

ACRS - 2025
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

SCHEDULE AND OUTLINE FOR DISCUSSION
274TH ACRS MEETING
FEBRUARY 10-12, 1983
WASHINGTON, D.C.

Thursday, February 10, 1983, Room 1046, 1717 H Street, NW, Washington, DC

- 1) 8:30 A.M. - 8:45 A.M. ACRS Chairman's Report (Open)
 - 1.1) Meeting announcement (JJR)
 - 1.2) Items of interest regarding ACRS activities (JJR/RFF)

- 2) 8:45 A.M. - 11:30 A.M. Skagit/Hanford Nuclear Project Units 1 & 2 (Open)
 - 2.1) 8:45 A.M.-9:15 A.M.: Report of ACRS Subcommittee (JCM/AJC)
 - 2.2) 9:15 A.M.-11:30 A.M.: Meeting with NRC Staff and Applicant
(Note: Portions of this session will be closed as necessary to discuss Proprietary Information applicable to this project.)

- 3) 11:30 A.M. - 12:30 P.M. NRC Safety Research Program and Budget (Open)
 - 3.1) Discuss proposed ACRS report to the U.S. Congress regarding the proposed NRC Safety Research Program and Budget for FY 1984-85 (CPS et al./SD et al.)

- 12:30 P.M. - 1:30 P.M. LUNCH

- 4) 1:30 P.M. - 2:00 P.M. ACRS Activities (Closed/Open)
 - 4.1) 1:30 P.M.-1:45 P.M.: Appointment of ACRS members (JJR/DU/RFF)(Closed)
(Note: This session will be closed to discuss matters that relate solely to the internal personnel rules and practices of the agency.)
 - 4.2) 1:45 P.M.-2:00 P.M.: Future ACRS activities (Open)
 - 4.2-1) Anticipated Subcommittee activity (MWL)
 - 4.2-2) Future Committee activities (RFF)

5) 2:00 P.M. - 4:00 P.M.

Meeting with NRC Commissioners (Open)5.1) 2:00 P.M.-2:30 P.M.: Discuss items for meeting with NRC Commissioners:

5.1-1) SECY-82-1B, Proposed NRC Policy Statement on Severe Accidents and Related Views - ACRS report of Jan. 10, 1983 (WK/AJC)

5.2) 2:30 P.M.-4:00 P.M. Meeting with NRC Commissioners5.2-1) 2:30 P.M.-3:00 P.M.: Summary of ACRS comments/recommendations regarding SECY-82-1B, Proposed NRC Policy Statement on Severe Accidents and Related Views - ACRS report of Jan. 10, 1983 (WK, et al.)5.2-2) 3:00 P.M.-3:30 P.M.: Comments by EDO regarding SECY-82-1B and ACRS report of Jan. 11, 19835.2-3) 3:00 P.M.-4:00 P.M.: Round-table discussion

6) 4:00 P.M. - 6:00 P.M.

NRC Safety Research Program and Budget (Open)

6.1) Discuss proposed ACRS report to the U.S. Congress regarding the proposed NRC safety research program and budget for FY 1984-85 (CPS, et al./SD et al.)

Friday, February 11, 1983, Room 1046, 1717 H Street, NW, Washington, DC

7) 8:30 A.M. - 12:30 P.M.

Clinch River Breeder Reactor (Open)7.1) 8:30 A.M.-8:45 A.M.: Report of ACRS Subcommittee and consultants (MWC et al./PAB et al.)7.2) 8:45 A.M.-12:30 P.M.: Meeting with NRC Staff and Applicant

(Note: Portions of this session will be closed as necessary to discuss Proprietary Information applicable to this project.)

- 12:30 P.M. - 1:30 P.M. LUNCH
- 8) 1:30 P.M. - 8:00 P.M. Clinch River Breeder Reactor (Open)
8.1) Meeting with NRC Staff and Applicant
- Saturday, February 12, 1983, Room 1046, 1717 H Street, NW, Washington, DC
- 9) 8:30 A.M. - 10:30 A.M. Preparation of ACRS Reports (Open/Closed)
9.1) Discuss proposed ACRS reports on:
. Skagit/Hanford Project (Closed)
. NRC Safety Research Program and Budget (Open)
- 10) 10:30 A.M. - 11:00 A.M. Scope/Conduct of ACRS Activities (Open)
10.1) Discuss proposed changes in the scope and conduct of ACRS activities to increase Committee effectiveness (JJR/RFF)
- 11) 11:00 A.M. - 12:30 P.M. Reports of ACRS Subcommittees (Open/Closed)
11.1) 11:00 A.M.-11:45 A.M.: Regulatory Policies and Practices (HWL/MCG) - Proposed regulatory reform (Closed)
11.2) 11:45 A.M.-12:30 P.M.: TMI-2 and Metal Components - Steam generator tube repairs and restart of TMI-1 (PGS-DWM/RKM)
- 12:30 P.M. - 1:30 P.M. LUNCH
- 12) 1:30 P.M. - 3:30 P.M. Reports of ACRS Subcommittees (Open)
12.1) Class 9 Accidents - Severe Accident Research Program (WK/AJC)
12.2) Decay Heat Removal - Removal of decay heat by feed and bleed (DAW/PAB)
- 13) 3:30 P.M. - 4:00 P.M. Concluding Session (Open)
13.1) Complete discussion of items considered during this meeting

be permitted only during those portions of the meeting when a transcript is being kept, and questions may be asked only by members of the Subcommittee, its consultants, and Staff. Persons desiring to make oral statements should notify the Designated Federal Employee as far in advance as practicable so that appropriate arrangements can be made to allow the necessary time during the meeting for such statements.

The entire meeting will be open to public attendance.

The agenda for subject meeting shall be as follows:

Tuesday, February 22, 1983—8:30 a.m. Until the Conclusion of Business

The Subcommittees will review the Source Term Program with various members of the NRC/RES Staff.

During the initial portion of the meeting, the Subcommittees, along with any of their consultants who may be present, will exchange preliminary views regarding matters to be considered during the balance of the meeting.

The Subcommittees will then hear presentations by and hold discussions with representatives of the NRC Staff, their consultants, and other interested persons regarding this review.

Further information regarding topics to be discussed, whether the meeting has been cancelled or rescheduled, the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted therefor can be obtained by a prepaid telephone call to the cognizant Designated Federal Employee, Mr. Gary Quittschreiber or Mr. Don Bucci (Telephone 202/634-3257) or Ms. R. C. Tang (202/634-1414) between 8:15 a.m. and 5:00 p.m., EST.

Dated: January 25, 1983.

John C. Hoyle,

Advisory Committee Management Officer.

[FR Doc. 83-2580 Filed 1-28-83; 8:45 am]

BILLING CODE 7580-01-M

Advisory Committee on Reactor Safeguards; Meeting

In accordance with the purposes of Sections 29 and 82b of the Atomic Energy Act (42 U.S.C. 2039, 2232b), the Advisory Committee on Reactor Safeguards will hold a meeting on February 10-12, 1983, in Room 1046, 1717 H Street, NW, Washington, DC. Notice of this meeting was published in the Federal Register on January 18, 1983.

The agenda for the subject meeting will be as follows:

Thursday, February 10, 1983

8:30 A.M.—8:45 A.M.: Opening Remarks (Open)—The ACRS Chairman will report briefly on matters of current interest regarding ACRS activities.

8:45 A.M.—11:30 A.M.: Skagit/Hanford Nuclear Projects Units 1 and 2 (Open)—The members will hear and discuss the report of the ACRS project subcommittee and consultants who may be present regarding the request for a Construction Permit for this facility.

Members of the NRC Staff and representatives of the Applicant will make presentations and respond to questions regarding this matter.

Portions of this session will be closed as necessary to discuss Proprietary Information related to this project.

11:30 A.M.—12:30 P.M.: NRC Safety Research Program (Open)—The ACRS members will discuss the proposed ACRS annual report to the U.S. Congress regarding the proposed NRC safety research program and budget for FY 1984-85.

1:30 P.M.—2:30 P.M.: ACRS Activities (Open/Closed)—The members will discuss the basis for reappointment of ACRS members to the Committee.

The members will also discuss proposed and anticipated subcommittee and full Committee assignments as well as the scope and nature of ACRS activities.

The members will also discuss their report of January 10, 1983 on SECY-82-1B: Proposed Commission Policy Statement on Severe Accidents and Related Views on Nuclear Reactor Regulation.

A portion of this session will be closed as necessary to discuss matters that relate solely to the internal personnel rules and practices of the agency.

2:30 P.M.—4:00 P.M.: Meeting with NRC Commissioners (Open)—The members will meet with the NRC Commissioners to discuss the recommendations of the Committee in its report of January 10, 1983 on SECY-82-1B: Proposed Commission Policy Statement on Severe Accidents and Related Views on Nuclear Reactor Regulation.

4:00 P.M.—6:00 P.M.: NRC Safety Research (Open)—The Committee members will discuss the proposed ACRS annual report to the U.S. Congress regarding the proposed NRC safety research program and budget for FY 1984-85.

Friday, February 11, 1983

8:30 A.M.—12:30 P.M. and 1:30 P.M.—5:30 P.M.: Clinch River Breeder Reactor (Open)—The members will hear and

discuss the report of the CRBR Subcommittee and designated working groups, and ACRS consultants who may be present regarding the request for a Construction Permit for the CRBR. Representatives of the NRC Staff and the Applicant will report to the Committee regarding the proposed facility design and respond to related questions.

Portions of this session will be closed as necessary to discuss Proprietary Information applicable to this matter.

Saturday, February 12, 1983

8:30 A.M.—10:30 A.M.: ACRS Reports to NRC and the U.S. Congress (Open/Closed)—The Committee will complete its reports to the NRC and the U.S. Congress regarding matters discussed during this meeting.

Portions of this meeting will be closed as necessary to discuss information which will be involved in an adjudicatory proceeding.

10:30 A.M.—12:00 Noon and 1:00 P.M.—3:00 P.M.: Reports of ACRS Subcommittees (Open/Closed)—The Committee will hear and discuss reports of designated subcommittees regarding ongoing safety related activities including proposed reform of the regulatory process, repair of the Three Mile Island Nuclear Station Unit 1 steam generators, proposed NRC action plan regarding steam generator tube integrity, consideration of Class 9 accidents in the regulatory process, and decay heat removal provisions in nuclear power plants.

3:00 P.M.—3:30 P.M.: Miscellaneous (Open)—The members will complete action regarding items considered during this meeting.

Procedures for the conduct of and participation in ACRS meetings were published in the Federal Register on October 1, 1982 (47 FR 43474). In accordance with these procedures, oral or written statements may be presented by members of the public, recordings will be permitted only during those portions of the meeting when a transcript is being kept, and questions may be asked only by members of the Committee, its consultants, and Staff. Persons desiring to make oral statements should notify the ACRS Executive Director as far in advance as practicable so that appropriate arrangements can be made to allow the necessary time during the meeting for such statements. Use of still, motion picture and television cameras during this meeting may be limited to selected portions of the meeting as determined by the Chairman. Information regarding the time to be set aside for this purpose

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may be obtained by a telephone call to the ACRS Executive Director (R. F. Fraley) prior to the meeting. In view of the possibility that the schedule for ACRS meetings may be adjusted by the Chairman as necessary to facilitate the conduct of the meeting, persons planning to attend should check with the ACRS Executive Director if such rescheduling would result in major inconvenience.

I have determined in accordance with Subsection 10(d) Pub. L. 92-463 that it is necessary to close portions of this meeting as noted above to discuss Proprietary Information (5 U.S.C. 552b(c)(4)), and information which will be involved in an adjudicatory proceeding (5 U.S.C. 552b(c)(10)) and information that relates solely to the internal personnel rules and practices of the agency (5 U.S.C. 552b(c)(2)).

Further information regarding topics to be discussed, whether the meeting has been cancelled or rescheduled, the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted can be obtained by a prepaid telephone call to the ACRS Executive Director, Mr. Raymond F. Fraley (telephone 202/634-3285), between 8:15 A.M. and 5:00 P.M. EST.

Dated: January 25, 1983.

Joan C. Hoyle,

Advisory Committee Management, Officer.

[FR Doc. 83-2579 Filed 1-28-83; 8:45 am]

BILLING CODE 7580-01-M

POSTAL RATE COMMISSION

[Docket No. A83-13; Order No. 480]

Mrs. Lois Allen, Petitioner; Notice and Order of Filing of Appeal

January 24, 1983.

On January 18, 1983, the Commission received an appeal letter from Mrs. Lois Allen (hereinafter "Petitioner"), Reed, Oklahoma 73563 concerning the United States Postal Service's decision to consolidate the Reed, Oklahoma, post office. The appeal letter appears to request the review provided for by section 404(b) of the Postal Reorganization Act [39 U.S.C. 404(b)].¹

The Act requires that the Postal Service provide the affected community with at least 60 days' notice of a proposed post office closing so as to "ensure that such persons will have an opportunity to present their views."²

¹ 39 U.S.C. 404(b) was added to title 39 by Pub. L. 94-421 (September 24, 1976), 90 Stat. 1310-11. Our rules of practice governing these cases appear at 39 FR 3001.110 et seq.

² 39 U.S.C. 404(b)(1).

The petition requests that the decision to consolidate the Reed post office be reconsidered.

The Postal Reorganization Act states:

The Postal Service shall provide a maximum degree of effective and regular postal services to rural areas, communities, and small towns where post offices are not self-sustaining. No small post office shall be closed solely for operating at a deficit, it being the specific intent of the Congress that effective postal service be insured to residents of both urban and rural communities.³

Section 404(b)(2)(C) of the Act specifically includes consideration of this goal in determinations by the Postal Service to consolidate post offices. The effect on the community is also a mandatory consideration under section 404(b)(2)(A) of the Act.

The petition appears to set forth the Postal Service action complained of in sufficient detail to warrant further inquiry to determine whether the Postal Service complied with its regulations for the consolidation of post offices.⁴

Upon preliminary inspection, this case appears to involve the following issues of law:

1. Did the Postal Service properly consider the effect on the community under 39 U.S.C. 404(b)(2)(A)?
2. Did the Postal Service adequately consider the effect on employees under 39 U.S.C. 404(b)(2)(B)?

Other issues of law may become apparent when the Commission has had the opportunity to examine further the determination made by the Postal Service. The determination may be found to resolve adequately one or more of the issues involved in the case.

In view of the above, and in the interest of expediting this proceeding under the 120-day decisional deadline imposed by section 404(b)(5), the Postal Service is advised that the Commission reserves the right to request a legal memorandum from the Service on the issues described above and/or any further issues of law disclosed by the determination made in this case. In the event that the Commission finds such memorandum necessary to explain or clarify the Service's legal position or interpretation on any such issue, it will make the request therefor by order, specifying the issues to be addressed.

When such a request is issued, the memorandum shall be filed within 20 days of the issuance, and a copy of the memorandum shall be served on the Petitioner by the Service.

³ 39 U.S.C. 101(b).

⁴ 42 FR 59079-85 (November 17, 1977). The Commission's standard of review is set forth at 39 U.S.C. 404(b)(5).

In briefing the case or in filing any motion to dismiss for want of prosecution, in appropriate circumstances the Service may incorporate by reference all or any portion of a legal memorandum filed pursuant to such an order.

The Act does not contemplate appointment of an Officer of the Commission in section 404(b) cases,⁵ and none is being appointed. The Commission orders:

(A) The appeal letter from Mrs. Lois Allen of the Reed post office be accepted as a petition for review pursuant to section 404(b) of the Act [39 U.S.C. 404(b)].

(B) The Secretary of the Commission shall publish this Notice and Order in the Federal Register.

By the Commission,
David F. Harris,
Secretary.

APPENDIX

Docket No. A83-13	
Jan. 18, 1983	Filing of Petition.
Jan. 24, 1983	Notice and Order of Filing of Appeal.
Feb. 2, 1983	Filing of Record by Postal Service (see 39 CFR 3001.113(a)).
Feb. 7, 1983	Last day for filing of petitions to intervene (see 39 CFR 3001.111(b)).
Feb. 17, 1983	Petitioner's Initial Brief (see 39 CFR 3001.115(a)).
Mar. 4, 1983	Postal Service Answering Brief (see 39 CFR 3001.115(b)).
Mar. 21, 1983	(1) Petitioner's Reply Brief should petitioner choose to file one (see 39 CFR 3001.115(c)). (2) Deadline for motions by any party requesting oral argument. The Commission will exercise its discretion, as the interest of prompt and just decision may require, in scheduling or dispensing with oral argument.
May 18, 1983	Expiration of 120 day decisional schedule (see 39 U.S.C. 404(b)(5)).

[FR Doc. 83-2568 Filed 1-28-83; 8:45 am]

BILLING CODE 7715-01-M

SECURITIES AND EXCHANGE COMMISSION

[Release No. 12985 (812-5380)]

Alliance Tax-Exempt Reserves, Inc.; Filing of an Application

January 21, 1983.

Notice is hereby given that Alliance Tax-Exempt Reserves, Inc., ("Applicant"), 140 Broadway, New York, NY 10005, a diversified, open-end, management investment company, registered under the Investment Company Act of 1940 (the "Act"), filed an application on November 19, 1982, for an order of the Commission, pursuant to

⁵ In the Matter of Gresham, S.C. Route #1, Docket No. A78-1 (May 11, 1978).

Issue Date:

July 7, 1983

MINUTES OF THE
274TH ACRS MEETING
FEBRUARY 10-12, 1983
WASHINGTON, DC

CERTIFIED

The 274th meeting of the Advisory Committee on Reactor Safeguards, held at 1717 H Street N.W., Washington, DC, was convened by Chairman J. J. Ray at 8:30 a.m., Thursday, February 10-12, 1983.

[Note: For a list of attendees, see Appendix I].

The Chairman noted the existence of the published agenda for this meeting, and identified the items to be discussed. He noted that the meeting was being held in conformance with the Federal Advisory Committee Act and the Government in the Sunshine Act, Public Laws 92-463 and 94-409, respectively. He also noted that a transcript of some of the public portions of the meeting was being taken, and would be available in the NRC's Public Document Room at 1717 H St. N.W., Washington, DC.

[Note: Copies of the transcript taken at this meeting are also available for purchase from the Alderson Reporting Company, Inc., 400 Virginia Ave. S.W., Washington, DC 20024.]

I. Chairman's Report (Open to Public)

[Note: Raymond F. Fraley was the Designated Federal Employee for this portion of the meeting.]

