules of practice for discretionary grant of public proceedings; CLI-77-032, C, (6 NRC 854, 858 (1977))

SPECIAL NUCLEAR MATERIALS, EXPORT LICENSES, PROCEEDINGS
criteria for issuance; CLI-77-032, D, (6 NRC 854, 858 (1977))

SPENT FUEL STORAGE
see Reactor Fuels

ST. LAURENT B1
XSNM-1176, discretionary hearings for export license applications, comments requested; CLI-77-031, A, (6 NRC 849 (1977))

ST. LAURENT B1
XSNM-1176, intervention standing for export licensing hearings; CLI-77-024, A, (6 NRC 525 (1977))

ST. LUCIE NUCLEAR POWER PLANT, Unit 1
operating license compliance, finality of decision relative to antitrust matters; CLI-77-030, A, (6 NRC 847 (1977))
operating license, antitrust initiation denied for lack of jurisdiction; ALAB-428, A, (6 NRC 221 (1977))
operating license, compliance with antitrust laws; CLI-77-026, (6 NRC 538 (1977))

ST. LUCIE NUCLEAR POWER PLANT, Unit 2
construction permit, Commission review scope for late intervention denial; CLI-77-030, A, (6 NRC 847 (1977))
construction permit, initial decision affirmation subject to steam generator tube integrity outcome; ALAB-435, A, (6 NRC 541 (1978))
construction permit, untimely antitrust intervention grant affirmed; ALAB-420, A, (6 NRC 8 (1977))
operating license, improper AEC employee behavior; CLI-77-028, (6 NRC 717 (1977))
operating license, offsite power grid stability; CLI-77-028, (6 NRC 717 (1977))

STANISLAUS NUCLEAR PROJECT, Unit 1
construction permit, summary disposition of antitrust allegations denied; LBP-77-045, A, (6 NRC 159 (1977))

STATES

SUBJECT INDEX

authority of adjoining, over NRC licensing power; LBP-77-052, E, (6 NRC 294, 337 (1977))

authority under FWPCA relative to radiological health and safety matters; LBP-77-052, D, (6 NRC 294, 339 (1977))

effects of concurrent regulatory proceedings on NRC licensing; ALAB-443, D, (6 NRC 741, 748 (1977))

effects of regulation of financial qualifications of applicant; ALAB-422, D, (6 NRC 33, 77 (1977))

effects of regulatory concurrent proceeding on NRC construction permit proceeding; ALAB-443, C, (6 NRC 741, 747 (1977))

federal preemption of local zoning laws; LBP-77-063, (6 NRC 799 (1977))

intervention requirements under 10 CFR 2.715(c); ALAB-444, D, (6 NRC 760, 768 (1977))

intervention standing of those other than in which activities under the license will occur; LBP-77-059, B, (6 NRC 518, 521 (1977))

obligation to offer public hearings on FWPCA 401 certification issues; LBP-77-052, C, (6 NRC 294, 338 (1977))

Ohio law effects on construction permit licensing; ALAB-443, C, (6 NRC 741, 747 (1977))

party rights and obligations for Commission certiorari participation; CLI-77-025, C, (6 NRC 535 (1977))

rules of practice for granting intervention to states distant from site; ALAB-447, B, (6 NRC 873 (1977))

scope of operation of local zoning laws in respect to nuclear power plants; LBP-77-063, (6 NRC 755 (1977))

STATUTES

weight accorded NRC interpretation; LBP-77-069, F, (6 NRC 1179, 1183 (1977))

STAY

construction activity pending resolution of remanded safety issues; ALAB-429, E, (6 NRC 229, 247 (1977))

pending appeal denied for Marble Hill 1 and 2; ALAB-437, A, (6 NRC 630 (1977))

pending appeal, rules of practice; ALAB-424, F, (6 NRC 122, 127 (1977))

pending appeal, rules of practice for; ALAB-437, B, (6 NRC 630 (1977))

pending appeal, rules of practice for immediate effectiveness of both ASLB and ASLAB decisions; ALAB-423, B, (6 NRC 115 (1977))

rules of practice for interlocutory; CLI-77-027, B, (6 NRC 715 (1977))

