UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

William C. Parler, Chairman
Dr. John H. Buck, Member
Dr. Lawrence R. Quarles, Member

In the Matter of CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. (Indian Point Station, Unit No. 2)	Docket No. 50-247

Messrs. Leonard M. Trosten and Edward L. Cohen, Washington, D. C., for the applicant, Consolidated Edison Company of New York, Inc.

Mr. Anthony Z. Roisman, Washington, D. C., for the intervenor, Citizens Committee for the Protection of the Environment.

Mr. Angus Macbeth and Ms. Sarah Chasis, New York, N. Y., for the intervenor, Hudson River Fishermen's Association.

Mr. James P. Corcoran, New York, N. Y., on behalf of the State of New York By The Attorney General.

Mr. Myron Karman for the AEC Regulatory Staff.

DECISION

April 4, 1974

(ALAB-188)

By initial decision dated September 25, 1973, the Atomic Safety and Licensing Board authorized the

Director of Regulation to issue, in accordance with the terms of that decision, a full-term, full-power operating license to Consolidated Edison Company, the applicant.[1/]

Exceptions to the initial decision[2/] have been taken by the Citizens Committee for the Protection of the Environment (CCPE), the Hudson River Fishermen's Association (HRFA), the Attorney General of the State of New York (New York) and the applicant. Generally, CCPE's exceptions raise radiological safety issues. The exceptions of the other parties raise environmental issues which relate primarily to the aquatic impacts on the striped bass fisheries as a result of Indian Point operation with a once-through cooling system.

1/ LBP-73-33, reported at RAI-73-9 751. The license authorized by the initial decision was issued by the Director of Regulation on September 28, 1973.

Details concerning the administrative proceeding before the Licensing Board are in the reported initial decisions and will not be repeated here.

2/ The initial decision incorporated by reference (RAI-73-9 at 752) an earlier initial decision which the Licensing Board issued in this proceeding. The earlier initial decision, dated July 14, 1972 (LBP-72-16, reported at TID-26300 43), authorized certain testing operations. The September 25, 1973 initial decision will be referred to as the "initial decision" and the earlier initial decision as the "July 14, 1972 initial decision".

The AEC regulatory staff supports the initial decision and opposes all of the exceptions. At our request, oral argument was heard on several issues associated with the environmental exceptions.[3/]

We have examined the voluminous record in this proceeding with care and thoroughness.[4/] In that regard, it merits interjection that our review was aided by the briefs of the parties and the parties' responses to our questions at and subsequent to the oral argument.[5/] Based on our review of the entire record of this proceeding, we deny CCPE's exceptions other than exceptions 18-21, and affirm the Licensing

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3/ Our order of December 21, 1973 enumerated specific areas on which we desired the parties to focus during the oral argument. Subsequent to the oral argument, we sent written questions to the staff. We received the staff's answers as well as comments on them from the applicant and HRFA.

4/ At the outset we took steps to assure ourselves that we did in fact have the complete record before us for review. Our order of December 5, 1973 and memorandum of December 28, 1973, each to the Licensing Board, were issued for that purpose. The Commission's Rules of Practice include no requirement for the record below to be transmitted to us when exceptions have been filed to an initial decision. We recommend that the rules be appropriately amended, or that adequate arrangements be made, to assure that as a matter of routine we receive the complete record for review.

5/ This assistance was especially important in view of the complete absence of record references in the initial decision.

Board's findings regarding the radiological safety matters to which the exceptions we consider in this decision relate. CCPE's exceptions 18-21 are directed to the applicant's security program. In ALAB-177 (RAI-74-2 153 (February 26, 1974)), we requested further information on that matter. We are reserving judgment on these exceptions pending the completion of our review.

The central issue which the environmental exceptions raise is the length of time the Indian Point facility should be permitted to operate with a once-through cooling system before being required to operate with a closed-cycle cooling system. The applicant is now required by a license condition to operate with a closed-cycle cooling system after May 1, 1978. It contends in its exceptions that it should be allowed to operate with once-through cooling until September, 1981, so that the data from its research program on the environmental impact of such operation can be collected and analyzed before the actual construction of a closed-cycle system commences. HRFA and New York argue, on the other hand, that sufficient data are already available to demonstrate that closed-cycle cooling is required and such a system should be functional by January 1, 1977.

The question concerning the projected environmental impact of long-term operation with a once-through cooling system was the subject of conflicting expert testimony at the hearing. The experts recognized, as did the Licensing Board, that their predictions involved a considerable number of unknowns regarding the predicted impact of once-through cooling if that mode of cooling is used permanently. Divergent views also exist on the question of whether results of the applicant's research program will provide more persuasive empirical data on the predicted impact. The applicant's evidence is inconclusive regarding the acceptability of a once-through cooling system on a long-term basis, as the applicant has itself apparently recognized by virtue of its September 1981 proposal. On the other hand, the regulatory staff and HRFA, for the most part on the basis of evidence which is grounded on a pyramid of conservative (i.e.most pessimistic) assumptions, predict substantial impact from once-through cooling.

We have concluded that the Indian Point No. 2 facility operating license should be amended to permit operation, subject to conditions to assure that the environment is protected, with a once-through cooling system until May 1, 1979.[6/] We should point out the obvious -- that date was arrived at on the basis of the evidentiary record in this proceeding and it is not the date which may be required under applicable law which is in the province of some other governmental body.

It suffices at this point to emphasize at the outset that this Decision allows a modest amount of time:

(1) For reevaluation and reconsideration of the Final Environmental Statement in the light of this Decision;

6/ We earlier decided in ALAB-174, RAI-74-1 55 (January 29, 1974) to direct an extension from March 1, 1974, until December 1, 1974, of the date by which the applicant must submit an environmental report evaluating the economic and environmental impacts of an alternative closed-cycle cooling system. HRFA's motion for reconsideration of that order was denied. ALAB-178, RAI-74-2 157 (February 26, 1974). We stated in ALAB-174 that the extension "shall not affect our decision, either directly or indirectly, regarding the May 1, 1978 date". RAI-74-1 at 56. Our decision regarding that date is grounded on considerations other than the due date for the applicant's environmental report on closed-cycle cooling.

(2) For the applicant to collect data on the environmental impact of once-through cooling and data to evaluate the possible impact of closed-cycle cooling;

(3) For the applicant, staff and interested governmental bodies to analyze the data with the objective of reaching an informed decision on the permanent cooling system for Indian Point No. 2; and

(4) For construction of a cooling tower if such tower is required for the permanent cooling system.

This Decision further assures that:

(1) The operation with the once-through cooling system as authorized in this Decision is subject to license conditions designed to protect the environment through monitoring procedures and mitigating measures; and

(2) Interested parties will be provided on a timely basis with reports from the applicant on its analysis of environmental impact data collected during the period of operation with the once-through cooling system authorized herein.

I.

We turn first to consider CCPE's exceptions. These exceptions filed by CCPE in part fall into the following categories: Pressure Vessel Integrity (Ex. 1-3); the Commission's Interim Acceptance Criteria for emergency core-cooling systems (Ex. 4-8); Quality Assurance (Ex. 9-12); the Containment Spray System (Ex. 16-17); Plant Security (Ex. 18-21);[7/] Emergency Plan in the event of an accident (Ex. 22-25); and challenges to the Licensing Board's ultimate findings (Ex. 27-34). In addition, exceptions have been filed which deal generally with the following: the air supply for the control valves (Ex. 13); alleged

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7/ As previously noted (supra, p. 4), we are still considering the issues raised by these exceptions and therefore are reserving judgment on them in this Decision. Accordingly, they will be handled at an early date by a separate action.

unresolved deficiencies at the plant (Ex. 14); and the adequacy of evidence regarding the applicant's compliance with Commission standards and criteria (Ex. 15).

A. Pressure Vessel Integrity: Exceptions 1-3

CCPE recognizes that its first three exceptions concerning the matter of the integrity of the pressure vessel for Indian Point No. 2 have in part already been the subject of an order by the Commission in this proceeding.[8/] A reason asserted by CCPE for these exceptions is "to clearly protect the right to judicial review".[9/]

8/ Consolidated Edison Co. of New York (Indian Point Unit No. 2), CLI-72-29, TID-26300 20, 21 (October 26, 1972).

9/ CCPE Exceptions, p. 2.

1. In its order, the Commission gave clear guidance that matters concerning pressure vessel failure need not automatically be considered by a licensing board. According to the Commission, protection against the consequences of pressure vessel failure need not be required for a particular facility which has been shown to meet applicable Commission regulations:[10/]

> 'unless it has been determined that for such facility there are special considerations that make it necessary that potential pressure vessel failure be considered'. * * * Where there are matters raised in a case that are of 'special safety significance', supplementary measures in respect to the facility under review are an appropriate subject of hearing exploration.

2. The Licensing Board found that:[11/]

> the reactor vessel for Unit No. 2 was designed and constructed and will be operated in accordance with the requirements of the rules and regulations of the Commission and that there is reasonable assurance that it can be operated without undue risk to the health and safety of the public.

This finding is supported by extensive testimony in the evidentiary record.[12/]

10/ Consolidated Edison Co. of New York, CLI-72-29, supra, TID-26300 at 21.

11/ Initial Decision, supra, RAI-73-9 at 752.

12/ See, e.g. Tr. 665, 728, 888-890, 917, 1932-1936, 2032-2058, 2715, 3934-3946, 3948-3950, 3952, 3954-3977, 3979-3981; Applicant's Answers to Licensing Board Questions (Tr. 1652-1658); and document entitled "Additional Testimony of Applicant Concerning Reactor Vessel Integrity", September 17, 1971 (after Tr. 1485).

3. CCPE argues that it was erroneous for the Licensing Board to conclude that the proximity of Indian Point 2 to a large population center was not a matter of special safety significance warranting further inquiry into the integrity of the reactor vessel and the need for protection against its failure.[13/] In rejecting CCPE's interpretation of "special safety significance" the Licensing Board asserted:[14/]

> Population density and proximity to population centers are considerations in the evaluation of the suitability of each site proposed for a nuclear power plant, and are considered in the first instance at the construction permit hearings. This was done in the construction permit proceeding for Unit No. 2 and again in the initial phases of this operating permit proceeding. Although the potential consequences of a pressure vessel failure at the Indian Point site might be greater than for other sites that have been approved, the term 'special safety significance' generally refers to considerations directed to the design, mode of manufacture and proposed limits of operation of the reactor vessel. The intervenor CCPE did not contend that any features of the reactor vessel or of other parts of the plant or of their construction or operation might increase the likelihood of failure of the vessel or the consequences of such a failure.

13/ CCPE Exception 1.

14/ Initial Decision, RAI-73-9 at 752.

a. CCPE argues that the Licensing Board erred in its conclusion that the proximity of Indian Point No. 2 to a large population center was not a matter of "special safety significance" within the meaning of the Commission's Memorandum and Order of October 26, 1972.[15/] Although neither the Commission nor the Licensing Board enumerated the items embraced by the term "special safety significance", we believe that a review of the origin of that term supports the Licensing Board's conclusion. In its Memorandum and Order of October 26, 1972, the Commission stated:[16/]

> We adopt the view expressed by the staff as consistent with the language of the regulation and the underlying Statement of Considerations.

The regulation referred to by the Commission is 10 CFR Part 50.55a which was accompanied by a Statement of Considerations which provided, in part:[17/]

> Compliance with the provisions of the amendments and the referenced codes is intended to insure a basic, sound quality level. It may be that the special safety

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15/ CCPE Brief at p. 2.

16/ Consolidated Edison Co. of New York, CLI-72-29, supra, TID-26300 at 21.

17/ 36 F.R. 11424 (June 12, 1971).

> significance of a particular system or component will call for supplementary measures. If analysis of the system shows that such is the case, appropriate supplementary measures are expected to be adopted by applicants and licensees, or will be required by the Commission. (Emphasis supplied).

It would appear that the term "special safety significance" as used by the Commission referred to such matters as design, mode of manufacture and proposed limits of operation of the reactor vessel. Keeping the question of proximity of reactors to population apart from the "special safety significance" inquiry does not mean that proximity does not receive attention. It routinely does so as part of the Commission's review under 10 CFR Part 100, "Reactor Site Criteria".

b. CCPE refers to a letter dated October 5, 1973, from the Director of Regulation to another applicant and states that we[18]

> can take judicial notice of the fact that the regulatory staff now opposes construction of the Newbold Island nuclear plants because of the proximity of large population contributions even though all of the requirements of 10 CFR Part 100 are met.

We have reviewed that letter and even a casual reading shows that the site considerations discussed did not

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18/ CCPE Brief at p. 2.

involve any non-compliance with 10 CFR Part 100. Instead, the letter referred to another location which the staff concluded, as a part of its National Environmental Policy Act (NEPA) balancing, to be a more desirable site from the environmental standpoint.

c. CCPE also argues with regard to the probability of reactor vessel rupture, that the testimony of Dr. Monroe S. Wechsler was erroneously excluded from the record.[19/] In this regard, CCPE asserts:[20/]

> CCPE sought to introduce evidence and conduct cross-examination which would demonstrate that when the likelihood of a pressure vessel rupture occurring is applied to the Indian Point site and the consequences of such an event are calculated, the result is an unacceptable risk. Testimony from Dr. Wechsler would have established the various modes of pressure vessel failure and indicated the range of probabilities of a pressure vessel failure.

Although Dr. Wechsler was not offered as a witness, CCPE sought to introduce the draft of a report he prepared. The draft report had been available to AEC

19/ CCPE Brief at pp. 1 and 4.

20/ Id., at pp. 1-2.

for some time and, in any event, it does not cast doubt on the Licensing Board's conclusion regarding the integrity of the Indian Point 2 reactor vessel.[21/]

For the foregoing reasons, CCPE's exceptions 1 through 3 are denied.

B. Emergency Core Cooling System (ECCS) and Interim Acceptance Criteria (IAC): Exceptions 4-8

1. CCPE alleges that the Licensing Board erred in failing to determine whether the requirements of Design Criterion 35 (10 CFR Part 50, Appendix A) had been met.[22/] According to CCPE, the Licensing Board has expressed "serious doubts about the validity of the Interim Acceptance Criteria" and "[i]n the face of these doubts its failure to find specific compliance with Design Criteria 35 is extremely significant".[23/]

21/ The question of receiving the draft report into evidence without Dr. Wechsler being available for examination was the subject of considerable discussion at the evidentiary hearings on April 9 and 10, 1973 (See Tr. 10,177-10,320 and 10,417-10,418).

22/ CCPE Exception 4.

23/ CCPE Brief at p. 5.

a. We do not agree with CCPE's assertion that the Licensing Board expressed "serious doubts" regarding the validity of the IAC. The Licensing Board in fact stated:[24/]

> The record of this hearing contains much expert opinion that the Interim Criteria are highly conservative. On the other hand, the cross-examination by the Citizens Committee provides a substantive basis for questioning the adequacy of the Interim Criteria, the analysis of the performance of the ECCS, and the research and development results that provide the basis for the criteria and the analysis. Passing judgment on the adequacy of the Commission's regulations is not within the jurisdiction of the Board. The Interim Criteria are presently the subject of public rule making proceedings and the decisions reached as a result of those hearings will apply to Unit No. 2.

The express finding was made by the Licensing Board that the applicant has provided an ECCS that satisfies the requirements of the Commission's regulations as they are defined in the IAC.[25/]

b. The Commission's General Design Criteria establish minimum requirements for the principal design criteria for water-cooled nuclear power plants. Criterion 35 "Emergency core cooling" requires "[a] system to provide abundant emergency core cooling". The IAC were the criteria against which the Licensing Board judged

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24/ July 14, 1972 Initial Decision, supra, TID-26300 at 49.

25/ Ibid.; Initial Decision, supra, RAI-73-9 at 753.

the adequacy of the Indian Point 2 ECCS. It is apparent that compliance with the specific criteria in the IAC demonstrated that the general design objective of Criterion 35 was satisfied.

c. To the extent that CCPE's argument rests on the position that a licensing board must make specific and separate findings of compliance with every applicable Commission regulation, it is rejected. Our decisions in Duke Power Company and Vermont Yankee cited by CCPE do not support that position.[26/] They both deal with findings of compliance when there is an issue raised that there exists an unresolved question of compliance with a specific regulatory requirement, the resolution of which is necessary for the ultimate licensing findings which have to be made.

2. CCPE's exceptions 5, 6 and 7 all rest on the alleged illegality of not allowing the IAC to be challenged in this proceeding. We have already ruled in this proceeding[27/], consistent with rulings in every other

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26/ Duke Power Co. (William B. McGuire Nuclear Station, Units 1 and 2), ALAB-128, RAI-73-6 399 (June 13, 1973); Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), ALAB-124, RAI-73-5 358 (May 23, 1973).

27/ ALAB-46, WASH-1218 293 (March 10, 1972); ALAB-95, RAI-73-1 33 (January 18, 1973).

proceeding in which the same issue has been raised, that only the applicant's compliance with the IAC could be raised in individual licensing proceedings.[28/] These rulings were grounded on the fact that the Commission had decided to resolve questions relating to the adequacy of the IAC in the ECCS rulemaking proceeding (Docket RM-50-1), and the criteria which were the product of that rulemaking would apply to plants which had been licensed under the IAC.[29/] Indeed, the issues raised by exceptions 4 through 7 would appear to us to be largely academic because the ECCS rulemaking action has now been completed and revised criteria have been published by the Commission which apply to all nuclear power reactors including Indian Point No. 2.[30/]

28/ See, e.g. Boston Edison Co. (Pilgrim Nuclear Power Station), ALAB-83, WASH-1218 (Suppl. 1) 552, 559 (December 4, 1972); Long Island Lighting Co. (Shoreham Nuclear Power Station), ALAB-156, RAI-73-10 831, 834 (October 26, 1973).

29/ On November 30, 1971, the Commission announced (36 F.R. 22774) that a public rulemaking hearing would be held concerning its interim statement of policy establishing acceptance criteria for emergency core cooling systems for light water-cooled nuclear power reactors. The interim criteria were published initially on June 29, 1971 (36 F.R. 12247) and were amended on December 18, 1971 (36 F.R. 24082).

30/ See 39 F.R. 1001, (January 4, 1974), "Acceptance Criteria for Emergency Core Cooling Systems for Light Water-Cooled Nuclear Power Reactors."

3. In its exception 8, CCPE alleges that the Licensing Board erred in concluding that reducing the peaking factor to compensate for fuel densification did not necessitate an examination of the adequacy of the IAC. As we understand the CCPE argument, it seems to be based primarily on the following ground:[31/]

> Inasmuch as the IAC represented an alleged careful balance of several safety considerations, any change in plant operating limits which destroys the initial margins should trigger a full review of the adequacy of the margins remaining.

We have already noted that the Licensing Board found that Indian Point No. 2 complied with the IAC. It also found that "reducing the limit on the total peaking factor during operation to the extent that this has been done for Unit No. 2 is an acceptable method of providing conformance to the requirements of the Interim Acceptance Criteria".[32/]

We do not accept the CCPE argument that a finding of compliance with the IAC is not enough, but that the Licensing Board should also have evaluated any reductions in safety margins which might have resulted from a reduction in the maximum allowable peaking factor. In the first place, a finding of compliance with the IAC is enough (supra, pp.17-18). We would additionally

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31/ CCPE Brief at p. 7.

32/ Initial Decision, RAI-73-9 at 754.

note that margins of safety are provided in the IAC. Moreover, even the maximum peaking factor allowed due to fuel densification is well above the normal operating peaking factors of the plant and does not have the effect of significantly lowering the safety margin provided over and above the inherent safety margins of the IAC. Finally, the question raised is largely academic in view of the results of the Commission's ECCS rulemaking proceeding.

For the foregoing reasons, CCPE's exceptions 4 through 8 are denied.

C. Quality Assurance: Exceptions 9-12

1. CCPE argues in support of its exception 9 that there has been no finding by the Licensing Board that the applicant's quality assurance program is in compliance with 10 CFR Part 50, Appendix B and with the substantive requirements of Safety Guide 33.[33/] Indeed, CCPE argues, the staff is "demanding compliance" and the real issue under our decisions in Duke Power and Vermont Yankee is whether a license can be issued when there is a failure of compliance with quality assurance requirements. The answer, under such circumstances, CCPE says must be negative.[34/]

33/ CCPE Brief at pp. 8-9.

34/ Id., at 9.

a. With regard to CCPE's argument asserting no finding of compliance with Appendix B to Part 50, the Licensing Board found:[35/]

> Some of the evidence indicates that the quality assurance program was less stringent than is presently required. The record, however, supports a finding that the quality control program in effect provides reasonable assurance that the components of Unit No. 2, and particularly items of major safety significance, were manufactured and assembled in conformance with the prescribed codes and specifications and the Commission's requirements.

The Licensing Board convened an additional evidentiary hearing and reopened the record on September 12, 1973 to consider further the applicant's quality assurance program for operations.[36/] There was ample opportunity at that hearing for the Board and CCPE to probe into the adequacy of the applicant's quality assurance program and circumstances surrounding incidents mentioned in staff inspection reports. The Board found that the applicant is complying with the "suggested upgrading" in its quality assurance program and "the concerns respecting the incidents have been or are being satisfactorily resolved".[37/]

35/ Initial Decision, *supra*, RAI-73-9 at 756.

36/ *Ibid*.

37/ *Ibid*.

With respect to the applicant's quality assurance program for operations, the Licensing Board stated:[38/]

> The Board examined the organizational structure for the nuclear operations.
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> * * * * *
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> The Board concludes from the several presentations of data respecting the quality assurance program, including that presented before the September 12, 1973 session, that Applicant's management and operating personnel recognize the need for quality assurance and its importance to nuclear safety. The Board finds that the quality assurance program is satisfactory and that the Applicant's organization as a unit is prepared to continue to carry forward the program as presently devised, and as it may be upgraded.

b. To the extent that exception 9 is based on the lack of language in the initial decision which states that "the applicant is in compliance with 10 CFR Part 50, Appendix B", it has no merit. There is no requirement that findings be cast in a specific form if the words used communicate a board's position. In our judgment the Licensing Board's findings here clearly convey its position that the applicant is in compliance with Appendix B to Part 50.

38/ Ibid.

c. We agree with the staff's position that the CCPE allegation[39/] that the staff has not approved the applicant's quality assurance program is contrary to the evidentiary record.[40/] The record reveals that the staff has concluded that the applicant's program meets applicable regulatory requirements.[41/]

d. Safety Guide 33 (now Regulatory Guide 1.33) is not a regulation and there is no requirement for a board to make findings that there is compliance with such guides.[42/] Nevertheless, we agree with the staff

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39/ CCPE Brief at p. 9.

40/ Staff Brief in Opposition at p. 17.

41/ CCPE Exhibit AA, Part 1, letter from Kniel to Cahill, August 30, 1973, Tr. 11465-11466; see also Tr. 11468-11469.

42/ The preamble to the Commission's "Regulatory Guide Series", December 12, 1972, states in part:

> The primary purposes of Regulatory Guides are (1) to describe and make available to the public methods acceptable to the AEC Regulatory staff of implementing specific parts of the Commission's regulations and in some cases to delineate techniques used by the staff in evaluating specific problems or postulated accidents and (2) to provide guidance to applicants concerning certain of the information needed by the Regulatory staff in its review of applications for permits and licenses. Regulatory Guides are not intended as substitutes for regulations, and therefore compliance with these guides is not required.

that the record demonstrates that the applicant will comply with the requirements of Regulatory Guide 1.33.[43/]

e. To the extent that CCPE relies on our decisions in Duke Power (ALAB-128) and Vermont Yankee Nuclear Power Corporation (ALAB-124) for the proposition that operation cannot be authorized until all deficiencies have been resolved, such reliance is misplaced.

In Duke Power, we stated:[44/]

> The applicant is under the impression that its organization does not comply entirely with Appendix B and the regulatory staff has given a less than adequate explanation for its position in view of the applicant's admission of noncompliance. * * * In an area as significant as quality assurance, the record should leave no doubt as to whether an applicant is in full compliance with applicable criteria and, if not, the basis upon which the regulatory staff authorizes any departure from such criteria.

43/ Staff Brief in Opposition at p. 18. See Tr. 11774-11785.

44/ Duke Power Co., ALAB-128, supra, RAI-73-6 at 410.