A. Introductions

Chairman Ray mentioned the request by Billie Pirner Garde of the Government Accountability Project to make a public statement regarding quality assurance at the Midland Nuclear Power Plant in Midland, Michigan.

B. Work Assignments

Chairman Ray indicated that the Committee would require some discussion regarding proposed testimony for the February 22 hearing of the Subcommittee on Energy and Environment chaired by U. S. Representative M. Udall. He noted a proposed assignment for the Human Factors Subcommittee regarding a request by Commissioner John A. Ahearne to examine the quality of plant operational personnel at nuclear power plants as well as the quantity.

C. Meeting with Commissioner Asselstine

Chairman Ray reported on discussion with Commissioner Asselstine recently during which Commissioner Asselstine expressed his interest in an opportunity to discuss significant letters at more frequent meetings with ACRS Committee Members. Chairman Ray pointed out Commissioner Asselstine's particular interest in ACRS activities regarding the Commission's proposed safety goals with particular emphasis on ALARA concepts, and discussions regarding probabilistic risk assessment. Chairman Ray noted some interest in the subject of early NRC Staff/ACRS interaction on important issues. D. Okrent and W. Kerr cautioned regarding early ACRS participation in Staff activities because of the potential for misinterpretation of ACRS positions.

II. Skagit/Hanford Nuclear Project Units 1 and 2 (Open to Public)

[Note: A. J. Cappucci was the Designated Federal Employee for this portion of the meeting.]

A. Report of ACRS Subcommittee

C. Mark reported that the ACRS Subcommittee held a meeting on January 24-25, 1983 regarding the application of Puget Sound Power and Light Company for a construction permit for the Skagit/Hanford Nuclear Project Units 1 and 2. He noted that while the project is owned by a consortium of utilities, Puget Sound Power and Light Company is the managing utility. He explained that Puget Sound Power and Light Company had planned in the mid 1970s to build a BWR/6 with a Mark III containment on a site on the Skagit River. The license process was protracted by both seismic and environmental concerns to the point that in 1981 a plan was put forth to move the plant and locate it on the Hanford reservation where the plant would be built on soil instead of on rock as it would have been at the Skagit River. Mentioned were letters from ACRS consultants Z. Zudans, I. Catton, and G. A. Thompson (see Appendix IV). C. Mark indicated that several questions introduced at the subcommittee meeting did not receive sufficient attention and should be discussed at this session.

- . Way in which the population density takes account of the presence of about 5000 workers at the FFTF and the WPPSS Nuclear Plant Number 2 now under construction
- . Possible interactions between power supply grids for the three closely located plants.
- . The statement in the SER that Appendix I dose limits might be set aside in the event that there is a need for a dependable source of power

- . Conservatism in aspects of the design brought about by the change in site
- . Operability of the reactor core isolation cooling system in the event of failure of offsite power
- . Participation of Skagit personnel in the conduct of a Plant Specific Probabilistic Assessment.

C. Mark referred to a letter by E. J. Markey of the U.S. House Subcommittee on Oversight and Investigations to Chairman Palladino regarding the use of ACRS resources to review the licensing of the Skagit/Hanford plant (see Appendix V). He indicated that this letter had been answered from the NRC Chairman's office noting that the ACRS had a statutory obligation to respond to such a request for a review.

D. W. Moeller inquired as to whether the question regarding goals for collective occupational doses would be discussed.

D. Okrent asked whether the Staff had commented on consultant G. Thompson's statements on the May Junction monocline. The Committee briefly discussed the suggestion by the Staff for drilling to study faulting at the site and the criteria to be applied to the definition of the safe shutdown earthquake.

B. Plant Description by the Applicant

M. Stimac, Puget Power and Light Company, explained that recent developments regarding regional power planning in the Pacific Northwest have caused the owners of the Skagit/Hanford Project to request that their safety and environmental proceedings be temporarily suspended. He defined the organization of the project and presented a synopsis of the federal licensing effort (see Appendix VI). He described the site, the location of the two units with respect to the N reactor, FFTF, and Washington Public Power Supply System Units 1, 2 and 4, and a 30 day reservoir associated with each unit as ultimate heat sink. P. G. Shewmon requested information regarding the Applicant's current activities in the area of stress corrosion cracking control of primary system piping. Chairman Ray suggested that the Applicant discuss bulk power system stability questions and the arrangement of the four transmission lines associated with the two units.

C. NRC Staff Discussion of Open Items and Commitments

C. Moon, NRC Staff, indicated that there are no outstanding issues for a construction permit for the Skagit/Hanford plants. He offered a list of principal review issues regarding the change of site location (see Appendix VII). With regard to

potential hazards from nearby facilities, he indicated that the transportation of ammonia down highways was evaluated by the Staff and the risk found insufficient to require protection against the ammonia spill that would be postulated. Mentioned also was a proposed toxic chemical dump to be located two to three miles from the facility. He added that the Applicant has made a commitment to provide the control room with appropriate monitors for protection if needed should the hazardous waste dump be constructed. The Committee briefly discussed technical aspects of the proposed hazardous waste dump. With regard to the design basis tornado, which was not discussed at the Subcommittee meeting, C. Moon indicated that an errata sheet attached to the handout pointed out that the tornado would have design parameters for a Class 2 region. This is acceptable because the Staff's Regulatory Guide 1.76 shows this site in a Class 3 region. C. Moon noted that with regard to site geology, the Staff believes that there are questions concerning the May Junction monocline and believes that additional subsurface data are needed.

C. Moon reviewed the major Staff conclusions, pointing out that the Staff believes that the Skagit/Hanford site conditions will be accommodated in the design and operating procedures. He indicated that the Staff had reviewed the Applicant's commitments and again stated that there were no open issues in SER supplements. He mentioned the Applicant's request for an Atomic Safety and Licensing Board delay, noting that the Staff had not responded to the request.

D. Applicant Presentation Regarding Organization and Management

R. V. Myers, Vice-President of Puget Sound Power and Light Company, discussed a 1980 bill which passed the Washington State Legislature called "The Pacific Northwest Power Resources Planning and Conservation Act" and how it impacted Puget Sound Power and Light Company's request for suspension of licensing proceedings. He discussed the results of a two year study made by a regional commission set up under provisions of the Act which predicted a maximum rate of load growth in the region of 2.9 percent and 5000 megawatts of load reduction as a result of conservation over the next 20 years. Since the final draft recommendation of this commission, which is due in April, 1983, may call for no additional construction of thermal power plants, it may recommend that the Skagit nuclear units are unnecessary. Therefore, the Utility has decided that it would be unwise to proceed with the final environmental statement.

R. V. Myers set forth an agenda to discuss project ownership, and organizational structure, responsibilities of Puget Sound Power and Light and NESCO, a project management and engineering/ construction organization, and the QA/QC program for the nuclear units (see Appendix VIII). He explained how, as individual investor owned utilities in shared projects throughout the Pacific Northwest, each utility had the

requirement to provide an internal staff capable of providing the overview of activities with respect to design, construction, and operation of thermal facilities. This led to the concept of NESCO as a service company.

R. V. Myers discussed the organization and the backgrounds and disciplines of the personnel. The Quality Assurance Program objectives for the Skagit/Hanford nuclear project were explained (see Appendix VIII). He stated his recognition of the fact that quality does not merely come from the Quality Assurance Staff which does the verifying, but from the work force that understands that you are relying on them for that quality. Puget Power also understands that the Quality Assurance Program is a way to assure a reliable and cost effective project. The Committee discussed the scope and responsibility of the Quality Assurance staff. R. V. Myers indicated that it was not the intention of Puget Sound Power and Light Company to develop the expertise within the QA organization to deal with highly technical specific systems. A team effort involving the Utility, the architect/engineer and sometimes consultants would be used to address particular problems. M. Bender was particularly interested in how the capabilities to address specific technical problems were established within Puget Sound Power and Light Company's management concept.

E. Site Characteristics

J. Mecca, NESCO Manager of Safety Systems, described the geography and demography of the site, nearby facilities and their relationship to the low population zone, the meteorological and hydrological characteristics of the Hanford reservation, and the geology and seismology in the vicinity of the plant site. He pointed out that the reservation in the surrounding areas to the site has been instrumented for years and studied strenuously over the last 30 to 40 years. He characterized the area as of low seismic relief and low seismic activity that are very much diffused and scattered. The major geologic structures in the vicinity of the site were highlighted. With regard to faulting on these structures, he indicated that the Gable Mountain fault is judged capable by the NRC Staff. He noted that there is a fault with very small displacement on the Southeast anticline which has been judged in excess of 700,000 years old and not capable. He mentioned a Rattlesnake-Wallula Mountain alignment with a zone of faults that are not dateable and therefore judged capable. With regard to the May Junction monocline, he explained that NESCO has agreed that additional core borings will be done to check for evidence of faulting as required by the Staff.

J. Mecca indicated that the maximum credible earthquake had been set by a consultant to the NRC Staff at a magnitude of 6.5 on the Rattlesnake-Wallula Mountain alignment and magnitude 5 on the Gable Mountain fault. He indicated that NESCO

determined that the determining event is the 6.5 magnitude earthquake at 15 km.

W. Furgeson, President of NESCO presented additional information on the Applicant's design review capability regarding questions asked by M. Bender during the presentation by R. V. Myers. He talked about task force meetings with General Electric and other vendors involving principal systems under review. He indicated that key staff people on NESCO were assigned to work on task forces to address particular nuclear system problems and to be active in the industry task forces that have evolved. He stated that Puget Power and NESCO have remained in a position to maintain a design overview which goes back even to the basic design criteria on which the plant was drawn. In answer to a question by Chairman Ray, W. Furgeson explained how a number of the people in NESCO who are functioning during construction as an oversight engineering organization will phase into the technical staff of Puget Sound Power and Light during the operational phase of the plants.

R. Newkirk, Puget Sound Power and Light, explained that after review of a General Electric topical paper on expected exposures for the BWR 6 design, Puget Power agrees that the 370 man-rems mentioned in that document should be an appropriate goal. This is because the Skagit design will include all of the improved design features introduced by General Electric in the BWR 6 design. In answer to a question by D. W. Moeller, R. Newkirk indicated that there is continual interaction with General Electric regarding system situations that would impede the goal of maintaining occupational exposures as low as reasonably achievable. The objective has been to request that General Electric improve the design of particular systems where it is recognized that there will be a large potential source of exposure from repeated failures. In answer to a question by P. G. Shewmon regarding the plant deaeration capability before startup, R. Newkirk indicated that 304 stainless steel piping, which has been delivered and warehoused, may never be used because of its connection with the oxygen control issue.

F. Design Considerations

D. Hacking, NESCO, discussed a few of the design considerations evaluated at the time the decision was made to move the site to the Hanford reservation. He explained that Puget Sound Power and Light opted to retain the original design wherever possible, allowing some conservatism in the plant and the option of making changes in the future if desired. An example of this was retention of snow loading and tornado design criteria for the structures even though these criteria were greater at the Skagit site than at the Hanford reservation. The capability was retained in the structures with the conservatism and the structures were not redesigned. In answer to a question by J. Ebersole, D. Hacking indicated that a change was made from natural circulation to force draft cooling

towers because the climate necessitated an increase in the height of the cooling towers an additional 100 feet over the 500 feet originally planned. Since a 600 foot tall natural draft cooling tower would be pushing the state of the art and would no longer be advantageous the decision was made to go to a mechanical draft cooling tower.

D. Hacking explained interaction of the 500 kv transmission line with the two units (see Appendix X). He explained that the plants remain tied to the grid in the event of loss of one or as many as three of the four independent 500 kv lines. Chairman Ray expressed some concern regarding the physical separation between the four independent transmission lines and the Committee briefly discussed the matter.

J. Ebersole asked if there was a fundamental reason for the Skagit/Hanford plants to have a common dump volume for the 185 to 200 control rods. D. Hacking indicated that a question such as that has not been asked before, but similar questions have been asked during the Staff review and particularly when reviewing the nuclear steam supply system with Bechtel and General Electric. He suggested that General Electric would be in the best position to address this point. In answer to another question by J. Ebersole regarding dependence of the semi-automatic relief system on activated solenoids in hostile environments, D. Hacking indicated that NESCO has assured itself that the environmental qualifications for the equipment have been identified and those requirements are being met by the Bechtel Corporation.

D. Hacking attempted to field another question specifically addressing containment atmosphere cooling during operation and the cooling system for pump seals. He explained that a commitment has been made that the cooling recirculation pumps will be designed to seismic Category I, equivalent to other Mark III units; that information is in the SER Supplement 1 issued some time ago.

III. Clinch River Breeder Reactor

[Note: P. A. Boehnert was the Designated Federal Employee for this portion of the meeting.]

A. Subcommittee Chairman's Report

M. W. Carbon set the agenda for the session as including discussion on the plant seismic margin, mechanical, nuclear and thermal hydraulic design of the reactor core, the internals of the reactor vessel, and some discussion of fluid circuitry and the sodium water interface as well as steam generator accidents and consequences. He noted that contrary to previous sessions the Staff does have and will present its final positions on several of the topics discussed. The Committee's attention was drawn to an article on LMFBRs entitled, "The State of the Art

for Fast Reactors," based to a considerable extent on an interpretation of some of the discussion of the material at the Fast Reactor Safety Conference in Lyon, France in July 1982. He pointed out that while there are differences in the approaches among the French, the British, and the U.S. in regard to fast reactor safety, the article should provide background information for today's discussions (see Appendix XI). He mentioned the U.S. belief that a heterogeneous core offers some definite safety advantages over a homogeneous one. Neither the French, British, nor Germans use such a core but use a homogeneous core. He pointed out that the French and the British make more extensive use of incore thermocouples, that the British have ultrasonic equipment for undersodium testing, and that the British and French are both using core catchers in their large, prototype size reactors which are several times the size of the Clinch River Breeder Reactor (CRBR).

B. NRC Presentation of CRBR CP Review Items

R. Stark, NRC Staff, explained that the subject of external phenomena was primarily contained in Chapter 2 of the Preliminary Safety Analysis Report (see Appendix XII). Two items in the CRBR review of Chapter 2 had changed since the summer of 1982. The first of these involved a meteorology review which brought the meteorological dispersion model into compliance with Regulatory Guide 1.145. The other item involved the results of a seismic review based primarily on receipt of a report from the U.S. Geologic Survey which has been factored into the SER. He pointed out that Chapter 2 as it now stands has no open items. In answer to a question from M. Bender regarding the liquid pathway for small releases of radionuclides, R. Stark indicated that the Final Environmental Statement addresses the impact on ground water and states that it is of the order of 8 or 9 years until the radionuclides are found in ground water in the event of major accidents. R. Codell, NRC Staff, answered M. Bender's additional concern regarding support of that position by indicating that the Environmental Statement presents an analysis in which potential groundwater releases are compared to atmospheric releases as in other environmental statements and the contamination of water supplies analyzed with respect to atmospheric fallout from large atmospheric releases. R. Codell stated that the results confirmed that the liquid pathway consequences and risks are far less than the atmospheric risks. M. Bender explained that his concern was with accidents for which containment penetration is postulated and a pathway established for the resultant liquid releases through to the groundwater. R. Codell indicated that certain basic hydrologic factors have been studied for the site, such as the permeability, porosity, and the chemical behavior of radionuclides in the soil. M. Bender asked for a copy of this analysis along with all of the assumptions involved.

R. Rothman, NRC, stated that conclusions reached in the SER are that faults at the site and site region are not capable of sustaining an earthquake. He explained that the design is based on a recurrence of the 1897 Giles County maximum modified intensity 8 event, and a safe shutdown earthquake of 0.25g anchoring a Regulatory Guide 1.60 spectrum. He indicated that the Staff has recommended a further confirmatory study of the noncapability to investigate the relationships of the Pleistocene River terrace deposits to the local faults in the Clinch River area. In answer to an inquiry by D. Okrent, R. Rothman explained that a probabilistic analysis was performed by the U.S. Geologic Survey (USGS) which indicates an order of magnitude difference in the recurrence of the safe shutdown earthquake acceleration if this seismogenic zone is considered to exist as opposed to the diffuse seismicity in the southern Appalachian region which has a number assigned on the order of 2×10^{-4} . In answer to another D. Okrent question, S. Brocum of the Geology section of NRC, indicated that with regard to the Charleston earthquake which lies in the eastern system, the USGS defines the eastern system as the Coastal Plain and the Piedmont. Taking this definition strictly, the Clinch River Breeder Reactor is west of their definition of the eastern seaboard.

R. E. Palm, Burns and Rowe, discussed how the Clinch River design accommodates the effects of various natural phenomena such as tornadoes, maximum precipitation effects, flood effects, and earthquake conditions (see Appendix XIII). He explained that the project has established a design basis tornado for the CRBR in accordance with Regulatory Guide 1.76. J. Ebersole asked if there were tornado damage, how long could the plant be in a blackout condition. G. Clare, Westinghouse, explained that the plant has tornado protection capability for all three of the diesel generators which can run for many days without having fuel brought on site. R. E. Palm, in answer to a question by M. W. Carbon, explained how the diesel sites were tornado hardened, a seismic Category I enclosure on subsurface material to account for potential instability from tornado winds or an earthquake. R. E. Palm discussed design of the plant with regard to the probable maximum flood and probable maximum precipitation as a result of a maximum potential storm. In answer to a question by M. W. Carbon, D. Newton, TVA, indicated that rainfall data used in the flood hazard analysis was derived from the U.S. National Weather Service. The Committee discussed the CRBR tornado design coverage. He explained that the operating basis earthquake for the CRBR was one-half the SSE and that the design followed the recognized and accepted light-water practices identified in the Standard Review Plan and the Regulatory Guides. In answer to a question by M. W. Carbon, R. E. Palm stated that earthquake design problems were addressed through specific analyses done by Westinghouse with Burns and Rowe providing input regarding response spectra and time histories. P. Dickson, Westinghouse, added that problems that would be different from a light-water

reactor such as the sloshing of sodium in the vessel, thin wall piping in the primary system, and accommodation of the guard vessel concept were addressed in these specific analyses.

D. Newton, TVA, discussed determination of the design basis flood level for the CRBR site (see Appendix XIV). He noted that TVA determinations made in the early 1970s are in accordance with the current Regulatory Guide 1.59 and ANSI Standards. He noted that the water shed drainage area totals some 1700 square miles. Various dam features were pointed out on a map and he indicated that the Norris Dam, upstream of the site, is really the controlling feature in terms of flood levels. It was mentioned that potential sources of flooding at the site are storms which produce the probable maximum precipitation on the Clinch River or the Tennessee River or some combination thereof. The probable maximum flood is defined as the upper limit of flooding, and the controlling event would result from seismically induced dam failures. The Committee discussed the impact of the probable maximum flood on the Norris Reservoir and the Norris Dam.