STEAM GENERATOR TUBES

appellate jurisdiction terminated for Seabrook; ALAB-442, (6 NRC 728 (1977))

denting phenomena, generic considerations and technical aspects; ALAB-427, (6 NRC 212 (1977))

findings for Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 254 (1977))

integrity considerations for Prairie Island; ALAB-427, (6 NRC 212 (1977))

integrity issues for Seabrook, appellate jurisdiction terminated; ALAB-442, (6 NRC 728 (1977))

integrity of St. Lucia, jurisdiction retained with construction permit affirmation; ALAB-435, A, (6 NRC 541 (1978))

STEAM GENERATORS

findings for North Anna 1 and 2; LBP-77-068, A, (6 NRC 1127 (1977))

tube integrity resolution problems for Seabrook, ASLAB jurisdiction retained; ALAB-422, A, (6 NRC 33 (1977))

STERLING POWER PROJECT, Nuclear 1

construction permit issuance with conditions; LBP-77-053, (6 NRC 350 (1977))

SUBPCENAS

rules of practice for issuance or denial; ALAB-422, S, (6 NRC 33, 93 (1977))

SUMMARY DISPOSITION

burden of proof rules of practice; ALAB-443, H, (6 NRC 741, 752 (1977))

rules of practice for antitrust matters; LBP-77-045, E, (6 NRC 159, 162 (1977))

SUSQUEHANNA STEAM ELECTRIC STATION, Units 1 and 2

construction permit, interim-fuel-cycle rule effects on NEPA balance; ALAB-426, A, (6 NRC 206 (1977))

TANKER SHIPS

accident potential for fire hazards to Hope Creek; LBP-77-073, (6 NRC 1310 (1977))

SUBJECT INDEX

- TAXPAYER**
standing conferred for intervention; LBP-77-059, A, (6 NRC 518 (1977))
- TECHNICAL QUALIFICATIONS**
co-applicant requirements; LBP-77-067, B, (6 NRC 1101, 1117 (1977))
findings for North Anne 1 and 2; LBP-77-068, A, (6 NRC 1127 (1977))
intervenor considerations for construction permit proceedings; LBP-77-059, A, (6 NRC 518 (1977))
- TELEPHONE CONFERENCE CALLS**
rules of practice for ASLB; ALAB-443, F, (6 NRC 741, 751 (1977))
- THERMAL EFFLUENTS**
see Effluents, Thermal
- THREE MILE ISLAND NUCLEAR STATION, Unit 2**
full-term operating license authorized; LBP-77-070, (6 NRC 1185 (1977))
- THREE MILE ISLAND NUCLEAR STATION, Units 1 and 2**
construction permit, operating license, interim-fuel-cycle rule effects on NEPA balance; ALAB-426, A, (6 NRC 206 (1977))
- TRINAGUE NUCLEAR POWER PLANT**
XSNM-1162, discretionary hearings for export license applications, comments requested; CLI-77-031, A, (6 NRC 849 (1977))
XSNM-1162, intervention standing for export license hearings; CLI-77-024, A, (6 NRC 525 (1977))
- TIME, EXTENSION OF**
rules of practice for untimely briefs submission; ALAB-424, C, (6 NRC 122, 125 (1977))
- TIMELINESS**
good cause considerations for three-year delay in intervention petition; LBP-77-052, (6 NRC 506 (1977))
good cause finding for late intervention petition; ALAB-444, K, (6 NRC 760, 796 (1977))
rules of practice for late intervention; ALAB-440, B, (6 NRC 642 (1977))
rules of practice for supporting exceptions briefs; ALAB-424, B, (6 NRC 122, 125 (1977))
rules of practice for untimely supporting briefs filing; ALAB-424, C, (6 NRC 122, 125 (1977))
- TORNADOES**
findings for Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))
- TOURISM**
impacts from Seabrook; LBP-77-065, (6 NRC 816 (1977))
- TRANSMISSION LINES**
electrical hazards from Sterling 1; LBP-77-053, (6 NRC 350 (1977))
environmental impacts and costs for Seabrook 1 and 2; ALAB-422, A, (6 NRC 33 (1977))
environmental impacts from Tyrone Energy Park 1; LBP-77-071, (6 NRC 1232 (1977))
impacts from Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))
NRC jurisdiction over offsite routes; ALAB-422, Q, (6 NRC 33, 82 (1977))
routes affirmed for Seabrook; ALAB-422, Q, (6 NRC 33, 82 (1977))
- TRANSPORTATION OF RADIOACTIVE MATERIALS**
see Radioactive Materials Transportation
- TREES**
clearing impacts, pre-LWA findings standard; ALAB-446, C, (6 NRC 870, 871 fn. 3(1977))
damage assessment for pre-LWA activity grant; LBP-77-061, C, (6 NRC 674, 677 (1977))
environmental impacts from clearing for access road work; ALAB-446, B, (6 NRC 870 (1977))
removal activity not approved for pre-LWA activity; LBP-77-056, (6 NRC 478 (1977))
- TRICASTIN-1 NUCLEAR REACTOR**
XSNM-1176, discretionary hearings for export license applications, comments requested; CLI-77-031, A, (6 NRC 849 (1977))
XSNM-1176, intervention standing for export licensing hearings; CLI-77-024, A, (6 NRC 525 (1977))
- TRICAN NUCLEAR PLANT**
operating license amendments, spent fuel pool modification affirmed; LBP-77-069, A, (6 NRC 1179 (1977))