Our Vermont Yankee decision stated in part:[45/]

> It follows from what we have said that we are deeply concerned over the fact that the facility operated under the temporary operating license for a protracted period without a satisfactory quality assurance program. And, if it still appeared that an adequate program were lacking, we would likely be compelled now to reverse the decision authorizing issuance of the permanent operating license, and thus to require immediate cessation of plant operation, until the quality assurance matter was resolved.

Neither of these decisions stands for the general proposition that all quality assurance matters must be satisfactorily resolved before operation can be authorized. The language has to be viewed in the context in which it was used. In Duke Power, there was a possible departure from the Appendix B criteria by the applicant's own statement without comment by the staff. In Vermont Yankee, it appeared that an adequate quality assurance program was lacking prior to the issuance of the temporary operating license. Whether

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45/ Vermont Yankee Nuclear Power Corporation, ALAB-124, supra, RAI-73-5 at 362.

licensing can be authorized in the light of existing deficiencies obviously depends on the significance of the deficiencies. For example, the deficiencies may include non-compliance with regulatory criteria which have to be satisfied in order for the necessary findings for licensing authorization to be made. (See supra, p. 17). But this is not translated into an overall requirement that there can be no licensing if there are any outstanding deficiencies even though the necessary licensing findings can be made.

2. It is CCPE's position that the Licensing Board erred in concluding that the applicant had an acceptable quality assurance plan: "when the real underlying cause of deficiencies in previously discovered defects in the plant were not disclosed and thus steps were not taken to prevent recurrence of similar problems"; and when no evidence was received on the adequacy of the applicant's vendors' quality assurance programs and their implementation.[46/]

46/ CCPE Exceptions at pp. 3-4 and Brief at pp. 11-12.

a. Our review of the record indicates that the evidence does not support the conclusions CCPE asserted in support of these exceptions. The Licensing Board pointed out that "no quality assurance program, however thorough, can guarantee that there will be no errors in design and construction, or failures of equipment, or misoperation in a nuclear plant".[47/] Indian Point No. 2 had its share of occurrences in this regard.[48/] This does not mean, however, that the record also shows that either the staff or the applicant was content not to locate and resolve the underlying cause of the occurrences. The staff asserts that it carefully follows up each incident to see that effective measures are taken to prevent recurrence of errors.[49/] The evidence also shows that the applicant has tried to learn the causes of defects and errors. Such efforts, which obviously are in the applicant's best interest, are illustrated by a review of certain staff inspection reports and the follow-up actions taken by the applicant in regard to discrepancies.[50/]

47/ Initial Decision, supra, RAI-73-9 at 755-756.

48/ See CCPE Brief at pp. 11-13 and CCPE's Exhibit AA.

49/ Tr. 11,564-11,569.

50/ See RO 50-247/72-17; 73-02; 73-03; 73-04; 73-05; 73-09; and 73-11.

b. The applicant is of course responsible for assuring that its vendors have a quality assurance program which conforms to AEC requirements.[51/] It should also be noted in this regard that the Licensing Board convened a special hearing session for the consideration of quality assurance problems. The parties had full opportunity to cross-examine witnesses, including the reactor vendors, at that hearing session.

3. Finally, CCPE's exception 12 alleges error in the Licensing Board's conclusion that the applicant has demonstrated a willingness and desire to implement adequately the quality assurance program.[52/] This exception, which seems to pervade the other three challenging the Board's quality assurance findings, is based on one example when the applicant was allegedly slow in adopting changes in procedures.[53/]

a. We stated in our Midland decision that:

> No QA program is self-executing. Thus, irrespective of how comprehensive it may appear on paper, the program will be

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51/ See Section VII of Appendix B to 10 CFR Part 50 which provides in part that: "[t]he effectiveness of the control of quality by contractors and subcontractors shall be assessed by the applicant or designee at intervals consistent with the importance, complexity, and quantity of the product or services".

52/ CCPE Brief at p. 13

53/ Ibid.

> essentially without value unless it is timely, continuously and properly implemented. This being so, it seems to us to follow that it is not enough for a licensing board to satisfy itself that, if implemented, the program described in the PSAR [Preliminary Safety Analysis Report] will adequately protect the health and safety of the public. At least where, as here, there has been a legitimate question raised in the course of the proceeding, the board must go on to inquire into whether there is, in fact, a reasonable assurance that the applicant * * * will carry out the program in accordance with its terms.54/

Admittedly this involves a subjective judgment based on evidence of an applicant's actions and inactions over a period of time. In some instances, the warning signals of an applicant's recalcitrance in matters of quality assurance may be clear. We find no such warning signals here. There is no doubt, on the other hand, that quality assurance improvements have been needed.55/ In part, the quality assurance experience resulted from the fact that the Indian Point 2 reactor was constructed during a period "when the Commission was establishing its requirements for quality assurance programs".56/

54/ Consumers Power Company (Midland Plant, Units 1 and 2), ALAB-106, RAI-73-3 182, 184 (March 26, 1973).

55/ It is obvious that the applicant's housekeeping practices during the precritical testing of the plant left much room for improvement. As a result, debris left in the reactor coolant system after construction caused damage to the plant. (Initial Decision, supra, RAI-73-9 at 755). See in this regard, Regulatory Guide 1.39 "Housekeeping Requirements For Water-Cooled Nuclear Power Plants", March 16, 1973.

56/ Initial Decision, supra, RAI-73-9 at 756.

b. We agree with the Licensing Board's finding that the applicant "has demonstrated a willingness and indeed, desire * * * to faithfully execute the quality assurance program found to be satisfactory to the Regulatory Staff".[57/] The record is convincing that the applicant's management reacted with reasonable promptness to make continuing improvements in its quality assurance program and management.[58/]

For all of the foregoing reasons, CCPE's exceptions 9-12 are denied.

57/ Ibid.

58/ This is particularly evident from the testimony of the applicant's vice-president for quality assurance and reliability (see Tr. 11,554-11,561). Also, the applicant reacted promptly to the quality assurance problems that were identified by the staff. See, e.g., Inspection Reports 50-247/72-17 , 73-02 and 73-03.

D. Alleged Unresolved Deficiencies: Exceptions 13-14

These two exceptions involve the allegations that: the Licensing Board followed the procedure of "removing contested items from the hearing and leaving them to post-decision resolution";[59/] and there can be no full-power, full-term license issued if any safety items noted in staff inspection reports "remain unresolved on the record".[60/]

1. According to CCPE, the Licensing Board followed the procedure of removing contested issues from the hearing and leaving them to post-decision resolution presumably "to get the license out before the previous license expired rather than to resolve the problem in a responsible manner.".[61/] The example on which this most serious charge is made concerns the resolution of the problem with the freezer-dryer in the air supply for the control valves.[62/]

59/ CCPE Brief at p. 13.

60/ Id. at pp. 15-16.

61/ Id., footnote on p. 15.

62/ Id. at pp. 13-14.

At the outset, it should be noted that the Licensing Board itself raised the freezer-dryer issue as a result of presentations to it by the applicant and regulatory staff at a reconvened hearing on September 12, 1973.[63/] In the words of the Licensing Board:[64/]

> The Board * * * has concerns regarding the present status of the resolution of the problem with the freezer-dryer in the air supply for the control valves. Resolution of the problem involved raising the set point on the temperature control for the freezer-dryer and making design studies of a system that would automatically bypass the freezer-dryer in the event of another freeze-up. At present, however, the Staff inspection report indicates that a freeze-up would cause a total failure of the air system of Unit No. 2. The Board directs the Staff to be certain before a license is issued under this Initial Decision that all necessary measures have been taken to prevent another freeze-up of the freezer-dryer or to assure that such an event will not interrupt the air supply. On this basis the Board concludes that the matter is satisfactorily resolved.

Pursuant to the Licensing Board's direction, and prior to the issuance of the full-term, full-power license, the regulatory staff filed a precise report on the design changes which had been made to improve the reliability of freezer-dryer operation.[65/]

63/ At that hearing, testimony was taken on the matter of the freezer-dryer occurrence. (Tr. 11,505-11,507, 11,566-11,567, 11,739-11,742, 11790).

64/ Initial Decision, *supra*, RAI-73-9 at 756-757.

65/ Memorandum Report, September 28, 1973 from James P. O'Reilly to J. G. Davis.

The record in this proceeding simply does not support the serious charge by CCPE that the Licensing Board removed the freezer-dryer or any other contested issue from the proceeding and left it for post-decision resolution.

2. CCPE argues that a "thorough search of the AEC Act and Regulations fails to disclose any legal authority to authorize a full-power, full term license for a plant which has unresolved safety items."[66/] Moreover, CCPE cites Section 192b. of the Act for the proposition that "complete resolution of all items was a prerequisite to issuing authorization for a license".[67/]

a. Prior to authorizing any operation the Commission must make the necessary findings required by applicable laws and regulations. In the safety area, the touchstone for licensing the operation of a nuclear facility is the finding that there is reasonable assurance that the facility can be operated without endangering the health and safety of the public and will be in conformance with the Commission's regulations. (10 CFR §50.57).

66/ CCPE Brief at p. 16.

67/ Ibid.

b. Neither Section 192b.of the Atomic Energy Act (42 U.S.C. 2242(b)(Supp. II, 1972)) nor its history supports the proposition advanced by CCPE that "complete resolution of all items" is a prerequisite for licensing authorizations. Even a casual reading of the text of Section 192b will reveal that the section on its face does not deal at all with that proposition. This is entirely understandable in view of the purpose of the section. Section 192 was enacted primarily to enable the Commission to license certain facilities on a temporary basis for a specified period of time, even though the final environmental statement under NEPA had not been completed for full-power, full-term operation. The legislative history cited by CCPE is concerned with one central theme in Section 192 -- that no licensing, be it labelled temporary or otherwise, will by-pass the safety findings necessary and relevant to the activity to be licensed. But this has nothing at all to do with the resolution of all items as a prerequisite to any licensing authorization.

c. There is no requirement of which we are aware that supports the position advanced by CCPE.

That position is clearly contrary to reason and common sense. Nuclear facility licensing and regulations do not reach the static condition of "no unresolved safety items". Should that point ever be reached, perhaps it would be appropriate to reappraise the need for continued licensing and regulation. But until that time comes, the very essence of the regulatory program, as far as unresolved items are concerned, is continuing surveillance conducted by the Directorate of Regulatory Operations.

For the foregoing reasons, CCPE's exceptions 13 and 14 are denied.

E. Iodine Removal Capability (Exceptions 16 and 17)

1. Exception 16 asserts that the Licensing Board erred in concluding that the sodium hydroxide-boric acid solution for the containment spray system was acceptable and that sodium thiosulfate should not be required.[68] The Licensing Board said:[69]

> Although the sodium hydroxide-boric acid solution chosen by the Applicant for use in the spray system is less effective than

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68/ CCPE Brief at p. 17.

69/ July 14, 1972 Initial Decision, supra, TID-26300 at 50-51.

> sodium thiosulfate solution for absorbing some species of iodine expected to be present in the containment atmosphere, the testimony shows that the effect of this difference on the overall performance of the iodine removal systems would be small and that other advantages accrue from the use of the chosen solution. The evidence supports a finding that the sodium hydroxide-boric acid spray solution is an adequate choice.

a. It is manifest that the Licensing Board has found that the iodine spray removal system for Indian Point No. 2 meets Commission requirements. We have held that where, as here, these requirements have been satisfied, the fact that they may also be satisfied, perhaps in a more satisfactory manner, by some other alternative is legally irrelevant.[70/] We are aware of no persuasive reason for us to depart from our prior holdings in that regard.

b. CCPE also argues that the Licensing Board's conclusion regarding the adequacy of the applicant's proposed sodium hydroxide-boric acid spray solution is not consistent with its acceptance of CCPE's proposed findings 3a 21 and 3a 2m. The two proposed findings

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70/ See, e.g., Wisconsin Electric Power Co. (Point Beach Nuclear Plant, Unit 2), ALAB-31, WASH-1218 201, 208 (August 18, 1971); Consumers Power Co. (Midland Plant, Units 1 and 2), ALAB-35, WASH-1218 241, 243 (September 21, 1971); and Wisconsin Electric Power Co. (Point Beach Nuclear Plant, Unit 2), ALAB-78, WASH-1218 (Suppl. 1) 517, 528 (November 10, 1972).

in effect state that sodium thiosulfate is a better alternative as a spray additive. That point is not at issue, and we need not express a view on the merits of the finding. There is no inconsistency between the Licensing Board's conclusions and its acceptance of CCPE's two findings.[71/]

2. CCPE argues in its exception 17 that the Licensing Board erred in its conclusion that Indian Point No. 2's iodine removal capability is adequate to keep doses to the public below 10 CFR Part 100 guidelines.[72/] According to CCPE the "critical dispute is whether the staff justified the use of a presumed organic iodine content of 5% of the total 50% of reactor iodine available leakage".[73/]

71/ This was alluded to by the Licensing Board in its initial decision, RAI-73-9 at 786. The two findings, along with others were accepted with the notation "that these findings do not invalidate a finding that the factors involved have been considered adequately by the Applicant and the Staff in their analyses".

72/ The Licensing Board's conclusion and supporting discussion appear in the July 14, 1972 Initial Decision, TID-26300 at 50-51.

73/ CCPE Brief at p. 18.

a. The CCPE's assertion that the Licensing Board did not deal with the real issue (i.e., the "critical dispute" regarding the percentage of total iodine inventory in the reactor core that is organic iodine) is contrary to what the Licensing Board did. The Licensing Board specifically stated:[74/]

> The evidence shows that the Staff examined a variety of experimental data and information on the processes of formation of organic iodine, including that in BNWL-319, in arriving at a value for the organic iodine fraction that they consider to be conservative for use in the LOCA [loss-of-coolant accident] analysis.
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> * * * * *
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> Implicit in the Board's finding is the conclusion that the Staff's values for the total amount of iodine that would be released to the containment atmosphere and the total amount of organic iodine that would be in the containment atmosphere in a design basis LOCA are conservative.

b. We agree with the regulatory staff that the evidence demonstrates that the assumptions regarding iodine content which it used in calculating LOCA offsite dose were very conservative.[75/]

c. CCPE's argument to the contrary appears to be based on its erroneous interpretation of the record,

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74/ July 14, 1972 Initial Decision, supra, TID-26300 at 51.

75/ Staff Brief In Opposition at p. 30.

particularly the letter of October 4, 1971 from AEC's Dr. Morris to Mr. Cruger.[76/] CCPE's calculations (in its proposed finding 4) apparently confuse the percentage of iodine that is released as organic iodine with the percentage of the total iodine inventory in the reactor core that is available for release as organic iodine. The Morris letter states that since plate-out begins immediately after iodine is released from the fuel elements, the amount of iodine available for release from the containment is 25% of the total iodine inventory. Included in this available iodine inventory, according to the Morris letter, will be organic iodine from the following sources and in the following amounts: (1) produced in the fuel -- 0.5% of available inventory; (2) produced in the pressure vessel -- 5% of available inventory; and (3) produced in the containment building -- 1 to 5% of available inventory. At a maximum, these total approximately 10% of all the iodine available for release. The product of the percentage of the total

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76/ The letter was admitted into evidence by stipulation at Tr. 4840.

organic iodine produced and the percentage of total iodine inventory available for release is 2.5% (10% X 25% of the available iodine inventory), and not 5% as assumed by Cruger.

d. Moreover, CCPE's argument ignores staff evidence that the organic iodine available for release will probably be less than 2.5%. In this regard, the staff asserted:[77/]

> For iodine concentrations in the range of those stated in TID-14844, both the predicted and observed fractional conversion to organic iodides becomes very small and would seldom be expected to exceed 1% of the total gas phase iodine.

For the foregoing reasons, CCPE's exceptions 16 and 17 are denied.

77/ See letter from AEC's Mr. Karman to Mr. Trosten with attachment, February 3, 1972, following Tr. 4842.

F. Emergency Plans: Exceptions 22-25

CCPE's exceptions 22 through 25 allege that the Licensing Board committed various errors in regard to the applicable emergency plans. The Licensing Board concluded that:[78/]

> the plans, fully implemented and maintained, will provide reasonable assurance that the health and safety of the public will not be endangered by an accident at Unit No. 2. Con Ed, as the operator of the plant, must be certain that the plans are implemented and that they are maintained.

Whether the Licensing Board's conclusion should be sustained depends on whether the applicant has satisfied the provisions of Appendix E to 10 CFR Part 50, "Emergency Plans for Production and Utilization Facilities". It should be noted that, although Appendix E calls for plans for coping with emergencies, the "details of these plans and the details of their implementation need not be included".[79/] The plans submitted "must include a description of the elements set out in section IV ["Content of Emergency Plans"] to an extent sufficient to demonstrate that the plans provide reasonable assurance that appropriate measures

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78/ July 14, 1972 Initial Decision, supra, TID-26300 at 54. The quoted conclusion might be subject to the interpretation that only Consolidated Edison is involved in assuring that the plans are implemented and maintained. Such an interpretation would be erroneous because obviously the State of New York, the AEC, and perhaps others, also have certain duties and responsibilities.

79/ Part III of Appendix E to 10 CFR Part 50.

can and will be taken in the event of an emergency to protect public health and safety and prevent damage to property".[80/]

The applicant's Radiation Contingency Plans and the New York State Emergency Plan were received in evidence in this proceeding and were the subject of extensive testimony.[81/] The staff has reviewed the plans and found them to be adequate.[82/] The Licensing Board noted that although CCPE "contended that more protective arrangements should be devised for the public, it adduced no evidence to show that the present plans are inadequate".[83/]

1. CCPE claims in its exception 22 that it has not been established that in the event of a major accident radiological releases will be kept as low as practicable. If indeed CCPE intended to relate this exception to releases, the exception is misplaced. The objective of engineered safeguards -- e.g., ECCS, containment sprays, filter systems and containment system -- is to limit radiological releases in the event of a design bases accident. While CCPE has raised questions concerning the

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80/ Ibid.

81/ See State of New York Exhibit No. 2, introduced into evidence at Tr. 1748, and No. 5, introduced into evidence at Tr. 1797. See, e.g., Tr. 1754 and 1797 et seq of the July 21, 1971 hearing session.

82/ Staff Brief in Opposition at p. 35.

83/ July 14, 1972 Initial Decision, supra, TID-26300 at 54.

ECCS and the containment spray system, we have rejected those exceptions. No question has been raised about the ability of Indian Point 2's outer containment structure to retain major portions of any radioactivity in an accident.

Although CCPE's brief sheds no further light on this contention, we assume that instead of radiological releases, CCPE intended that exposures would not be kept as low as practicable in the event of a major accident because of the alleged deficiencies in the emergency plans. We now consider the exceptions which claim that there are such deficiencies.

2. Exception 23 asserts error on the part of the Licensing Board because it did not find that the plan met the requirements of Appendix E.

The Licensing Board specifically referred to Appendix E[84/], and after summarizing salient aspects of the evidentiary record regarding emergency plans,[85/] concluded that the plans, fully implemented and maintained, will provide reasonable assurance that the health and safety of the public will not be endangered by an accident at Unit No. 2.[86/] No more explicit finding is required (see p. 22, supra).

84/ Id. at 53.

85/ Id. at 53-54.

86/ Id. at 54.

3. Exception 24 claims error in the Licensing Board's finding that New York State officials have had sufficient experience in disasters to obviate the need for a specific plan for evacuation and for tests of that plan. CCPE also asserts, in its exception 25, that it was erroneous for the Licensing Board to conclude that New York's plan was adequate when it was only designed to cope with accident consequences one-tenth as severe as those postulated for the design basis accident.[87/]

a. It is evident that the CCPE concept of an emergency plan for the area surrounding Indian Point No. 2, which is covered by the State plan, differs substantially from the State's concept. CCPE's position, as we understand it, is that procedural details for handling every emergency must be written down and every local resident oriented to the procedure to be followed in the event of an emergency. The State's position is to have available a state-wide flexible organization with a trained police force, and other units which react to emergencies, to respond to a situation when it occurs.

87/ See CCPE Brief at p. 24.

CCPE also appears to insist on immediate evacuation procedures in the event of an emergency which could affect people off-site. The State's position is that evacuation may not be necessary or be the best procedure even in the event of a serious accident.[88/]

b. CCPE offered no evidence in support of its claim that New York State officials have not had sufficient experience in disasters to obviate the need for a specific plan for evacuation and for tests of that plan. Our review of the record does not convince us, at least for Appendix E purposes, that such experience is inadequate or that the State approach is unsound.

c. CCPE's argument in support of Exception 25 that the New York plan assumes that off-site conditions, in the event of an accident, will be no worse than 10% of the off-site conditions calculated by the staff is not correct.[89/] The New York plan provides for preplanned protective measures in the event of accidents involving off-site doses to the public no greater than

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88/ Tr. 1821-824. Even though the Staff Brief appears to indicate otherwise at p. 35, we believe that the word "not" was inadvertently omitted. That there was such an omission is confirmed by the sense of the sentence and the response of the Staff to CCPE's Proposed Findings, pp. 22-23, March 10, 1972.

89/ CCPE Brief at p. 24.

10% of the calculated dose from the design basis accident. The objective of these measures is to limit the radiation dose to the public by: urging people to stay indoors, limited evacuation, and monitoring and control of food and water supplies. In the event off-site doses greater than 10% of the calculated dose are involved, the State will follow its general emergency procedures.[90/]

For the foregoing reasons, we deny CCPE's exceptions 22-25. We do not wish to leave the impression, however, that some of the questions raised by CCPE are without merit and should now be forgotten. The essential purpose of emergency plans is to assure, in the unlikely event of an accident which releases radiation off-site, that the radiological exposure to off-site members of the public is kept to a minimum. No profound thought is required for one to realize the overriding importance of assuring that: the plans are adequate, the people involved are trained

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90/ See, e.g., testimony of Mr. Davies following Tr. 1754 and Tr. 1996; State of New York Exhibit 2; Tr. 1846-1847, 3754. See also July 14, 1972 Initial Decision, supra, TID-26300 at 53.

and knowledgeable, and that requisite actions are taken in a timely and coordinated manner. When, and if, emergency action is required, the people involved must be ready to implement viable plans. It appears to us that the staff should carefully appraise whether 10 CFR Part 50, Appendix E, is sufficiently comprehensive to serve most effectively its intended purpose. In that regard, certain matters, such as AEC's role in the event of an emergency, and minimum requirements for the training and testing of the people involved could, and perhaps should, be elaborated on in Appendix E.

G. Adequacy of Final Environmental Statement: Exception 32

CCPE's exception 32 states that the Licensing Board erred in its NEPA responsibilities because the FES estimate "of adverse consequences from accidents estimated exposures substantially lower than those required for safety evaluations without disclosing the factual basis for the use of these so-called 'realistic' figures".[91/] In its brief, CCPE argues that NEPA "requires that all possible environmental effects [of a particular action] be disclosed", and therefore a "LOCA with consequences as severe as those calculated in the SSE [Staff Safety Evaluation]" and "Class 9 accidents" should have been included in the Final Environmental Statement.[92/] CCPE also argues that the Staff has failed to "disclose the facts which are contrary to its assumptions" concerning Class 9 accidents.[93/] Moreover, CCPE states that it "believes" that the staff has available to it experts who will testify that "the possible consequences of

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91/ CCPE Exceptions, at p. 7. "NEPA", of course, is the National Environmental Policy Act of 1969.

92/ CCPE Brief at pp. 25-26.

93/ Id., at p. 28.

accidents are extremely severe" and "that the probability of a LOCA or more severe accident occurring is extremely difficult to determine".[94/]

1. We have considered the issues raised by this exception on several previous occasions, one being our Shoreham decision.[95/] There (RAI-73-10 at p. 836) we responded to an assertion substantially the same as the argument here:

> As put to us, this assertion brings into question the comprehensiveness of the environmental review mandated by NEPA -- i.e., whether it must include all theoretically possible environmental effects arising out of an action, or whether it may be limited to effects which are shown to have some likelihood of occurring. NEPA itself supplies little guidance in this respect, providing only that the environmental effects of a proposed agency action must be discussed 'to the fullest extent possible' through the medium of a 'detailed statement'. But there has been clear judicial sanction of a 'rule of reason' in the application of NEPA. See N.R.D.C. v. Morton, 458 F. 2d 827 (D.C. Cir. 1972). The reasonableness standard was specifically invoked in EDF v. Corps of Engineers, 348 F. Supp. 916 (N.D. Miss.1972), where the court required a statement assessing

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94/ Id. at p. 29.