D. Newton described the procedure for the analysis of various seismically induced dam failures. He then discussed the potential modes of failure including the major elements of the analysis for seismically induced failure of the Norris Dam (see Appendix XVI). In answer to a question by F. J. Remick regarding the March date on the flow discharge curves from the failed dam, D. Newton indicated that the date ties into the date of the probable maximum flood which tends to occur in July except for large area storms in the region which occur in March. D. Newton indicated that the operating basis earthquake with one-half the probable maximum flood is the controlling event for failure of the Norris Dam.

J. Ebersole noted that the old Norris Dam had gasoline engine generators to control spillway gates and sluices in event of a loss of power. He asked several questions regarding the operability of the spillway gates at the dam. D. Newton indicated the TVA would have backup capability for operating the gates during storms or floods. C. P. Siess asked how much time would be required to find an alternate source of power for spillway gate operation should there be loss of power from transmission lines. The Committee discussed the positioning and operation of the spillway gates during a flooding event. D. Newton contended that with regard to the safety of the dam or the safety of the Clinch River site, operation of the gates has no effect on the flooding problem. C. P. Siess suggested that TVA should consider doing a sensitivity study with the gates up and note how the reservoir elevation is influenced by having the spillway gates up during the controlling event.

A. Marone, Westinghouse, explained that the reserve seismic margin available beyond the .25g SSE for the CRBR was based on a generic analysis with ratios and extrapolations from linear

elastic analysis. The intent is to determine the ground acceleration beyond that associated with the SSE at which systems, structures, and components begin to fail (see Appendix XV). Several Members expressed concerns regarding definitions of terms and the applicability and conservatism of the analysis. D. Okrent questioned the appropriateness of the use of average when defining ultimate strength of components since some components or some parts of components are weaker than the average but always above code minimum, such that using the average would underestimate the capability of the stronger part but overestimate the capability of the weaker part. He noted that it is the weak point that is of interest. A. Marone indicated that the use of average would not be appropriate for design purposes but he expressed his believe that in this case use of the average for the determination of the largest earthquake that the plant can take before the systems start to fail is more appropriate than using a minimum value. D. Okrent questioned the use of ultimate stress when going through significant plastic deformation, and particularly pointing out the difference between loading to near ultimate and loading 100 cycles to near ultimate with regard to the start or a failure of a piece of equipment.

A. Marone described the reserve seismic capability system evaluation procedure, going into detail regarding each of the component capability quantities (see Appendix XV). He explained quantities such as the structural strength nominal margin, system seismic response conservatism, equipment structural reserve seismic margin, containment structural reserve seismic margin, and equipment functional reserve seismic margin. M. Bender suggested that the analysis would be more effective if margin to failure was defined as a little bit less than failure. He noted the difficulty in defining actual failure of particular components and equipment. R. E. Palm indicated that when Westinghouse is speaking of the ultimate strength as the maximum capability, there is still on the order of 70 to 80 percent of the whole plastic strain range of the material beyond that maximum capability available as margin. H. Etherington suggested that he was not sure whether this analysis represented a best estimate since observed deficiencies in engineering as well as observed deficiencies of construction and materials are not factored into the analysis. C. P. Siess asked whether there were any cases in the design of this plant where failure in structures would be defined in terms of excessive deformation rather than inadequate resistance. A. Marone suggested that possibility with the EM pumps.

D. Okrent asked where penetrations in structures are taken account of in the analysis. R. E. Palm indicated that he was not sure how the question regarding penetrations in structures related to the previous question by C. P. Siess. C. P. Siess indicated that the conservatisms taken advantage of in the analysis in terms of inelastic behavior will lead to increased

strength but also increased deformation, and if deformation is a governing factor, that is not the conservative direction. D. Okrent suggested that the reliability of some of the penetrations in an earthquake would depend on the amount of deformation. R. E. Palm admitted that Burns and Rowe had not checked displacements at penetrations or at similar types of locations recognizing that it is a problem endemic to a generic approach to seismic margins. D. Okrent noted that if the generic analysis is not sufficiently complete, it may yield deceptive results. P. Dickson, Westinghouse, pointed out that the results of the analysis showed that the approach to the ultimate stress is not controlling since the design to yield becomes the controlling influence. D. Okrent expressed his belief that although the presentation was interesting, it will have to be better documented in order for the ACRS to evaluate whether the generic sampling and methodology are adequate to address the problem. D. A. Ward asked if there were a topical report on the material presented by A. Marone. P. Dickson mentioned a 1977 report which basically described the methodology, even though some of the designs have changed. D. A. Ward requested that a copy of this report be provided. M. Bender asked the NRC Staff whether it agrees with the conclusions drawn by the Applicant. R. Stark indicated that in accord with the ACRS letter of January 11, which the Staff is now reviewing, concerning this particular subject, the Staff agrees basically with the need to assess or produce additional information in this area. He added that while the Staff and researchers are proposing a seismic research plan to deal with this particular item, the Staff believes that the Clinch River Breeder Reactor structural and equipment design margins can be handled on a generic basis. But, it appears that piping designs cannot be handled generically.

J. Ebersole expressed concern that since in LWRs the shutdown heat removal system hinges on operation of the d.c. batteries, he expressed his belief that until sufficiently demonstrated, the batteries in the d.c. systems at the CRBRP would have to be investigated. Dickson indicated that Westinghouse has considered what would happen if the batteries fail, and it has been determined that the system can be operated manually.

F. J. Remick pointed out, after asking the Staff, that the Commission's rules and regulations do not have a requirement for seismic design margin beyond the SSE for the CRBR. Therefore, he concluded from the licensing standpoint, the importance of a particular shutdown margin is academic. C. P. Siess suggested that if the Staff sticks with the legal requirements only, perhaps the ACRS should recommend that they raise the safe shutdown earthquake to a lower probability earthquake. M. Bender expressed concern that the ACRS is getting involved in a legal question, a question which should be dealt with in a technical way. He suggested that the Committee not spend any further time attempting to change the SSE unless the Staff has doubts regarding the safety of the

CRBR. R. Stark explained that the Staff would license the CRBR at point 0.25g without the requirement for additional seismic margins. However, the Staff is open to ACRS comments and will look into this particular area for additional information to resolve this issue.

G. Clare presented the results of earthquake studies in the Oak Ridge area over the last ten years (see Appendix XVI). It was concluded that the CRBR would be able to withstand an earthquake on the order of 2 times the SSE peak ground acceleration. He added that Westinghouse affirmed that the risk for large earthquakes was not insignificant but was not the dominant factor in the risk from the CRBR. It was a significant contributor, but less than 50 percent of the overall risk. The more recent studies, including that done by A. Marone, have led to the conclusion that the seismic risk for the CRBR is less than what was estimated in the earlier assessment in 1977. D. Okrent still expressed concern that the availability of a plant specific probabilistic risk assessment would be helpful to confirm the capability of the CRBR to withstand seismic events since one could envision the lack of containment integrity during the occurrence of a severe accident.

D. Newton, TVA, answered an earlier ACRS question regarding height of the headwater level and the sensitivity of TVA conclusions regarding the maximum flood level at the CRBR site. He indicated that the hydraulic lift gates are normally in a down position in flood operation. He explained that in flood operations and the PMF and the one-half PMF with the seismic OBE failure, the gates had been lifted deliberately to force the flood levels to the maximum heights possible to utilize the available storage. Therefore, he indicated, there is no other operation of the gates. If the gates were not to operate, they would be assumed in the down closed position and would have passed more water and the water level would not have gotten to the maximum 1035 foot level. It does not make a difference even if they were opened and not operable, because TVA has already assumed that the gates are up. D. Newton explained the operation of the spillway gates. There is a hydraulic lift gate opening valves to let water in and the water lifts the gates. He added that there is a backup system to provide power for opening the valves.

C. PSAR Chapter 4 - Reactor

R. Baars, Los Alamos National Laboratory, defined the scope of the NRC review as covering the mechanical design of the fuel, blanketing, control pins, and assemblies including design criteria/limits, design methods for steady state and transient conditions. He indicated that the Staff had reviewed developmental testing plans including in-reactor, ex-reactor, steady state, and transient conditions (see Appendix XVII). In answer to a comment by P. G. Shewmon, he indicated lack of

preparation to discuss a comparison between the CRBR fuel and FFTF fuel and the experience base of the FFTF fuel and its use. He discussed acceptance criteria, favorable factors for the success of the CRBR fuel system, criteria issues regarding coolable geometry limits, methods and issues for fuel evaluation models, and data base issues. It was noted that the NRC Staff strongly recommends that the Applicant adopt a firm cladding temperature as a coolable geometry limit, one that would be well below melting and for which there is data that can show that the coolable geometry would not be affected. This would replace the current cladding melting limit. He stated that to assist in assuring that cladding melting will not be reached, a no-boiling guideline should be used. This limit would be essentially a screening criteria where further analysis for above boiling conditions would be done to determine whether the cooling geometry would be compromised. He also expressed his belief that neither cladding nor coolant temperature limits are adequate of themselves to guard against molten fuel expulsion when overpower conditions are present, and some limits should be adopted more directly related to overpower.

R. Baars stated that the prospects for success of the CRBR fuel system justify issuance of a construction permit (see Appendix XVII). He based his conclusions on previously discussed favorable factors and the Applicants' commitment to resolve issues that might arise by the time of FSAR submittal.

W. Brooks, NRC Staff, discussed Section 4.3 of the PSAR or SER, nuclear design. He spoke of the principal design criteria affecting the core, the reactivity control system including relevant criteria and design bases, and reactivity coefficients and core stability (see Appendix XVIII). He showed a layout for the Clinch River Breeder Reactor core and pointed out the two control systems. M. Bender inquired regarding the prescribed mode of control rod programming. W. Brooks explained the normal prescribed operation of the primary and secondary scram rods for operational control of the plant. He stated the Staff's overall conclusion that the nuclear design of the core meets the requirements of the criteria established although the Staff would require that the applicant submit more verification and documentation of their methods used in the FSAR. In answer to a question by M.W. Carbon, he indicated that the Staff does not anticipate any particular problems even though there might be small differences as a result of new critical experiments.

T. King, NRC, indicated that the thermal hydraulic design of invessel components included design criteria/limits and design methods for both steady state and transient conditions (see Appendix XIX). He stated that the Staff had reviewed developmental testing done and startup testing planned for the plant also involving steady state as well as transient conditions.

He indicated that the Staff's acceptance criteria were conformance with two principal design criteria, one on reactor design and the other on flow blockage, and conformance with the applicable sections of the Standard Review Plan on thermal hydraulic design. He discussed major safety features of the design and items to be resolved as part of the final design. On the subject of monitoring instrumentation for core assembly outlet temperatures, D. A. Ward asked if monitoring could detect if a fuel element might be swelling before a cladding rupture. T. King explained that it could only be detected if the swelling were due to overtemperature only if thermocouples picked up the increase in temperature before the cladding failure.

T. King discussed independent overcheck calculations done by Brookhaven National Laboratory and Argonne National Laboratory (see Appendix XIX). Graphs of transient temperature profiles compared to computer code simulations such as the supersystems code by Brookhaven were presented. Members of the Committee sought comparison of these results for CRBR with the FFTF and Phenix reactors. The subject was discussed by the Committee.

R. Vijuk, DOE, focused on the developmental testing done for the CRBR core to demonstrate features of the design or the performance of the total design. F. Balok, Westinghouse, described the reactor enclosure including the enclosure head, the vessel, the lower internals, (including all the permanent structures other than the core removal components) and the upper internal structure. A diagram of the reactor closure head assembly was explained in detail. F. J. Remick noted that the EBR 2 reactor had problems with rotating plugs freezing. He asked if there were any special provisions to prevent that on the CRBR. F. Balok indicated that Westinghouse was aware of their problems and has addressed them through design of a multiple barrier seal system whose primary function is to maintain the purity of sodium so that freezing problems do not arise.

F. Balok described the reactor vessel noting that it is primarily a 304 stainless steel structure. D. A. Ward asked if at the end of life neutron irradiation down in the core area would significantly affect the properties of the stainless steel. F. Balok stated that it would be well below any threshold for loss of ductility in this area. The lower internal system core support structure was discussed in detail. P. G. Shewmon asked whether Westinghouse could say whether the 316 stainless steel would swell enough at full burnup to actually bind up the core. F. Balok indicated that the passive core support system has been confirmed to show acceptable operation based upon the experience at the FFTF so far. The presentation concluded with a detailed description of the upper internal structure (see Appendix XX).

R. Doncals, Westinghouse, explained the critical experiment program and reactor design areas supported by critical experiments (see Appendix XX). F. J. Remick mentioned that a frequently heard criticism of the CRBR is that it is an outmoded design. R. Doncals said that the CRBR is a very advanced design in that it incorporates the heterogeneous configuration which has considerable merits over a homogeneous core. He pointed out that with a small fuel pin similar to that on the FFTF, high breeding ratios in excess of 1.2 can be achieved with a doubling time on the order of 30 years. The fluences on the fuel assemblies can also be reduced by 20 to 30 percent which has a significant effect on fuel life time.

In answer to a question by M. Bender regarding evaluation of the core under malfunction conditions (specifically the effect on power distribution from sticking control rods), R. Vejuk indicated that there are procedures for rod banking, and if the banking can not be held within specifications, there is a technical specifications shutdown. M. Bender asked if fuel could be misplaced during occasional shifting of fuel elements. R. Doncals indicated that in the CRBRP, the fuel is burned in place and the whole core replaced. Assemblies are never shuffled. The blanket is burned in place and removed as a unit also. He added that due to this design, the power distribution is relatively flat and uniform burnups are achieved.

R. Markley, Westinghouse, explained the core thermal and hydraulic analysis and design. He discussed the core thermal hydraulic description and bases including flow paths, principal design data, and flow allocation. He then summarized performance predictions from both steady state and transient thermal and hydraulic test programs.

R. Markley discussed the CRBR flow paths using a schematic of the reactor vessel (see Appendix XX). Flow swirl which is caused by wire wrap spacer systems and a mixing chamber, and fuel orificing was discussed by the Committee. D. W. Moeller expressed interest in a 1.4 percent flow bypass and leakage allocation (see Appendix XX). R. Markley explained that this was not leakage out of the primary system, but deliberate leakage allowed to provide for a considerable number of tests on the piston rings. R. Axtmann posed a hypothetical situation involving progressive degrading of the wirewrap bundles. R. Markley indicated that a slight local hotspot might develop if the wire wrap accumulated at the top of the fuel. R. Vejuk explained that this problem would be detected by the operating fuel monitoring system, by delayed neutron detectors on the primary pipes, or activity detected in the cover gas at the top of the vessel. A tech spec limit on the number of failures allowable would govern operation of the reactor. D. A. Ward asked how Westinghouse would locate the fuel pin or assembly that had failed. R. Vejuk explained that there is a discreet tag gas on each assembly that would allow detection.

When R. Markley discussed core assembly mix mean outlet temperatures and the location of a single thermocouple at the outlet of each of the assemblies, D. W. Ward asked how failures of those thermocouples would be addressed. R. Markley indicated that a certain number of failures will be allowed before continued operation would be jeopardized. P. G. Shewmon asked about replacement of failed thermocouples. F. Balok explained that it was an extensive process and that thermocouples would only be replaced when the plant was shutdown.

R. Markley discussed thermal and hydraulic developmental testing results. M. W. Carbon asked if R. Markley would explain recent information regarding a pressure drop in the FFTF of up to 15 percent. R. Markley indicated that Westinghouse was looking at the situation and attempting to factor any data into the CRBR design. The subject was briefly discussed by the Committee and the sense of the discussion was that this phenomenon was still under investigation. R. Markley stated that in the core thermal hydraulic developmental testing area Westinghouse has a large data base available, and uncertainties, based upon this data, have been factored into the PSAR for CRBR. He concluded that the reactor flow distributions in the CRBRP do meet the component design requirements. The cooling flow paths are well characterized. They are controlled by orifices which have been tested over a wide range of conditions and the results are factored into the CRBR analyses. M. Bender asked if Westinghouse envisioned other kinds of affirmatory tests that might be needed for the plant in a preoperational or operational status. W. Markley noted that Westinghouse is running a natural circulation confirmatory test and that there are many system flow tests to be conducted during startup, many of them cold and some at heated conditions. D. A. Ward asked whether fuel assembly failures, even though they might be detected by cover gas systems, would represent a safety issue in addition to an operational issue. R. Markley expressed his belief that it is primarily an operational issue since no propagation of any sort has been seen in these assemblies and calculations say that trouble with failed assemblies would be an unlikely happening.

A. Schwallie, Westinghouse, discussed techniques used to preclude failure of the fuel rod and the blanket rod for all mechanistic phenomena understood. He defined a ductility-limited strain criteria that accounts for pertinent aspects such as thermal creep and plasticity which was derived primarily from the design of the FFTF and is basically a designer oriented quick tool for assessing the design. He described a cumulative damage function technique which was predictive and able to dynamically track the materials properties and fuel performance over time as well as radiation, fluence effects, and hardening. The Committee discussed the details of the CRBRP fuel assembly from a schematic exploded view (see Appendix XX).

M. W. Carbon inquired about the quality control aspects of the manufacturing process or analysis (air flow and water flow testing) involved in design of flow orifices for the fuel assemblies. R. Stark, NRC Staff, indicated that the Staff has concentrated largely on the analysis of the overall quality assurance program for the plant and has not looked in detail at the manufacturing process or analysis with regard to the fuel assemblies yet. In answer to a question regarding the Staff position on the adequacy of procedures, T. King, NRC, explained that the Staff has not reviewed the QA administrative controls for the fabrication process in any particular detail other than getting a commitment from the Applicant with regard to airflow tests. He stated that the Staff considers these items as more of an issue at the operating license stage than at the construction permit review stage.