SUBJECT INDEX

operating license, directed certification refused for interlocutory rulings in spent fuel proceeding; ALAB-451, A, (6 NRC 225 (1977))

TURKEY POINT, Units 3 and 4
operating license compliance, finality of decision relative to antitrust matters; CLI-77-030, A, (6 NRC 847 (1977))
operating license, antitrust initiation denied for lack of jurisdiction; ALAE-428, A, (6 NRC 221 (1977))
operating license, compliance with antitrust laws; CLI-77-026, (6 NRC 538 (1977))

TYRONE ENERGY PARK, Unit 1
construction permit, issuance authorized; LBP-77-071, (6 NRC 1232 (1977))

UNTIMELINESS
rules of practice for considering late intervention petitions; ALAB-431, B, (6 NRC 460 (1977))

URANIUM
export license issuance criteria for high-enriched; CLI-77-032, D, (6 NRC 854, 858 (1977))
fuel cycle effects of Seabrook, NEPA cost-benefit update; ALAE-422, W, (6 NRC 33, 102 (1977))
interim fuel cycle rule effects on Seabrook and Vermont Yankee; ALAB-421, A, (6 NRC 25 (1977))
numerical fuel cycle values of revised Table S-3, decisive weight in cost-benefit balance; ALAB-426, C, (6 NRC 206, 205 (1977))
numerical values for fuel cycle effects on 11 pending license applications; ALAE-426, A, (6 NRC 206 (1977))

VERMONT YANKEE NUCLEAR POWER STATION
operating license amendment, authorization to increase spent fuel storage; LBP-77-054, (6 NRC 436 (1977))
operating license, environmental effects of interim fuel cycle rule; ALAE-421, A, (6 NRC 25 (1977))

VICLATICKS
effects on future authorization of LWA or CP; LBP-77-052, E, (6 NRC 294, 301 (1977))

WATER QUALITY
findings for Three Mile Island 2; LBP-77-070, (6 NRC 1185 (1977))
groundwater contamination probability for Marble Hill 1 and 2; LBP-77-052, A, (6 NRC 294 (1977))

WATER REQUIREMENTS
environmental impacts from Tyrone Energy Park 1; LBP-77-071, (6 NRC 1232 (1977))

WEST VALLEY REPROCESSING PLANT
termination of GESMO proceedings; CLI-77-033, (6 NRC 861 (1977))

WCLF CREEK GENERATING STATION, Unit 1
construction permits, procedural rulings for initial decision appellate review; ALAB-424, A, (6 NRC 122 (1977))

WPPSS NUCLEAR PROJECT, Units 3 and 5
construction permit record reopened for safe shutdown earthquake fire protection; LBP-77-045, (6 NRC 257 (1977))

WURGASSEN REACTOR
XSNM-1116 export license issuance without public hearings; CLI-77-029, A, (6 NRC 719 (1977))
XSNM-1116, intervention standing for export license hearings; CLI-77-024, A, (6 NRC 525 (1977))

YELLOW CREEK NUCLEAR PLANT, Units 1 and 2
construction permits, scheduling affirmed for proceedings initiation; ALAE-445, A, (6 NRC 225 (1977))