95/ Long Island Lighting Co., ALAB-156, supra, RAI-73-10 st 835-36. See also Consumers Power Co. (Midland Plant, Units 1 and 2), ALAB-123, RAI-73-5 331, 347 (May 18, 1973); Wisconsin Electric Power Co. (Point Beach Nuclear Plant, Unit 2), ALAB-137, RAI-73-7, 491 502 (July 17, 1973); and Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), ALAB-179, RAI-74-2 159, 162 (February 28, 1974).

> the impact of a facility to contain a discussion only of 'the significant aspects of the probable environmental impact of the proposed agency action.'
>
> The court found no necessity for the agency to consider what that court described as 'mere possibilities unlikely to occur as a result of the proposed activity.'
>
> That description fits the Class 9 accident. In the absence of a showing that, with respect to the reactor in question, there is a reasonable possibility of the occurrence of a particular type of accident generically regarded as being in Class 9, NEPA does not require a discussion of that type of accident. It does not require an impact statement or a licensing board to exhaust all theoretical possibilities, whether or not they have been identified by a party.

2. It should also be noted that extensive testimony was received from applicant and staff witnesses with respect to the particular "Class 9" accidents whose low probability was challenged by CCPE (failure of pressure vessel and failure of ECCS to perform). Exceptions were filed on these issues and have been denied.

3. We do not disagree with CCPE's statement that the probability of a LOCA or more severe accident occurring is extremely difficult to determine and that equally reliable estimates may be off by an order of magnitude.[96] But, in any event, it is clear from this

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96/ CCPE Brief at p. 30.

record that the staff's position is that such events are extremely remote in probability. If the staff's assessment of that risk materially changes, we have no reason to believe that the public will not be informed.

We believe that our Shoreham ruling is controlling here, CCPE having advanced no arguments which persuade us that a different course is required by NEPA. According, exception 32 is denied.

H. Challenges to the Adequacy of the Evidence and to the Ultimate Findings By the Licensing Board: Exceptions 15, 27-31, and 33-34

Exception 15 asserts that the Licensing Board erred in concluding (RAI-73-9 at 758) that there is reliable, probative and substantial evidence of compliance by Applicant with standards and criteria established by the Commission. Exceptions 27-31 and 33-34 allege, respectively, that the Licensing Board erred in each of its ultimate findings. These exceptions in essence are grounded on the argument generally that the record does not contain adequate evidence to support the Licensing Board's findings.[97/] The two paragraphs in CCPE's brief which deal with these exceptions set forth no specific arguments other than that "a full explication of a rational basis for these ultimate findings does not appear in either of the Initial Decisions".[98/] Apparently CCPE relies upon the arguments it has advanced for the other exceptions which we have already considered.

We are of the view that the evidentiary record supports the Licensing Board's ultimate findings. We also conclude that there is an adequate rational basis set forth in the initial decision for the Licensing Board's ultimate findings. Accordingly, all of these exceptions are denied.

97/ CCPE Brief at pp. 17 and 25.

98/ Id. at p. 25.

II.

The applicant has filed 23 exceptions to the initial decision all of which relate directly or indirectly to the condition imposed by the Licensing Board that

> operation of Indian Point Unit No. 2 with the once-through cooling system will be permitted until May 1, 1978 and thereafter a closed-cycle cooling system shall be required.

Generally these exceptions fall into the two major groups: those (Exceptions 1, 2, 3, 4, 5, 6, 20 and 22) which challenge the Licensing Board's interpretation and application of the National Environmental Policy Act; and the others which challenge specific findings of the Licensing Board.[99/]

The parties other than the applicant contend that operation of Indian Point Unit Nos. 1 and 2 with their present once-through cooling systems will adversely influence the fish populations that use the area for spawning and initial periods of growth and development. (FES V-39 - V-40).[100/] Because the striped bass are

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99/ The NEPA-related exceptions are briefed in Parts I and II of the applicant's brief, at pp. 1-26. The second group of exceptions is briefed in Part III of that brief at pp. 26-58.

100/ The Indian Point Station will have three nuclear units. Although the present action is concerned only with an operating license for Unit No. 2, the FES considers the environmental impact of the simultaneous operation of Unit Nos. 1 and 2

(FOOTNOTE CONTINUED ON NEXT PAGE)

economically important for both sport and commercial fisheries, the FES analyzed in greatest detail the probable impact of plant operations on the populations of that species which are maintained by recruitment from nursery areas in the Hudson River. The impact results from the increased mortality caused by entrainment[101/] of eggs, larvae and juveniles and impingement[102/] of young-of-the-year.

The Hudson River is an estuary which is the spawning and nursery area for anadromous species including striped bass. (FES II-33). Each spring the striped bass return

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(FOOTNOTE CONTINUED):

(265 and 873 MWe, respectively). Separate studies of the environmental impact of Unit Nos. 1 and 3 are also being made by the staff, in which the combined effects of the units will be taken into account. (FES i). The staff has also evaluated the environmental impacts of the once-through cooling system of Indian Point Unit No. 2 superimposed upon the cumulative effects of existing fossil plants (over which the Commission has no jurisdiction) on the river.

101/ The organisms because of their small size are able to pass through the intake screens (which are used to filter out debris that could cause damage to the once-through cooling system) and thus are carried with the cooling water as it circulates through the once-through cooling system.

102/ Fish unable to escape the intake velocity of the cooling water being pumped into the cooling system strike, but because of their size do not pass through the intake screens.

from the ocean at the ages of five to thirteen years to migrate upstream to spawn in fresh waters of the Hudson River. This occurs in May and June. (FES-V-40). Data in the FES reveal that these fish spawn mostly upstream from the Indian Point site,[103/] although the exact locations vary.

The greatest area of spawning is a few miles upstream from the salt water front, which varies in location from year to year. (FES-A-II-22). The non-adhesive demersal eggs are semibuoyant and require sufficient vertical water flow in order to remain suspended. The eggs average 0.134 inches in diameter and hatch in 1 or 2 days. After hatching, the eggs become larvae which continue to drift downstream. At this stage in development, the larvae are still unable to move effectively against the currents and will settle to the bottom in quiet water despite swimming efforts to approach the surface. Once the larvae reach a length of 0.5 inches, they appear capable of sustained swimming and make extensive vertical diurnal migrations producing a somewhat higher concentration near the surface at night than during the day. These young, called

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103/ The record refers in some instances to locations by mile-points. New York City at the Battery is mile-point 0. Mile-point 150 is located at Troy. The Indian Point site is mile-point 43 (FES-XII-44, Figure XII- 3).

juveniles, remain in a planktonic stage for 6 to 8 weeks. It is during the planktonic stage that the striped bass are subject to entrainment. At the end of their planktonic stage, the juveniles move to shallow waters which serve as nursery areas (FES-V-40). The major nursery areas are south of the Indian Point site. At the age of 2 or 3 years the striped bass migrate to the sea and the life cycle is repeated.

At the Indian Point site, the Hudson River is from 4,500 to 5,000 feet across and has a maximum depth of about 85 feet (FES-II-10). Under average conditions, the freshwater flow of the river ranges from a maximum of over 30,000 cfs in the spring to a minimum of 6,500 cfs in the late summer. The maximum water requirement for Indian Point Unit Nos. 1 and 2 is 2,650 cfs (FES-A-V-36). At Indian Point, the average cross-sectional area of the river is about 160,000 $ft.^2$, and the volume contained within a linear mile of river at the site is about 8.5×10^8 $ft.^3$. The combined flow of 2,650 cfs through the once-through cooling systems will equal that volume in about 3.8 days (FES-V-22). The entrainment impact of the plant is obviously related to the rate at which river water is used for cooling purposes. Ibid. The degree of impact also is dependent

upon the concentration of entrained organisms in the intake water. The FES asserts that two aspects may be particularly important in that regard: the concentration of entrained organisms at various points in the river and the fraction of organisms originating above the Indian Point site which pass through the once-through cooling systems for Units 1 and 2 before they leave the area in a downstream direction. (FES-A-V-36).

A considerable portion of the expert testimony in this proceeding is directed to the fraction of striped bass eggs, larvae and juveniles which will be entrained in the once-through cooling systems of Indian Point Units 1 and 2. With the foregoing as background, we turn now to consider the applicant's exceptions which challenge the Licensing Board's interpretation and application of the National Environmental Policy Act (NEPA)[104/].

A. Licensing Board's Application of NEPA

In its exception 4, the applicant argues that the Licensing Board erred in its conclusion that NEPA requires that

> the Hudson River fishery be protected from 'serious damage' by installation of a closed-cycle cooling system for Indian Point No. 2

104/ 42 U.S.C. §4321 *et seq*. NEPA became effective January 1, 1970.

> notwithstanding the estimated balance of monetary benefits and costs of a closed-cycle cooling system 105/

Two portions of the initial decision are cited by the applicant in support of this exception, the first being the following finding:106/

> On the basis of estimates of monetary values alone, the Board finds that the benefits, to the extent they can be quantified, to be derived from installation of a closed-cycle cooling system on Unit No. 2 are unlikely to approach the cost. This must certainly be true over the next ten years. This, however, is not the only consideration. As the National Environmental Policy Act declares:
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> > Sec. 2. The purposes of this Act are: . . . to promote efforts which will prevent or eliminate damage to the environment . . . .
> >
> > Sec. 101.(a) . . . it is the continuing policy of the Federal Government, . . . to use all practicable means and measures, including financial and technical assistance, . . . to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.
> >
> > (b) . . . it is the continuing responsibility of the Federal Government to use all practicable means, . . . to the end that the Nation may - * * *
> >
> > (3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;

105/ Applicant's Exceptions at pp. 3-4.

106/ RAI-73-9 at 782.

> The law requires that a natural resource like the Hudson River fishery be protected from serious damage if economic means having less adverse environmental impact are available to provide such protection.

The second portion of the initial decision cited by the applicant is:[107]

> In a previous section [of the initial decision], the Board concluded that the Hudson River supplies between 20 percent and 80 percent of the recruits to the Middle Atlantic striped bass fishery. If the total value of the fishery is $20 million per year, the Hudson River contribution is between $4 million and $16 million per year. Based on the Applicant's 'best estimate' that the reduction in recruitment from the Hudson River would be 5 percent, the impact of once-through cooling of Unit Nos. 1 and 2 would be only $200,000 to $800,000 per year in the tenth year after operations have commenced. On the basis of Applicant's most conservative estimate (adopted by the Board as being a reasonable expectation), the reduction in recruitment would be 35 percent and the cost would be $1.4 million to $5.6 million per year in the tenth year.

The foregoing language, the applicant argues, shows that the Licensing Board believed that Indian Point No. 2 must be operated in a manner

> which will minimize suspected adverse environmental impact on the fishery.[108]

Moreover, the applicant asserts that the Licensing Board's statement that NEPA

> requires that a natural resource like the Hudson River fisheries be protected from

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107/ RAI-73-9 at 770-771.

108/ Applicant's Brief, at p. 6.

> serious damage if economic means having less adverse environmental impact are available to provide such protection

is not only "factually incorrect in its implications but also evidences a misconceived and inaccurate interpretation of the law".[109] NEPA, unlike some statutes, we are told by the applicant, does not make "protection of the environment paramount among factors entering into agency decision-making" but rather, citing Calvert Cliffs[110], Congress

> desired a reordering of priorities, so that environmental costs and benefits will assume their proper place along with other considerations.

The applicant argues that NEPA dictates no particular substantive result from the agency decisional process.[111] Although the applicant asserts that the detailed environmental statement provides a basis for the evaluation of a proposed project in light of its environmental risks, it argues that NEPA neither authorizes nor requires an agency choice of the alternative which supposedly has the least impact on the environment, notwithstanding countervailing economic and other factors.[112]

109/ Id. at pp. 7-8.

110/ Calvert Cliffs' Coordinating Committee, Inc. v. AEC, 449 F. 2d 1109, 1112 (D. C. Cir. 1971).

111/ Applicant's Brief at p. 10.

112/ Id. at pp. 10-11.

We consider at this point only the narrow issue raised by this exception: whether the Licensing Board misinterpreted and misapplied NEPA.[113/]

1. The Applicable NEPA Principles

a. We begin our inquiry with the applicable provisions of NEPA. The language of NEPA, as well as its legislative history, is clear that it established a statement of national policy for the environment which is intended to make substantive changes in decision-making affecting the environment. Section 101 of NEPA sets out specific environmental goals and principles as well as the mandate

> to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources

to the end that broad national goals in the management of the environment may be attained. Section 102(1) of NEPA directs that the policies, regulations and public laws of the United States be interpreted in accordance with

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113/ This appears to be the central issue raised by exception 4 (see Applicant's Brief at pp. 6-13 and 18-19). Other related issues such as the data needed and the standard of proof for NEPA purposes, and specific Licensing Board findings will be discussed subsequently. The fundamental question concerning the Licensing Board's application of NEPA pervades the applicant's brief.

the Section 101 statement of national policy to the fullest extent possible. NEPA's procedural requirements are set forth in Section 102. Their purpose is to assure that the policies enunciated in Section 101 are implemented by action-forcing procedures designed to insure that environmental considerations are given careful and appropriate weight in Federal Government decision-making.114/

Neither on its face nor in its legislative history does NEPA require that environmental considerations be given paramount consideration so that in all instances all environmental impacts must be minimized. Indeed, the expression of broad national goals in NEPA suggests otherwise since those goals are to be achieved by the use of "all practicable means, consistent with other essential considerations of national policy".115/

Thus, the general substantive policy of NEPA is flexible and

> leaves room for a responsible exercise of discretion and may not require particular substantive results in particular problematic instances.116/

Agencies must consider environmental issues just as they consider other matters within their mandates.117/ In

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114/ See S. Rep. No. 91-296, 91st Cong., 1st Sess. 19 (1969).

115/ Section 101(b) of NEPA, 42 U.S.C. 4331(b)(1970).

116/ Calvert Cliffs' Coordinating Committee, Inc. v. AEC, supra, 449 F. 2d at 1112.

117/ Ibid.

order to include all possible environmental factors in the decisional equation, agencies must

> identify and develop methods and procedures * * * which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision-making along with economic and technical considerations.118/

"Environmental amenities" will often be in conflict with "economic and technical considerations". 119/

> In some instances environmental costs may outweigh economic and technical benefits and in other instances they may not. But NEPA mandates a rather finely tuned and 'systematic' balancing analysis in each instance.120/

Moreover, according to Judge Wright in Calvert Cliffs,121/

> NEPA mandates a case-by-case balancing judgment on the part of federal agencies. In each individual case, the particular economic and technical benefits of planned action must be assessed and then weighed against the environmental costs; alternatives must be considered which would affect the balance of values.* * * The magnitude of possible benefits and possible costs may lie anywhere on a broad spectrum. Much will depend on the particular magnitudes involved in particular cases. In some cases, the

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118/ Calvert Cliffs' Coordinating Committee,Inc. v. AEC, supra, 449 F. 2d at 1113.

119/ Ibid.

120/ Ibid.

121/ Calvert Cliffs' Coordinating Committee, Inc. v. AEC, supra, 449 F. 2d at 1123.

> benefits will be great enough to justify a certain quantum of environmental costs; in other cases, they will not be so great and the proposed action may have to be abandoned or significantly altered so as to bring the benefits and costs into a proper balance. The point of the individualized balancing analysis is to ensure that, with possible alterations, the optimally beneficial action is finally taken.

An interpretation of NEPA as requiring that in all events environmental amenities should be given precedence over other considerations is not supported by the leading judicial decisions, such as Calvert Cliffs', interpreting it. Moreover, as a practical matter, such an interpretation would do violence to the fundamental objective of using an individualized balancing analysis to ensure that the optimally beneficial action is finally taken. For if it were a NEPA requirement to minimize environmental impacts in all instances, the individualized balancing approach, no matter how finely tuned and systematic, would not alter the ultimate conclusion regarding the priority which must be given to environmental protection.

With these governing principles in mind, we consider first whether the Licensing Board applied NEPA in this proceeding in a manner consistent with them.

2. Our review of the first portion of the initial decision which the applicant cites in support of this exception leads us to the conclusion that considerable

ambiguity surrounds the question of the Licensing Board's interpretation of NEPA.[122/] The only citation we have in the initial decision which gives any guidance on the Licensing Board's interpretation of NEPA is its quotation of excerpts from Section 101 of that Act (RAI-73-9 at 782). There are certain factors which tend to support the applicant's position. Noticeable by its omission from the Licensing Board's quoted excerpts from Section 101(b) of NEPA are the words "consistent with other essential considerations of national policy". These words are very significant because they indicate that NEPA does not establish environmental protection as an exclusive goal, but as one national policy, with the result that environmental costs and benefits will assume their proper place in the reordering of priorities, along with other considerations. Moreover, it should be noted that the excerpts from Section 101 appear to be used by the Licensing Board as a rebuttal to the finding which it had just made that over the next ten years

> the benefits, to the extent they can be quantified, to be derived from installation of a closed-cycle cooling system on Unit No. 2 are unlikely to approach the cost. (RAI-73-9 at 782).

122/ The second portion of the Initial Decision (RAI-73-9 at 770-771) apparently is relevant to the issue before us only because it contains the monetary range of estimated environmental impacts per year from once-through cooling in the tenth year of operation.

There is, however, another statement in the initial decision which suggests that the Licensing Board properly applied NEPA. Following its quotation from Section 101 of NEPA, the Licensing Board stated that the

> law requires that a natural resource like the Hudson River fishery be protected from serious damage if economic means having less adverse environmental impact are available to provide such protection. (RAI-73-9 at 782).

HRFA and the regulatory staff argue, in essence, that the Licensing Board did recognize the role of "economic means" in weighing environmental costs and benefits, and that the heart of the applicant's exception is that unquantified environmental values improperly tipped the balance as far as the Licensing Board was concerned.[123/]

In view of the ambiguity which inheres in the language relied upon by the applicant in support of this exception, and with no additional aids to enlighten us, we are unable, on the basis of that language, to ascertain with reasonable certainty what interpretation the Licensing Board placed on NEPA (see infra, pp.110-116). It is sufficient for present purposes for us to state that any interpretation of NEPA that requires, as a general proposition, the protection of environmental values as an exclusive goal is erroneous. Environmental values must, of course, be given meaningful consideration in the decision-making process through a rather finely tuned and systematic balancing analysis in each instance.

123/ See, e.g., HRFA's Brief in Opposition at pp. 2, 8-11.

B. Standard of Proof

We now consider the applicant's arguments that the Licensing Board imposed on it an undue quantum of proof burden.

Exceptions 5, 6, 20 and 22 raise the general issue of whether the Licensing Board erred, with respect to certain contested matters, by allegedly imposing an undue quantum of proof burden on the applicant, and, in some instances, by making allegedly inconsistent findings.124/

We consider here only the general legal principles which govern the issues raised by these exceptions. Whether the Licensing Board erred with respect to specific findings which are the subject of other exceptions will be considered subsequently in the light of these general legal principles and the relevant portions of the evidentiary record.

The initial decision language around which these exceptions center generally relates to the environmental impact on the striped bass fishery by the operation of the once-through cooling system. Exception 5 refers to the following Licensing Board rulings (Applicant's Exceptions at pp.5-6):

a. The numerical values which should be assigned to f factors.125/ The Licensing Board stated that "calculations

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124/ See Applicant's Brief at pp. 19-25 and 31-33.

125/ The f factors are important in the applicant's calculations of the predicted impact of once-through cooling by the entrainment of striped bass (i.e., the eggs, larvae and juveniles), which would pass through the plant's cooling system. This subject is discussed in some detail in the text, infra, at pp. 123-135.

with the combined f factors equal to 1 [is] appropriately conservative" notwithstanding its recognition that "the Applicant has some justification for its best estimate of the combined f factors." (RAI-73-9 at 765).

b. The mitigating effects of compensation.[126/] The Licensing Board said that it "agrees that it is desirable to take compensation into account but does not find convincing evidence that the effects at the present level of population are likely to be as effective in reducing the plant impact as Applicant's calculations indicate". (RAI-73-9 at p. 766). A related finding by the Licensing Board is that "[n]one of the present evidence demonstrates that compensation will be effective in preventing drastic reductions in the fish populations". (RAI-73-9 at p. 780).

c. The Licensing Board conclusion that "[f]or the present it is only prudent to assume that the impact of operation of the plants as they are presently designed" will be at least as great as shown by the "Applicant's conservative calculations". (RAI-73-9 at 766).

The Licensing Board's reference to the "Applicant's conservative calculations" is also the ground for Exception 6.[127/] Exception 20 refers to similar statements in the initial decision concerning the applicant's research program.[128/] These statements include language

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126/ Compensation, as envisioned by the applicant, is a naturally occurring process which results in adjustments -- up or down -- to population which are density-dependent. Thus, the applicant argues, as a result of this process, the percentage decline in the adult striped bass population spawned in the Hudson River would be less than the percentage of Hudson River striped bass killed during the early stages of life (i.e., various stages from egg to juvenile) by the once-through cooling system. This subject is discussed in the text infra at pp. 136-139.

127/ Applicant's Brief at pp. 31-33.

128/ Applicant's Brief at pp. 25, 54-57.

which suggests that such program:

a. must be able to "conclusively demonstrate" certain things (RAI-73-9 at 780);

b. must provide "a statistically valid demonstration that the adverse impact of Unit No. 2 operations on the river ecology is acceptably small" (RAI-73-9 at 780);

c. "will not provide a direct answer to the question" of the effect Indian Point 2 "operations may have on the Middle Atlantic striped bass fishery" (RAI-73-9 at 780);

d. "is unlikely to resolve the important questions" in an extra year or two. (RAI-73-9 at 780).

The applicant also, by its Exception 22 places the following initial decision language in the same category of the aforementioned instances on which the Licensing Board allegedly applied erroneous standards of proof:

> If stocking is to be used to mitigate the effects of once-through cooling, it is incumbent on the Applicant to show that the benefits of maintaining the populations of other species fall short of compensating for the costs. (RAI-73-9 at 777).

The applicant argues that NEPA requires that an assessment of evidence must be based on "realistic standards" and not on the use of the "most conservative" approach.[129/] In that regard, the applicant contends that an

> analysis of the language of the Licensing Board's decision reveals that the Board's

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129/ Applicant's Brief at pp. 19-20.

> underlying rationale is that it must use only the 'most conservative' estimates and calculations when evaluating unresolved environmental factors to determine the impact of once-through cooling.130/

A consequence of this erroneous rationale, the applicant asserts, is the Licensing Board's imposition of unjustified and unreasonable requirements of evidence concerning environmental impacts.131/ The Licensing Board's action in employing such assumptions, the applicant argues, is "both irrational and untenable" and is based on a "misunderstanding of NEPA".132/ Concluding, the applicant argues that the Licensing Board, by applying "unsubstantiated and unrealistic standards in evaluating the factors used in the environmental balance", committed substantial error.133/

We have the benefit of HRFA and the staff's opposition arguments.134/ HRFA asserts that the issues involved were hotly contested in an evidentiary proceeding. There is no indication, HRFA argues, that the Licensing Board reached the conclusion that, although the applicant had discharged its burden of proof, the Board nevertheless ruled against the applicant.135/ Although one "may quibble"

130/ Id. at p. 20.

131/ Id. at p. 25.

132/ Id. at p. 24.

133/ Id. at p. 25.

134/ See HRFA's Brief in Opposition at pp. 36-51 and Staff's Brief in Opposition at pp. 13-19.

135/ HRFA's Brief in Opposition at p. 38.

on the exact words used by the Licensing Board, HRFA states that "there is no doubt that the Licensing Board used the appropriate standard in judging the evidence."[136/]

Similarly, the staff argues that the applicant's real concern is with the Licensing Board's use of the evidence before it.[137/] There was little available direct evidence on the contested environmental issues, the staff asserts, and the applicant's argument that the decision must await empirical evidence has specifically been rejected by the courts in decisions applying NEPA.[138/] Furthermore, the staff in its opposing argument asserts that the applicant has mischaracterized the Licensing Board's assessment of the evidence and takes statements by that Board out of context.[139/] The staff's position is that the Licensing Board clearly did not use only the most conservative estimates and calculations in the record.[140/] As summarized in its Brief in Opposition, the staff's position is that[141/]

> . . . the Board did observe the proper legal principles in applications of NEPA in this proceeding. In the very difficult task of attempting to strike a balance between costs

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136/ Id. at p. 42.