M. Bender asked whether Westinghouse prepressurizes their fuel. He was also interested in the behavior of the fuel and the fuel gas gap with burnup. A. Schwallie indicated that the fuel is not prepressurized and that as you ascend to power the fuel thermally expands out toward the cladding but does not close the gap until the fuel is restructured and a central void created. This can be done within two to three days of full power operation with full restructuring of the fuel by two percent burnup. He explained that this yields a 20 to 30 millimeter thick central void in the center with the fuel in contact with the cladding at that point in time. From that point to the point of five to six percent burnup there is fuel clad and mechanical interaction until the cladding reaches a fluence level where it will begin to swell a bit. He pointed out that this relieving mechanism plus radiation creep, off-balances the differential growth of the fuel cladding over time. He explained that the objective is to maintain fuel/clad contact over three-quarters of the fuel height throughout the lifetime of the core after two percent burnup. In answer to a question regarding fission gas pressure buildup in the system, A. Schwallie indicated that the cladding is strong enough to hold the pressure. The Committee briefly discussed fuel characteristics. M. Bender asked about experience with breakage of the wire wrap on fuel or blanket rods. A. Schwallie explained the behavior and characteristics of the wire wrap and Westinghouse experience with wire wrap and FFTF. A. Schwallie discussed developmental testing programs for fuel support as well as blanket support. F. J. Remick asked the objectives of the run beyond cladding breach test in the EBR 2. A. Schwallie explained the objective is to use the delayed neutron detection system as a diagnostic regarding breach of the fuel in the core. In answer to an additional question by reactor maintenance. In answer to an inquiry by D. A. Ward, A. Schwallie commented on an alternate fuel design that would have grids instead of wire wraps, and he expressed his belief that blockage and debris retention would be more of a concern for grids than for the wire wrap now used.

D. Fluid Circuitry and Interfaces

G. Clare discussed the primary sodium coolant system, the intermediate sodium coolant system, the ex-vessel storage tank (EVST) sodium coolant system, and the interface with the argon cover gas. He explained that the principal interface between the primary and intermediate sodium coolant cooling system is the passive boundary of the intermediate heat exchanger. In answer to an informational question by D. W. Moeller, G. Clare explained that passive meant that the heat exchanger was a solid steel tube with no valves for leakage paths from the original design standpoint.

The Committee discussed the use of NaK, a eutectic mixture of sodium and potassium used as an additional interface between the primary and secondary sodium coolant systems (see Appendix XXI). G. Clare explained that the NaK is used to cool the cold trap and also as a secondary coolant through a heat exchanger in the direct heat removal service. F. J. Remick asked if there are limitations such as operational limitations on the amount of in-leakage of NaK into the sodium coolant and whether it is an activation product. P. Dickson explained that the quantity of primary sodium is so vast compared with the quantity of NaK that you would never notice an activation problem in comparison to the design basis amount of fission products assumed in the sodium. In answer to a question by M. Bender, G. Clare indicated that he was unaware of corrosion problems associated with the potassium influence on the sodium and elevated temperatures.

During the discussion of the intermediate sodium coolant system, R. Axtmann noted mention of an aerosol mitigation system. G. Clare described the system as consisting of a combination of louvers and dampers used to limit the amount of aerosol to be released to the environment of the plant during pressure relief in the steam generator building cells. F. J. Remick inquired regarding the operation of the radioactive argon processing system for the collection of fission gases. G. Clare explained that the fission gases are not released to the atmosphere but are put through a cryogenic still, bottled, and stored for the period of a year after which the still bottle is drained and the radioactive gas released to a radwaste system called the cell atmosphere processing system. That system contains cryogenic charcoal debris bags to provide additional holdup before venting to the atmosphere. The noble gases krypton and xenon are eventually vented to the atmosphere.

E. Steam Generator Accidents and Consequences

R. Stark contrasted the Clinch River Breeder Reactor steam generator with that of a pressurized water reactor noting three principal safety functions

- . Decay heat removal
- . Mitigation of steam line break accident
- . Involvement in outleakage of radioactive fission products from the primary system

He confirmed that the Clinch River Breeder Reactor steam generator is used for decay heat removal but indicated that it has little impact on a steam line break accident since such an accident is extremely minor in this particular plant. He noted that since the intermediate coolant loop is nonradioactive, there are no radioactive consequences. The Committee briefly discussed consequences of steam line breaks and steam leaks on the CRBR steam generator.

G. Clare defined the subject of his presentation as "Steam Generator Leaks," how they are detected and accommodated. He explained that a steam generator leak would involve shutting down of the reactor with less shutdown heat removal capacity than would otherwise be available. Because of the vigorous reaction between water and sodium, mechanical loadings on the primary and intermediate coolant boundaries could be generated with hydrogen generated as a by product of the chemical reaction. Potential indirect effects of steam generator tube leaks were addressed (see Appendix XXII). Three levels of protection provided against the effects of steam generator tube leaks were discussed. P. G. Shewmon noted that the leak detection system discussed for detection of steam generator tube leaks will not specifically pinpoint where a marginal leak is to be found. P. Dickson explained that the operator would wait until the leak is large enough to be detected, drain the water out of the steam generator, and pinpoint the leak by visual inspection by eddy current and pressure.

G. Clare explained how the design basis accident for the sodium-water reaction pressure relief system (SWRPRS) serves as the design basis accident for the primary and intermediate coolant boundaries for mechanical loading. He indicated that this was done by use of conservative engineering judgment, consideration of reactor experience, use of an extensive experimental data base and some analysis results. Mentioned were the three important mechanisms that could cause tube to tube failure: propagation-wastage, corrosion and stress rupture. He pointed out that the stress rupture is the most important of the three mechanisms. In defining the importance of the size of the stress rupture failure, D. W. Moeller asked what the typical leak flow rate from such a break was. G. Clare explained that Westinghouse tests have not shown a leak greater than the equivalent of 50 percent of a double-ended guillotine rupture while 10 to 30 percent is more typical. M. W. Carbon requested a clarification of the tube rupture scenario. G. Clare explained that a primary failure occurs on a tube called a precursor such that the water leaking out of this tube creates a reaction which overheats the adjacent tube

causing a stress rupture in that adjacent tube which then creates a larger reaction. Failure of an additional tube could be postulated which would then be a secondary failure. The Committee discussed the results of experiments involving steam generator tube leaks on sodium-water-filled steam generators. After a comparison had been made by G. Clare of U.S. data on steam generator leaks with foreign sodium-water reaction design events, P. G. Shewmon pointed out that the British have had a noticeable amount of trouble with steam generator leaks. G. Clare pointed out that the British have 321 stainless steel units and have found problems with the reliability of their welding process. He added that the U.S. is not having this type of problem specifically because a specially designed weld configuration on the CRBRP is highly reliable. P. Dickson added that the British experience is with leaks which occurred in tube to tube sheet welds which have been eliminated for the CRBR not just as a weld technique but as a design concept. J. Longren, Westinghouse, identified three problems that the British had which caused some of their difficulties

- . Use of bad materials - dirty chromoly steel
- . Failure to stress relieve or have a volumetric inspection of tube to tube sheet welds
- . Failure to do testing for operating phenomena like flow induced vibrations

M. W. Carbon asked if there were a specific reason for the variety of difficulties experienced by the British. J. Longren pointed to the lack of a good data base on stress relief of and inadequate preservice inspection for detection of leaks. D. W. Moeller expressed concern regarding the validity of the TRANSWRAP computer code to evaluate conservatively large sodium water reaction events but was satisfied by assurances from Westinghouse that code results were thoroughly validated and correlated with observed results and that it does not underpredict.

IV. Meeting with the Commissioners (Open to Public)

[R. F. Fraley was the Designated Federal Employee for this portion of the meeting.]

Chairman Palladino explained that the pending Commission policy statement SECY 82-1B regarding the Commission position on the need to address severe accident issues for existing plants and for new applications will be issued in lieu of a generic severe accident rulemaking at this time. He referred to the ACRS report on SECY 82-1B, dated January 10, 1983 (see Appendix XXIII) and an EDO memorandum dated February 7 (see Appendix XXIV) which incorporates some modifications based on the ACRS concerns.

W. Kerr indicated that the January 10, 1983 ACRS report stressed the particular attention and dependence placed upon probabilistic risk assessment methodology in the decision-making process and in the proposed method for dealing with severe accidents. He expressed the Committee's concern regarding the accuracy with which one could predict the probability of very low probability accidents. He noted that the methodology proposed to deal with existing plants is not well defined. Concern was expressed that lack of attention had been given to an appropriate balance between prevention and mitigation. He expressed his belief that the tradition of defense in depth as an approach in licensing always was a wise approach which should have been given some quantitative attention with regard to boundaries between the emphasis given to prevention versus mitigation.

Chairman Palladino pointed out his understanding that the Staff was trying to develop techniques for evaluating event trees and fault trees to identify accident scenarios not previously foreseen. W. Kerr agreed for the most part with Chairman Palladino's remarks that PRAs can be extremely useful in uncovering weaknesses in systems which would be factored in a disciplined way into sequences described by fault trees. He suggested that it is the Committee's concern that PRAs will be used for decision-making purposes using only the resulting quantitative assessment of plant safety. He pointed out that uncertainties will result in special difficulties when one attempts to make decisions based upon very low probability events on which data for validation purposes is very sparse. W. Kerr expressed the Committee's reservations about a strong dependence on PRA alone. He noted his interpretation that the approach to licensing new plants will involve PRA plus engineering judgment. Chairman Palladino indicated that he viewed PRA as a tool to help make engineering judgments.

Commissioner Gilinsky summed up the situation by suggesting that one can view reactor safety as the safety of the entire plant as a unit, or various parts of the reactor system with the imposition of individual requirements which add up to a system of defense in depth. He suggested that techniques and methods of calculation point more to the defense in depth concept than that of the overall safety of the plant. P. G. Shewmon indicated his concern regarding the tenuous link between offsite consequences and a particular system or piece of plant equipment and the fact that decision-making is frustrated by the difficulty in linking the two.

Commissioner Ahearne asked if the conclusion in the ACRS January report which stated that SECY-82-1B was "seriously flawed" referred to the philosophy behind the balance between accident prevention and mitigation or was focused on a perceived deficiency in the severe accident research program. W. Kerr explained that the research program was an important part of the overall subject but that the letter had addressed primarily the lack of a stated policy with respect to:

- . Whether implementation involved licensing new plants or existing operating plants

- . Whether proposed approaches will allow the research program to answer questions whose answer is required before the policy can be implemented

The ACRS and Commissioners discussed the focus and objectives of the severe accident research program, discussing in particular, the definition of the source term as derived from severe fuel damage research.

Commissioner Gilinsky focused on three Committee suggestions in its January 10, 1983 letter for possible direction by the Commission. He requested expansion on those ideas.

- . Specify the performance of containment systems including sub-systems for heat removal
- . Specify improved performance for decay heat removal systems
- . Give direction to a licensee that a plant design must include specific consideration or features to decrease the probability of damage from sabotage.

Commissioner Gilinsky asked if the Committee thought more extensive operator training on accidents which go beyond the categories of accidents emphasized up to now is necessary.

W. Kerr suggested that a quantitative requirement on mitigation might allow definition of performance specifications on the containment and subsequent focus on research regarding containment performance. M. Bender suggested that it should be recognized that containments have a certain unreliability and uncertainty attached to their reliance as the ultimate barrier to the release of radionuclides in an accident. He suggested further exploration into the physical behavior of radionuclides that are released into the containment during an accident and exploration of other barriers which can mitigate the effects of an accident. He suggested study of mitigation actions in regard to severe accidents and the sequence of events and physical phenomena associated with them. Commissioner Gilinsky and M. Bender exchanged comments regarding containment performance criteria and research associated with the definition of these criteria.

W. Kerr commented on the usefulness of operator training to deal with severe accidents or emergencies. He noted that research in this area appears to be well organized and competent but needs to be better focused in its objectives. D. Okrent noted that in several recent ACRS Operating License reviews, it was found that no one in the technical management of the plant was knowledgeable regarding the phenomena and different scenarios having to do with severe accidents. He suggested that this was a deficiency in the nuclear plant staff which is of considerable importance.

Mention was made by D. Okrent of the concern by people in Europe, especially the French, with regard to the unavailability of major societal resources such as important regions of land. They are motivated to modify their large dry containment through backfitting in order to mitigate these effects. He described the philosophy in Europe of designing the containment against only certain accidents which can most effectively be prevented or mitigated by the design. He indicated that to some extent the NRC's response to severe accidents can be guided by how the Commission shapes qualitative or quantitative safety goals. Commissioner Ahearne spoke of the difference in philosophy regarding major societal resources between the Europeans and Americans, and expressed his confidence that during the two year evaluation period for the safety goals, both alternatives would be considered.

H. W. Lewis expressed his concern with the use of PRAs in bottom line decision-making. He suggested that it might be a bad idea to do a PRA on a plant since this suggests combination of all the effects and equipment in a plant with the objective of getting to a bottom line number. He suggested that PRAs can be done for some sections or elements of the plants and can more importantly determine whether incremental NRC rules, actions, or requirements are cost effective. Commissioner Ahearne indicated that often the Staff is pressed by the Congress as well as the Commission to use PRA for a final bottom line. M. Bender again expressed his concern that PRAs submitted by licensees and used by the Staff in discussing regulatory requirements are stylized bottom line kinds of analyses.

W. Kerr explained that the second comment in the ACRS report noted the fact that removal of decay heat was such an important function that the Committee had recommended that special attention be given to deriving performance criteria to prevent degraded plant conditions. In answer to a question by Commissioner Gilinsky, he said that he was unaware of the existence of any performance criterion for decay heat removal systems other than the single failure criterion. The Committee and the Commissioners discussed the nature and content of potential performance criteria for decay heat removal systems. D. Okrent cautioned against approval of this version of SECY 82-1B for several reasons.

- . Implies very strong use of the safety goals with respect to severe accidents. It has already been indicated that the safety goals should only be evaluated and applied cautiously
- . With regard to unresolved safety issues, the safety goal document is currently limited to existing plants while SECY 82-1B is basically aimed at future plants
- . Proposes to use PRA to judge whether existing designs meet the safety goals and bases possible improvements on \$1000 per man-rem conditions to test alternatives.

D. Okrent explained that with regard to existing plants, SECY 82-1B is flawed because it assumes that the PRA data base is

complete and decisions for existing plants can be made on a generic basis with the use of existing PRA information. He expressed his belief that this is an incorrect technical assessment of the state of knowledge. He iterated his desire for plant specific PRAs for every existing plant, and contended that the existing body of knowledge from PRAs is presently not sufficient for use as the basis for arriving at severe accident decision-making. He recommended the use of prudence and cost benefit analysis to facilitate the study of improving mitigation in particular plants.

Commissioner Gilinsky inquired regarding plant features to reduce the probability of sabotage. Committee members suggested that the meeting might best be held in a different forum in closed session. The subject was discussed only briefly in very general terms with respect to an emphasis needed on plant design to reduce the potential for or consequences of sabotage.

Commissioner Gilinsky solicited the Committee's reaction to the notion of training operators in severe accident mitigation. Committee members were generally supportive of this view. D. A. Ward noted, in particular, that the emphasis should be placed on making sure that the plant staff and not just the shift crew understands the possibilities involved in accidents, what can be done to mitigate them and, in particular, translation of their understanding into useful and available plant procedures which involve the available instrumentation. He added that this should take priority over design of advanced models for simulators.

The EDO stated that a rereading of SECY 82-1B might allay many of the concerns expressed regarding the use of PRAs, indicating that the three points raised in the ACRS report have been incorporated in the policy statement. He explained that the policy paper does not stipulate regulatory requirements but identifies concerns and indicates how reviews might proceed. Implementation of the policy statement would be done through a rulemaking. W. Kerr pointed out that none of the various versions of SECY 82-1 identifies a general approach to implementation of this policy. He added that the Committee does believe that reliance on PRA as an approach to new plants is a viable one.

D. Okrent stated that part of the problem may arise because of what appears to be an attempt to use one set of safety goals for both existing and future plants. He expressed his belief that there should be two sets of goals, one which aspires to improve safety for future plants, and one that one should accept for existing plants. He added that existing plants should be evaluated individually using PRA techniques but not be asked to meet the higher standards of safety set for future plants.

M. Bender pointed out that currently there is more focus on the question of nuclear plant quality than the question of design features. Judgment as to the adequacy of the quality of design, construction, operation, including conformance with written specifications, as well as the importance of imposed standards and codes is a most important area which should not be forgotten. Chairman Palladino acknowledged that the area of plant quality is not addressed in the policy document.

Chairman Ray suggested that a preliminary schedule of a series of joint meetings between the Commission and the Committee should be set up even if only on a tentative basis. The Commissioners expressed their agreement with this proposal and Chairman Palladino suggested bi-monthly meetings as most appropriate. The fact that the current meeting was devoted to a single issue made it more useful than previous meetings which have covered a whole series of items. He suggested that future meetings would be most effective if limited to a single issue.

V. Quality Assurance Implementation Problems at the Midland Nuclear Power Plant (Open to Public)

[Note: D. C. Fischer was the Designated Federal Employee for this portion of the meeting.]

Billie Pirner Garde, representing the Government Accountability Project (GAP), asked the ACRS to make a second review of the situation at Midland with regard to existing quality assurance implementation problems. She suggested that the ACRS Midland Subcommittee pay particular attention to day-to-day happenings at Midland. She provided the Committee with a package of materials which included a GAP analysis of Consumers Power Company's Proposed Construction Completion Plan (see Appendix XXV). She discussed a recent NRC inspection of the diesel generator building which resulted in a \$120,000 fine being levied by the NRC for violations at the plant. She also mentioned the third party audit of Midland's QA Implementation Plan. She suggested that the ACRS hold another meeting, preferably in Midland, to review the credibility of the third party auditor proposed by Consumers Power Company. The Committee discussed the organization, scope, and resources of the Government Accountability Project and the extent of its involvement or potential involvement in the Midland hearings. Miss Garde suggested that the ACRS provide an extra check on the NRC Staff's work to determine how serious QA deficiencies at Midland are and encouraged the Committee to ask for a comprehensive third party audit.

VI. NRC Safety Research and Budget (Open to Public)

[S. Duriswaimy was the Designated Federal Employee for this portion of the meeting.]

The Committee's agenda called in particular for review of Part 1, General Comments and Recommendation of the Proposed Report to

Congress entitled "Review and Evaluation of the Nuclear Regulatory Commission Safety Research Program for Fiscal Year 1984 and 1985." D. W. Moeller spoke in particular on Section 3.2 of Part 1 entitled "Occupational Protection" noting that a comprehensive data base of occupational dose information is not yet available and this may be causing an adverse impact on occupational safety.