FACILITY INDEX

ALVIN W. VOGTLE NUCLEAR PLANT, Units 1 and 2; Docket 50424;50425
Licensing-(uranium fuel cycle effects); 09-08-77; Memorandum and Order;
ALAB-426 (6 NRC 206 (1977))

BARNWELL NUCLEAR FUEL PLANT SEPARATIONS FACILITY;BARNWELL URANIUM HEXAFLUORIDE
FACILITY;BARNWELL PLUTONIUM PRODUCT FACILITY; Docket 50332;701327;701821
Rulemaking; 12-23-77; Order; CLI-77-033 (6 NRC 861 (1977))

BEAVER VALLEY POWER STATION, Units 1 and 2; Docket 50334;50412
Licensing-(uranium fuel cycle effects); 09-08-77; Memorandum and Order;
ALAB-426 (6 NRC 206 (1977))

BLACK FOX NUCLEAR GENERATING STATION, Units 1 and 2; Dockets STN 50556;STN
50557
Construction Permit; 07-20-77; Order; LBP-77-046 (6 NRC 167 (1977))

CALLAWAY PLANT, Units 1 and 2; Docket STN 50483;STN 50486
Licensing-(uranium fuel cycle effects); 09-08-77; Memorandum and Order;
ALAB-426 (6 NRC 206 (1977))

CATAWBA NUCLEAR STATION, Units 1 and 2; Docket 50413;50414
Licensing-(uranium fuel cycle effects); 09-08-77; Memorandum and Order;
ALAB-426 (6 NRC 206 (1977))

CHEROKEE NUCLEAR STATION, Units 1, 2 and 3; Dockets STN 50491;STN 50492;STN
50493
Construction Permit; 07-26-77; Partial Initial Decision, Supplemental;
LBP-77-047 (6 NRC 191 (1977))
Construction Permit; 10-26-77; Decision; ALAB-440 (6 NRC 642 (1977))
Construction Permit; 12-30-77; Partial Initial Decision; LBP-77-074 (6 NRC
1314 (1977))

DAVIS-BESSE NUCLEAR POWER STATION, Units 1, 2 and 3; Dockets
50346A;50500A;50501A
Antitrust; 09-02-77; Memorandum and Order; ALAB-430 (6 NRC 457 (1977))

DIABLO CANYON NUCLEAR POWER PLANT, Units 1 and 2; Dockets 50275 OL;50323 OL
Operating License; 09-15-77; Order; CLI-77-023 (6 NRC 455 (1977))

FLODATING NUCLEAR POWER PLANTS; Docket STN 50437
Manufacturing License; 08-01-77; Memorandum and Order; LBP-77-048 (6 NRC 249
(1977))

GENERIC ENVIRONMENTAL STATEMENT ON MIXED OXIDE FUEL; Dockets RM 505
Rulemaking; 12-23-77; Order; CLI-77-033 (6 NRC 861 (1977))

GREENE COUNTY NUCLEAR POWER PLANT; Docket 50549
Construction Permit; 09-16-77; Memorandum and Order; ALAB-434 (6 NRC 471
(1977))
Construction Permit; 10-21-77; Memorandum and Order; ALAB-439 (6 NRC 640
(1977))

HARTSVILLE NUCLEAR PLANT, Units 1A, 2A, 1B and 2B ; Docket STN 50518;STN
50519;STN 50520;STN 50521
Licensing-(uranium fuel cycle effects); 09-08-77; Memorandum and Order;
ALAB-426 (6 NRC 206 (1977))

HARTSVILLE NUCLEAR PLANT, Units 1A, 2A, 1B and 2B; Dockets STN 50518;STN
50519;STN 50520;STN 50521
Construction Permit; 07-11-77; Memorandum and Order; ALAB-418 (6 NRC 1
(1977))

HOPE CREEK GENERATING STATION, Units 1 and 2; Dockets 50354;50355
Construction Permit; 08-24-77; Decision; ALAB-429 (6 NRC 229 (1977))
Construction Permit, Compliance; 12-23-77; Order; LBP-77-073 (6 NRC 1310
(1977))