137/ Staff's Brief in Opposition at p. 13.

138/ Id. at p. 14.

139/ Id. at p. 15.

140/ Ibid.

141/ Id. at p. 19.

and benefits involving important quantifiable elements (such as monetary elements) and the significant unquantifiable elements (the natural resource of the Hudson River and Mid-Atlantic fishery), the Board gave proper weight to protection of the Hudson River fishery.

1. We consider first the generally applicable principles.

a. The environmental issues in this proceeding are sharply contested. Under the Commission's Rules of Practice (10 CFR 2.732), the applicant has the burden of proof.[142/] The issues must be resolved on

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142/ The ultimate burden of proof on whether a license should be issued remains on an applicant. But where, as here, (see discussion infra at pp. 84-92. on staff's position regarding the contribution of the Hudson River to the Middle Atlantic striped bass fishery), one of the other parties advances a contention, that party has the burden of going forward with evidence to buttress that contention. As a general proposition at least, once that party has introduced sufficient evidence to establish a prima facie case, the burden then shifts to the applicant who, as part of its overall burden of proof, must provide a sufficient rebuttal to satisfy the presiding board that it should reject the contention advanced by the particular party. See Consumers Power Co., ALAB-123, supra, RAI-73-5 at 345. See and compare Consumers Power Co. (Midland Plant, Units 1 and 2), CLI-74-5, RAI-74-1 19, 31-32 (January 24, 1974); Office of Communication of United Church of Christ v. FCC, 425 F. 2d 543, 546-550 (D.C. Cir. 1969).

Applying the foregoing principle in this case, we have found that the staff has not introduced sufficient evidence to establish a prima facie case for the position which it advanced on the contribution of the Hudson River to the Middle Atlantic striped bass fishery. See infra, pp. 84-92.

the basis of the evidentiary record developed in the proceeding conducted by the Licensing Board. With regard to whether an applicant has sustained its burden of proof on contested issues, the quantum of proof which must be adduced is a preponderance of the evidence.[143/] Whether or not the record evidence on contested issues satisfies the preponderance rule is a judgmental process which is often of the highest order and complexity. Especially is this so where, as here, there is a voluminous record, with conflicting expert opinions, and a paucity of data or experience which would either inspire or not inspire confidence in such opinions.

b. Under the Commission's overall adjudicatory scheme established for licensing matters, the responsibility for the appraisal *ab initio* of the record normally is

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143/ See, *e.g.*, *International Harvester Co.* v. *Ruckelshaus*, 478 F. 2d 615, 643, 648 (D. C. Cir. 1973); *Kent* v. *Hardin*, 425 F. 2d 1346, 1349, (5th Cir. 1970); and Jaffe, *Administrative Law: Burden of Proof and Scope of Review*, 79 Harv. L. REV. 914 (1966).

placed in licensing boards which, in each proceeding, render an initial decision giving that appraisal. The Licensing Board has performed that function here, and our function is to review the initial decision in the light of the exceptions which have been filed, and to assess its sufficiency and correctness. Our review is a part of the administrative decisional process. As such, we are not bound by the plentitude of decisions which concern the extent to which courts defer to rulings of an administrative body.[144/] Nevertheless, as enunciated in our Point Beach decision, we do not ordinarily make our own findings based on our independent review and assessment of the evidence:[145/]

> Obviously, an essential element of [our] review in a particular case is an inquiry into whether each of the essential findings of the Licensing Board is supported by reliable, probative and substantial evidence of record. But it scarcely follows that, even though we may be clothed with legal authority to do so, it is appropriate for us as a reviewing tribunal to substitute our judgment on purely factual matters for that of the Licensing Board. Specifically, while it is our duty to reject or modify factual determinations which we conclude are not well founded and rational, we see no justification for setting aside licensing board findings simply because, had we been the trier of fact, we might have found differently.

144/ See e.g., Universal Camera Corp. v. NLRB, 340 U.S. 474, 476 (1951).

145/ Wisconsin Electric Power Co. (Point Beach Nuclear Plant, Unit 2), ALAB-78, WASH-1218 (Suppl.1) 517, 520 (November 10, 1972).

> A broader scope of appellate review normally obtains, of course, where the question of fact is inextricably interwoven with one or more questions of law. But even though in that situation there may be greater latitude for the exercise of independent judgment by the Appeal Board, we still do not operate on a clean slate. In reaching our own conclusions on a mixed question of fact and law, due consideration will be given to the views of the Licensing Board on the question.

c. We must, of course, form our own conclusions regarding the disposition of exceptions to initial decisions.[146/] Where exceptions, as here, challenge a licensing board's findings regarding highly complex matters which were the subject of expert testimony which is extensive and often conflicting, we cannot abdicate our responsibilities.[147/] We must look for light from every quarter of the evidentiary record to assure ourselves where the preponderence of the evidence lies on contested findings, to determine whether findings are consistent, and if not,

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146/ See Greater Boston Television Corp. v. FCC, 444 F. 2d 841, 853 (D.C. Cir. 1970), Cert. denied, 403 U.S. 923 (1971). See also Universal Camera Co. v. NLRB, supra, 340 U.S. at 496; and Cinderella Career and Finishing Schools, Inc. v. FTC, 425 F. 2d. 583, 588 (D.C. Cir. 1970).

147/ Our decision must, of course, find support in the record, and we must give our reason for disagreeing with conclusions of a licensing board which are controverted or supported in exceptions. See Greater Boston Television Corp., supra, 444 F. 2d at 852; and FTC v. Crowther, 430 F. 2d 510, 513-515 (D.C. Cir. 1970).

whether the inconsistencies are harmful from the standpoint of the correctness of the ultimate conclusions which were reached and the reasons given in support of those conclusions.[148/]

The results of our search of the evidentiary record, our own conclusions, and our supporting reasons are revealed subsequently in the remaining portions of this decision.

d. We have previously concluded (supra pp. 61-64) that NEPA does not require the use of the most conservative assumptions in evaluating environmental impacts. In the absence of any such requirement, such assumptions should not be used, for they most surely would distort the finely tuned and systematic balancing which is performed. However, acceptance of the applicant's apparent position that "realistic standards" should be used also presents potential problems. The decision in this proceeding must be based on the evidentiary record. Admittedly there are uncertainties with regard to significant matters. An inflexible rule that under

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148/ See and compare, e.g., Environmental Defense Fund, Inc. v. Ruckelshaus, 439 F. 2d 584, 595, 598 (D.C. Cir. 1971).

such circumstances either "conservative" or "realistic standards" must be used would not necessarily be conducive to arriving at the most reasonable expectation as to the predicted environmental effects of a proposed course of action. What is a "realistic standard" would depend in part on the uncertainties which exist in the evidence to which the standard pertains, the potential for environmental impact, the availability of reasonable alternatives, and the reasonableness of assurances, if any, that actions can be taken to detect and mitigate significant adverse environmental impacts. In other words, a rule of reason should apply in evaluating and predicting environmental effects when there are unknowns in the prediction and evaluation processes.[149/] The approach suggested by the applicant that "realistic standards" may mean having to wait for empirical data is not necessarily compatible with a rule of reason approach.

2. Having reviewed the generally applicable principles, we now apply them to the applicant's exceptions which argue that the Licensing Board erred by imposing an

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149/ See, e.g., Natural Resources Defense Council, Inc. v. Morton, 458 F. 2d 827, (D.C. Cir. 1972); Environmental Defense Fund Inc. v. Froehlke, 473 F. 2d 346 (8th Cir. 1972); Scientists' Institute for Public Information, Inc. v. AEC, 481 F. 2d 1079, 1092 (D. C. Cir. 1973).

undue quantum of proof burden on the applicant. At the outset, several observations are pertinent. It is extremely difficult, if not an impossible task, to determine whether the Licensing Board erred by focusing simply on the statements on which the applicant relies (supra, at pp. 57-59). There is nothing on the face of these statements which directly supports the errors alleged by the applicant. Whether or not the Licensing Board was indeed influenced by a misunderstanding of NEPA, and consequently required a higher quantum of proof by the applicant, would require an analysis of the context in which the various statements were made. The context, as far as the f factors, compensation, predicted once-through cooling impact, and the applicant's research program are concerned, goes to the very core of the substantive issues before us for decision on this appeal. (See infra, at pp. 84-92, 118-139, 159-166).

a. Even if one chose to view the Licensing Board's statements in isolation, it should be understood that the evidentiary hearing on environmental issues was concerned principally with the question of once-through cooling versus closed-cycle-cooling. It was not until after the completion of the evidentiary hearing that the applicant offered, in its proposed findings, to install

a closed-cycle-cooling system by September 1, 1981.[150/] In addition to the uncertainties in the evidentiary record concerning the long-term environmental effects of once-through cooling, no particular effort was made to focus on the expected short-term environmental impact of once-through cooling. That background, coupled with the lengthy record, the sharp conflict in testimony of expert witnesses, the complexity and the novelty of the issues, surely did not minimize the likelihood that there might be some inconsistencies in the Licensing Board's statements.

b. Worth noting in connection with the applicant's "quantum of proof" argument, is a portion of the applicant's proposed finding 019 which we now quote:[151/]

> On the basis of presently available information, Applicant anticipates being able to demonstrate conclusively by April 1976 whether a 25% reduction in abundance of Age Group 0 striped bass and white perch present in areas of the Hudson River adjacent to Indian Point has occurred as a result of Indian Point Unit No. 2 operations, with a 95% confidence level. (Emphasis supplied).

150/ See Applicant's Proposed Findings and Conclusions, p. 245, May 17, 1973.

151/ Applicant's Proposed Findings and Conclusions, p. 233, May 17, 1973.

And the next proposed finding (020) states in part:[152/]

> The feasibility of rearing and stocking juvenile striped bass to mitigate losses caused by plant operations will be determined by thoroughly investigating the technology and economics of existing hatchery programs. * * * The major objective is to demonstrate the technical feasibility of mitigating losses occurring at power plants on the Hudson River through the study of artificially propogated striped bass. (Emphasis supplied).

(1) Without explanation, the applicant is now excepting to Licensing Board statements (as having possible "quantum of proof" implications) which contain the exact or similar words which the applicant used in its proposed findings. It might just well be that the applicant's own statements are the source of at least some of the words which the applicant now suggests have legal significance. In any event, we do not find any basis in the record for concluding that the Licensing Board's alleged imposition of an undue quantum of proof burden on the applicant resulted from its misunderstanding of NEPA.

(2) As a practical matter, if the Licensing Board, for any reason, imposed an undue quantum of proof burden on the applicant, that fact should be fairly obvious in

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152/ Ibid.

the record. We have examined the record and have found no instance in which a higher standard of proof was required on a contested issue even though the preponderance standard had been clearly satisfied by the applicant.

3. In our judgment, there is no error in the Licensing Board's finding which is the subject of the applicant's exception 22. (Supra, p.69). The applicant offered the following proposed finding which is relevant to the Licensing Board's finding to which this exception pertains:[153]

> The applicant has made no proposal,nor has it testified, concerning the feasibility of stocking the Hudson River with species other than striped bass. HRFA and the Staff have offered evidence which indicates that there might be significant practical difficulties in carrying out such a program . On the basis of the evidence in this record, there has been no showing by any party that the benefit of replacing by artificial propogation, other species which may be affected by the plant, * * * are equal to the costs of constructing and operating such a hatchery.

The Licensing Board's language which is the subject of this exception is preceded by the following Board language:[154]

153/ Applicant's Proposed Findings and Conclusions, pp. 210-211, May 17, 1973.

154/ RAI-73-9 at 777.

> The Board rejects the Applicant's position that replacing other species which may be affected by the plant is unnecessary because there has been no showing that the benefits are equal to the costs of constructing and operating such a hatchery.

The Licensing Board has not erred. The applicant has the burden of proof. It failed to offer any evidence regarding the replacement of species of fish other than striped bass. (In this regard, see <u>infra</u>, pp. 140-141 for our discussion of the issue raised by the applicant's exception 11).

For the foregoing reasons, exceptions 5, 6, 20 and 22 are denied.

C. Exceptions Based On Technical Controversies

The remainder of the applicant's exceptions in the environmental area are based on the Licensing Board's findings concerning the technical issues in controversy. We will consider first the issues concerning the effects of once-through cooling operation on the Mid-Atlantic fishery, a subject which the Licensing Board recognized is most significant in determining the "kind and urgency of measures" to be taken to maintain the striped bass population (RAI-73-9 at 768). Then we will consider in order: the exception which directly challenges the Licensing Board's choice of the May 1, 1978 date for the termination of operations with once-through cooling; the exceptions which are directed to Licensing Board findings on certain other contested technical matters; the exceptions related to the environmental effects of, and construction schedule for, a proposed closed-cycle cooling system; the exception related to the applicant's research program; and the exception concerning the potential use of stocking to mitigate losses of striped bass from once-through operation.

1. Exceptions 7, 8, 9 and 10 are all based on the Board's ruling that the "Hudson River supplies between 20 percent and 80 percent of the recruits to the Middle Atlantic fishery" and that

> [u]se of Hudson River water for once-through cooling of power plants in the striped bass spawning and nursery areas must be considered a possible cause if a continuing decline should occur in the Middle Atlantic striped bass fishery. (RAI-73-9 at 769.)

Exceptions 7 and 8 specifically except to these rulings while exceptions 9 and 10 except to the costs of the environmental impact of the plant which follows from them.155/

The proposition that the Hudson River is the major source of supply for the Mid-Atlantic striped bass fishery was advanced by staff witness Goodyear. While HRFA witness Clark appears to support the 80% value, we note that he bases this support only on the assumption that Goodyear's ideas and calculations are correct. Clark originally testified that he had no number of his own as to the percentage of the Mid-Atlantic fishery supplied by the Hudson River (Tr. 8458-59). But later, using some tagging data of "fish taken in spawning situations" which he admitted were "numerically weak" and not representative of all the fish areas (Tr. 8562), he

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155/ Applicant's Brief at pp. 27-31 and 33-36.

stated

> "One might conclude that 80 percent of the tagged stock resorted to the Hudson to spawn. One might further conclude that 18% went to the Delaware and 2 percent to the Chesapeake, since recaptures were 16 and 1 fish respectively". [Emphasis added]

However, he later stated that the total striped bass catch in 1965 from Delaware to Maine totalled about 14.7 million fish and

> "the quantitative data from the Hudson do not indicate that it could supply this whole fishery of 14.7 million fish or even the substantial portion of it, the 80 percent". (Tr. 8564-65)

We will therefore restrict our further review of the subject to the staff testimony.

In the FES (XII-30 to XII-38) the staff discusses its theory that the Hudson River is the major source of supply for the Mid-Atlantic fishery. It admits that all of the scientists who have actually done experimental work in this area believe that the Chesapeake Bay supplies most of the striped bass stock along the Middle and North Atlantic coasts. But the staff reaches the conclusion that the Hudson, not the Chesapeake, is the major source. This result is based on a literature study of tagging experiments in the Chesapeake and a purported correlation found by the staff between striped bass

catches in the Hudson and striped bass catches in the Mid-Atlantic.[156/]

a. We will now discuss our view of the evidence presented by the staff, considering first the various interpretations of tagging studies that have been made as to the importance of the Chesapeake striped bass to the Mid-Atlantic fishery. As indicated in the FES (at XII-35),

> [t]he prevailing opinion [is] that the bulk of the striped bass fishery in the Mid-Atlantic and New England states is supported by recruitment from spawning and nursery areas in the Chesapeake Bay area .

In the FES and Goodyear's testimony[157/] the staff claimed that its literature study indicated that:

> Studies of tagged striped bass recaptured within the Chesapeake Bay drainage basin show that only a very small proportion of the bass less than four years old migrate out of the Bay. This information is in direct conflict with the hypothesis that the Chesapeake produces the migratory stock which populates the Atlantic Coast. The conflict results from the fact that two-year old fish composed the largest proportion of the coastal populations studied by Merriman and Alperin, and were also consistently present in Shaefer's [sic] samples .

156/ FES XII-29 to XII-38 and V-56 to V-61; Tr. 6764, 6772-6774, 6781-6782, 6824-6867, and 9035-9038; Redirect-Rebuttal Testimony of Dr. Goodyear, "Origin of the Striped Bass Stock of the Middle Atlantic Coast", March 1, 1973 (after Tr. 9892); and Redirect-Rebuttal Testimony of Dr. Goodyear, "Factors Related to Hudson River Striped Bass Population", April 9, 1973 (after Tr. 10,826).

157/ FES XII-36; and Redirect-Rebuttal Testimony of Dr. Goodyear, "Origin of the Striped Bass Stock of the Middle Atlantic Coast", March 1, 1973 (after Tr. 9892).

In its rebuttal testimony[158/] applicant refutes both the conclusions of the tagging studies of Clark in the Atlantic[159/] and those drawn by the staff from the Chesapeake tagging studies. In this rebuttal testimony applicant points out that the conclusion reached by Goodyear that "two-year old fish composed the largest proportion of the coastal populations studied by Newman and Alperin . . ." was based on only one study out of several and only this study

> showed large numbers of two year olds entering the fishery, and in this case the author correlated their occurrence with the advent of large year classes in the Chesapeake. 160/

From other studies reviewed by Schaefer[161/] it is evident that two-year olds do not normally predominate but often represent less than 12% of the striped bass population.

Our review of the data resulting from tagging studies

158/ Redirect-Rebuttal Testimony of Dr. Lawler, "Contribution of the Hudson River to the Middle Atlantic Striped Bass Fishery", February 5, 1973 (after Tr. 9405); and the Additional Testimony of Dr. Lawler, Appendix D, "Contribution of the Hudson River to the Mid-Atlantic Striped Bass Population, March 30, 1973 (after Tr. 10,339).

159/ See text, supra, at pp. 84-85.

160/ See Appendix D, supra, note 158 in the Additional Testimony of Dr. Lawler, March 30, 1973 (after Tr. 10,339).

161/ Ibid.

in the Chesapeake indicates that they do not provide a statistically valid base for the conclusions which Goodyear draws.

In this connection, we wish to comment on the staff testimony as presented by witness Goodyear. We note, for example, that Goodyear places great reliance on the data in table 11 of his rebuttal testimony[162/] dated March 1, 1973, from which he chooses to conclude:

> A second and very important point which was deduced from the tag and recapture data of fish tagged in the Chesapeake is that fish of 1- and 2-year-old age groups simply do not leave the system. In fact, no 1-year-old striped bass have been tagged in the Chesapeake and thereafter recovered as 1-year-olds on the Atlantic coast. Of the 2-year-olds tagged in the Chesapeake, only 2 fish could be identified by the Staff as having been recaptured outside the Chesapeake as 2-year-old striped bass. This represents 2 fish out of nearly 7000 recaptured striped bass, for a total contribution of some 0.03% of the total striped bass population of the Chesapeake. In other words, it would appear that only 3 out of 10,000 2-year-old striped bass in the Chesapeake migrate out of the Chesapeake to enter the fishery along the Atlantic coast.

162/ Redirect-Rebuttal Testimony of Dr. Goodyear, "Origin of the Striped Bass Stock of the Middle Atlantic Coast", March 1, 1973 at pp. 7-8 (after Tr. 9892).

The conclusions in this paragraph are not warranted on the basis of the data in table 11. First Goodyear states ". . . fish of 1 or 2-year-old age groups simply do not leave the system." Even on Goodyear's view of the data, this is an overstatement since he admits that the table shows that out of 117 recaptures outside the Bay, two were 2-year-old fish. However, what is more important is the staff's omission of any reference to the data in table 11 on the experiments of Nichols and Miller, who tagged 8973 fish, evidently about 80% or more being 2- and 3-year olds. They recaptured 52 outside the Bay, 88% of which were 3-year olds and of the remaining 12%, or six fish, table 11 shows that none were younger than 2 years old. This would indicate that one or more of these were 2-year olds. Again in table 11, of the fish recaptured outside the Bay, the staff ignores the fact that 16 of them were not identified as to age. The staff gives no reason for assuming that none of these were 2-year olds.

Dr. Goodyear goes on to say, in the paragraph quoted above, that the two recaptured 2-year old fish represent

> 2 fish out of 7000 recaptured striped bass . . . . In other words, it would appear that only 3 out of 10,000 2-year old striped bass in the Chesapeake migrate out of the Chesapeake to enter the fishery along the Atlantic coast.

In the first place, the "nearly 7000" recaptured bass were not all 2-year olds and no data are given to show how many 2-year olds were recaptured. However, table 11 shows that a total of 26,356 were tagged, with 6540 of these being 2-year olds. The table also shows that of the total fish tagged, 6942 were recaptured. Thus, the fraction $\frac{6942}{26,356}$ of the fish tagged were recaptured and one would expect this same proportion of tagged 2-year olds to be recaptured. On this basis, approximately 1700 2-year olds would be recaptured -- not 7000, as is necessarily implied by Goodyear in arriving at his conclusion of "only 3 out of 10,000 2-year olds."

The staff states that 105 fish were recaptured (table 11 actually shows 117, not 105) which means, even on the staff view, that nearly 2% of the fish recaptured outside the Bay were 2-year olds. However, if one assumes that all of the unknown age recaptures outside the Bay (including those of Nichols and Miller) were 2-year olds, one can reach a figure of 24 2-year olds recaptured, or 20% of the total out-of-Bay recaptures.

The point is that Goodyear's use of the data is worthless to prove anything about the Mid-Atlantic fishery. With these obvious discrepancies and other similar ones in

Goodyear's testimony, we must completely reject his thesis that he has "proven" that the Chesapeake cannot be a major source of the Mid-Atlantic fisheries.

b. On the basis that it has shown that the Chesapeake cannot be the major source for the Mid-Atlantic fishery, the staff proceeds to "prove" that the Hudson River is the real major source by comparison of the striped bass catches in the Hudson with the bass catches in the Mid-Atlantic five years later. The staff states its theory in the FES (XII-36) as follows:

> The hypothesis that the Hudson spawning and nursery areas provide important recruitment to the Mid-Atlantic States is consistent with the available data. Because of size limits, striped bass enter the Mid-Atlantic fishery at four to six years of age. Furthermore, because of the 16" minimum size, the spring landings of striped bass in the Hudson reflect the abundance of adult fish available for spawning. Comparison of Hudson landings with Atlantic landings five years later (three point moving averages) shows the probable importance of the Hudson as the source of the Mid-Atlantic stock (Figure XII-2).

In the comparison the staff claimed to get a "highly significant" regression analysis.[163/] However, on cross-examination staff witness Goodyear admitted that the regression analysis was invalid (Tr. 6838).[164/]

163/ FES, XII-37, 38.

164/ The Licensing Board found that the "regression analyses do not provide a basis for choosing between the positions of the parties". RAI-73-9 at 769.

c. What we are faced with here then, is the witness Goodyear's rejection, on the basis of a literature study, of the conclusions of all the authors involved. His conclusion is based on data from which certain numbers were selected on no apparent basis other than to attempt to establish support for a theory. This is followed by a further attempt to support the theory with an invalid analysis. Accordingly, we must reject the staff's claim that the Hudson River is a major source of the Mid-Atlantic striped bass fishery and, also, therefore, its prediction of the damage that is grounded thereon.[165/]

165/ Our conclusion renders moot the applicant's exception 8 to the Licensing Board's finding that the "[u]se of Hudson River water for once-through cooling . . . must be considered as the possible cause if a continuing decline should occur in the Middle Atlantic striped bass fishery" (RAI-73-9 at 769).

We wish to observe, however, that the staff testimony, claiming that as water uses by power plants on the Hudson River has increased, the Mid-Atlantic striped bass catches have decreased (after a period of five years), is also marred by unexplained inconsistencies. (See Redirect-Rebuttal Testimony of Dr. Goodyear, "Factors Related to Hudson River Striped Bass Population", April 9, 1973 (after Tr. 10,826)). As examples, the staff testimony ignores data (in Figure 3 of the prepared testimony) which show that the Mid-Atlantic catches between 1963 and 1968 increased by approximately 40 percent even though the water withdrawal during an equal time interval five years earlier had increased by approximately 100 percent. The staff testimony (Figure 3) also shows that the Mid-Atlantic catches have decreased since 1968, even though fish catches in the Hudson have continued to increase. Under the staff's theory of the Hudson as a source for the Mid-Atlantic fishery, the increases in the Hudson catch should have resulted in increases in the Mid-Atlantic catch.