C. Kelber, NRC Staff, addressed ACRS concerns regarding the Severe Accident Research Plan with particular emphasis on description of the phases of the research underway at the Powerburst Facility (PBF). He indicated that the Phase 1 tests on early melt progression are essentially complete and Phase 2 follow on tests using previously irradiated fuel to investigate the fission product source term and fuel damage are underway. He noted that funding for the Atomic Energy of Canada Limited test reactor (NRU) will be under negotiation until the end of March. He suggested that delaying the NRU experiments any longer would lessen the value of the results. Committee members suggested that this was not a cost effective area of research.

C. Kelber discussed several specific objectives of severe accident research which he suggested might be compromised by lack of resources and early Commission decisions. These included aerosol production and retention in the upper plenum of a facility, the behavior of fission products, loading imposed upon the containment by various accident conditions, and understanding of the behavior of the molten core.

VII. Executive Sessions (Open to Public)

[Note: R. F. Fraley was the Designated Federal Employee for this portion of the meeting.]

A. Subcommittee Assignments

1. Regulatory Policy and Procedures

H. W. Lewis reported to the Committee as Chairman of the Regulatory Policy and Procedures Subcommittee regarding the matter of nuclear regulatory reform legislation. The ACRS was unable to reach a consensus on several issues presented in a proposed report to the Commissioners. H. W. Lewis did receive considerable guidance from the Members for a redraft of the report for further deliberation at the 275th ACRS Meeting in March.

D. Okrent, during the discussion of a letter regarding the proposed regulatory reform, noted that there are implicit as well as explicit references to backfitting in the proposed bill which should be documented for ACRS review. It was suggested that P. Tremblay, AEC Fellow, look into the implications of backfitting in the regulatory reform legislation and prepare a report for ACRS consideration.

2. Human Factors

Commissioner John Ahearne has requested (letter dated January 7, 1983) that the ACRS review the question of what qualifications would be desirable for members of the operations staff of nuclear power plants and recommend changes it deems desirable. D. A. Ward noted that Commissioner Ahearne had identified specific work by INPO regarding human factors programs involving shift staffing but suggested that INPO was reacting to NRC Staff direction. The Human Factors Subcommittee was assigned to develop a response to Commissioner Ahearne by June, if possible. D. A. Ward, Chairman of the Human Factors Subcommittee, suggested the need for a novel approach for the review, and solicited guidance from Committee Members.

3. Midland Plant Units 1 and 2

The Committee briefly discussed QA problems at the Midland Plant including plans for a third party quality assurance audit of the Midland Plant quality assurance program. D. Okrent, Subcommittee Chairman, was provided guidance from the Members regarding whether the Committee wishes to review this audit plan versus the results of the audit review and/or other facets of the Midland QA situation.

B. ACRS Reports, Letters, and Memoranda

1. ACRS Report on the Skagit/Hanford Nuclear Project, Units 1 and 2

The Committee prepared a report to the Commissioners of its review of the application of the Puget Sound Power and Light Company, the Pacific Power and Light Company, the Washington Water Power Company, and the Portland General Electric Company (the Applicants) for a permit to construct the Skagit/Hanford Nuclear Project, Units 1 and 2. The Committee indicated that if there are significant changes in the design or regulatory requirements before the actual start of construction, the ACRS would expect to review this application again. The Applicant agreed to provide additional information concerning their construction schedule (see Appendix XXVI).

2. ACRS Review and Report of the NRC Safety Research Program

The Committee completed its report to the U.S. Congress regarding the proposed NRC Safety Research Program for Fiscal Years 1984 and 1985.

3. Regionalization of NRC Staff Activities

The Committee prepared a letter to the EDO outlining several concerns it has regarding the impact that this

decentralization or expanded regionalization of NRC Staff licensing activities may have on the safety of nuclear facilities. The ACRS proposed that the EDO and DEDROGR be invited to its March meeting to discuss regionalization and, in particular, specific areas of concern/interest, many of which are delineated in the letter. The ACRS expects that this discussion will better inform the Committee in the preparation of related comments that it anticipates forwarding to the Commission regarding this matter.

Several references were made to a National Academy of Sciences publication entitled Improving Aircraft Safety, FAA Certification of Commercial Passenger Aircraft during the Committee's discussion of the regionalization of certain NRC operations. Members suggested that a committee letter on the matter of regionalization explore how the evaluation of the FAA experience noted in this document applies to NRC activities. Improving Aircraft Safety criticizes the functional decentralization of FAA and calls for more centralization.

C. Future Schedule

1. Future Agenda

The Committee agreed on a tentative agenda for the 275th ACRS Meeting, March 10-12, 1983 (see Appendix II).

2. Future Subcommittee Activities

A schedule of future subcommittee activities was distributed to Members (see Appendix III).

D. ACRS Chairman's Report Issue

Chairman J. J. Ray mentioned and briefly discussed the suggestion that the ACRS get involved at the beginning of the regulatory process on some major generic issues such as revision of the General Design Criteria for nuclear power plants. The Members agreed to further discussion of this subject at an appropriate future time.

The 274th ACRS Meeting was adjourned at 3:00 p.m., Saturday, February 12, 1983.

APPENDIXES
TO
MINUTES OF THE 274TH ACRS MEETING
FEBRUARY 10-12, 1983

ACRS - 2075 -

ATTENDEES
274TH ACRS MEETING
FEBRUARY 10-12, 1983

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

Jeremiah J. Ray, Chairman
Jesse Ebersole, Vice-Chairman
Robert C. Axtmann
Myer Bender
Max W. Carbon
*Harold Etherington
William Kerr
Carson Mark
Carlyle Michelson
Dade W. Moeller
David Okrent
Forrest J. Remick
Paul G. Shewmon
Chester P. Siess
David A. Ward

*Member Emeritus

ACRS STAFF

Raymond F. Fraley, Executive Director
Marvin C. Gaske, Assistant Executive Director
M. Norman Schwartz, Technical Secretary
Herman Alderman
Stuart K. Beal
Alden Bice
Paul A. Boehnert
Don Bucci
Anthony J. Cappucci
Robert Cushman
Sam Duraiswamy
David C. Fischer
Sergio Guarro
Elpidio G. Igne
Morton W. Libarkin
Richard K. Major
Charles A. McClain
Thomas G. McCreless
John C. McKinley
Thomas McKone
Austin Newsome
Jan Preston
Gary R. Quittschreiber
Denny T. Ramani
Christopher Ryder
Richard P. Savio
Stanley Schofer
R. C. Tang
Paulette Tremblay
Raji Tripathi
Laura Wainer

NRC ATTENDEES

Friday, February 11, 1983

Nuclear Reactor Regulation

S. Brocoum
W. Brooks
P. Check
R. Codell
J. Grace
T. L. King
C. Moon
R. Rothman
R. Stark
M. Tokar

Consultant

R. D. Epps

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APPLICANT ATTENDEES

274TH ACRS MEETING

Westinghouse

F. J. Baloh
G. H. Clare
R. A. Doncals
R. A. Markley
T. Marrone
A. L. Schwallie
R. M. Vijuk

Puget Sound Power and Light

R. V. Myers
M. V. Stimac

PUBLIC ATTENDEES

274TH ACRS MEETING

J. E. Mecca, Northwest Energy Services Co
D. B. Hacking, Northwest Energy Services Co.
R. Baars, Los Alamos National Laboratory
D. Newton, TVA
R. E. Palm, Burns & Roe, Inc.
Billie Pirner Garde
W. P. Barthold, Brookold & Assoc, Inc.

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APPENDIX A
FUTURE AGENDA

MARCH ACRS MEETING

Clinch River Breeder Reactor--Continue construction permit review	14.5 hrs
Discuss steam generator tube repairs and related plant operations at Three Mile Island Unit 1 (includes report of ACRS Subcommittee on Metal Components (PGS/EI)	3/4 hr
Yankee (Rowe)--SEP review	5 hrs
Catawba Nuclear Stations Units 1 and 2--OL review	4 hrs
ACRS report/comments to NRC regarding the proposed regulatory reform legislation/regulation	
ACRS discussion with the EDO regarding the proposed commission regionalization of the NRC Staff licensing activities	
Hydraulic Control Unit Line Integrity--Complete the ACRS letter to the EDO which was discussed during the 273rd ACRS meeting	
Prioritization of Generic Issues--ACRS comments regarding application of the Staff methodology for specific issues	Tentative 1 hr
Sizewell Technical Exchange--NRC Staff briefing regarding "improvements" in Sizewell type nuclear plants	1 hr

ACRS Subcommittee Reports

Subcommittee on Emergency Core Cooling Systems regarding proposed changes in BWR evaluation models (SAFER/GESTER) (DAW/PAB)	1/4 hr
Subcommittee on Class 9 Accidents regarding the Severe Accident Research Program Plan (Revised NUREG-0900) (WK/DAB)	1/4 hr
Subcommittee on Reliability and Probabilistic Assessment regarding a discussion of the Oak Ridge Accident Precursor Study (APS)	1 hr
Subcommittee on Decay Heat Removal Systems regarding decay heat removal by feed and bleed	1/4 hr

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APPENDIX A (Cont.)

SECRET

APRIL

ACRS comments on the Severe Accident Safety Research Plan

GESSAR FDA

Clinch River Breeder Reactor construction permit review (Final)

Seabrook Nuclear Plant Units 1 and 2--OL review

Haddam Neck Nuclear Plant--SEP review

Steam Generator Program Briefing

MAY

LaCrosse--OL Review

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SCHEDULE OF ACRS SUBCOMMITTEE MEETINGS

FEBRUARY

- 17 & 18 ECCS (San Jose, CA) (Boehnert) - Ward, Ebersole, Ray, Okrent. Purpose: Continue review of GE SAFER/GESTER ECCS Licensing Code. Meeting will be closed.
- 22 Class 9 Accidents & Reactor Radiological Effects (Bucci/Tang/Quittschreiber) - Kerr/Moeller, Axtmann, Okrent, Ward, Ebersole. Purpose: To discuss program being proposed and conducted to confirm and verify the existing or new source term for severe accidents.
- 23 SEP Subcommittee on Yankee Rowe (Alderman/Major) - Siess, Kerr, Ebersole, Ward. Purpose: Review of Yankee Rowe SEP.
- 23-24 CRBR (Boehnert) - Carbon, Axtmann, Bender, Mark. Purpose: To continue review for CRBR CP application.
- 24 CRBR Working Group on Systems Integration/Control (Savio) - Kerr, Ebersole, Ray, Ward, Carbon. Purpose: To continue review of CRBR plant protection and control systems, the reliability program, the reliability assessment of the decay heat removal systems, and the rule of human factors engineering in the control room.

MARCH

- 4 & 5 (tent.) CATAWBA (Rock Hill, SC) (Major/McClain) - Kerr, Ebersole, Moeller. Purpose: Site visit and OL review.
- 8 Equipment Qualification (Cappucci) - Ray, Bender, Ebersole, Kerr, Ward. Purpose: Review status of USIA-46, EQE Pilot Program Report, and RES status on their program concerning plant aging.
- 9 Reliability and Probabilistic Assessment (Savio) - Okrent, Bender, Ebersole, Kerr, Mark, Siess, Lewis. Purpose: Discuss methodology and conclusions of NUREG/CR 2497.

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SCHEDULE OF ACRS SUBCOMMITTEE MEETINGS

MARCH (cont.)

- 10-12 275th ACRS Meeting
- 16-17 Combined CRBR Subcommittee/Structures and Materials Working Group (Boehnert) - Carbon/Shewmon, Axtmann, Bender, Mark, Siess. Purpose: Continue review of HCDA for CRBR.
- 18-19 (tent.) Waste Management (Tang) - Moeller, Axtmann, Carbon, Kerr, Mark, Ray. Purpose: Review and comment on DOE proposed guidelines for recommendation of repository sites.
- 24 & 25 Groupe Permanent/ACRS Meeting (Fraley) - Ray, Bender, Kerr, Carbon, Moeller and Shewmon.
- 30 Joint Metal Components/Combination of Dynamic Loads (Igne) Shewmon, Bender, Etherington, Okrent, Ward, Axtmann, Lewis, Siess. Purpose: To review the reevaluation of double-ended guillotine break design requirements for Westinghouse PWR plants.
- 31 (tent.) CRBR (Boehnert) - Carbon*, Axtmann, Bender*, Mark. Purpose:
- 3/31 - 4/1 Seabrook 1 (To be determined) (Major) - Kerr, Bender*, Lewis, Carbon (tent.)*, Moeller. Purpose: Site Visit and OL review.

APRIL

- 6 Reactor Operations (Major) - Ebersole, Bender, Kerr, Moeller, Okrent, Ray, Remick, Ward. Purpose: Review Final Rules 10 CFR 50.72 and 10 CFR 50.73.
- 14-16 276th ACRS Meeting
- 21 (tent.) Class 9 Accidents (Bucci) - Axtmann*, Bender, Moeller*, Okrent, Shewmon, Siess, Ward. Purpose: Review NUREG-0900.
- 21-23 (tent.) Waste Management (Tang) - Moeller*, Axtmann*, Carbon, Kerr, Mark, Ray. Purpose: Review and comment on DOE's Site Characterization Report for the Basalt Isolation Project (for Hanford Site).

*Conflict to be resolved

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SCHEDULE OF ACRS SUBCOMMITTEE MEETINGS

APRIL (cont.)

29 (tent.)

Reactor Radiological Effects (Tang) - Moeller, Axtmann, Ebersole, Ray, Bender. Purpose: To review Shippingport decommissioning.

MAY

11 (1/2 day meeting)

Plant Features Important to Safety (Major) - Ward, Bender, Ebersole, Kerr, Okrent, Siess. Purpose: Obtain status report and program plans on Equipment Qualification and Classification Systems dealing with both mechanical and electrical components. New initiatives in the quality assurance area will be explored.

DATES TO BE DETERMINED

Date to Be
Determined
(March - tent.)

Metal Component Working Group (Igne) - Bender, Shewmon, Etherington, Okrent, Ward, Axtmann, Lewis. Purpose: Review status of NRC PTS research program.

Date to Be
Determined
(April-tent.)
(2 consec. days)

Westinghouse Water Reactors/GE Water Reactors/
Safeguards & Security (Cappucci/Major/Fischer) - Ebersole, Ray, Mark, Etherington, Okrent, Shewmon, Siess, Bender, Carbon. Purpose: Begin review of Westinghouse Advanced PWR concepts, laying ground work for the PDA.

Date to Be
Determined

Midland Plant Units 1 & 2 (Fischer) - Okrent, Bender Ebersole, Ward. Purpose: To review Consumers Power Company's plan for an audit of plant quality at Midland Plant Units 1 and 2.

Date to Be
Determined

Human Factors (Fischer) - Ward, Bender, Lewis, Moeller, Ray, Remick. Purpose: Review the question of what qualifications would be desirable for members of a nuclear power plant operating staff, the adequacy of the application of the generic safety issue prioritization methodology to human factors related safety issues, proposed human fact

Date to Be
Determined
(May-June)

Metal Components (Igne) - Shewmon, Etherington, Bender, Okrent, Ward, Axtmann, Lewis. Purpose: Review NRC action plan on integrity of bolts.

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SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
FEB. 17 & 18	ECCS	(Boehnert) <u>Ward</u> , Ebersole Ray, Okrent Cons.: I. Catton, V. Schrock, T. Theofanous, C. Tien, Z. Zudans M. Plesset

LOCATION: San Jose, CA

BACKGROUND:

Who proposed action:

Purpose: Continue review of GE SAFER/GESTER ECCS Licensing Code (Meeting will be closed to discuss GE proprietary information).

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

To be provided in near future.

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
Feb. 22, 1983	Class 9 Accidents & Reactor Radiological Effects	(BUCCI/TANG/QUITTSCHREIBER) Kerr/Moeller, Axtmann, Okrent, Ward, Ebersole, Siess Cons.: Catton, First, Lawroski, Steindler, Lee

LOCATION: Washington, DC

BACKGROUND:

Who proposed action: D. Ross/NRC Staff

Purpose: To discuss the research program being proposed and conducted to confirm and verify the existing or new source term for severe accidents. This meeting is being held in response to Commission request that the NRC Staff work with the ACRS to resolve the differences of opinions on the severe accident research program (Memo from Chilk to Dircks, 10/25/82).

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

1. NUREG-0956, "Radionuclide Release Under Specific Accident Conditions, Vol. 1 - A PWR Analysis, January 1983.
2. Project Status Summary and Tentative Schedule fr. D. Bucci to W. Kerr with attachments dtd. February 9, 1983.
3. NUREG-0900, Nuclear Power Plant Severe Accident Research Plan, published January 1983. Distributed to Members at February full Committee meeting.

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
February 23	SEP Subcommittee on Yankee Rowe	(HA/R&M) Siess, Kerr, Ebersole, Ward Cons.: Catton, Fitzsimmons, Lipinski

LOCATION: Washington, D. C.

BACKGROUND:

Who proposed action: NRC Staff

Purpose: Subcommittee review of Yankee Rowe SEP,
Full Committee Review March, 1983

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

Advance copy of Chapter 4 of Integrated Plant Safety Assessment mailed to Dr. Siess by Federal Express January 28, 1983.

Draft Integrated Plant Safety Assessment scheduled to be delivered to Subcommittee on February 11, 1983.

Yankee Rowe is one of the early PWRs and has had an excellent operating history. It was designed to early criteria which differ considerably from current criteria. It may be necessary to have two subcommittee meetings to review this plant, and the full Committee may slip to April 1983.

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
February 23-24	CRBR	(BOEHNERT) Carbon, Axtmann, Bender, Mark Cons: Lipinski, Kastenberg, Zudans, Mathis

LOCATION:

BACKGROUND:

Who proposed action: M. Carbon

Purpose: To continue review for CRBR CP application.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

To be provided in near future

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
Feb. 24	CRBR Working Group on Systems Integration/Control	(SAVIO) Kerr, Ebersole, Ray, Ward, Carbon Cons.: Lipinski, Nertney

LOCATION: Washington, DC

BACKGROUND:

Who proposed action: M. Carbon and W. Kerr

Purpose: To continue the Working Group's review of the CRBR plant protection and control systems, the reliability program, the reliability assessment of the decay heat removal systems, and the rule of human factors engineering in the control room.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

1. Revised reliability program (Submitted to NRC, January 7, 1983) to be supplied
2. Status report for 2/24/83 meeting, to be supplied at least 2 weeks before the meeting.