FACILITY INDEX

Licensing-(uranium fuel cycle effects); 09-08-77; Memorandum and Order;
ALAB-426 (6 NRC 206 (1977))
INDIAN POINT, Unit 2; Docket 50247
Construction Permit; 11-23-77; Order; LBP-77-063 (6 NRC 799 (1977))
INDIAN POINT, Units 1, 2 and 3; Dockets 50003;50247;50286
Operating License; 10-12-77; Decision; ALAB-436 (6 NRC 547 (1977))
LIMERICK GENERATING STATION, Units 1 and 2; Docket 50352;50353
Licensing-(uranium fuel cycle effects); 09-08-77; Memorandum and Order;
ALAB-426 (6 NRC 206 (1977))
LOW-ENRICHED URANIUM EXPORTS TO EURATOM MEMBER NATIONS; Dockets
702566;702568;702608;702647;702657;702667;702674;702675
Special Nuclear Materials, Export Licenses; 10-22-77; Memorandum and Order;
CLI-77-031 (6 NRC 849 (1977))
MARBLE HILL NUCLEAR GENERATING STATION, Units 1 and 2; Dockets STN 50546;STN
50547
Construction Permit; 08-22-77; Partial Initial Decision, LWA; LBP-77-052 (6
NRC 294 (1977))
Construction Permit; 10-14-77; Memorandum and Order; ALAB-437 (6 NRC 630
(1977))
Construction Permit; 12-09-77; Partial Initial Decision, LWA-2; LBP-77-067
(6 NRC 1101 (1977))
MIDLAND PLANT, Units 1 and 2; Dockets 50329A;50330A
Antitrust; 12-30-78; Decision; ALAB-452 (6 NRC 892 (1977))
Construction Permit; 09-23-77; Order; LBP-77-057 (6 NRC 482 (1977))
Construction Permit; 10-19-77; Memorandum and Order; ALAB-438 (6 NRC 638
(1977))
Construction Permit, Compliance; 12-14-77; Memorandum; ALAB-450 (6 NRC 887
(1977))
NORTH ANNA NUCLEAR POWER STATION, Units 1 and 2; Dockets 50338 OL;50339 OL
Operating License; 11-26-77; Initial Decision; LBP-77-064 (6 NRC 808 (1977))
Operating License; 12-13-77; Initial Decision; LBP-77-068 (6 NRC 1127
(1977))
NUCLEAR FUEL RECOVERY AND RECYCLING CENTER; Docket 50564
Construction Permit; 08-03-77; Memorandum and Order; ALAB-425 (6 NRC 199
(1977))
Construction Permit; 09-30-77; Order; LBP-77-059 (6 NRC 518 (1977))
Construction Permit; 12-13-77; Decision; ALAB-447 (6 NRC 873 (1977))
Rulemaking; 12-23-77; Order; CLI-77-033 (6 NRC 861 (1977))
ON APPLICATION TO EXPORT SPECIAL NUCLEAR MATERIAL; Docket 70-2561
Special Nuclear Materials Export License; 11-10-77; Memorandum and Order;
CLI-77-029 (6 NRC 719 (1977))
OYSTER CREEK NUCLEAR GENERATING STATION; 50219
Operating License; 09-28-77; Memorandum and Order; LBP-77-058 (6 NRC 500
(1977))
PEACH BOTTOM ATOMIC POWER STATION, Units 2 and 3; Dockets 50277;50278
Construction Permit, Operating License; 10-28-77; Initial Decision-Remanded
cost-benefit analysis issues; LBP-77-062 (6 NRC 680 (1977))
Licensing-(uranium fuel cycle effects); 09-08-77; Memorandum and Order;
ALAB-426 (6 NRC 206 (1977))
Operating License; 12-13-77; Decision; ALAB-448 (6 NRC 882 (1977))
PERKINS NUCLEAR STATION, Units 1, 2 and 3; Dockets STN 50488;STN 50489;STN
50490
Construction Permit; 09-08-77; Decision; ALAB-431 (6 NRC 460 (1977))
Construction Permit; 09-16-77; Memorandum and Order; ALAB-433 (6 NRC 469
(1977))
PERRY NUCLEAR POWER PLANT, Units 1 and 2; Docket 50440A;50441A
Antitrust; 09-02-77; Memorandum and Order; ALAB-430 (6 NRC 457 (1977))
Construction Permit; 11-08-77; Decision; ALAB-443 (6 NRC 741 (1977))
Construction Permit; 12-14-77; Decision; ALAB-449 (6 NRC 884 (1977))
PHIPPS BEND NUCLEAR PLANT, Units 1 and 2; Dockets 50553;50554
Construction Permit; 10-14-77; Partial Initial Decision-Nepa and site
suitability; LBP-77-060 (6 NRC 647 (1977))
PILGRIM NUCLEAR POWER STATION, Units 2 and 3; Dockets 50471;50472
Construction Permit; 11-30-77; Partial Initial Decision; LBP-77-066 (6 NRC
839 (1977))
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, Units 1 and 2; Dockets 50282;50306