2. The applicant argues that the pivotal issue in the proceeding is not whether Indian Point No. 2 should be authorized to operate with its presently-designed once-through cooling system but, rather, how much time should be allowed for environmental study before a closed-cycle cooling system is required for Indian Point Unit No. 2.[166/]

Notwithstanding the admitted importance of this issue, it is not treated specifically in any detail in the applicant's brief. We are informed in general terms of alleged legal errors which the Licensing Board committed, but a critical analysis of that Board's reasoning which led to the choice of the May 1, 1978, date was not made.[167/] In view of the importance of this issue, and the manner in which the applicant chose to deal with it in its brief, we consider all relevant matters in some detail here.

We start with the applicant's argument. As we understand the argument advanced in support of its

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166/ Applicant's Brief at 14. The Licensing Board apparently agrees, in view of its statement that the "primary issue for [it] to decide is whether a closed-cycle cooling system should be imposed on Unit No. 2 now or the decision should be delayed until Applicant's ecological study is completed in 1977 . . . " (RAI-73-9 at 761).

167/ See Applicant's Brief at pp. 15-19.

exception 3 and related exceptions (infra, pp. 118-139), the applicant asserts that the operation of Indian Point No. 2 with its once-through cooling system should not be terminated in 1978 unless the evidence demonstrated that "(a) the Middle Atlantic striped bass fishery would be irreversibly harmed by the operation of the once-through cooling system between 1978 and 1981 and that (b) should severe adverse environmental effects be observed from operation of the once-through cooling system, appropriate steps could not be taken to limit such effects".[168/]

Further, the applicant asserts that the Licensing Board agreed with the applicant "that there is unlikely to be a serious permanent effect on the fishery by a delay of a year or two in starting construction of a closed-cycle cooling system".[169/] In addition, the applicant argues that the Licensing Board specifically found that should severe adverse environmental effects be observed during this time, appropriate steps could and would be taken to limit such effects consistent with economic and technical considerations.[170/]

168/ Id. at 14-15.

169/ Id. at 15. See RAI-73-9 at 780.

170/ Ibid. See RAI-73-9 at 783, 789 at which the Licensing Board accepted without qualification proposed findings of fact N4 by the applicant and the regulatory staff.

The staff, HRFA and New York all argue that since the projected damage from operation with once-through cooling is so severe, measures to mitigate such damage should be undertaken promptly.[171] The staff informs us:[172]

> A fair reading of the decision as a whole evidences the Board's conclusion, along with the staff, that the reduction in projected damage to the Hudson River fishery resource as a whole, considering the monetary values and the important unquantifiable value of the Hudson River resource over and above the monetary value of the catch, offsets the costs of closed-cycle cooling and warrants the use of cooling towers for operation of the facility after May 1978.

The staff's brief in opposition also argues that the May 1, 1978 date is correct in spite of the monetary values arrived at in the cost-benefit analysis. The staff's explanation of its position is:[173]

> The Board concludes that the law requires that a natural resource like the Hudson River fishery must be protected. This reflects the considerable weight which the Board attributed to the unquantifiable value of the Hudson River and Mid-Atlantic

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171/ See Staff's Brief in Opposition at p. 12; HRFA's Brief in Opposition at 31-34; and New York's Brief at 4-10.

172/ Staff's Brief in Opposition at 10. In footnote 5 on p. 10 the staff reminds us that although its proposed date for termination of open-cycle operation was January 1, 1978, it believes "that the additional four months of open-cycle cooling . . . will not cause any irreparable damage to the fishery".

173/ Staff's Brief in Opposition at p. 9.

> fisheries. This properly reflects the character of these resources and is supported by the evidence. The staff expressed its position that the fishery is a 'priceless resource not only to the present generation but to future generations as well' (Tr. 6988), and that the operation of the once-through cooling system has 'the potential for a long-term environmental impact . . . which would result in permanent damage to and severe reduction in the fish population, particularly striped bass, in the Hudson River, Long Island Sound, the adjacent New Jersey Coast and the New York Bight. As such the environmental impact as detailed in this statement over the long-term are considered by the staff to be an unacceptable assault on the Hudson River fishery resource and the environment which lead to an irreversible loss of productivity of the river . . . ' (FES p. XII-41). The staff concluded that a license should require closed-cycle cooling after January 1, 1978, 'upon consideration of the welfare of the present generation and protection of the environment for future generations. . .' (FES p. XII-41).

a. We first must attempt to discern as clearly and completely as we can the basis for the Licensing Board's ruling establishing the May 1, 1978 termination date for once-through cooling. This required our search for and consideration of statements in the initial decision which reasonably appear to relate to that ruling.

(1) It is manifest that the initial decision recognizes that the primary issue which the Licensing Board must decide is whether a closed-cycle cooling system should be imposed on Indian Point No. 2 now or

whether that decision should be delayed until the applicant's ecological study is completed in 1977 "on the possibility that the data obtained will show other measures to be preferable". RAI-73-9 at 761. Also the initial decision properly states that a major issue in the proceeding is "the prediction of the level of reduction of striped bass populations that would result from passage of entrained eggs, larvae, and early juveniles through the once-through cooling system of Indian Point Unit Nos. 1 and 2". (RAI-73-9 at 762). After reviewing the evidence on the predicted impact of once-through cooling (RAI-73-9 at 762-766), the Licensing Board concluded that:174/

> the impact of one year of plant operation is unlikely to be as great as is predicted by the Staff and HRFA. However, Applicant's conservative calculations show reductions in striped bass population of 20 percent in the fifth year and 35 percent in the tenth year for operation of the Indian Point Units Nos. 1 and 2, and 40 and 60 percent for operation of all plants now on the river, including Unit Nos. 1 and 2. For the present it is only prudent to assume that the impact of operation of the plants as they are presently designed will be at least that great.

174/ RAI-73-9 at 766. See also p. 125 *infra*, for our discussion of the Licensing Board's use of the term "Applicant's conservative calculations" in the quotation in the text.

(2) Later on the Licensing Board stated that the importance of the Hudson River as a breeding ground for striped bass is related to the extent to which the river's population contributes to the Mid-Atlantic fishery. (RAI-73-9 at 768.) The Licensing Board referred to the conclusion reached by the staff that the "Hudson River provides 80 percent or more of the Middle Atlantic stock", and to the applicant's conclusion that the maximum contribution that can "with certainty be attributed to the Hudson River is 10 percent". (RAI-73-9 at 769.) (For our conclusion on this matter, see supra, p. 92.) The Licensing Board concluded (RAI-73-9 at 768 and 769).

> No party contends that operation of the power plants should be permitted to deplete the population of fishes in the Hudson River even though the river is not important to the Middle Atlantic fishery, but the river is not a major sport or commercial fishery. The kind and urgency of measures taken to maintain the population might be entirely different if protection of the Hudson River fishery were the major consideration. * * * The Board finds the record replete with logical arguments supporting and opposing the theses put foward by the various participants. For several decades scientists have concluded that most of the Atlantic coastal migratory stock came from sources south of the Hudson River. Only recently have these conclusions been challenged by the Staff and HRFA. That truth of the matter is that the type and magnitude of data about

> striped bass origins has never been undertaken. Studies by the New York State Department of Environmental Conservation and the National Marine Fisheries Service during the next three years may help to resolve some of the questions with regard to the Hudson River source. The Board concludes from the evidence and testimony . . . that the Hudson River supplies between 20 percent and 80 percent of the recruits to the Middle Atlantic fishery. . . .

(3) In its discussion of the monetary impact of once-through cooling on the striped bass fishery, the Licensing Board stated that the uncertainties with regard to the impact of once-through cooling on the recruitment of Hudson River striped bass to the Middle Atlantic fishery make it "unusually difficult" to establish a monetary value of the impact for cost vs. benefit purposes.[175/] The staff's position that the striped bass fishery is a "priceless resource not only to the present generation but to future generations as well" was alluded to by the Licensing Board.[176/] The following additional reference was also made to the staff's position:[177/]

> The Staff also asserted that although insufficient data exist to accurately assess the damage to the fishery of long-term once-through operation of Unit No. 2, permanent damage to and severe reduction in the fish population could occur during the time required to collect sufficient data. The Staff concluded that installation of a closed-cycle cooling system is required to prevent this potentially serious impact.

175/ RAI-73-9 at 769-70.

176/ RAI-73-9 at 770.

177/ Ibid.

(4) The Licensing Board's discussion of the closed-cycle cooling system refers to the staff conclusion that operation of Unit Nos. 1 and 2 with the present once-through cooling system "has the potential for causing a serious adverse impact on the aquatic biota in the Hudson River and, in particular, on the striped bass fishery that is stocked by recruits from the river".[178/] Also that discussion notes that "[a]fter considering the potential impact of the combined operation of all the plants on the Hudson River, the Staff recommended that the closed-cycle cooling system should be installed and in operation as soon as practicable but no later than January 1, 1978."[179/] The applicant's expressed conviction that a closed-cycle cooling system would be "an unnecessary and unjustifiable expense" for Unit No. 2 was noted by the Board.[180/] Thereafter the Licensing Board concluded that such a system could be completed on a schedule that would permit termination of the present once-through system by May 1, 1978, "the beginning of the period when entrainment of striped bass is of serious concern".[181/]

178/ RAI-73-9 at 773.
179/ Ibid.
180/ RAI-73-9 at 775.
181/ Ibid.

(5) The Board noted that mitigating measures of environmental impact from once-through cooling are in "various stages of research and engineering and little can be concluded regarding their cost or effectiveness". RAI-73-9 at 776. But subsequently in its discussion of license conditions proposed by HRFA the Board stated in its opinion that "the increment of damage to the fishery that would be avoided by restricting operations during the winter and early summer over this period is reversible and that the fishery will rapidly recover from such increment of damage if appropriate measures are then taken". RAI-73-9 at 778. The Board ruled that all phases of the research program (infra, p.159) "aimed at determining the impact on the aquatic biota of once-through cooling of Unit No. 2 [should] be continued at least through the first year of operation". RAI-73-9 at 781. Continuing, the Licensing Board said that thereafter, if the applicant also agrees that installation of the closed-cycle cooling system is the proper course, "the research program could be replaced by a monitoring program sufficient to assure that the effects are kept below a level that would be of serious concern over the long term". (Ibid.)

(6) In its discussion of the applicant's research program, the Licensing Board opined that "the effect of the plant on the Hudson River ecology in the vicinity of Indian Point is not the primary question", the important question being "the effect that plant operations may have on the Middle Atlantic striped bass fishery". RAI-73-9 at 780. Continuing on this subject, the initial decision stated:[182]

> The Board agrees with the Applicant that there is unlikely to be a serious permanent effect on the fishery by a delay of a year or two in starting construction of a closed-cycle cooling system. However the Board also agrees with the Staff, HRFA, and the State of New York that operation of Unit No. 2 with a once-through cooling system can have a seriously adverse effect on the fishery, and that Applicant's research program is unlikely to resolve the important questions in that extra year or two. The Board finds, therefore, that the research program does not presently provide sufficient reason to delay construction of a closed-cycle cooling system for Unit No. 2.

(7) Another portion of the Licensing Board's analysis is given in its discussion of compliance with NEPA requirements (see also supra p. 57): [183]

182/ It should be noted that the second sentence of the quote in RAI-73-9 at 780 does not include the correction which the Licensing Board made to an obvious error. Reference to a closed-cycle system was made in a context where it is clear that a once-through system was intended. Our quote above includes the correction.

183/ RAI-73-9 at 782-783.

> Operation of Unit No. 2 has the potential for causing serious long-term damage to the Hudson River fishery. Installation of a closed-cycle cooling system, similar to systems being used or installed when needed on other nuclear plants and on fossil-fueled plants, would remove most of the potential for damage to the fishery at the expense of the visual impact of the natural draft cooling tower. The Staff and the Intervenors contend that this adverse effect is more than compensated by the beneficial effect on the fishery. The Applicant neither adopted nor controverted this position. The Applicant has not, however, provided reliable, probative and substantial evidence to constitute a convincing case that its research program will resolve the question of the impact of entrainment at Unit Nos. 1 and 2 on the fisheries. Therefore, the Board concludes that the Applicant should proceed expeditiously with construction of a closed-cycle cooling system and that operation with the present system should be terminated by May 1, 1978.

(8) Summarizing its findings and conclusions, the Licensing Board concluded that (RAI-73-9 at 789)

> the Staff's summary of the benefit-cost analysis is modified to provide that operation of Indian Point Unit No. 2 with its presently designed once-through cooling system shall be permitted until May 1, 1978. Operation after this date shall be permitted only after a closed-cycle cooling system has been installed and placed in operation. Operation with the once-through cooling system prior to that date will be in compliance with the Technical Specifications accompanying this license and applicable federal, state and local regulations. As an interim measure to minimize damage to the environment from the once-through cooling system, the plan of action as approved by the Commission will be implemented at the start of commercial operation.

(9) Finally, it should be noted that the Licensing Board ruled, in the manner discussed at RAI-73-9 at 783-788, on each of the proposed findings submitted by the parties. Several of those rulings would appear to be pertinent.

The Board rejected "in part" the applicant's proposed finding D 2 because it is not clear "what is meant by irreversible". RAI-73-9 at 783. Among other things, in its proposed finding D 2, the applicant stated that it presented expert testimony that "the operation of Indian Point Units 1 and 2 on a short-term basis will not produce an irreversible adverse effect on the fish populations in the Hudson River".[184/] However, the Board accepted without comment (RAI-73-9 at 783, 788), the staff and the applicant's proposed findings N 4, which assert that the "evidence demonstrates that, should severe adverse environmental effects be observed during operation of the once-through cooling system, steps can and will be taken to limit these effects consistent with economic and technical considerations".[185/]

184/ Applicant's Proposed Findings, May 17, 1973 at pp. 48-49.

185/ Id. at 197. Staff's Proposed Findings, June 11, 1973 at p. 67. See also Tr. 10509, 10516-19.

The Board rejected "in part" the applicant's proposed findings O 28 and O 29 on the ground that it is not clear that the applicant's program "is capable of detecting what the Board and other parties consider to be a substantial impact in a timely manner". (RAI-73-9 at 786). These proposed findings in effect asked the Board to conclude that the applicant's research program is capable of detecting either "substantial or irreversible harm to the fish populations on a timely basis to permit interim and permanent corrective measures to be taken".186/ However, the Board accepted in its entirety and without comment (RAI-73-9 at 783) the applicant's proposed finding O 19, the substance of which is that the applicant "anticipates being able to demonstrate conclusively by April 1976 whether a 25 percent reduction in abundance of Age Groups O striped bass and white perch present in areas of the Hudson River adjacent to Indian Point has occurred as a result of Indian Point Unit No. 2 operations, with a 95 percent confidence level".187/

186/ See Applicant's Proposed Findings, May 17, 1973 at pp. 240-42.

187/ Id. at 233.

b. In addition to the statements which we have summarized, we have searched the entire initial decision for any explanation why the Licensing Board concluded that after May 1, 1978, the environmental cumulative impact from once-through cooling is expected to become irreversible or so substantially adverse that it becomes unacceptable under the circumstances which are documented in the record of this proceeding. Our search has been in vain.

True, there is substantial disagreement about the long-term impact of such a system primarily, but not exclusively, because of the uncertainty of the Hudson River's contribution to the Mid-Atlantic striped-bass fishery which may not be answered by the applicant's research program. To the extent that this may be the underpinning for the Licensing Board's May 1, 1978 determination, see our discussion, supra, pp. 84-92. It is also true that the record reveals there are substantial differences in the estimates of predicted annual impact of the once-through system. That matter is also discussed extensively in another part of this opinion, see infra, pp. 118-139. Quite aside from the differences and inconclusiveness in the testimony in these very important areas, we have considerable uncertainty as to the reasons for the Board's selection of the May 1, 1978 date.

(1) Our uncertainty results at least in part from what appears to us to be inconsistencies in the Board's findings in areas which could bear significantly on the correctness of the selection of the May 1, 1978 date. Although the Board finds that there must be compliance with the technical specifications "as an interim measure to minimize damage to the environment from the once-through cooling system", it is not clear to us the extent to which monitoring and mitigating measures called for by the operating license were considered in the selection of the May 1, 1978 date. (RAI-73-9 at 789). If these measures are effective, there would appear to be no good reason for concern about damage to the environment being allowed to become unacceptably large over the short-term. Moreover, if the Licensing Board believed these measures would not be effective over the short-term, it did not so state. In fact, the monitoring and mitigating measures are the subject of detailed environmental technical specifications with which the applicant must comply.188/ That the Board has confidence in the monitoring program seems clear to us by its statement that after a closed-cycle system is

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188/ See operating license condition 2.E.(3); and Appendix B to the applicant's operating license, "Environmental Technical Specification Requirements For Once-Through Cooling".

installed, "the research program could be replaced by a monitoring program sufficient to assure that the effects are kept below a level that would be of serious concern over the long-term" (RAI-73-9 at 781). There is no dispute that the environmental impact on the striped bass from a closed-cycle cooling system will be smaller than the predicted impact from once-through cooling. If the Board has confidence in a monitoring program under such conditions, it is not reasonable for us to assume that it did not also have confidence, at least over the short-term, in the monitoring program which is embraced in the applicant's more detailed research program to examine the effects of once-through cooling. While it is true that certain proposed mitigating measures for a long-term solution to environmental impact may be in various stages of research and engineering (RAI-73-9 at 776), it is manifest that effective mitigating measures, such as reduction in level of operation or plant shutdown, can be taken if needed.

(2) It appears to us that the Board did not rely on the protection afforded by the monitoring program and mitigating measures in selecting the May 1, 1978 date.

All other matters aside, the availability of such protection would appear to us to provide some flexibility in the choice of the date for termination of the short-term once-through system operation. The Board itself recognized, and we agree, that the May 1, 1978, date was not cast in concrete, for if

> the results in the eight completed [research] reports are as favorable as the Applicant expects, it should have sufficient evidence, before excavation starts, to apply for permission to delay the construction . . . (RAI-73-9 at 781).

But the time schedule imposed by the Board would have allowed a very limited time for the applicant to have submitted an amendment to AEC to extend the May 1, 1978 date and to have received an AEC decision, one way or the other, on any such amendment. Allowing such a short time for a crucial amendment to be submitted and approved is impractical and unrealistic and, in effect, means that the results of the research program, along with the analysis of the predicted environmental effects from a closed-cycle cooling system, could not be factored into the final decision on the choice of a permanent cooling system. That result would not appear to us to be intended by

the Licensing Board (RAI-73-9 at 781). Furthermore, proper reliance on monitoring and mitigating measures to arrive at some date beyond May 1, 1978 would have provided adequate time for these inputs to be available for, and considered in, the final decision on the cooling system for long-term operations.

c. There may be a slight clue in the initial decision that, despite all of the record considerations which suggest some flexibility in the choice of the termination date for once-through cooling, the Licensing Board selected May 1, 1978 because of the influence of its possible interpretation of NEPA (RAI-73-9 at 782). It is in the context of its discussion of compliance with NEPA procedures and requirements that the Board concluded "that the Applicant should proceed expeditiously with construction of a closed-cycle cooling system and that operation with the present system should be terminated by May 1, 1978." (RAI-73-9 at 781-783.) We consider here only the NEPA considerations, recognizing, as we already have, that there are other factors which the Licensing Board may have taken into account. (See supra, pp. 84-92 and infra, pp. 118-139).

The applicant's argument in support of this exception, as well as several others, is based almost

entirely on its assertion that the Licensing Board misinterpreted and misapplied NEPA.[189/] For that reason, we have already considered the legal principles which are generally applicable and concluded in effect that a rule of reason should govern the choices made after the procedures of NEPA are invoked and completed (see supra, pp. 76-77).

A rule of reason application of NEPA under the circumstances involved in this proceeding certainly would not appear to require the selection of the May 1, 1978 date. Indeed, it is our judgment, for the reasons which follow, that such an application of NEPA would not support the selection of the May 1, 1978 termination date for once-through cooling operation.

(1) At the outset we wish to state emphatically that our reasons do not depend on the fact that a monetary value can be given to only a portion of the fish and that, to a considerable extent, the environmental values involved are unquantifiable. We are also mindful of the position of the staff, HRFA and New York that these unquantifiable values should be considered and should, in their opinion, control even though the

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189/ See Applicant's Brief, October 29, 1973, pp. 1-25.

monetary balance supports at least a deferred decision on the installation of a closed-cycle system. Although we agree as a general proposition that unquantifiable values must be considered in the overall balancing process,[190/] we need not base our decision here on the extent to which such values should properly affect the result which is otherwise suggested by the strictly monetary balancing of quantifiable costs and benefits. We so conclude on the basis of our understanding of the record, including the initial decision, that the environment, including environmental amenities which are unquantifiable, will be protected against significant adverse impacts during short-term operations. We have already stated that, during operation with once-through cooling, the applicant is required by environmental technical specifications to conduct monitoring surveillance and to detect, and institute mitigating measures to protect against, significant adverse impacts. The effectiveness of this requirement is not altered even if one wishes to decide now that the applicant's research program will not provide sufficient information

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190/ Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), ALAB-179, RAI-74-2 159. (February 28, 1974).

to assess long-term impacts. (See infra, pp. 159-166.) If the observed impacts are within the range of acceptability, the record does not suggest, and we do not believe, that it is likely that those impacts will nevertheless have substantial long-term implications.[191] In the words of the staff's Final Environmental Statement (FES IX-5): "The environmental monitoring program will serve to provide a means for assessment of any damage to the environment and can be used to predict any irreversible or irretrievable damage to the environment".

(2) The short-term period of operations with adequate safeguards to protect the environment should result in the gathering of additional information which will permit an informed re-evaluation of the proper choice for a cooling system for long-term operations. Empirical data from operation of the once-through system could possibly answer some of the uncertainties which exist concerning the predicted impact of such a system. Also, the final report on the predicted impact of a

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191/ See Applicant's Proposed Finding 026 at p. 239 of Applicant's Proposed Findings, May 17, 1973. That proposed finding (referencing Tr. 9516-9518) declares, in part, that if the applicant "confines its assessment to those early life stages [of the life history of striped bass] and there is relatively small impact, then it is clear that there cannot be more than that small impact which is passed on to the adult stages". The Licensing Board accepted the "sense of the finding". RAI-73-9 at 783.

closed-cycle system should be available, as was not the case when the Board chose the May 1, 1978 date. This information should enable the optimum cost-benefit balancing of all considerations involved in the final choice of a cooling system. Such a result appears to us to be entirely consistent with the objectives of NEPA. Both short-term operation and the research program can proceed in parallel, with conditions to assure environmental protection, with the objective of obtaining information necessary to arrive at an informed decision. Under these circumstances, the selection of a fixed-date which would preclude an informed choice, in the absence of some overriding reason to do so, would appear to us to be counter-productive to NEPA goals. Our discussion above (supra, pp. 106-113), indicates that we are not aware of any overriding reason which dictates the choice of the May 1, 1978 date. To the contrary, the reasons we have given point in the direction of a later date.

d. It should also be noted that the May 1, 1978 date is not mandated by the Final Environmental Statement (FES). The FES finds five years of once-through cooling operation to be warranted on the basis of the benefits derived compared to the projected impact during

this limited period (FES iv and XI-72-Xi-74). Operation of Indian Point 2 through five spawning seasons would mean that operation with once-through cooling could continue until May 1979 even accepting the staff's projected impact on the striped bass.[192/]

e. Finally, an awareness of the many questions raised by the Licensing Board's analysis surrounding its choice of the May 1, 1978 date prompted us to hold oral argument. We questioned the parties, particularly the staff, extensively on most of the matters which we have previously considered. The staff's responses to us recite four points, which were taken directly from its answers to the Licensing Board's questions, for its choice of a termination date. (See after Tr. 10,826 at p. 2).[193/] Summarizing, these points are: (a) before January 1978 there will be serious ecological damage, but beyond that date damage will be irreparable;

192/ We have stated elsewhere in this decision that the staff's projected impact is based on a pyramid of highly conservative (i.e., pessimistic) assumptions, some of which, in our judgment, have no reliable record basis (see supra, pp. 84-92 and infra, pp. 118-139). But assuming that the worst does happen in accord with staff predictions, and further assuming that the applicant's monitoring program does not detect these substantial impacts, and that the applicant takes no mitigating measures, we read the FES as saying that operation through five spawning seasons is nevertheless acceptable.