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
March 4-5 (tent.)	CATAWBA	(MAJOR/McCLAIN) <u>Kerr</u> , Ebersole, Moeller
		Cons.: Philbrick, Trifunac

LOCATION: Rock Hill, SC (Site)

BACKGROUND:

Who proposed action: Staff/ACRS

Purpose: Site visit and operating license review.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

1. SER due in February, 1983.

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SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
March 8, 1983	Equipment Qualification	(CAPPUCCI) Ray, Bender, Ebersole, Kerr, Ward Cons.: Catton, Lipinski, Zudans

LOCATION: Washington, DC

BACKGROUND:

Who proposed action: ACRS/NRC Staff

Purpose: To review the status of USIA-46, "Seismic Qualification of Equipment in Operating Plants," EQE Pilot Program Report, "Program for the Development of an Alternative Approach to Seismic Equipment Qualification," and RES Status on their program concerning plant aging.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

1. EQE, Incorporated, "Volume I/II: Pilot Program Report - Program for the Development of an Alternative Approach to Equipment Qualification," Peter I. Yoneo, Sam W. Swan.
2. Memo for Cappucci to Ray dtd. December 16, 1983, "Pilot Program Reprt - Alternative to Seismic Equipment Qualification."
3. USI A-46, "Seismic Qualification of Equipment in Operating Plants" (To be provided later)

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
March 9	Reliability and Probabilistic Assessment	(Savio) Okrent, Bender, Ebersole, Kerr, Mark, Siess, Lewis Cons.: Hickman, Mueller, Lipinski

LOCATION:

BACKGROUND:

Who proposed action: Subcommittee Chairman and NRC Staff

Purpose: To discuss the methodology and conclusions of NUREG/CR2497, "Precursors to Potential Severe Core Damage Accidents: 1969-1979, A Status Report," and the Industry comments on this report.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

1. NUREG/CR2497, "Precursors to Potential Severe Core Damage Accidents: 1969-1979, A Status Report," Vol. 1 and 2.
2. INPO 82-025, "Review of NRC Report: Precursors to Potential Severe Core Damage Accidents: 1969-1979, A Status Report."
3. Status Report dated 1/19/83 with attached peer group comments.
4. Status Report for this meeting is to be supplied at least two weeks before meeting.
5. Meeting Report on a March 1-2 EPRI sponsored meeting on NUREG/CR 2497

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
March 16-17	COMBINED CRBR SUBCOMMITTEE/ STRUCTURES AND MATERIALS WORKING GROUP	(BOEHNERT) <u>Carbon Shewmon</u> Axtmann, Bender, Mark, Siess Cons.: Kastenber, Lipinski, Zudans, Bush

LOCATION: Washington, DC

BACKGROUND:

Who proposed action: M. Carbon/T. Theofanous

Purpose: To continue the review of the HCDA for CRBR.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

To be provided later.

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SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
March 18-19 (Tent.)	Waste Management	(Tang) <u>Moeller</u> , Axtmann, Carbon, Kerr, Mark, Ray

LOCATION: Washington, DC

BACKGROUND:

Who proposed action: Dr. Moeller

Purpose: To review and comment on DOE proposed general guidelines for recommendation of repository sites (required under §112(a) of P.L. 97-425)

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

1. P.L. 97-425 (Nuclear Waste Policy Act of 1982)
2. DOE proposed guidelines for recommendation of repository sites (available in mid-late February)

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SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
March 30	Joint Metal Components/Combination of Dynamic Loads	(IGNE) Shewmon, Bender, Etherington, Okrent, Ward, Axtmann, Lewis, Siess

LOCATION: Washington, DC

BACKGROUND:

Who proposed action: NRC/P. Shewmon, M. Bender

Purpose: To review the reevaluation of double-ended guillotine break design requirements for Westinghouse PWR plants.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

Pertinent information on this matter will be selected and distributed in meeting status report.

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SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
March 31 (tent.)	CRBR	(Boehnert) <u>Carbon</u> , Axtmann, Berder, Mark Cons.: Kastenber, Lipinski, Zudans

LOCATION:

BACKGROUND:

Who proposed action:

Purpose:

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

A-21

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
March 31 - April 1	SEABROOK 1	(MAJOR) Kerr, Bender, Lewis, Carbon (tent.), Moeller Cons.: Philbrick

LOCATION: TO BE DETERMINED (NEAR SITE - TENTATIVE: SEABROOK FIRE STATION)

BACKGROUND:

Who proposed action: NRC Staff/ACRS

Purpose: ACRS Site Visit and Subcommittee Operating License review of the Seabrook Nuclear Plant Unit 1.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

1. Seabrook SER is currently expected in the first quarter of 1983.

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
April 6, 1983	REACTOR OPERATIONS	(MAJOR) Ebersole, Bender, Kerr, Moeller, Okrent, Ray, Ward, Remick Cons.: Catton, Lipinski, Mathis, Zudans

LOCATION: Washington, DC

BACKGROUND:

Who proposed action: ACRS

Purpose: 1. Review Final Rules 10CFR 50.72, Immediate Notification Requirements and 10CFR 50.73, the revised LER rule.

As Time allows, will discuss:

2. Review generic PWR procedures used to prevent a pressurized thermal shock (PTS) transient.
3. Review proposed rule (10CFR 50.54), Applicability of License Conditions and Technical Specifications in an Emergency.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

- Copies of draft final rules 10 CFR 50.72 and 10CFR 50.73 - Have been distributed
- Copies of Generic Guidelines for Operation Actions to Prevent PTS (B&W, CE, W)
- Copy of Proposed Rule 10 CFR 50.54

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
April 21 (tent.)	CLASS 9 ACCIDENTS	(BUCCI) Kerr, Axtmann, Bender, Moeller, Okrent, Shewmon, Siess, Ward

LOCATION: Washington, DC

BACKGROUND:

Who proposed action: W. Kerr

Purpose: To review NUREG-0900, Nuclear Power Plant Severe Accident Research Plan.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

1. NUREG-0900, Nuclear Power Plant Severe Accident Research Plan, January 1983. Distributed to ACRS Members at Full Committee Meeting (February 10-12, 1983).

Other information to be provided later.

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
April 21-23 (Tent.)	Waste Management	(TANG) <u>Moeller</u> , Axtmann, Carbon, <u>Kerr</u> , Mark, Ray

LOCATION: Washington, DC

BACKGROUND:

Who proposed action: NRC Staff/Subcommittee Chairman

Purpose:

To review and comment on DOE's Site Characterization Report for the Basalt Waste Isolation Project (for Hanford Site)

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

1. Site Characterization Report for the Basalt Waste Isolation Project (DOE/RL-82-3, 3 volumes), 11/82

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
April 29 (tent.)	REACTOR RADIOLOGICAL EFFECTS	(TANG) <u>Moeller</u> , Axtmann, Ebersole, Ray, Bender

LOCATION: Washington, DC

BACKGROUND:

Who proposed action: D. Moeller

Purpose: To review Shippingport decommissioning.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

FEIS for Decommissioning of the Shippingport Atomic Power Station (DOE/EIS-0080F),
May 1982.

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
May 11, (1/2 day meeting)	Plant Features Important to Safety	(RKM) DW, MB, JCE, WK, DO, CS

LOCATION: Washington, D.C.

BACKGROUND:

Who proposed action: D. Ward

- ' Purpose: To obtain a status report and program plans on Equipment Qualification and Classification Systems dealing with both mechanical and electrical components. New initiatives in the quality assurance area will be explored. Participation by RES, NRR, and IE is expected.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

Program plans, pertinent Reg. Guides and Draft Reg. Guides will be selected and distributed in meeting status summary.

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
March (tent.)	METAL COMPONENT WORKING GROUP	(IGNE) Bender, Shewmon, Etherington, Okrent, Ward, Axtmann, Lewis

LOCATION:

BACKGROUND:

Who proposed action: Bender/Research

Purpose: To review the status of NRC PTS research program.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

Pertinent information concerning this matter will be selected and incorporated in the meeting status report.

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SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
TO BE DETERMINED (April - tent.) (2 consec. days)	WESTINGHOUSE WATER REACTORS	(CAPPUCCI) <u>Ebersole</u> , Etherington, Okrent, Shewmon, Siess
	GE WATER REACTORS	(MAJOR) <u>Ray</u> , Ebersole, Etherington, Mark, Okrent
	SAFEGUARDS & SECURITY	(FISCHER) <u>Mark</u> , Bender, Carbon, <u>Ebersole</u> , Ray, Siess

LOCATION: Washington, DC

BACKGROUND:

Who proposed action: ACRS/Vendors

Purpose: To begin review of Westinghouse Advanced PWR concepts, laying ground work for the PDA. Request for PDA will be in March 1983.

GE will be requesting a "limited" final design approval (FDA) for the GESSAR II concept. The limited FDA will not include severe accident concepts. A complete FDA review will follow the limited review by about one year.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

Westinghouse has produced a Licensing Control Document which provides the basis for the WAPWR design in response to licensing requirements.

GE has produced a Standard SAR (GESSAR II) which is the document being used as the basis of the Staff's FDA reviews. A status report will serve as an abbreviated guide to the SAR.

Staff SER on a limited FDA for GESSAR II is currently scheduled for March 1983. Meeting will be coordinated with issuance of GESSAR II SER.

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
To be determined	Midland Plant Units 1 & 2	(FISCHER) Okrent, Bender, Ebersole, Ward Consultants: Epler, Lipinski, Osterberg

LOCATION: Washington, D. C.

BACKGROUND:

Who proposed action: D. Okrent

Purpose: To review Consumers Power Company's (CPCo) plan for an audit of plant quality at Midland Plant Units 1 and 2. In addition representatives of CPCo will report on design and construction problems at Midland, their disposition, and the overall effectiveness of the effort to assure appropriate plant quality. The Committee will be briefed on CPCO's Systems Completion Plan.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

1. P. Shewmon letter to N. Palladino dated June 8, 1982, Subject: ACRS Interim Report on Midland Plant, Units 1 and 2.
2. T. Novak Letter to P. Shewmon dated Nov. 19, 1982, Subject: Report on Midland Design and Construction Problems, Their Disposition, and Overall Effectiveness of the Effort to Assure Appropriate Quality.
3. M. Sinclair letter to D. Okrent dated Dec. 14, 1982, Subject: Midland quality assurance.
4. B. Garde letter to D. Okrent dated Jan. 13, 1983, Subject: Midland quality assurance/quality control.
5. J. Cook letters to H. Denton/J. Keppler dated Oct. 5, 1982, Nov. 11, 1982, and Dec. 3, 1982, Subject: Midland Plant Independent Review Program.
6. J. Cook letter to J. Keppler dated Jan. 10, 1983, Subject: Letter to J. W. Cook dated Dec. 30, 1982, from NRC Region III Regarding Construction Completion Program.

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
To be determined	Human Factors	(FISCHER) <u>Ward</u> , Bender, Lewis, Moeller, Ray, Remick Consultants: Buck, Catton, Debons, Keyserling, Nertney, Pearson, Reichenbach, Salvendy

LOCATION: Washington, D. C.

BACKGROUND:

Who proposed action: Commissioner Ahearne/D. Ward

- Purpose:
- a. To review the question of what qualifications would be desirable for members of a nuclear power plant operating staff.
 - b. To review the adequacy of the application of the generic safety issue prioritization methodology to human factors related safety issues.
 - c. To review proposed human factors related modifications to 10CFR50 Appendix A, General Design Criteria for Nuclear Power Plants.
 - d. To discuss Dr. G. Salvendy's proposal for training human factors engineers for safe design and operation of nuclear power plants.
 - e. To be briefed by the Office of Inspection and Enforcement on recent activities at the NRC's emergency response center.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

1. Commissioner Ahearne letter to Mr. J. Ray dated Jan. 7, 1983 Subject: Quality of Plant Operation Personnel.
2. P. Shewmon letter to N. Palladino dated Dec. 14, 1982 Subject: ACRS Comments on Rulemaking Concerning Staffing at Nuclear Power Plants and Draft Policy Statement on Shift Crew Qualifications.
3. SECY-81-84, Proposed Rulemaking, "Qualification of Reactor Operators", Feb. 2, 1981.
4. SECY-81-84A, Staff Requirements-Discussion of Revisions to Reactor Operator Qualifications, June 15, 1981.
5. SECY-82-56, Status of Reactor Operator Qualifications Peer Review Panel, Feb. 9, 1982.
6. SECY-82-162, Report from the Reactor Operator Qualifications Peer Review Panel, April 15, 1982.
7. SECY-82-162A, Integrated Plan for the Development of a Rule for Shift Crew Qualifications, August 26, 1982.
8. NUREG-0933, "A Prioritization of Generic Safety Issues" (Draft, Nov. 10, 1982).
9. J. Ray letter to N. Palladino dated Jan. 11, 1983, Subject: ACRS Report on the Proposed Generic Safety Issues Prioritization Methodology.
10. G. Salvendy memorandum to D. Fischer dated Nov. 22, 1982, Subject: A Proposal for Training Human Factors Engineers for Safe Design and Operation of Nuclear Power Plants.

SCHEDULE OF ACRS SUBCOMMITTEE MEETING

<u>DATE</u>	<u>SUBCOMMITTEE</u>	<u>STAFF ENGR. & MEMBERS</u>
TO BE DETERMINED (May-June)	Metal Components	(IGNE) Shewmon, Etherington, Bender, Okrent, Ward, Axtmann, Lewis

LOCATION: Washington, DC

BACKGROUND:

Who proposed action: NRC/P.G. Shewmon

Purpose: To review NRC action plan on Integrity of bolts.

PERTINENT PUBLICATIONS AND THEIR AVAILABILITY:

1. NRC action plan on bolt integrity is currently being written by NRC. This document will be available before the meeting. (Note: the NRC evidently views this matter lightly because of its many delays)



Franklin Research Center
A Division of The Franklin Institute

Z. ZUDANS, PH.D.

Senior Vice President and Chief Operating Officer

January 31, 1983

Mr. Anthony J. Cappucci, Jr.
Advisory Committee on Reactor Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Skagit/Hanford Nuclear Project

Dear Tony:

Overall impression of the Skagit/Hanford applicants presentation was good. The individual presentors were well prepared and could either answer all questions in satisfactory manner directly or came back with answers at a later time.

Skagit/Hanford site appears to be ideal, no civilian population to speak of within the LPZ, however, about 5,000 nuclear related workers within the Hanford Reservation need to be factored in. The only structural aspect that is novel is the 7.5 mi long, 36", raw water supply pipe and the intake structure on the Columbia River that is quite a ways away from the plant site. Whether or not this structure needs some special disposition in terms of safeguards depends on the acceptability of 30 day water reserve in the ultimate heat sink (UHS). Also the site is some 150 ft above the water level at the intake, however, potential for inadvertent drainage of the UHS is prevented by an appropriate placement of the pipe discharge end at or slightly below the UHS water surface.

The foundation of Skagit/Hanford is on soil unlike the original site where it was on the rock. If one factors in the problem with the backfill experienced at the Midland site, it is appropriate to review the backfill procedures carefully, in particular with respect to the compacting.

Skagit/Hanford management appears to be well structured and experienced in their functions. It was, however, not stated how much of their accumulated experience is derived from other than Skagit scenario. Top managements attitude and policy with respect to the quality assurance is sound and encouraging in particular as it was conveyed by Mr. Myers during his presentation. Apparently applicants strategy is to obtain CP for Skagit/Hanford, and then by consideration of the regional power requirement projections, the state of the economy and with the "regulatory ratched under control," to make the decision to construct or not to construct the plant. During the construction an independent Safety Engineering Group will be brought into existence at about the time of preoperational testing. For training, Black Fox simulator will be used (managed by GE).

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ATTACHMENT

Mr. A. J. Cappucci, Jr.
ACRS

- 2 -

January 31, 1983

Mark III pool dynamic loads were discussed. Applicant understands the phenomena and follows the design methodology used by others (NTOLS). Cross quenchers are used on the SKV discharge, rams on the RHR relief valve discharge. For H₂ control, a distributed igniter system is planned, similar to that used in Grand Gulf.

In summary, this applicant appears to know its plant well, follows the imposed requirements strictly, has a constructive policy with respect to the QA at the top of the management structure and with the assistance of Bechtel and NESCO should be able to construct a sound Skagit/Hanford plant.

Very truly yours,


Zenons Zudans

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11

This report may contain proprietary or other information which should be protected from public disclosure. It should not be released until a review of the document has been completed.

George A. Thompson
421 Adobe Place
Palo Alto, California 94306
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

January 25, 1983 FEB 1 1983

AK
7,8,9,10,11,12,13

Dr. Carson Mark
Advisory Committee on Reactor Safeguards
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Dr. Mark:

This letter summarizes my conclusions on questions about the geology and seismology relevant to the Skagit/Hanford site, as discussed in the ACRS Subcommittee meeting of January 24 and 25, 1983.

First, the May Junction monocline is an open issue, and core drilling is proposed to see whether or not the structure is faulted. The monocline, concealed by younger deposits, is about 2 1/2 miles long, has a structural relief of about 400 feet in the Elephant Mountain basalt, and has gentle dips of 10-15°. Gravity data are clear in showing that the structure terminates southward four miles north of the construction site. The question is whether the rocks are faulted in addition to being bent into a monocline. No subsurface method, including drilling, is likely to resolve faults in the basalt with vertical displacement less than about 20 feet. However, if such small faults exist, they would almost surely have been formed at the time of monoclinial bending, millions of years ago, and they would not present a significant earthquake hazard. I therefore recommend that additional drilling proposed by the NRC be designed to confirm present interpretations of the structure (i.e. no large faults) and not be directed at the impossible goal of proving "no faults."

Second, the analysis of seismic potential by Slemmons in an appendix to the SER is thorough and thoughtful. I concur in his conclusions about the likelihood of earthquakes of various magnitudes originating on known structures.

Third, in view of regional studies such as those made for the WPPSS site, we should be aware of the remote possibility of rare, unexpected events on old structures. Experience in central and eastern North America teaches us that earthquakes occur occasionally on old structures that were thought to be dead. In my opinion the basalt anticlines must reflect compression in deeper, totally concealed, structures, and there is a finite chance of rare earthquakes being generated on these old structures. For that reason, I am pleased that the facility is being designed for a safe shutdown earthquake of 0.35 g. This value provides considerable insurance against the unexpected and unpredictable.