FACILITY INDEX

Operating License; 07-12-77; Memorandum and Order; ALAB-419 (6 NRC 3 (1977))
Operating License; 08-12-77; Initial Decision; LBP-77-051 (6 NRC 265 (1977))
Operating License; 08-15-77; Memorandum; ALAB-427 (6 NRC 212 (1977))
Operating License (Spent Fuel Pool Modification); 09-08-77; Order;
LBP-77-055 (6 NRC 473 (1977))
Operating License, Amendments; 07-05-77; LBP-77-042 (6 NRC 131 (1977))
RECYCLE FUELS PLANT; Docket 50201
Rulemaking; 12-23-77; Order; CLI-77-033 (6 NRC 861 (1977))
RIVER BEND STATION, Units 1 and 2; Dockets 50458;50459
Construction Permit; 11-23-77; Decision; ALAB-444 (6 NRC 760 (1977))
SALEM NUCLEAR GENERATING STATION, Units 1 and 2; Dockets 50272;50311
Licensing-(uranium fuel cycle effects); 09-08-77; Memorandum and Order;
ALAB-426 (6 NRC 206 (1977))
SAN ONOFRE NUCLEAR GENERATING STATION, Units 2 and 3; Dockets 50361;50362
Construction Permit; 09-14-77; Decision; ALAB-432 (6 NRC 465 (1977))
SEABROOK NUCLEAR STATION, Units 1 and 2; Dockets 50443;50444
Construction Permit; 07-07-77; Initial Decision, Supplemental; LBP-77-043 (6
NRC 134 (1977))
Construction Permit; 07-26-77; Decision; ALAB-422 (6 NRC 33 (1977))
Construction Permit; 09-15-77; Order; CLI-77-022 (6 NRC 451 (1977))
Construction Permit; 10-14-77; Order; CLI-77-025 (6 NRC 535 (1977))
Construction Permit; 11-02-77; Memorandum and Order; ALAB-442 (6 NRC 728
(1977))
Construction Permit; 11-04-77; Order; CLI-77-027 (6 NRC 715 (1977))
Construction Permit; 07-26-78; Memorandum and Order; ALAB-423 (6 NRC 115
(1977))
Construction Permit; 11-30-78; Initial Decision, Supplemental; LBP-77-065 (6
NRC 816 (1977))
Uranium-Fuel-Cycle-Rule Effects; 07-18-77; Memorandum and Order; ALAB-421 (6
NRC 25 (1977))
SHOREHAM NUCLEAR POWER STATION, Unit 1; Docket 50322
Operating License; 08-01-77; Memorandum and Order; LBP-77-050 (6 NRC 261
(1977))
SKAGIT NUCLEAR POWER PROJECT, Units 1 and 2; Dockets STN 50522;STN 50523
Construction Permit; 07-07-77; Initial Decision, Pre-LWA Authority for Road
Construction; LBP-77-044 (6 NRC 141 (1977))
Construction Permit; 09-15-77; Order; LBP-77-056 (6 NRC 478 (1977))
Construction Permit; 10-28-77; Order; LBP-77-061 (6 NRC 674 (1977))
Construction Permit; 12-09-77; Decision; ALAB-446 (6 NRC 870 (1977))
Construction Permit (Pre-LWA Authority); 12-23-77; Order Following Remand;
LBP-77-072 (6 NRC 1308 (1977))
ST. LUCIE NUCLEAR POWER PLANT, Unit 1; Dockets 50335A
Operating License, Antitrust Review; 08-23-77; Decision; ALAB-428 (6 NRC 221
(1977))
Operating License, Compliance; 10-25-78; Order; CLI-77-026 (6 NRC 538
(1977))
ST. LUCIE NUCLEAR POWER PLANT, Unit 2; Docket 50389A
Construction Permit; 07-12-77; Decision; ALAB-420 (6 NRC 8 (1977))
Construction Permit; 10-07-78; Decision; ALAB-435 (6 NRC 541 (1978))
Licensing, Compliance; 11-08-77; Order; CLI-77-028 (6 NRC 717 (1977))
ST. LUCIE NUCLEAR POWER PLANT, Units 1 and 2; Dockets
50335A;50389A;50250A;50251A
Antitrust; 12-09-77; Order; CLI-77-030 (6 NRC 847 (1977))
STANISLAUS NUCLEAR PROJECT, Unit 1; Docket 50564A
Construction Permit, Antitrust; 07-08-77; Order; LBP-77-045 (6 NRC 159
(1977))
STERLING POWER PROJECT, Nuclear 1; Docket 50485
Construction Permit; 08-26-77; Initial Decision; LBP-77-053 (6 NRC 350
(1977))
SUSQUEHANNA STEAM ELECTRIC STATION, Units 1 and 2; Docket 50387;50388
Licensing-(uranium fuel cycle effects); 09-08-77; Memorandum and Order;
ALAB-426 (6 NRC 206 (1977))
TEN APPLICATIONS FOR LOW-ENRICHED URANIUM EXPORTS TO EURATOM MEMBER NATIONS;
Dockets 702614
Special Nuclear Materials, Export Licenses; 10-04-77; Memorandum and Order;
CLI-77-024 (6 NRC 525 (1977))