193/ Impact of Effects of Multiple Plant Operation on Conclusions Reached in the FES for Indian Point No. 2, Testimont of M. J. Oestmann, April 6, 1973.

(b) January 1, 1978 is a "reasonable, but outside limit" for putting a closed-cycle cooling system into operation; (c) the cost-benefit balancing showed that the need for power outweighed the corresponding environmental costs of once-through cooling on a short-term basis; and (d) beyond January 1978, the damage from once-through cooling outweighs the benefits.

These responses appear to us to be inconsistent with the recognition in the FES that once-through cooling can be used through five spawning seasons as well as with the staff's position on the environmental protection which will be afforded during short-term operation (supra, p. 113). Moreover, the staff has not given the expressed reasons for its conclusion on the choice of date for the termination of once-through cooling operations. Without such enlightenment, the rational path, if any, which lead to the staff's choice of its termination date remains obscured and confused.

We must, of course, reach our result on the basis of the evidentiary record. It will not do for us to conclude that the reasons for that choice can remain obscured on the ground that all except the applicant are in general agreement with it, and that, on the surface, that choice may appear to be in the best interests of environmental protection, and therefore should be readily accepted without critical analysis.

For all of the foregoing reasons, we find the applicant's exception 3 to be well taken, and to require that we modify the May 1, 1978, termination date for once-through cooling, subject to certain conditions (see *infra*, pp. 185-187).

3. Exceptions 1, 2 and 11 concern the effects of the Indian Point 2 facility on the Hudson River biota, and the estimated environmental costs of these effects. In summary, the applicant claims in these three exceptions that the Licensing Board erred in finding:[194/]

> (1) The estimates of impact upon the striped bass fishery based upon present modelling techniques and existing data are an adequate basis for making a decision now to require installation of a closed cycle cooling system . . . .
>
> (2) The potential adverse environmental impact of the once-through cooling system for Indian Point 2 justifies construction of a closed-cycle system even though the economic costs of such a system are greater than the Licensing Board's maximum predicted economic loss to the fishery and the environmental costs of the latter system have not yet been determined
>
> (3) The finding that 'one must expect' that there will be a serious adverse impact on other species of fish using the Hudson River in the vicinity of Indian Point as a spawning and nursery ground due to the operation of the once-through cooling system . . . .

In answering these exceptions we note first that the applicant claims that the effect of the Indian Point 2 facility is primarily on the biota in the immediate vicinity of the plant which may, in turn, affect the sports fishing in the Hudson River, Long Island Sound,

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194/ See Applicant's Brief at pp. 17-18 and 36-38.

and off the western end of the south shore of Long Island.[195] In addition, applicant's witness Lawler, in his February 5, 1973 Redirect-Rebuttal Testimony, presents a table showing that commercial catches of striped bass in the vicinity of the Hudson River amounted to only 12% of the total "Mid-Atlantic" catch.[196]

In the initial decision the Licensing Board considers two major areas[197] of possible damage to the Hudson River biota from operation of Indian Point 2: (a) thermal effects due to the output of heated water from the plant, and (b) mechanical effects on various biota due to entrainment and impingement of these biota in the cooling system of the plant.

a. We will first consider the thermal effects (RAI-73-9 at 758-761).

195/ There is agreement among the parties that the Hudson River is the major source of striped bass in these regions. We have already concluded, however, that the record does not support the staff position that it is also the primary source for the Mid-Atlantic fishery. Accordingly, in considering these particular exceptions we do not include possible damage to the Middle Atlantic fishery.

196/ "Contribution of the Hudson River to the Middle Atlantic Striped Bass Fishery" (after Tr. 9405), Table 2 after p. 9.

197/ Other possible effects of once-through cooling such as reduction of oxygen content and addition of chemicals, were not major points of controversy in the issues before us.

In this regard the applicant presented extensive testimony on its mathematical and hydraulic modeling on "The Effect of Indian Point Units 1 and 2 Cooling Water Discharge on Hudson River Temperature Distribution".[198/] The model made use of the hydrodynamic conditions of the Hudson River and meteorological conditions to describe the local, as well as overall, temperature distribution resulting from the heated effluent. Parameters such as the effect of the jet discharge design, the fresh water tidal flow under various seasonal and flow conditions, possible salt water-fresh water layering effects and heat transfer coefficients under various mixing conditions were considered.

This model resulted in the conclusion by the applicant that the summation of Indian Point Units 1 and 2 thermal discharge would clearly meet the New York State water standards for all expected river flow conditions.

The staff, in the FES, criticized the model as unsatisfactory since all parameters were not known and some extrapolations used by the applicant were not justified because field data to support such extrapolations had not been obtained.

198/ Lawler Testimony, April 5, 1972 (after Tr. 4831).

However, despite its criticisms, the staff concluded that the reactor would meet all the New York State water standards except the one requiring that

> the water temperature increases of 4°F shall not be exceeded over more than two-thirds of the river surface width nor over more than one-half the cross-section .

In its rebuttal testimony applicant claimed that the staff had misused some of the equations developed by the applicant in its models, particularly in calculations of the spread of the 4°F temperature isotherm. This appears to be admitted by the staff witness (Tr. 6914).

A witness for HRFA (Clark) introduced testimony[199/] on the effects of the so-called "diving plume" on the temperature distribution in the river resulting from the heated water discharge during the winter months. The misunderstanding of the "diving plume" phenomenon is evident here as it was in the same witness' testimony given in January of 1973 in the Shoreham case.[200/] No data were introduced nor convincing analysis presented to support his conclusions in this testimony.

199/ Testimony of Clark, "Effects of Indian Point Units 1 and 2 on the Hudson River Aquatic Life", Oct. 30, 1972 (after Tr. 6276), at p. 39.

200/ See Long Island Lighting Company (Shoreham Nuclear Power Station), ALAB-156, RAI-73-10 at 838-839 (October 26, 1973).

From the weight of the evidence, it appears to us that the applicant has developed reasonable thermal models and that the probability is that the operation of Indian Point Units 1 and 2 will not violate the New York State water standards. However, the possibility remains that the 4°F limit may be exceeded in extreme conditions of low river flow in very hot weather. This possibility can be evaluated during the next two years (assuming normal river flow and temperature variations) if the applicant maintains a careful monitoring program so as to improve its model with the inclusion of further data. In any case, conditions which would threaten the 4°F limit are rare and, if they occur, the applicant must conform to New York State standards and actions such as slight reductions in plant power output may be necessary.[201/]

201/ The applicant's operating license includes a condition (2.F.) which states that the license is "also subject to appropriate conditions imposed by the New York State Department of Environmental Conservation in its letter of September 24, 1973" to the applicant. That letter granted a Section 401 Certification for Indian Point Unit 2, under the Federal Water Pollution Control Act, 33 U.S.C. 1341 (Supp. II, 1972).

b. We turn now to the consideration of the effects of entrainment and impingement on the Hudson River biota due to the once-through cooling system. As the Board states, many species of fish may be affected but since all the parties recognized[202/]

> that the striped bass is economically important to sport and commercial fisheries and because much more is known about its behavior and life history in the Hudson River, almost all the evidence adduced in these hearings dealt with the effect of plant operation on this species .

While some consideration was given to the effect of the plant on fish over 3 months old, the most serious impact on the plant would be on the egg, larvae and very early fish stages. At these stages, the relationship of the spawning and nursery beds of striped bass in the Hudson River relative to the Indian Point 2 plant becomes an important factor. All parties agreed that spawning takes place in fresh water from just below the Indian Point location (Haverstraw Bay mile point 38) to as far north as Coxsackie (mile point 125). The main nursery ground appears to be south of the Indian Point location (Haverstraw Bay to the Tappan Zee Bridge area). Much of the data used by all parties came from the work of

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202/ RAI-73-9 at 761.

Carlson and McCann[203] in their study of the effect of the Cornwall pumped storage project on the Hudson River fish. This study was financed by Consolidated Edison and managed through the Hudson River Policy Committee.[204] This committee is continuing to supervise studies for Consolidated Edison at Indian Point.

Agreement among the parties, however, did not go beyond the basic life cycle of the striped bass. The estimates of the effect of the plant on the egg, larva and young fish were widely different. All parties developed models to show the effect of the plant but results from these models varied.

The initial decision contains a summary of the models proposed by the applicant, staff and HRFA. From the results obtained from these models the Licensing Board concluded that no one really knew

> in detail what activities of life go on in the unseen depth of the Hudson River nor what the future response to changing inputs is going to be .

Therefore, the Board stated, "the experts are free to choose their own assumptions", resulting in testimony which did not provide "answers that can be agreed upon, or that give

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203/ The Hudson River Fihseries Investigations, 1965-1968, Report of Policy Committee. Evaluation of a Proposed Pumped Storage Project at Cornwall, N.Y., Hudson River Policy Committee.

204/ See infra, p. 160.

clear guidance to a Board" (RAI-73-9 at 762).

The Licensing Board concluded (RAI-73-9 at 766):

> the impact of one year of plant operation is unlikely to be as great as is predicted by the Staff and HRFA. However, Applicant's conservative calculations show reductions in striped bass population of 20 percent in the fifth year and 35 percent in the tenth year for operation of the Indian Point Unit Nos. 1 and 2, and 40 and 60 percent for operation of all plants now on river, including Unit Nos. 1 and 2. For the present, it is only prudent to assume that the impact of operation of the plants as they are presently designed will be at least that great.

We first note that the characterization of these results as "Applicant's conservative calculations" is incorrect. The results quoted were obtained by the applicant on specific directions from the Board to calculate the effects if compensation and the so-called f factors were eliminated.[205/] Our detailed review convinces us that the Board's conclusion is not warranted on the record. Consideration of each of the major models involved will give the basis for our conclusion.

205/ Applicant's actual statement of its most conservative calculations are: reductions in striped bass population due to Indian Point 1 and 2 are five percent in fifth year and six percent in tenth year. (Testimony of Lawler, "Effect of Entrainment and Impingement at Indian Point . . .", Oct. 30, 1972 (after Tr. 6256), at Table 24 after p. 78. In later testimony (Additional Testimony of Lawler, March 30, 1973 (after Tr. 10,339) at Table II-4 after p. II-19) applicant indicates that its realistic estimates show reductions of 3% and 5% for the fifth and tenth years, respectively, of operation of Indian Point 1 and 2.

The HRFA model[206/] was the simplest of the models proposed, but obviously overestimated the percentage reductions in the striped bass population for two reasons:

(1) The model assumed mortalities caused by natural phenomena and by Indian Point 2 (or other plants) would be additive rather than competitive.

(2) The model used an estimated total population of striped bass in the Hudson River for each life stage -- i.e., eggs, various larval and juvenile stages and through 1-year old fish.[207/] From this, and a calculated total volume of water in the active spawning section of the river, an average for the population of various levels of bass (eggs, larvae and juveniles) was obtained for each 1000 cu. ft.

206/ See testimony of John Clark, "Certain Effects of Once-Through Cooling Systems of Indian Point Units Nos. 1 and 2 on Hudson Estuary Fishes and Their Environment", July 14, 1972 (after Tr. 6276).

207/ Applicant's witness Lawler divides the growth stages of striped bass into eggs, larvae and three stages of juvenile fish during the first year of life. On the average, the eggs will take 1.5 days to hatch into larvae. A larva will in turn live, on the average, 28 days before maturing into a more mobile Juvenile I fish. Lawler indicates a Juvenile I stage of approximately 80 days, Juvenile II, 100 days, and Juvenile III, the remainder of the year (154 days). See testimony of Lawler, "Effect of Entrainment and Impingement at Indian Point on the Population of Hudson River Striped Bass", October 30, 1972 (after Tr. 6254), Figure 5 after p. 13.

> of water. Assuming that each 1000 cu. ft. of water has an equal chance of being drawn through the plant cooling system and that all levels of eggs and larva so entrained will be killed, HRFA obtains a kill percentage. This resulted in a much higher figure than either staff or applicant previously estimated because no allowance was made for actual distribution of spawning and the time factors involved.

We also note that HRFA witness Clark admitted that he put himself "on the horns of a dilemma" by using one set of striped bass population figures to estimate percentage kills, and later, a much higher population figure to show that very large numbers of fish would be required to restock the river. We agree with the Licensing Board's comment on HRFA testimony (RAI-73-9 at 763):

> "The evidence in the record indicates that the impact of one year of plant operation on the production of Year Class 1 striped bass is likely to be less than was predicted by HRFA. The uncertainty is large enough that the HRFA analyses do not provide a satisfactory basis for deciding whether the Applicant's predictions or the Staff's predictions are more likely to be correct for comparable conditions".

We therefore turn our attention to a comparison of the applicant's and the staff's models.

The major difference between the initial models of the staff and applicant was in their treatment of the effect of the tides on the transport of eggs, larvae and young fish past the Indian Point facility. Both parties adopted the thesis that the incoming salt water would tend to flow in under the outflowing fresh water, giving a layered effect of incoming and outgoing water. (The evidence shows that this is an oversimplification since considerable vertical mixing does occur, as is evidenced by the gradual decrease in salinity from the bottom of the river to the top, rather than a sharp change in salinity at a particular depth. See FES at A-V-44.)

The staff model averaged the effect of ebb and flood conditions over a 24-hour period which resulted in any specific particle or larva in the river at the Indian Point location passing back and forth past the plant location many times -- a "continuous belt" effect. This continuous belt, being constantly fed from upstream during the larval period, also results, under the staff theory, in a pile-up of larvae at the salt front, which under some flow and tide conditions can be directly in the Indian Point location. The staff also assumes uniformity of the egg, larval and fish population across the river and

throughout the depth. These assumptions of the continuous belt in front of the Indian Point facility, and uniformity of mixing combined with the relatively high percentage of the total river water flow used by the Indian Point facility during the spawning period, result in the calculations showing a high percentage of eggs, larvae and young fish being entrained by the facility during the spawning season.

The applicant's model is more complex than the staff's in that it takes into account the vertical mobility of the striped bass larvae. In its Redirect-Rebuttal testimony,[208] the applicant points out that the larval striped bass make vertical diurnal migrations, tending to concentrate near the bottom during daylight and moving upward at night. Since the hours of daylight are considerably more than hours of darkness during the spawning season, the staff's averaging of ebb and flow conditions over 24 hours does not take into account the greater percentage of time spent by the larva in deep water. Applicant's model averages those conditions over three-hour periods (or as small as 1-hour periods), with the result that

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208/ Redirect-Rebuttal testimony of Lawler, "On the Mathematical Model Used by the Staff to Estimate the Effect of Indian Point Units 1 and 2 Entrainment on Hudson River Striped Bass", February 20, 1973 (after Tr. 9407), at pp. 4-15.

entrainable larvae are carried both up and down the river in the region of the salt front at a slower rate and, therefore, make fewer trips past any one point than in the staff's relatively rapidly moving continuous belt.

Staff witness Goodyear admitted this difference under cross-examination (Tr. 9257-9269), and also admitted that the endless belt concept made the entrainment estimate insensitive to input parameters such as conditions of flow and migration factors (Tr. 9293).

We believe the weight of the evidence presented shows that the applicant's model using the three-hour averaging more nearly conforms to reality and is superior to the staff's model. Therefore, we conclude that the staff's estimate of entrainment due to their endless belt concept is too high.

c. A second and more important difference in the models results from a modification which the applicant made to its model during the licensing proceeding.[209] As stated previously, both the applicant's and staff's initial models assumed a uniform mixture of eggs, larvae and juvenile fish throughout the width and depth of the river.

209/ Testimony on f factors was introduced by applicant's witness Lawler in his testimony on "Entrainment and Impingement", October 30, 1972 (after Tr. 6254).

The applicant introduced evidence to support its theory that the life style of the striped bass and the river dynamics produced significant variations in this uniform mixing concept which, in its opinion, resulted in considerably less entrainment than originally calculated. To identify these variations the applicant introduced the so-called plant impact, or f factors, which are defined as follows:210/

f_{1_i} = ratio of the daily average river concentration (for each of eggs, larvae, juveniles) in the general vicinity of the plant to the area average concentration across the width of the river at the plant location.211/

f_{2_i} = ratio of intake concentration to concentrations in vicinity of plant.

f_{3_i} = ratio of actual concentration in immediate vicinity of plant to normal concentration in vicinity of plant if population in the immediate vicinity is not immediately replaced when plant is in operation.

f_c = (cropping factor) fraction of living organisms in intake that are killed during passage through the plant.

In its review of the data, applicant concluded

210/ Lawler October 30, 1972 testimony on "Entrainment and Impingement", Oct. 30, 1972 (after Tr. 6254) at p. 32.

211/ The subscript "i" refers to the particular life stage to which the factor applies, i.e., one may substitute the word eggs, larvae, or juveniles, as appropriate.

that there were insufficient data to consider f_3 at any other value than 1.0 and that f_2 and f_c could only be considered as less than 1.0 for Juvenile I fish. It did, however, maintain that f_1 should be less than 1.0 for all categories -- eggs, larvae and Juvenile I. The staff, on the other hand, maintained in its Brief[212/] that "[T]he staff evidence and cross-examination demonstrated that there was no substantial basis for estimates that such factor (f_1) is less than 1". Our review of the record does not reveal any sound evidentiary basis to support the position in the staff Brief.

Our review of the testimony indicates that at least with respect to the depth distribution, both the applicant and staff data support an f_1 factor of considerably less than 1. The staff witness' statement[213/] in this respect appears to completely miss the point. He concludes that "withdrawal of water from the upper flow layer also includes

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212/ Brief in Opposition to Applicant's Exceptions at p. 29. This Brief references Tr. 9892, 9859, 10,349; none of these references are specific. These transcript pages are each followed by detailed written testimony on many subjects. This method of citation in a brief is not helpful and is unwarranted.

213/ Redirect-Rebuttal testimony of Goodyear, "Susceptibility of Larvae to the Intake at Indian Point 2", February 22, 1973 (after Tr. 9892) at p. 4.

organisms at the 'bottom' in a shallow zone". This is not supported by the evidence -- the intake is in a zone where the river bottom is sloping gradually down from the shore and is at a depth of approximately 30 feet. (See e.g., Tr. 9298.) The data in Table A-V-15 of the FES show that during the day over 80% of the larvae are at 30 feet or below, while at night generally over 70% are at 30 feet or below. The same table indicates that the percentage of total larval population at 45 feet or below varies from 49% to 84 (averaging approximately 70%) in the daytime, and from 47% to 96% (averaging approximately 63%) at night. The staff further acknowledges in the FES (A-V-73):

> A significant diurnal variation was observed (Table A-V-15). Thus, the data used in this analysis showed a vertical variation for each transect (but one) which was confined to the transect and did not contribute any large degree of lateral movement to deeper water during the day. [Emphasis added]

In other words, the large percentage of larvae in deep water noted above do not move laterally toward the intake structure.

Similarly, the data on Juvenile I fish, which is summarized in FES Table A-V-10, shows that they tend to seek the bottom of shallow shoals with water of 10 to 12 feet

deep.[214] This would place those juveniles that happen to be near the eastern shore at the Indian Point 2 vicinity well behind the intake structure. Those on the western shore of the river at this point will, of course, be too far (~1 mile) from the intake to be disturbed by it.

We are convinced from these considerations that the intake will draw water from a zone which contains populations of larvae and Juvenile fish which are significantly lower than the average population in the river water.

d. The other major facet in the f factors for which there is an evidentiary basis for assigning an f value less than unity, is the intake avoidance factor for juveniles which are capable of swimming against the intake flow. This is the only intake avoidance factor which the applicant takes to be less than 1, and it assumes a best estimate of 0.5. Intervenor HRFA assumes that in the early

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214/ HRFA witness Clark has stated agreement with this and points out that the later Juvenile I generally "become less pelagic and more bottom oriented" and "once they abandon the pelagic life habit they are no longer uniformly distributed through the water and subject to simple entrainment in the plant cooling water". Testimony of John Clark, "On Certain Effects of Once-Through Cooling Systems of Indian Point Units Nos. 1 & 2 on Hudson Estuary Fishes and Their Environment", July 14, 1972 (after Tr. 6276) at p. 31.

juvenile stage the entrainment factor would be between 0.5 and zero,[215] which is consistent with the applicant's use of f_2 as 0.5.

On the basis of these data, as warranted by the evidentiary record, we must conclude that a value of considerably less than 1 for the combined f factors has been justified by the applicant.

The Licensing Board, in discussing the f factors, stated that

> it is desirable to provide for such effects in a model * * * and that the Applicant has some justification for its best estimate of combined f factors. Because of the large uncertainties in the data, however, the Board considers the calculations with the combined f factors equal to 1 to be appropriately conservative. [216] [Emphasis added]

While uncertainties of the data may be too great to support fully the applicant's "best estimate", we are convinced that the evidentiary record, particularly the portions discussed above, clearly support the applicant's "apparent maximum"[217] value of the combined f factors.

215/ Ibid.

216/ RAI-73-9 at 765.

217/ Testimony of Lawler, "Effect of Entrainment and Impingement at Indian Point on the Population of Hudson River Bass", October 30, 1972 (after Tr. 6254). Table 20 (after p. 63) of this testimony gives the apparent maximum combined f factor values as: eggs, 0.5; larvae, 0.55; Juveniles, 0.3.

e. The third major area of disagreement concerning the models was the applicant's consideration of compensation as a factor in the overall effect of the Indian Point 2 facility on the Hudson River fish. Applicant's witness McFadden introduced the concept of compensatory reserve, as applied to striped bass, to the record in his testimony dated October 30, 1972.[218/] In the summary of his testimony, McFadden stated:

> The life history of striped bass in the Hudson River, basic concepts of population dynamics applicable to Hudson River fishes, and specific examples from scientific studies of striped bass on the Atlantic and Pacific coasts of North America are summarized. It is shown that striped bass populations typically fluctuate in abundance over more than a four-fold range and that they have substantial compensatory reserve. This compensatory reserve enables striped bass populations such as that of the Hudson River to offset, through increases in natural survival rates, losses imposed by the activities of man. A large number of scientific studies which demonstrate that annual removals of 25 to 30% are commonly sustained by fish stocks are summarized. Consistent with this general observation of exploited fish stocks, striped bass in New York waters have persisted or even increased in numbers during periods of increasing exploitation by man.

Both the staff and HRFA disputed the McFadden testimony. HRFA witness Clark in his testimony[219/] stated at page 49:

218/ Testimony of McFadden, "Impact of Entrainment and Impingement at Indian Point 1 and 2 upon Fish Populations", October 30, 1972 (after Tr. 6254), at p. 3.

219/ Testimony of John Clark, "Effects of Indian Point Units 1 and 2 on Hudson River Aquatic Life", October 30, 1972 (after Tr. 6276).

> The principle of overcrowding is generally accepted by fresh water fishery experts. It is quite demonstrable that if too many fish are crowded into a pond or small lake, the result is that individual fish become stunted from a shortage of food and do not reach a size desirable to fishermen.
>
> No applicable experimental results demonstrating overcrowding in a natural estuary are known to me.

and on page 51 he further states,

> . . . [F]rom the information at hand one gains the impression that the Hudson estuary is carrying less than its natural capacity of demersal fishes, rather than more. * * * Consequently, it appears that there would be no beneficial compensatory effect from thinning populations by killing fish at Indian Point.

Staff witness Goodyear presented the theory that, while there may be other compensatory mechanisms, the main one was the amount of commercial and sports fishing.[220/] Goodyear further stated his belief that there was no compensation operating during the first year of life of the striped bass (Tr. 6689). The witness based this statement on the assumptions that such compensation was only applicable if the spawning and nursery areas were

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220/ The staff emphasizes this in responding to one of our written questions by quoting Dr. Goodyear's February 22 testimony in which, in discussing the growth of the striped bass population along the Atlantic coast, he says: "There is no indication that this increase has reached the limiting capacity of the environment". See Staff responses dated January 25, 1974 to our questions, at p. 37.

saturated and that such saturation was not the case with striped bass in the Hudson River (Tr. 6727-28). However, he later admitted that compensation in other animals was strongly exhibited even as their numbers were reduced toward extinction (Tr. 6750). It should also be noted that while Goodyear claims compensation requires a saturation condition through the first three years, he does not require this for compensation to be effective after the fish reach three years old (first year of recruitment to the fishery. Tr. 6734).