Sincerely,

A-35 12

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555
February 8, 1983

FOIA EXEMPTION (b)5
TAB 2.1



MEMORANDUM FOR: A. J. Cappucci, Staff Engineer
FROM: *[Signature]* Ivan Catton, ACRS Consultant
SUBJECT: - CONSULTANT'S REPORT FOR SKAGIT SUBCOMMITTEE MEETING,
JANUARY 24-25, 1983, IN RICHLAND, WASHINGTON

The Skagit site is not only desolate, it has been reviewed several times in the past. With both FFTF and WPPSS near by, it's hard to imagine anything having been overlooked. A better site for a nuclear power plant would be hard to find.

The Staff presentation by C. W. Moon was somewhat lackluster. It could be that the utilities expressed willingness to incorporate answers to all problems found during the Grand Gulf and Perry reviews into their plans leaves very little to do. Further, it's not clear that the plant will ever be built and some would bet that it will not. Notably absent from the Staff's presentations was any mention of FFTF which is only five miles away. I have recollections of the fence post dose from FFTF being at the limit. With Skagit closer than the fence post, and FFTF not being a licensed facility, a cursory examination might be worthwhile.

The utility actively participates in appropriate BWR owner's group activities. They are therefore, aware of most of the questions that have arisen and seem to be willing to make whatever design changes are necessary. Their knowledge of the suppression pool issues was a clear demonstration of how well they had done their homework. Of course ten years to a CP should be enough time to do it.

Robert V. Myers, (V.P. Generation Resources) made a good impression. His ideas on how the plant should be operated certainly made sense. At present, he is responsible for generation of about 540 MW. This means that his responsibilities will grow by a factor of two. At present there are 15 to 18 people devoted to Skagit. This is not very many. NESCO, a utility owned company, will give the utilities project management. As construction winds down they will transfer people from NESCO to Skagit operations. Close interactions between those who will eventually run the plant and those who build it is very valuable. It is hoped that this transfer of personnel will take place in large enough numbers to be meaningful.

Skagit will be the first plant to do a pre-construction PRA. As a part of the PRA they plan to evaluate an additional decay heat removal system. Unfortunately they appear to be carrying it out because they have to not to gain anything or to optimize design. Furthermore, it appears as if they plan to have others do the work. It seems to me that they should be encouraged to involve themselves with the PRA in a more meaningful way.

cc: ACRS Members
ACRS Technical Staff

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APPENDIX V
LETTER TO CHAIRMAN PALLADINO FROM
CONGRESSMAN E.J. MARKEY, DTD. 1/10/83

January 10, 1983

Nunzio Palladino
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Palladino:

On December 30, a subcommittee of the Nuclear Regulatory Commission's Advisory Commission on Reactor Safeguards announced a technical meeting to discuss the proposed Skagit Nuclear Project at Benton County, Washington. In light of the financial and planning disaster which Washington Public Power Supply System represents, I find it absurd that the NRC is wasting its vital resources on this dubious project.

The problems of WPPSS are well known. Originally designed to meet the foreseen "burgeoning power demands" of the Northwest, WPPSS today offers a caricature of an oversupplied tanning-lotion merchant during the rainy season. If the nuclear industry and its regulators have learned anything from the lesson WPPSS offers, it is that we should not waste public, private, or regulatory resources on projects destined to meet the same fate WPPSS did in the marketplace.

I might further add that all of the utilities involved--Pugett Lighting and Sound, Portland Genral Electric Company, Pacific Power and Light Company, and Washington Water Power Company--have a financial interest in one or more of the WPPSS projects. An important question NRC must monitor is why these utilities are investing in nuclear power plants when nuclear plants they currently own are not needed.

I firmly believe the vital resources of the NRC's ACRS should be put to a better use. It is foolish to waste NRC's time and energy on a project which will never serve the public.

With best wishes,

Sincerely,
EJ Markey
Edward J. Markey
Chairman, Subcommittee
on Oversight & Investigations

cc: Paul Shewmon
Chairman, ACRS

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**SKAGIT/HANFORD NUCLEAR PROJECT
INTRODUCTION
SITE AND PLANT
DESCRIPTION**

**MICHAEL V. STIMAC
MANAGER LICENSING AND REGULATION
PUGET SOUND POWER & LIGHT COMPANY**

APPENDIX VI
INTRODUCTION SITE AND PLANT DESCRIPTION

A-38

SKAGIT/HANFORD NUCLEAR PROJECT
ACRS FULL COMMITTEE MEETING
FEBRUARY 10, 1983

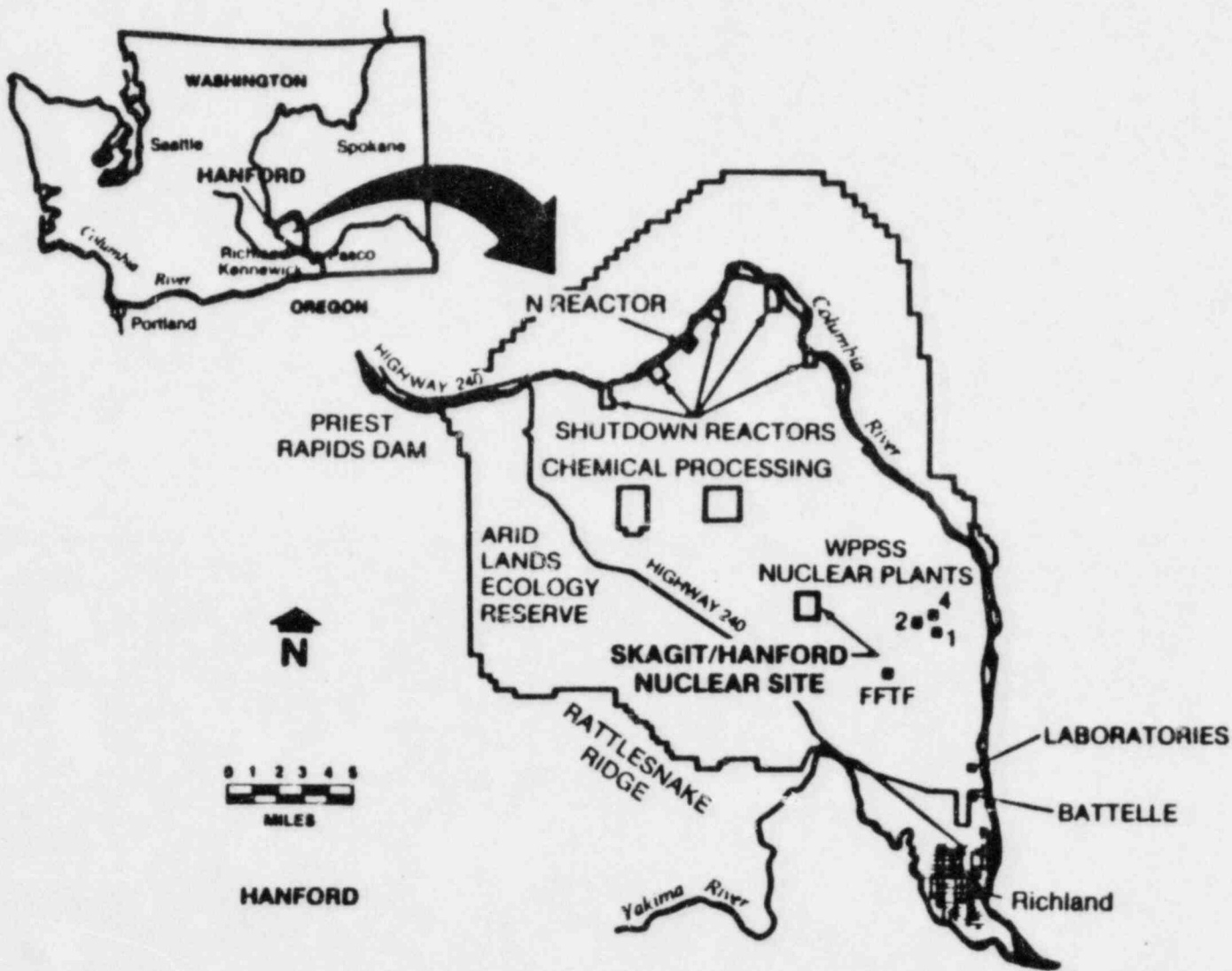
	<u>APPLICANT REPRESENTATIVE</u>	<u>APPROXIMATE TIME</u>
I. SUBCOMMITTEE REPORT		8:45- 9:00 AM
II. INTRODUCTION	M. STIMAC	9:00- 9:20 AM
III. NRC STAFF		9:20- 9:50 AM
A. OPEN ITEMS AND COMMITMENTS		
B. STAFF CONCLUSIONS		
IV. ORGANIZATION AND MANAGEMENT	R. MYERS	9:50-10:50 AM
V. SITE CHARACTERISTICS	J. MECCA	10:50-11:30 AM
VI. DESIGN CONSIDERATIONS	D. HACKING	11:30-11:50 AM

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SKAGIT/HANFORD NUCLEAR PROJECT FEDERAL LICENSING SYNOPSIS

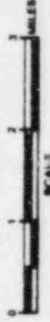
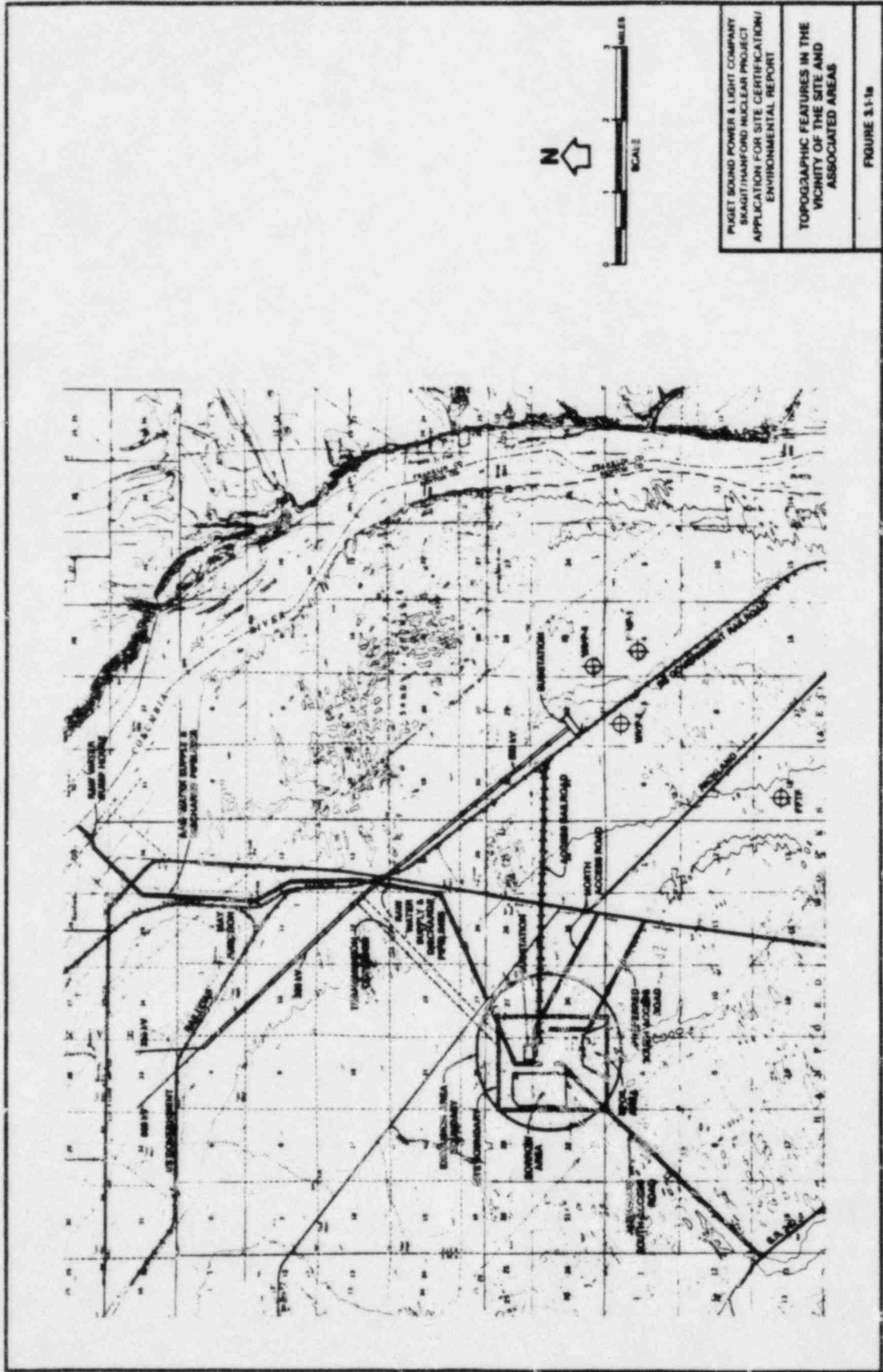
- JANUARY 1973 — ANNOUNCEMENT OF SKAGIT NUCLEAR POWER PROJECT
- AUGUST 1974 — LICENSE APPLICATION FILED
ENVIRONMENTAL REPORT (ER)
PRELIMINARY SAFETY ANALYSIS REPORT (PSAR), CHAPTER 2
- SEPTEMBER 1974 — APPLICATION AND ER DOCKETED
- DECEMBER 1974 — REMAINDER OF PSAR FILED
- JANUARY 1975 — PSAR DOCKETED
- MAY 1975 — FINAL ENVIRONMENTAL STATEMENT (FES) ISSUED
- JULY 1975 — SITE SUITABILITY AND ENVIRONMENTAL HEARINGS BEGAN
- SEPTEMBER 1977 — SAFETY EVALUATION REPORT (SER) ISSUED
— ACRS SUBCOMMITTEE MEETINGS
- NOVEMBER 1977 — ACRS FULL COMMITTEE MEETING (211)
— ACRS LETTERS ISSUED NOVEMBER 15 AND 18
- OCTOBER 1978 — SER SUPPLEMENT NO. 1 ISSUED
- MARCH 1979 — THREE MILE ISLAND ACCIDENT
- NOVEMBER 1979 — REZONE AGREEMENT NOT EXTENDED
- JULY 1980 — DECISION TO MOVE TO HANFORD
- SEPTEMBER 1980 — LICENSE APPLICATION AMENDED FOR SITE CHANGE
- JULY/SEPT 1981 — PSAR AMENDMENTS 21 & 22 SUBMITTED ON
TMI REQUIREMENTS
- OCTOBER 1981 — TITLE CHANGED TO SKAGIT/HANFORD NUCLEAR PROJECT
— SER SUPPLEMENT NO. 2 (TMI) ISSUED
- DECEMBER 1981 — SITE CHANGE AMENDMENTS SUBMITTED
- APRIL 1982 — DRAFT ENVIRONMENTAL STATEMENT (DES) HANFORD SITE
- DECEMBER 1982 — SER SUPPLEMENT NO. 3 ISSUED
- JAN 24 & 25, 1983 — ACRS SUBCOMMITTEE MEETING
- FEBRUARY 10, 1983 — ACRS FULL COMMITTEE MEETING

SKAGIT/HANFORD NUCLEAR PROJECT AREA MAP



19-41

HANFORD

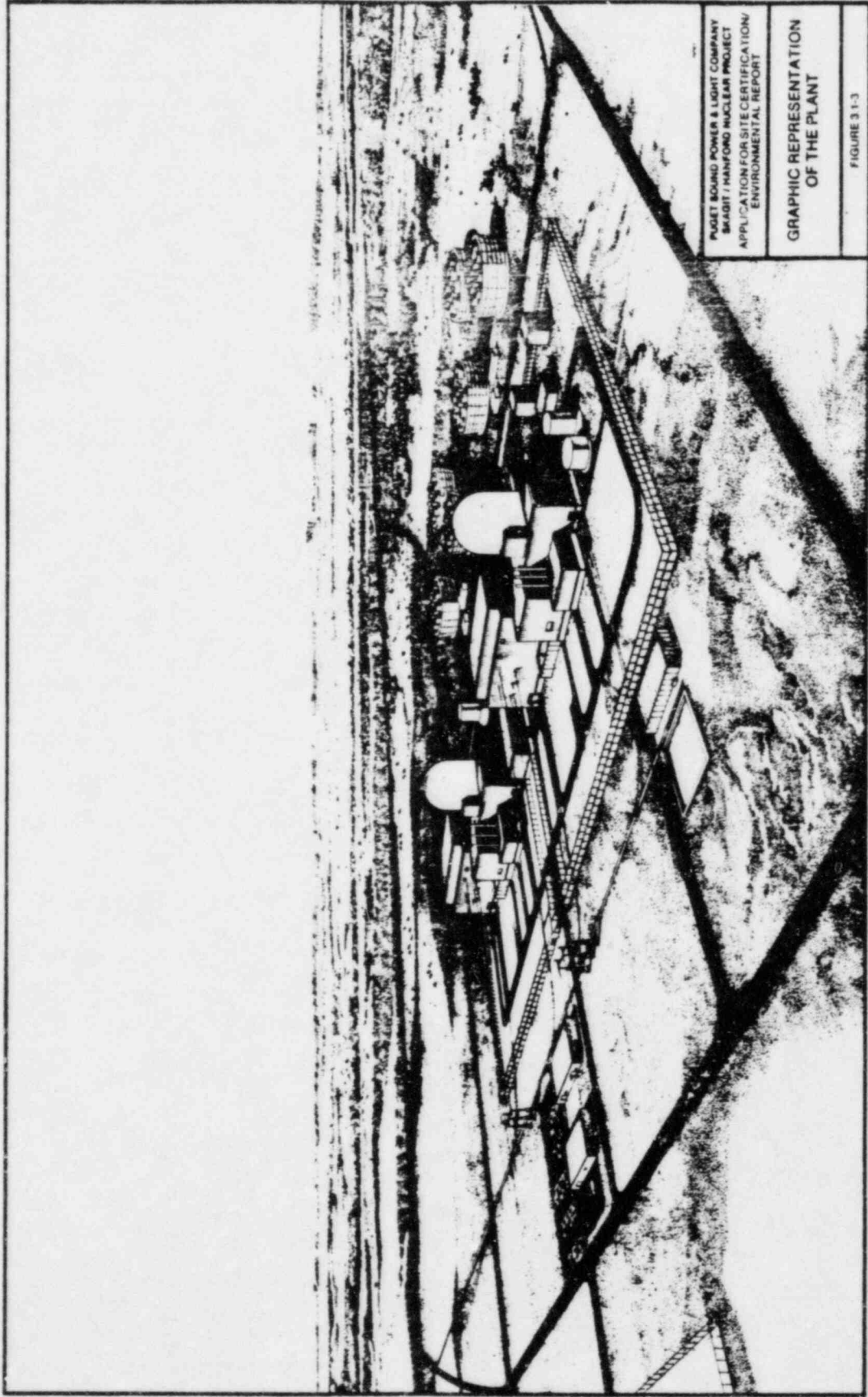


PIGET SOUND POWER & LIGHT COMPANY
 SKAGIT/HANFORD NUCLEAR PROJECT
 APPLICATION FOR SITE CERTIFICATION/
 ENVIRONMENTAL REPORT