FACILITY INDEX

THREE APPLICATIONS FOR HIGH-ENRICHED URANIUM EXPORT TO THE FEDERAL REPUBLIC OF GERMANY; Dockets 702421;702600;702694
Special Nuclear Materials, Export Licenses; 12-22-78; Memorandum and Order; CLI-77-032 (6 NRC 854 (1977))

THREE MILE ISLAND NUCLEAR STATION, Unit 2; Docket 50320
Operating License; 12-19-77; Initial Decision; LBP-77-070 (6 NRC 1185 (1977))

THREE MILE ISLAND NUCLEAR STATION, Units 1 and 2; Docket 50289;50320
Licensing-(uranium fuel cycle effects); 09-08-77; Memorandum and Order; ALAB-426 (6 NRC 206 (1977))

TROJAN NUCLEAR PLANT; Docket 50344
Operating License; 12-20-77; Memorandum and Order; ALAB-451 (6 NRC 889 (1977))
Operating License, Amendments (Spent Fuel Pool Modification); 12-14-77; Memorandum and Order; LBP-77-069 (6 NRC 1179 (1977))

TURKEY POINT, Units 3 and 4; Docket TURKEY POINT, Units 3 and 4
Antitrust; 12-09-77; Order; CLI-77-030 (6 NRC 847 (1977))
Operating License, Antitrust Review; 08-23-77; Decision; ALAB-428 (6 NRC 221 (1977))
Operating License, Compliance; 10-25-78; Order; CLI-77-026 (6 NRC 538 (1977))

TYRONE ENERGY PART, Unit 1; Docket 50484
Construction Permit; 12-23-77; Initial Decision; LBP-77-071 (6 NRC 1232 (1977))

VERMONT YANKEE NUCLEAR POWER STATION; Docket 50271
Operating License; 08-30-78; Initial Decision; LBP-77-054 (6 NRC 436 (1977))
Uranium-Fuel-Cycle-Rule Effects; 07-18-77; Memorandum and Order; ALAB-421 (6 NRC 25 (1977))

WEST VALLEY REPROCESSING PLANT; Docket 50201
Rulemaking; 12-23-77; Order; CLI-77-033 (6 NRC 861 (1977))

WOLF CREEK GENERATING STATION, Unit 1; Docket STN 50482
Construction Permit; 07-29-77; Memorandum and Order; ALAB-424 (6 NRC 122 (1977))

WPPSS NUCLEAR PROJECT, Units 3 and 5; Dockets STN 50508;STN 50509
Construction Permit; 08-01-77; Memorandum and Order; LBP-77-049 (6 NRC 257 (1977))

YELLOW CREEK NUCLEAR PLANT, Units 1 and 2; Dockets STN 50566;STN 50567
Construction Permit; 12-08-77; Memorandum and Order; ALAB-445 (6 NRC 865 (1977))