It certainly appears that the staff witness does not understand that compensation, as discussed by the applicant, while density dependent, does not require saturation. However, he presents no evidentiary basis for his conclusion that saturation is required for the operation of density dependent compensation.

In rebuttal to HRFA and staff testimony, applicant's witness McFadden supplied specific support for his position.[221/] McFadden provides a list of references[222/] to show that

> "[C]ompensatory processes have been shown to be operative in estuarine and high seas fish

221/ Rebuttal testimony of Dr. McFadden, "Effects of Indian Point Units #1 and #2 on Hudson River Fish Populations", February 5, 1973 (after Tr. 9405).

222/ Id. at p. 3 and Table 1, p. 5.

> populations including striped bass and indeed are operative in all animal populations".223/

Finally, we note that the applicant's position does not depend only on compensation in the first years of the striped bass life cycle. Applicant's witness McFadden stated in his testimony,224/ "While compensatory changes in population may occur at any stage of the life cycle, they usually are most effective early in life". In later redirect testimony, McFadden emphasized his original statement by stating:

> "If we would detect a substantial impact on the early life stages, we would be conservative if we assumed that that level of impact was also passed on unmitigated to the adult stages of the population, and the reason I say that is that it would be possible for a plant-imposed impact on the early stages of the life history to be partially offset by some compensatory response of the older fish in the stock, and should we gauge the impact as being passed on proportionately from young stages to old, as I say, we would be conservatively estimating the impact on the adult stock" (Tr. 9517).

We conclude from the record that compensation during the entire life cycle of the striped bass can be expected to be a factor in offsetting losses incurred by the operation of the Indian Point facility.

223/ See also Dr. Lawler's answers to questions on redirect at Tr. 10,124 to 10,129.

224/ Testimony of Dr. McFadden, "Impact of Entrainment and Impingement . . . ", October 30, 1972 (after Tr. 6254), at p. 10.

f. The applicant objects in its exception 11 to the Licensing Board's finding (RAI-73-9 at 771), that

> "[t]o the extent that the other species use the river in the vicinity of Indian Point as a spawning and nursery ground, one must expect that the impact of once-through cooling on the populations of those fishes will be similar to the impact on the population of striped bass".

This finding, the applicant asserts, is not supported by the record which contains, for the most part, unsubstantiated speculations relating to the adverse impact on fish species other than striped bass.[225/]

The FES points out that because

> "the striped bass is economically important for both sport and commercial fisheries, the staff has analyzed in greatest detail the probable impact of plant operations on the population of this species that are maintained by recruitment from nursery areas in the Hudson River" (FES-V-40).

Even though the controversy has focused on the impact of once-through cooling on striped bass, the record also indicates that other species of fish will be affected (see e.g., FES V-39). But, in the words of the Licensing Board (RAI-73-9 at 771),

> "the data available do not permit any firm conclusions to be drawn concerning the impact . . . on the populations of other species of fish in the Hudson River".

225/ Applicant's Brief at pp. 36-38.

For species other than striped bass, "nothing about the magnitude of the impact of once-through cooling is available in the testimony of this proceeding". (Ibid.)

With the foregoing as background, it is understandable why the Licensing Board qualified its "one must expect" language with the words "[t]o the extent that the other species use the river in the vicinity of Indian Point as a spawning or nursery ground". We view this to mean that if any other species had a life cycle the same as striped bass (i.e. migratory and whose migratory path for reproduction purposes is in the river area of the Indian Point site), then "one must expect" that the impact on such species to be similar to the impact on the striped bass. But the record does not show that there are such other species. In any event, we do not agree with the applicant[226/] that the Licensing Board's decision to require a closed-cycle cooling system by May 1, 1978 rests on the adverse impact which might occur to species of fish other than striped bass.

4. We now consider the issues raised by the applicant's exceptions 14-18, which generally concern the schedule for cooling tower planning and construction.

226/ Applicant's Brief at p. 437.

The Licensing Board notes[227/] that the applicant proposed a schedule by which it would release the specifications for bids in May, 1977, with excavation to start in January, 1978, and the tower to be in service in September of 1981. A later schedule provided by the applicant provided for excavation to begin in January, 1977, and service by September, 1980.[228/] A third schedule of the applicant called for excavation to start in May, 1976, and service in November of 1979.[229/] This schedule considered a slippage from February, 1973, to May, 1973, in the beginning of the environmental studies. (Later statements by the applicant indicate the studies did not get underway until September 1, 1973.[230/]) The staff proposed a schedule calling for the tower to be in service by January 1, 1978, and the intervenors proposed a schedule for service by January 1, 1977.

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

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227/ RAI-73-9 at 775.

228/ Testimony of Newman, "Alternative Closed-Cycle Cooling Systems at Indian Point 2", October 30, 1972 (after Tr. 6254), in Table A.

229/ Redirect-Rebuttal testimony of Newman, "Alternative Closed-Cycle Cooling Systems . . .", February 5, 1973 (after Tr. 9405) in Exhibit 1.

230/ Applicant's Brief at p. 44.

cooling. The events which must occur prior to the initiation of those steps may not be as apparent. These events include the submission of the applicant's environmental report on the effects of a closed-cycle cooling system; staff consideration of that report as well as the applicant's reports on environmental effects observed during interim operations with once-through cooling; and regulatory approvals from all required agencies (see infra, p. 145). Although the applicant must act with due diligence in carrying out its responsibilities with regard to these matters, it is beyond dispute that the applicant cannot control the time required for regulatory actions. And, moreover, we are not endowed with the powers of clairvoyance which would enable us to know how those matters will be resolved or when. Thus, a fundamental point which should be understood is that the reasonableness of the construction schedule has to be judged on its own merits and the necessary time provided (see infra, p.148). In view of the uncertainties which surround the events over which the applicant has no control, tying the completion of construction now to some date certain in the future would not appear to be correct. We must consider whether the Licensing Board's fixed dates of May 1, 1978 for termination of once-through cooling cycle operation,

and December 1, 1978 for resumption of plant operation with a closed-cycle system, are appropriate on the basis of the record before us.

a. We now consider the Licensing Board's approach in concluding that the tower could be in service by December 1, 1978.[231/] It developed this date by successive steps:[232/]

(1) Enough data are already available or currently being obtained to permit the submission of a "satisfactory environmental report to the Staff by March 1, 1974".

(2) "the reviews can be completed and necessary approvals obtained before March 1, 1975".

(3) "it should be feasible to complete the project in 45 months after March 1, 1975, or December 1, 1978".

As set forth in our order (ALAB-174), the date of March 1, 1974 was not realistic and the due date for the environmental report has been established as December 1, 1974.

By accepting the applicant's proposed finding M29, the Board agreed that 12 months is appropriate for agency approval of the environmental report of the closed-cycle cooling system. The record adequately supports this.

231/ RAI-73-9 at 775.

232/ Ibid.

Witness Newman named several federal, state and local agencies which must be contacted.[233] The staff response to our questions listed the following federal and state agencies from which approvals for the closed-cycle system must be obtained:[234]

The Atomic Energy Commission

The State of New York:

Department of Environmental Conservation, and Public Service Commission

U.S. Corps of Engineers

Environmental Protection Agency

Federal Aviation Administration

National Register of Historic Places

The staff reply further stated:

> . . . The staff did estimate that three to six months would be a reasonable period of time required for the AEC regulatory staff to complete its evaluation of the Environmental Report (Tr. 6957).[235]

We can find no record justification for the Licensing Board's statement that

> [t]he time allowed for review and approval by state and federal agencies reflects the

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233/ Tr. 7572-73.

234/ Staff responses dated January 24, 1974 to our written question 29, at p. 2.

235/ Ibid.

> view that agencies, which have already taken a position in favor of cooling towers, should be able to expedite the approvals. 236/

Similarly, we find no support for the opinions on this point expressed by intervenors HRFA and the State of New York.

HRFA says "[t]he necessary reviews may be carried on simultaneously . . ."237/ This is obviously in error as far as simultaneous review by the Commission and other agencies are concerned, since Commission regulations require the staff to prepare a draft statement which is then sent to other agencies for comment.238/ The State of New York cites the staff's statement that Commission review would take between three and six months, and then goes on to say,

> "[t]here is no reason to assume, and there is no reason in the record to indicate, that other governmental agencies will take twice as long as the AEC to complete their review procedures".239/

This position misapprehends the events which must take place during the proposed review period. The twelve-month review period is supposed to provide time for: AEC review of the applicant's environmental report and all other

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236/ RAI-73-9 at 775. We hope the Board did not mean to suggest that the agencies have already decided on the tower requirement without due consideration of the possible adverse data resulting from the on-going environmental study of tower effects.

237/ HRFA Memorandum in Support of Exceptions, at p. 6.

238/ Appendix D to 10 CFR Part 50, Section A, para. 6.

239/ Brief on Exceptions of the State of New York at p. 5.

relevant reports; the preparation of a draft environmental statement; circulation of that statement to other interested agencies for comment; the preparation of a final environmental statement; and the completion of all other regulatory reviews and approvals which may be required for the cooling system. All of these steps must be performed within the twelve months review time.

The Licensing Board found twelve months after the submission by the applicant of its environmental report to be an appropriate time for review. We consider this to be a minimum time required for agency review and approval if normal procedures are followed. As it had already established March 1, 1974 as the date by which the applicant's report must be submitted, it then set March 1, 1975 as a "reasonable" time limit for completion of review.[240/] By our order (ALAB-174), we modified the due date for the applicant's report to December 1, 1974, hence, the review completion date must also be extended. Exception 14 is granted and the Licensing Board's finding is modified by changing March 1, 1975[241/] to December 1, 1975.

The findings and conclusions of this decision, the

240/ RAI-73-9 at 775.

241/ Ibid.

results of the applicant's research program to the extent they may be available, as well as full consideration of the environmental impact of a closed-cycle cooling system, may well require extensive revision of the FES in the record of this proceeding. The outcome of the present environmental study on closed-cycle cooling and the results being obtained by the applicant's research program are, of course, not known at present. Thus, we cannot determine what modifications of the FES may be forthcoming and what effects these may have on the tower requirements. Further, we are not now aware what, if any, additional administrative proceedings may be requested and conducted. Therefore, we consider the construction schedule for the tower on the basis of the present record in terms of the reasonableness of the time which the parties assert is needed for the several sequential steps required for the design and construction of the tower, rather than in terms of fixed dates. (Supra, pp. 142-143.) Our order in this proceeding provides necessary flexibility for any adjustments caused by events such as we have discussed. (Infra, pp. 185-186.)

At the outset, we note that there is a sharp disagreement among the parties on the time needed for a reasonable design and construction schedule. HRFA and New York except to the Board's findings that December 1, 1978 is a feasible date for completion of the closed-cycle cooling system, contending that this allows a year more than necessary.[242] Applicant's exception 15 contends that the Board's estimate of construction time is too short.[243]

b. We now discuss the schedule for the steps which will be necessary, in the event that the decision is made that the tower must be constructed, and after all governmental approvals necessary for the initiation of construction have been granted.

(1) The Licensing Board accepted[244] the applicant's proposed finding M30 which states "three months are required to finalize engineering and incorporate Federal and State agency recommendations" and an additional two months for awarding the contract. This total 5-month period was concurred in by the staff with a slightly different breakdown.[245]

242/ HRFA's Brief at pp. 6-9, 19, and New York's Brief at pp. 4-9.

243/ Applicant's Brief at pp. 45-47.

244/ RAI-73-9 at 783.

245/ Redirect-Rebuttal testimony of Knighton, "Supporting Information for Staff Testimony on Cooling Towers", February 22, 1973 (after Tr. 9892) at p. 3.

The applicant's proposed finding M31

> shows three (3) months are necessary to obtain information from the vendor required to produce detailed final engineering designs and one month to mobilize a work force.

The proposed finding then goes on to say "[w]e find this four-month period reasonable for these purposes". The Licensing Board accepted this entire finding. While we agree the two individual periods mentioned are reasonable, we do not find adequate evidence to support their running consecutively as proposed by the applicant. The applicant does not state in its proposed finding that four months are required for producing the detailed drawings and the flow chart submitted by witness Newman[246/] does not show a time overlap in these two operations. We see no reason why the work force cannot be obtained and excavation started while these detailed drawings are being completed. Thus, excavation should start one month after the contract is awarded.

(2) The question of excavation, both problems and schedule, presents no agreement among the parties. The staff does not break out this item in its analysis of the construction

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246/ Redirect-Rebuttal testimony of Newman, "Alternative Closed-Cycle Cooling Systems . . .", April 9, 1973 (after Tr. 10,339), Exhibit F.

schedule but, rather, it justifies its schedule by comparison of Indian Point and other plants having towers,[247/] i.e., Davis-Besse, Vermont Yankee and Palisades. Davis-Besse is the only example in the staff comparison with a natural draft tower. The construction problems for such towers are radically different than those for mechanical draft towers. Dr. Aynsley, an HRFA witness, arrived at his estimate of construction time largely by consultation "with those involved in the construction industry".[248/] He testified that in his professional endeavors he had not been responsible for construction work of this magnitude or on this type project, and he had never been responsible for the design of cooling towers.[249/] Furthermore, he had not "discussed the construction schedule for towers at Indian Point No. 2 with any constructors or cooling tower manufacturers".[250/] In response to questioning he said, "[i]t is a general and typical time given by a manufacturer . . .".[251/] In short, Dr. Aynsley showed little, if any, first hand professional knowledge of cooling tower

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247/ Redirect-Rebuttal testimony of Knighton, "Supporting Information for Staff Testimony . . . ", February 22, 1973 (after Tr. 9892) at pp. 2-3.

248/ Tr. 8950.

249/ Tr. 8902.

250/ Tr. 8949.

251/ Tr. 8951.

construction. He cited the schedule of a tower for the Northern Indiana Public Service Company.[252/]

We do not find these comparisons and general schedules convincing. The Indian Point No. 2 tower would, if built, be the largest diameter tower.[253/] Northern Indiana, on the other hand, is a natural draft tower which is significantly different from the proposed Indian Point tower.[254/] The Northern Indiana plant rating is only 60% of that of Indian Point, and its tower is approximately 100 feet smaller in diameter and height than the proposed tower here. The location of the tower vis-a-vis the Northern plant required much less auxiliary construction than will be required here because of differing conditions in this regard at Indian Point.

Intervenor witness Aynsley makes a rough approximation that the excavation would take nine months[255/] and indicated his construction time estimate could be modified for "extensive excavation and possible blasting". He admitted lack of familiarity with the Indian Point site

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252/ Tr. 8960.

253/ Tr. 9004-05.

254/ Redirect-Rebuttal testimony of Newman, "Alternative Closed-Cycle Cooling Systems . . .", February 5, 1973 (after Tr. 9405) at p. 4.

255/ Tr. 901

and with various aspects of the problem of towers at Indian Point.[256]

Excavation times cannot be obtained by comparison with other plants cited by the staff and intervenor. The Northern Indiana tower is located on flat sand-clay soil and required no rock excavation or piling.[257] Vermont Yankee required very little rock removal and the tower is built on a compacted earth base.[258] Davis-Besse soil is quite different than Indian Point. The latter tower will require 70 feet of rock excavation.[259] Normal rock excavation techniques are restricted because of the proximity to the operating reactors. The applicant has had considerable experience in excavating on the site and on the basis of this experience changed a preliminary estimate of 6 months to 12 months.[260] The evidence supports the applicant's figure of 12 months for excavation as set forth in his proposed finding M32. The Licensing

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256/ E.g., Tr. 8902, 8951, 8997, 9002.

257/ Redirect-Rebuttal testimony of Newman, "Alternative Closed-Cycle Cooling Systems . . .", April 9, 1973 (after Tr. 10,339) at p. 26.

258/ Ibid.

259/ Tr. 9021.

260/ Redirect-Rebuttal testimony of Newman, "Alternative Closed-Cycle Cooling Systems . . .", February 5, 1973 (after Tr. 9405), Exhibit 1; Redirect-Rebuttal testimony of Newman, same subject, April 9, 1973 (after Tr. 10,339), Exhibit F and at p. 30.

Board's statement rejecting in part that proposed finding "as not being firmly established enough to reach conclusion" is unclear as to which part is not firmly established. The original 6 months figure for excavation was a preliminary estimate and was firmed to 12 months on the basis of further investigation. On the basis of our review of the record, we find 12 months to be a reasonable time for excavation.

(3) The applicant has testified that after completion of excavation, 27 months will be required for construction with three more to complete cut-over.[261] This is generally within the range of the staff's estimate of two to three years for construction,[262] including excavation, recognizing that the staff allowed only six months for excavation.[263] Dr. Aynsley testified that excavation and construction would require 18 to 24 months.[264] We have

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261/ Redirect-Rebuttal testimony of Newman, "Alternative Closed-Cycle Cooling Systems . . .", April 9, 1973 (after Tr. 10,339), Exhibit F.

262/ Tr. 6939; Redirect-Rebuttal testimony of Knighton, "Supporting Information . . .", February 22, 1973 (after Tr. 9892) at p. 3.

263/ The staff primarily based its estimate of two to three years on its knowledge or experience with other towers where foundation conditions and construction problems, such as limited blasting, were quite different than here.

264/ Testimony of Aynsley, "Alternatives to Once-Through Cooling at Indian Point Unit No. 2", April 5, 1972 (after Tr. 4839), at p. 25; and Tr. 8961.

already commented on his testimony (supra, at p. 151).

On the basis of all of the foregoing, in the event the decision is made that the tower must be constructed, we find that a period of 48 months, to run from the date at which all governmental approvals necessary for the initiation of tower construction have been received, is a reasonable time to allow for that construction. The 48 months for construction will have the effect, if the contemplated schedules for all required governmental decisions are adhered to (supra, at pp. 146-147), of extending the final date for cessation of once-through cooling operation for approximately one year beyond May 1, 1978.[265] We find on the basis of the record in this proceeding that this additional year of once-through cooling operation will not

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265/ The text discussion also is responsive to the issues raised by the applicant's exception 17 which concerns statements by the Licensing Board which, generally speaking, questioned the reasonableness of the applicant's proposed construction schedule.

In its exception 18, the applicant asserts that the Licensing Board did not provide adequate time for the completion of its research program and for relief (from the fixed May 1, 1978 date) if favorable data comes from that program. Under the new schedule established in the text, excavation does not need to start until about June 1976. If before that time the results from the research program provide, in the applicant's judgment, an adequate justification for modification of the requirement, it may file a timely request for that purpose.

cause significant adverse impact to the environment (supra, at pp. 111-117). We note in this regard that the Licensing Board appears to agree, for it stated (RAI-73-9 at 780):

> The Board agrees with the Applicant that there is unlikely to be a serious permanent effect on the fishery by a delay of a year or two in starting construction of a closed-cycle cooling system.

It is to be noted that the 48-month period does not allow for unforeseen contingencies beyond the applicant's control. Should any such event occur, the applicant may, of course, request an appropriate extension. Conversely, 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.

c. Applicant, in its exception 16, objects to the Licensing Board's finding that the "[e]vidence does not demonstrate the need for 5 months' outage in addition to normal refueling outage". Accordingly, the Board "[r]ejected in part" applicant's proposed finding M13.[266/] The applicant believes this finding of the Board "is not supported by the record".

266/ RAI-73-9 at 785.

In its opposition brief the staff claimed the "exception is of no significance" because the Board provided for 7 months outage during the last part of the construction.[267] The HRFA made essentially the same argument in its brief, saying that by providing the 7-month period "[t]he Board recognized and accepted Con Edison's argument regarding the outage period required in installation of a closed-cycle cooling system".[268]

It is not clear that the Board allowed the time required to make the change-over. The Board concluded "that it should be feasible to complete the project within 45 months after March 1, 1975, or by December 1, 1978".[269] It then says

> [t]he Applicant estimates that Unit No. 2 will have to be shut down during the last seven months of the construction period, or, on this schedule, from about May 1, 1978. [270]

At first glance this appears to grant the applicant the appropriate seven-month interval to effect the change-over. However, the Board's statements need to be evaluated in

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267/ Staff Brief in Opposition, at p. 43.

268/ HRFA Brief in Opposition, p. 77.

269/ RAI-73-9 at 775.

270/ Ibid.

light of the evidence presented by the applicant to support the need for seven months.[271/] The various phases of the required work and work flow chart were presented in this testimony. The flow chart shows in detail the relation of the various steps to one another. Certain of this cut-over work may be performed while the tower construction itself is being completed, but other parts of it mustwait the completion of the tower. Applicant's testimony shows the latter phase is expected to require the last three months of the seven-month overall period.[272/] This evidence was not refuted by the other parties and, in fact, the Board itself recognized the need for the seven months.[273/] However, the outage time cannot begin seven months before the completion of the tower as stated by the Board.

The Board's partial rejection of proposed finding M13 and its agreement that seven months are needed, appear to be in conflict. Regardless of the interpretation placed on the Board's allowance of seven months, the period should start four months, not seven, before completion of the tower itself.

271/ Testimony of Newman, Alternative Closed-Cycle Cooling Systems . . .", October 30, 1972 (after Tr. 6254) at p. 13.

272/ Redirect-Rebuttal testimony of Newman, same subject, February 5, 1973 (after Tr. 9405) at pp. 3-4 and Exhibit 3.

273/ RAI-73-9 at 775.

5. The applicant's exception 21 is directed to three separate findings in which the Licensing Board, in effect, asserts that the applicant's proposed research program will not accomplish its intended purpose in the time available. These findings, in essence, are that the

> . . . natural variations in the populations and phenomena being observed are so great as to make it unlikely that the Applicant can provide in a period as short as five years a statistically valid demonstration that the adverse impact of Unit No. 2 operations on the river ecology is acceptably small;

the program "will not provide a direct answer to the question" of the effect of Indian Point No. 2 operations may have on the Middle Atlantic striped bass fishery; and the research program is "unlikely to resolve the important questions". RAI-73-9 at 780.

a. The scope and objectives of the research program are set forth in the testimony of applicant's witnesses McFadden and Woodbury.[274/]

They testified that the research studies will be in four general fields:[275/] meteorological, botanical, noise, and biological. The first three of these are designed to

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274/ See testimony of McFadden and Woodbury, "Indian Point Studies to Determine the Environmental Effect of Oce Through vs, Closed Cycle Cooling at Indian Point Unit No. 2", February 5, 1973 (after Tr. 9405).

275/ Id. at pp. 2-3.

determine the effects of a closed-cycle natural draft wet cooling tower. The fourth one is concerned with (1) determining the effect of cooling tower operation on the biology of the river, and (2) evaluating the effects on the ecosystem of the river from the operation of units 1, 2 and 3 with once-through cooling. Another objective of the studies is to further evaluate ways to mitigate any adverse effects of the plant operation.

The overall program has as a steering committee the Hudson River Policy Committee, having representatives of the U.S. Bureau of Sports Fishery, U.S. Bureau of Commercial Fisheries, Departments of Environmental Conservation of Connecticut, New York and New Jersey. Consolidated Edison's Fish Advisory Board, with Messrs. Lawler, Lauer, McFadden, Raney, and others as members, supervises the actual implementation of the program.

It appears to be generally agreed that the program is a good one. The staff's witness in this area, Dr. Goodyear, stated that "generally speaking, it is a thorough, ambitious, and well-presented research proposal".[276/] "Applicant's research program should provide much valuable and needed information".[277/]

276/ Testimony of Goodyear, "Consolidated Edison Research Program. . .", February 22, 1973 (after Tr. 9892) at p. 1.

277/ Id. at p. 6.

b. In spite of these impressive credentials for it, the program is criticized by the staff, intervenors, and in the Licensing Board findings because it cannot guarantee all the desired answers before the study starts.

The applicant argues generally that for its research program to be found acceptable by the Licensing Board, the program would have to prove the falsity of all of the Board's exaggerated assumptions.[278/] HRFA and the staff argue in opposition to this exception that the applicant's research program will not yield the necessary information for a number of reasons, including: the natural variations in fish population, the effects of the operation of units other than Indian Point, the detection capabilities of the program may be limited, and no research will be undertaken in certain areas, such as hydraulics and compensatory mechanisms.[279/]

We have already summarized the findings, referred to by the applicant in this exception, which suggest that the Licensing Board did not anticipate any useful results from that program (supra, p. 159). On the other hand, other findings by the Licensing Board suggest otherwise. For

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278/ Applicant's Brief at p. 56.

279/ HRFA's Brief in Opposition at pp. 85-88; Staff's Brief in Opposition at pp. 50-52.

example, the Licensing Board stated that it was

> impressed by the careful planning, the magnitude of the effort, and the high level of competence of personnel engaged in the program. Much valuable information should come from the work. (RAI-73-9 at 780.)

And the Licensing Board, after noting that all but three of the research reports are to be completed by May 1, 1975, stated that

> if the results in the eight completed reports are as favorable as the Applicant expects, it should have sufficient evidence, before excavation starts, to apply for permission to delay the construction until the program has been completed. (RAI-73-9 at 781.)

Commenting on the program, the Licensing Board also stated that it believes (Ibid.):

> . . . it would be advisable that all phases of the program aimed at determining the impact on the aquatic biota of once-through cooling of Unit No. 2 be continued at least through the first year of operation. If at that time the Applicant also agrees that installation of the closed-cycle cooling system is the proper course, the research program could be replaced by a monitoring program sufficient to assure that the effects are kept below a level that would be of serious concern over the long term.

The Licensing Board noted, without comment (RAI-73-9 at 779), that

> [t]he Staff witness was of the opinion that Applicant's research program might, within the proposed time frame, determine accurately whether large fractions of eggs, larvae and early juveniles are entrained, whether the

> mortality rate of entrained organisms is high, and whether substantial fractions of later juveniles and young of the year are impinged on the screens.

c. The Licensing Board does not satisfactorily explain why, although it apparently accepts the usefulness of the proposed research program for some purposes, it nevertheless rejects it for other purposes. In this regard, there is apparently agreement among the parties that the program can accurately produce base data on entrainment and impingement impacts during interim operation with once-through cooling -- the crucial environmental impacts in controversy; yet, the significance of this fact passed without comment by the Licensing Board. Lacking such explanation, it is not easy for us to discern why the Licensing Board found that that "program does not presently provide sufficient reason to delay construction of a closed-cycle cooling system for Unit No. 2". (RAI-73-9 at 780.)

If that finding is grounded on the belief that the research program must produce data which will precisely demonstrate the cause of changes in the fish population, we would disagree. There is testimony in the record on this particular point. Dr. Goodyear testified that

(Tr. 11,281):

> it is quite possible for the research program to detect changes in population with sufficient precision to demonstrate the change which has occurred. However, the problem that must be resolved in that relationship is that it is necessary to demonstrate the cause of such changes.

But Dr. McFadden, a witness for the applicant, in responding to a question expressed a position on this particular matter which is quite different from that expressed by Dr. Goodyear. He said (Tr. 11,379):

> . . . I can say that we don't propose to take the length of time that would be required to understand all the other things, because we don't have to understand all other things in order to make the determination of serious impacts or no serious impact of the plant.
>
> We are focussing on identifying the plant impact, separating it from a very complex set of natural processes going on. * * *
>
> You can set forth an endless set of questions of that kind and insist that you can't make a reasonable determination of the power plant impact until all those questions are answered, and my position is that that is not correct.

We note also that HRFA asserts that the applicant's expert "indicated the [research] program would only be capable of detecting changes in abundance of 25 percent or more".[280/] This is not what the record shows. In their

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280/ HRFA Brief in Opposition at p. 86.

testimony[281/] McFadden and Woodbury stated, "We anticipate being able to discriminate a 25 percent change in abundance of these fish at the 5 percent probability level". In response to our question during oral argument, counsel for the applicant, while confirming that a 25% change could be detected with a 95% confidence level, pointed out that lesser percentage change could be detected but with a lower confidence level.

The Licensing Board's apparent belief that the research program "will not provide a direct answer to the question" of the effect of Indian Point No. 2 operation may have on the Middle Atlantic striped bass may have been a significant factor in the Board's appraisal of the program. If such were the case, it is now apparent from our Decision (supra, p. 92) that any presumed deficiency in the research program for that reason has no validity as far as this evidentiary record is concerned.

Although certain of the Licensing Board's findings cast doubt on the applicant's research program, it is manifest that it did not dismiss completely the possibility of useful information being generated by the program.

281/ Testimony of McFadden and Woodbury, "Indian Point Studies to Determine Effects . . .", February 5, 1973 (after Tr. 9405) at p. 23.

Indeed, the applicant is required to conduct the program.[282/] For the reasons we have given, we perceive no need for us to deal further with any of the residual questions which might be presented by this exception.

6. The applicant's exception 23 is to the Licensing Board's finding that it "does not presently accept rearing and stocking of striped bass as a viable alternative to a closed-cycle cooling system". (RAI-73-9 at 777.)[283/]

The applicant's proposed finding N6, which was accepted by the Licensing Board (RAI-73-9 at 783), included the following:[284/]

> The fundamental controversy among the parties relates to the likelihood, based on existing data, of successful stocking of striped bass as a means of mitigating postulated damage to the fishery caused by once-through cooling at Hudson River power plants . . .

Thus, it is apparent that the applicant has not proposed stocking as an alternate to closed-cycle cooling but, rather, as a means to mitigate the effect of once-through

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282/ See operating license condition 2.E.(3) and Appendix B to operating license, "Environmental Technical Specification Requirements for Once-Through Cooling".

283/ The introductory words in the sentence to which this exception is directed are "Because of the many uncertainties".

284/ Applicant's Proposed Findings, May 17, 1973 at p. 198.

cooling for a limited time.[285] During this time, the applicant will evaluate the effectiveness of the method as a viable alternative to a closed-cycle system.

HRFA in its Brief in Opposition refers to the staff testimony concerning the number of fingerlings required and the efficiency of hatchery operation to support its claim that stocking is not a viable method, "not only as a long term alternative to closed cycle cooling systems, but also as a short term alternative".[286] The staff presents essentially the same arguments.[287]

The applicant presented Dr. Stevens as its witness on the feasibility of the proposed stocking program. While he had no experience with the Hudson River, he was the only witness presented by any party with extensive hatchery experience.[288] The staff relied on its witness Goodyear, and HRFA presented witness Clark.

Stevens presented data to demonstrate significant advances which have been made in hatchery techniques in the past few years.[289] Many factors which previously

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285/ Applicant's Brief at p. 58.

286/ HRFA's Brief in Opposition, at pp. 89-91.

287/ Staff's Brief in Opposition, at pp. 53-56.

288/ Testimony of Stevens, "Feasibility of Stocking the Hudson River with Striped Bass", April 5, 1973 (after Tr. 10,339).

289/ Id. at pp. 2-3. See also Dr. Stevens' response to Licensing Board's request for additional data, after Tr. 178 of the Licensing Board's July 2, 1973 oral argument at p. 2.

limited the success of hatchery operation have now been identified.[290/] While efficiency of production from egg to fingerling has varied widely, Dr. Stevens testified that he believed, on the basis of actual hatchery results, that a 40% hatch (based on total eggs) and a survival rate of 25% from larvae to 3" fingerlings are realistic (Tr. 11,131). He further testified that survival in the hatchery would "almost certainly not" be comparable to survival in the estuary "because the hatchery product is protected" (Tr. 10,376).

This testimony is in contrast to that of Goodyear, who presented hatchery results to demonstrate much lower survival rates.[291/] As pointed out by Stevens, these data are inappropriate for use here because the data are largely from early results before hatcheries had gained the necessary experience; and Goodyear failed to use the correct total production figures, but, instead, talked about a limited number of fingerlings produced in tangential experiments. (Tr. 11,118; 11,121-22.) It seems clear from the record that the staff's figure of 0.8% was

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290/ Ibid.

291/ Testimony of Goodyear, "Staff Analyses of Artificial Propogation to Replace Hudson River Fishes Killed by Power Plant Operation", April 23, 1973 (after Tr. 11,220) at p. 5.

arrived at by a method which is highly questionable (Tr. 11,162-11,173).[292/] Accordingly, that figure is unrealistic at best and meaningless and misleading at worst.

HRFA witness Clark cited the closing of striped bass hatcheries (but gave no specific cases) to support his claim that the method has little prospect of success (Tr. 11,100). Stevens testified that not only

> has there not been any closing of striped bass hatcheries in the U.S. during the last decade, but rather there has been a great increase in number (Tr. 11,137).

There is testimony concerning the areas in which hatchery-reared fingerlings have been released. The record shows that most such releases are made in fresh water reservoirs in "put-grow-take programs".[293/] However, there

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292/ The staff's figure of 0.8% was not arrived at by a representative selection of survival data. Instead, it was the product of the selection of data which would inevitably lead to the lowest possible survival rate. For our comments on a similar questionable calculational technique, see supra, p. 92.

See Applicant's Exhibit 6, introduced into evidence at Tr. 11,125. This exhibit is a 1970 report issued by the Department of the Interior on production requirements for striped bass. See particularly pp. 12 and 26 of this report. Goodyear relied, in part, on the data in this report.

293/ Supplemental Staff testimony, "Feasibility of a Fish Hatchery" . . .", April 9, 1973 (after Tr. 10,826) at p. 7.

have been four cases of placing stock in estuaries. The first of these was the releasing of yearling striped bass from New Jersey in San Francisco Bay in the 1880's, which resulted in the establishment of a commercial fishery.[294/] The other three were Choctawhatchie Bay in Florida, Mobile Bay in Alabama and Mississippi Bay in Mississippi (Tr. 10,376). All of these latter three were quite recent, the earliest effort being 1968. None of these three have proven to have established a reproducing stock in the respective Bays. Apparently, in each instance the striped bass migrated to fresh water. This is understandable in view of the fact that the parental stock used were of the fresh water variety. This does not necessarily mean that if migratory parental stock, such as in the Hudson River, were used that the results would be the same. In fact, as we have already stated, the San Francisco Bay experience, which resulted from stocking almost a century ago, demonstrates that stocking with the proper parental stock can be successful in areas such as the Hudson River. Stevens testified that he knows of no biological reason why Hudson River fish cannot be reared in a hatchery (Tr. 10,378).

294/ Testimony of Stevens, "Feasibility of Stocking . . .", April 5, 1973 (after Tr. 10,339) at p. 5.

The applicant is already initiating a stocking experiment in the Hudson River and is now obtaining results which apparently are favorable.[295/]

In these circumstances, we do not view the record as requiring a conclusion at this time that stocking cannot be a viable alternative either as a mitigating measure for short-term impacts or as a viable permanent alternative to closed-cycle cooling. The research program now underway could result in meaningful data on the magnitude of the impact of interim operation. That information, coupled with the result of applicant's stocking experiment in the Hudson River starting in 1973, will probably permit a better assessment of the scope of the rearing and stocking programs which will have to be undertaken and the likelihood of success. For interim operations, we have already stated that significant adverse damage to the environment can be detected. Thus, it would appear that stocking could be used, at least to some degree, to offset any significant adverse damage which might result during interim operation. We do not interpret the initial decision as necessarily holding otherwise.

295/ See Applicant's "Plan of Action" Report, dated January 1, 1974, submitted to AEC in accord with a condition in its operating license. The stocking experiment is discussed at pp. 2-1 through 2-2a of the report.

D. Applicant's Remaining Exceptions

1. The applicant asserts in support of its exception 12 that it is misleading for the Licensing Board (RAI-73-9 at 780) "to refer to the Attorney General of the State of New York as the 'State of New York'."[296/] The point which the applicant argues is that the Attorney General is only one representative of the State of New York's interest in this proceeding.

It is true that the New York State Atomic Energy Council has also participated as a party to this proceeding. The Council has not excepted to the initial decision.[297/] But when the chief legal officer brings suit or, as here, participates in an administrative proceeding, he does so on behalf of the people of the state. We agree with the staff that the issue raised is without significance to the resolution of the substantive matters before us for decision.[298/]

296/ Applicant's Brief at p. 57.

297/ See New York's Brief in Opposition at pp. 24-25. We note that New York's Department of Environmental Conservation has issued the required certification under section 401 of the Federal Water Pollution Control Act. Also, agencies of the State are working with the Hudson River Policy Committee which is advising the applicant on its research program.

298/ Staff's Brief in Opposition at p. 53.

2. The applicant's exception 19 is directed to the Licensing Board's finding (RAI-73-9 at 774-775) which reduced the applicant's incremental generating costs attributable to a closed-cycle cooling system by an amount about equal to the present worth of certain federal income and property tax. With this reduction, such annual incremental generating cost would be around $16 million instead of $20 million.[299/] The Licensing Board's finding was based on the theory that such taxes are transfers within the economy.[300/]

HRFA and the Staff agree with the Board's finding, noting, among other things, that the Commission's guidance provides that such tax payments be treated as transfers within the economy.[301/]

We see no reason why that guidance is not adequate for present purposes. Accordingly, the applicant's exception 19 is denied.

299/ RAI-73-9 at 775.

300/ Ibid.

301/ HRFA's Brief in Opposition at pp. 83-84 and Staff's Brief in Opposition at p. 49. The Commission guidance is in Regulatory Guide 4.2 "Preparation of Environmental Reports For Nuclear Power Plants", at pp. 4.2-33-4.2-34 (March 1973).

III.

We now consider the exceptions filed by HRFA and New York.

A. A common exception of both HRFA and New York is that the Licensing Board erred in not requiring the applicant to terminate once-through cooling on May 1, 1977 rather than on May 1, 1978.302/

For the reasons which we have already stated, (supra, at pp. 150-154), we do not believe that the time schedule proposed by HRFA and New York is a reasonable one. We have found that a reasonable schedule can be provided for with necessary conditions to protect the environment, (supra, at p. 117). We reject the exceptions.

B. With regard to the remaining HRFA exceptions, we consider first exception 1.

1. HRFA asserts that it was erroneous for the Licensing Board to conclude that when juvenile striped bass reach a length of 1 to 1-1/2 inches, they are too

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302/ HRFA Exceptions 9 and 10, and Brief, Point 1 at pp. 3-9; New York Exception 2 and Brief at pp. 4-9.

large to pass through the screens ahead of the pumps in the cooling water system and are no longer entrainable.[303/] (RAI-73-9 at 762).

It is apparent that the basis for this exception is the possible ambiguity introduced by the numbers "1-1/2" at page 38 (slip opinion) of the initial decision.[304/] HRFA reads "1-1/2" to mean 1 to 1-1/2 inches. We read the numbers to mean 1 and 1/2 inches. Our reading is consistent with the staff's evidence (FES V-28). Accordingly, there is no need for this exception to be granted.

2. In its exception 8, HRFA asserts that it finds an ambiguity in the following statement of the Licensing Board (RAI-73-9 at 770):

> Since there are almost no data to provide a basis for calculation, none of the parties attempted to place a monetary value on other fish species in the Hudson River. The biological value of the other species ... could not be assessed quantitatively or qualitatively.

According to HRFA, if the foregoing statement means that there is no biological value of fish species in the

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303/ HRFA Brief at pp. 10-11.

304/ In the printed decision, RAI-73-9 at 762, the printing style --"1 1/2" -- removes the source of the possible ambiguity in the slip opinion.

Hudson River, other than striped bass, and no aesthetic value for the fishery as a whole, it excepts to any such conclusion. On the other hand, if the statement means that there are such values but that the Licensing Board could not place a particular qualitative value on them, it does not except.[305/]

The record before us and other statements by the Licensing Board in the initial decision (e.g., RAI-73-9 at 771 and 777) rebut any inference that fish species in the Hudson River have no value which might otherwise be drawn from the Licensing Board's statement. For our part, we do not read the statement as being subject to the meaning which is the ground for the HRFA exception. Accordingly, there is no need for this exception to be granted.

C. New York argues in its first exception that the Licensing Board erred by not including in its cost-benefit analysis "State fines arising from applicant's impingement of fish . . ."[306/].

305/ HRFA Brief at p. 12.

306/ New York's Brief at pp. 10-13.

The Licensing Board noted that no evidence was presented by the parties on the costs that might result from criminal fines arising from the impingement of fish, and that the matter is the subject of litigation in state courts in New York. (RAI-73-9, note 5 at 782). At oral argument, counsel for New York confirmed that the litigation had not been concluded.[307/] In these circumstances it is our view that the Licensing Board properly declined to speculate on the penalties, if any, which the applicant might eventially have to pay.

Moreover, as a practical matter, if future fish kills at Indian Point are substantial, the mitigating measures are not dependent on the assessment of penalties. We read the Environmental Technical Specifications[308/] as requiring acceptable mitigating measures (which could include plant shutdown) to be taken. These mitigating measures should minimize significant fish kills. We would also note that New York has not taken the position that the plant should not be allowed to operate until the closed-cycle cooling system is installed. It seems

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307/ As we understand counsel's remarks at our oral argument (App. Bd. Tr. 74-75, 79-81), the statute involved in the litigation, although enacted many years ago, was invoked for the first time in the action to impose a penalty on the applicant.

308/ Appendix B To Facility Operating License DPR-26.

to us that the inclusion or exclusion of State penalties would not affect the decision on the pivotal issue before us -- the timing for the installation and operation of a closed-cycle cooling system. Moreover, their exclusion from the cost-benefit analysis has no effect on the mitigating measures which the applicant must take to prevent unacceptable fish kills, and the actions which the State can take if it wishes to protect its resources. For these reasons, New York's exception 1 is denied.

IV.

For the reasons stated, we reach the following conclusions on the issues before us:

1. CCPE's exceptions, other than their exceptions 18-21 directed to the applicant's security program, are all denied. We are reserving our decision on the remaining exceptions (exceptions 18-21) and shall issue a supplemental decision on them. With respect to all other radiological safety and common defense and security findings to which CCPE's exceptions relate, the initial decision is affirmed in all respects. We recommend, however, that the staff carefully appraise whether 10 CFR Part 50, Appendix E, "Emergency Plans For Production and Utilization Facilities", is sufficiently comprehensive to serve most effectively its intended purpose.

2. With respect to the applicant's exceptions on environmental issues, we have concluded that the May 1, 1978 date imposed by the initial decision for the termination of the operation of Indian Point No. 2 with the once-through cooling system must be modified on the basis of the evidentiary record in this proceeding. The reasons for this conclusion are set forth in the text. To summarize, they are:

A. (1) the record does not support the staff position on the Hudson River contribution to the Mid-Atlantic fishery, a factor which the Licensing Board itself stated would affect the "kind and urgency" of measures taken with regard to the termination of once-through cooling operation (RAI-73-9 at 768);

(2) the record does not support the HRFA and staff position on the percentage of striped bass eggs, larvae, and juveniles I which it is reasonable to expect will be entrained in Units Nos. 1 and 2 during the spawning season;

(3) the record does not support the staff position that a compensatory effect will occur only during the adult life-cycle of striped bass, but not during any other part of the life-cycle;

(4) the record does not support the staff position that the applicant's research program would not produce useful base data on the entrainment and impingement impacts of Indian Point Units Nos. 1 and 2 on the Hudson River fishery.

B. Quite aside from, and independent of, reasons (1) through (4) under A above:

(1) the record establishes no compelling reason for the selection of the May 1, 1978 date, but suggests some flexibility is needed in the selection of the termination date for operation with once-through cooling in order to permit consideration of additional environmental impact data which will be relevant to reaching an informed decision on the permanent cooling system;

(2) the applicant is required to conduct a research program which the record establishes will enable potential significant and adverse environmental impacts to the Hudson River fishery to be detected and mitigating measures to be taken;

(3) the FES recognizes that the plant can be operated with once-through cooling through five spawning seasons. Assuming continuous plant operation from September 1973, the date on which the full-power license was issued, five spawning seasons cover the period until May 1, 1979, not 1978.

(4) In view of these circumstances, we fail to discern the rational path which lead to the choice of the May 1, 1978 termination date for once-through cooling operation.

3. For the reasons given in the text, we conclude that May 1, 1979, is a reasonable tentative date for us now to establish for the termination of operation with once-through cooling, if the final decision is that the tower must be constructed. This date provides a period for the occurrence of several events, some of which are beyond the direct control of the applicant, but which nevertheless have to take place prior to the commencement of construction. The May 1, 1979 date also provides for a reasonable construction schedule after the necessary approvals have been received for the commencement of construction.

4. We have also concluded that the May 1, 1979 date must be subject to conditions, and our order herein so provides. Obviously, the applicant must proceed with due diligence in seeking all regulatory approvals which must be obtained. If the applicant so proceeds, it should not be the victim of governmental inaction which extends beyond the 12-month period allowed herein for that purpose. And after construction is commenced, the May 1, 1979 date could be extended for good cause shown if unforeseen events occur. On the other hand, if the final decision is

made that the tower must be constructed, it should be recognized that the construction should be completed at the earliest feasible date; therefore, if developments show that all of the time provided in this decision for each step of construction is not needed, it is expected that the completion date will be advanced accordingly. But an overriding factor with regard to the May 1, 1979 date is that continued operation with a once-through cooling tower prior to that date, or to any date subsequent thereto which may be authorized, is conditioned on the existence and use of controls to assure that any significant adverse impact on the Hudson River fishery is detected and that mitigating measures are initiated.

5. We also conclude, for the reasons given in our discussion (supra, pp.118-139), that there are certain serious deficiencies in the staff's technical justifications for certain of its positions which bear directly upon the timing for, and the decision on, the permanent cooling system. Even if these deficiencies stood alone, we conclude that they are so fundamental as to require a fresh look at certain of the staff's positions and reconsideration of the portions of the Final Environmental Statement to which they relate.

6. In view of the interests of the parties involved in this proceeding, we conclude that it is essential that communications between the staff and the applicant regarding such operations, including the observed effects, be routinely and currently disclosed to interested parties to this proceeding at least until the issue of the permanent cooling system for operation is resolved, unless, of course, a party indicates that such information is no longer desired. Our order includes a license condition to this end.

V.

On the basis of the foregoing, the Director of Regulation is hereby directed to modify License No. DPR-26 in the following respects:

1. Substitute, for the existing language in Condition 2.E.(1), the following language:

> Operation of Indian Point Unit No. 2 with the once-through cooling system will be permitted during an interim period, the reasonable termination date for which now appears to be May 1, 1979. Such interim operation is subject to the following conditions, none of which shall be interpreted to limit or to affect in any way such other conditions as are imposed by the Atomic Energy Commission or any other governmental body in accord with applicable law:
>
> (a) interim operation shall only be permitted to the extent that the requirements of this license to protect the aquatic biota of the Hudson River from any significant adverse impacts are satisfied; any necessary mitigating measure shall be promptly taken; such measures to include any authorized remedy deemed to be appropriate by the Atomic Energy Commission, including an advancement of the May 1, 1979 date to an earlier date which is deemed reasonable and warranted by the circumstances.
>
> (b) The finality of the May 1, 1979 date also is grounded on a schedule under which the applicant, acting with due diligence, obtains all governmental approvals required to proceed with the construction of the closed-cycle cooling system by December 1, 1975. In the

event all such governmental approvals are obtained a month or more prior to December 1, 1975, then the May 1, 1979 date shall be advanced accordingly. In the event the applicant has acted with due diligence in seeking all such governmental approvals, but has not obtained such approvals by December 1, 1975, then the May 1, 1979 date shall be postponed accordingly.

(c) If the applicant believes that the empirical data collected during this interim operation justifies an extension of the interim operation period or such other relief as may be appropriate it may make timely application to the Atomic Energy Commission. The filing of such application in and of itself shall not warrant an extension of the interim operation period.

(d) After the commencement of the construction of a closed-cycle cooling system, a request for an extension of the interim operation period will be considered by the Atomic Energy Commission on the basis of a showing of good cause by the applicant which also includes a showing that the aquatic biota of the Hudson River will continue to be protected from any significant adverse impacts during the period for which an extension is sought.

2. Include the following new condition in operating license DPR-26:

In addition to the reporting requirements otherwise imposed by this license, the applicant is directed to file with the Commission and serve on the parties reports, under oath or affirmation, of its analysis of data collected during interim operation which bear on the environmental effects

of once-through cooling on the aquatic biota of the Hudson River. Such reports shall be made publicly available. The first such report shall be made as soon as is feasible after the end of the 1974 striped bass spawning season, and thereafter as significant new data become available.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND LICENSING
APPEAL BOARD

Margaret E. Du Flo

Margaret E. Du Flo
Secretary to the
Appeal Board