TOPOGRAPHIC FEATURES IN THE
 VICINITY OF THE SITE AND
 ASSOCIATED AREAS

FIGURE 3.1-1a

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INTRODUCTION

- o REVIEW FOR SKAGIT SITE, NSSS, BOP
 - SAFETY EVALUATION REPORT 9/77
 - ACRS LETTER 11/77
 - SER SUPPLEMENT NO. 1 10/78

- o REVIEW FOR TMI-RELATED REQUIREMENTS
 - SER SUPPLEMENT NO. 2 10/81
 - FINAL RULE CONFORMANCE 2/82

- o REVIEW FOR SKAGIT/HANFORD SITE
 - PSAR AMENDMENT 23 12/81
 - SER SUPPLEMENT NO. 3 12/82

PRINCIPAL ISSUES
SKAGIT/HANFORD SITE

- o AUTHORITY TO CONTROL ACTIVITIES IN EXCLUSION AREA
- o NEARBY FACILITIES
 - TRANSPORTATION OF AMMONIA - *risk insufficient to protect against*
 - EXTREMELY HAZARDOUS WASTE DUMP - *continuous monitors necessary*
- o METEOROLOGY
 - WNP-2 SITE DATA
 - ACCID. DOSES ENVELOPED BY SKAGIT CALCULATIONS
- o HYDROLOGICAL ENGINEERING
 - LOCAL FLOOD - ROOF LOADS
 - STAFF REVIEW OF UHS
- o GEOLOGY
 - WNP-2 REVIEW APPLICABLE
 - S/HNP - SITE/NEAR SITE INVESTIGATIONS
 - MAY JUNCTION MONOCLINE - ADDITIONAL SUBSURFACE DATA NEEDED
- o SEISMOLOGY
 - ^{.35g}SSE/OBE_{.75} USED FOR SKAGIT SITE ACCEPTABLE FOR S/HNP SITE

A-45

PRINCIPAL ISSUES
SKAGIT/HANFORD SITE
(CONT'D)

- o SUBSURFACE MATERIAL AND FOUNDATIONS
- o MASONRY WALLS
- o FACILITY OPERATION IN S/HNP SITE ENVIRONMENT - *volcanic ash*
- o APPENDIX I REVIEW - COST-BENEFIT ANALYSIS
- o EMERGENCY PLANNING - 12/80 NEW RULE
- o UNRESOLVED SAFETY ISSUES (USI's)

STAFF CONCLUSIONS

- o APPLICATION ACCEPTABLE FOR CP IN 10/78 EXCEPT FOR SKAGIT SITE ISSUES
- o NO MAJOR FACILITY CHANGES REQUIRED FOR SKAGIT/HANFORD SITE
- o SKAGIT/HANFORD SITE CONDITIONS WILL BE ACCOMMODATED IN THE FINALIZATION OF DESIGN AND OPERATING PROCEDURES
- o USI RESOLUTIONS WILL BE IMPLEMENTED
- o REQUIREMENTS OF RULE FOR TMI-RELATED REQUIREMENTS FOR CP/ML HAVE BEEN MET
- o PROVISION OF SUBSURFACE DATA FOR MAY JUNCTION MONOCLINE CAN BE ASSURED BY CP CONDITION
- o STAFF SAFETY REVIEW IS COMPLETE AND PROVIDES BASIS FOR DECISION TO ISSUE CP
- o ASLB PREHEARING ACTIONS 1/17 - 4/28/83
- o ASLB EVIDENTIARY HEARING START 5/17/83
(TENTATIVE)

ERRATA

SAFETY EVALUATION REPORT

SKAGIT/HANFORD NUCLEAR PROJECT
UNITS 1 AND 2
DOCKET NOS. STN 50-522 and 50-523

NUREG-0309

Supplement No. 2

Page ix line 3 change "in eastern Washington" to "in northwestern Washington"

Supplement No. 3

Page 2.6 1st full paragraph

line 3 change "360" to "300", change "3" to "2.25"

line 4 change "1" to "1.2"

line 4 and 5 change "closer to the more stringent Class I..." to
"are the values for the more stringent Class II..."

Page 2.7 3rd paragraph

line 3 change "address" to "meet"

line 5 change "upgrade the" to "implement an"

line 6 change "The upgraded" to "This"

Page 11.3 3rd full paragraph

lines 5, 6 and 7 delete the sentence "Similarly, the doses from liquid releases resulted in gross cost-assessment values of \$870 for the total body person-rem dose and \$6150 for the person-thyroid-rem dose."

Page 11.6 Table 11.2

4th line from bottom (Cs-136) Column "Auxiliary building vent"
change " 3.0×10^{-1} " to " 3.0×10^{-4} "

A-48

**SKAGIT/HANFORD NUCLEAR PROJECT
ORGANIZATION AND MANAGEMENT**

**ROBERT V. MYERS
VICE PRESIDENT GENERATION RESOURCES
PUGET SOUND POWER & LIGHT COMPANY**

APPENDIX VIII
ORGANIZATION AND MANAGEMENT

A-49

**SKAGIT/HANFORD NUCLEAR PROJECT
ORGANIZATION AND MANAGEMENT**

- **PROJECT OWNERSHIP AND STRUCTURE**
- **ORGANIZATION & RESPONSIBILITIES**

**PUGET
NESCO**

- **QA/QC PROGRAM**
- **TRANSITION TO CONSTRUCTION**
- **TRANSITION TO OPERATION**

A-520

SKAGIT/HANFORD NUCLEAR PROJECT
PROJECT OWNERSHIP AND STRUCTURE

OWNERSHIP

- PUGET SOUND POWER & LIGHT COMPANY (40%)
- PORTLAND GENERAL ELECTRIC COMPANY (30%)
- PACIFIC POWER & LIGHT COMPANY (20%)
- THE WASHINGTON WATER POWER COMPANY (10%)

PROJECT STRUCTURE

- PUGET — OVERALL RESPONSIBILITY FOR THE DESIGN, CONSTRUCTION AND OPERATION
- NESCO — PROJECT MANAGEMENT AND ENGINEERING/ CONSTRUCTION DIRECTION AND OVERVIEW
- BECHTEL — A/E, PROCUREMENT AND CONSTRUCTION MANAGEMENT
- GENERAL ELECTRIC — NUCLEAR STEAM SUPPLY SYSTEM
- WESTINGHOUSE — TURBINE GENERATOR
- SELECTED SPECIALTY CONSULTANTS

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**SKAGIT/HANFORD NUCLEAR PROJECT
PUGET SOUND POWER AND LIGHT
ORGANIZATION AND RESPONSIBILITIES**

OVERALL RESPONSIBILITY FOR:

- QA ACTIVITIES
- DESIGN
- PROCUREMENT
- FABRICATION
- CONSTRUCTION
- PREOPERATIONAL TESTING
- OPERATION

A-5-2

SKAGIT/HANFORD NUCLEAR PROJECT
NORTHWEST ENERGY SERVICES COMPANY

- 1. MANAGEMENT AND ENGINEERING SERVICES COMPANY**
- 2. PURPOSE — PROJECT MANAGEMENT FOR MAJOR ELECTRICAL GENERATING PROJECTS OF OWNER UTILITIES**
- 3. ADVANTAGES**
 - STRONG TECHNICAL INTERFACE BETWEEN PUGET AND PRINCIPAL CONTRACTORS**
 - CONSOLIDATES RESOURCES OF OWNER UTILITIES**
 - FACILITATES RECRUITING AND RETENTION OF PERSONNEL EXPERIENCED IN MANAGEMENT AND CONSTRUCTION OF LARGE PROJECTS**
 - FUTURE TECHNICAL SUPPORT FOR OPERATIONS AND MAINTENANCE**

A-5-3

SKAGIT/HANFORD NUCLEAR PROJECT
NUCLEAR EXPERIENCE OF
MANAGEMENT/TECHNICAL
STAFF PERSONNEL

INDIVIDUAL	TITLE	COMPANY	TOTAL YEARS	
			NUCLEAR EXPERIENCE	OTHER THAN SKAGIT/HANFORD
R.V. MYERS	VICE PRESIDENT GENERATION RESOURCES	PUGET	23	13
R.D. HILL	DIRECTOR NUCLEAR PROJECTS	PUGET	24	16
R.A. NEWKIRK	SENIOR STAFF ENGINEER	PUGET	18	12
S.W. MARTSOLF	STAFF ENGINEER	PUGET	16	7
M.V. STIMAC	MANAGER LICENSING & REGULATION	PUGET	14	4
R.N. HETTINGER	MANAGER QUALITY ASSURANCE	PUGET	37	28
W.J. FERGUSON	PRESIDENT	NESCO	32	22
E.V. PADGETT	DIRECTOR QUALITY ASSURANCE	NESCO	25	18
F.A. SPANGENBERG	PROJECT MANAGER	NESCO	19	18
J.E. MECCA	MANAGER SAFETY	NESCO	20	13
T.L. GREBEL	MANAGER LICENSING	NESCO	8	6
D.B. HACKING	PROJECT ENGINEER	NESCO	15	8
V.G. GRAYHEK	SENIOR STAFF ENGINEER	NESCO	28	21
E. NORMAND	SENIOR STAFF ENGINEER	NESCO	13	10
TOTAL			292	196
MAN-YEARS				

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SKAGIT/HANFORD NUCLEAR PROJECT
RECENT INDUSTRY CONSTRUCTION EXPERIENCE

- **REPORTS ON CONSTRUCTION QA PROBLEMS**
 - **SECY 82-352; ASSURANCE OF QUALITY**
 - **ANS CONFERENCE**
 - **EI QA COMMITTEE**

- **PRIMARY LESSONS LEARNED**
 - **FAILURE OF THE PROJECT MANAGEMENT TEAM TO PROVIDE ADEQUATE MANAGEMENT CONTROLS TO PREVENT A SIGNIFICANT BREAKDOWN IN QUALITY FROM OCCURRING**

 - **FAILURE OF THE OWNER'S QUALITY ASSURANCE PROGRAM TO DETECT THE BREAKDOWN IN A TIMELY MANNER; RECOGNIZE THE TRUE EXTENT AND NATURE OF THE PROBLEMS; AND TO OBTAIN THE NEEDED CORRECTIVE ACTION**

A-5-5

**SKAGIT/HANFORD NUCLEAR PROJECT
QA PROGRAM OBJECTIVES**

- 1. KNOW WHAT IS GOING ON
DON'T RELY ON CONTRACTORS**
- 2. EVALUATE CONTRACTOR'S CAPABILITY BEFORE START
OF WORK**
- 3. DO IT RIGHT THE FIRST TIME**
- 4. PROMOTE QUALITY CONSCIOUSNESS THROUGHOUT
PROJECT**
- 5. INSTILL PRIDE OF WORKMANSHIP**
- 6. KEEP QUALITY PROBLEMS IN OPEN**

A-5-6

SKAGIT/HANFORD NUCLEAR PROJECT TRANSITION TO CONSTRUCTION

1. PREPARED FOR CONSTRUCTION — NOVEMBER 1977
 - FULLY STAFFED FOR CONSTRUCTION
 - CONTRACTS IN-PLACE
2. PROJECT CURRENTLY ON HOLD
 - MANPOWER CUT-BACK
 - ACTIVITY TO SUPPORT CP LICENSING AT NEW SITE
 - RESTUDY PROJECT FOR DECISION TO PROCEED
3. PREPARATION FOR START OF CONSTRUCTION STARTS WITH CP AND DECISION TO PROCEED
 - MAINTAIN CP COMMITMENTS
 - MANPOWER BUILD-UP
 - CONSTRUCTION PLANNING
 - OPERATIONS PLANNING
4. START CONSTRUCTION
 - FULL STAFF
 - FULL QA PLAN IN PLACE
 - DESIGN RE-START
 - PROGRAM REVIEW AGAINST INPO CRITERIA FOR CONSTRUCTION PROJECTS

A-57

SKAGIT/HANFORD NUCLEAR PROJECT TRANSITION TO OPERATION

- **PUGET STAFF WILL OVERSEE DESIGN AND CONSTRUCTION**
- **NESCO RESIDENT ENGINEERING STAFF WILL BE ENCOURAGED TO TRANSFER TO OPERATIONS OR ENGINEERING SUPPORT GROUPS**
- **PUGET TECHNICAL SUPPORT WILL BE CONSISTENT WITH THE GUIDELINES OF NUREG-0731; "GUIDELINES FOR UTILITY MANAGEMENT STRUCTURE AND TECHNICAL RESOURCES"**
- **PUGET WILL EMPLOY THE OPERATING STAFF WITH AMPLE LEAD TIME TO LEARN S/HNP DESIGN AND OPERATION AND BE DIRECTLY INVOLVED IN THE PREOPERATIONAL AND STARTUP TEST PROGRAMS**

A-5-8

**SKAGIT/HANFORD NUCLEAR PROJECT
SITE CHARACTERISTICS**

**JAMES E. MECCA
MANAGER — SAFETY
NORTHWEST ENERGY SERVICES COMPANY**

APPENDIX IX
SITE CHARACTERISTICS

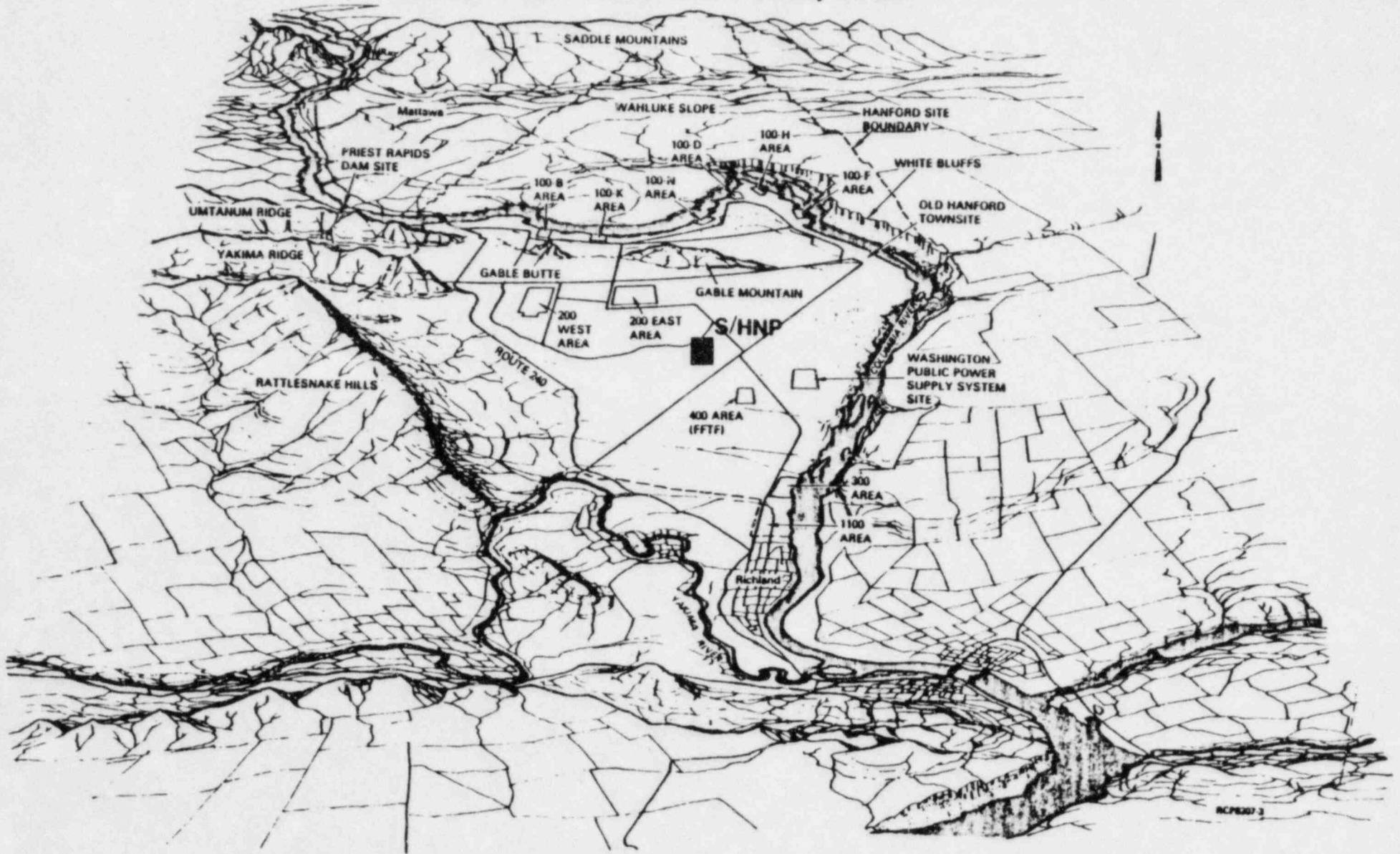
A-59

**SKAGIT/HANFORD NUCLEAR PROJECT
CHARACTERISTICS REVIEWED**

- GEOGRAPHY/DEMOGRAPHY
- NEARBY FACILITIES
- METEOROLOGY
- HYDROLOGY
- GEOLOGY AND SEISMOLOGY

A-60

**SKAGIT/HANFORD NUCLEAR PROJECT
THE HANFORD RESERVATION
AFTER ROCKWELL INTL., 1982**



**SKAGIT/HANFORD NUCLEAR PROJECT
GEOGRAPHY AND DEMOGRAPHY**

- **SITE: 1,200 ACRES**
- **EXCLUSION AREA BOUNDARY: 1 MILE RADIUS**
- **LOW POPULATION ZONE: 4 MILE RADIUS**
- **NEAREST RESIDENT: 7.5 MILES**
- **0-10 MILE 1990 POPULATION**
 - **520 RESIDENTS**
 - **6,200 INDUSTRIAL WORKERS**
- **0-50 MILE 1990 POPULATION — 340,000**
- **NEAREST POPULATION CENTER — NORTH RICHLAND (12 MILES)**
- **CONCLUSION:
THE EXCLUSION AREA, LOW POPULATION ZONE AND POPULATION
CENTER DISTANCE MEET THE CRITERIA OF 10 CFR 100**

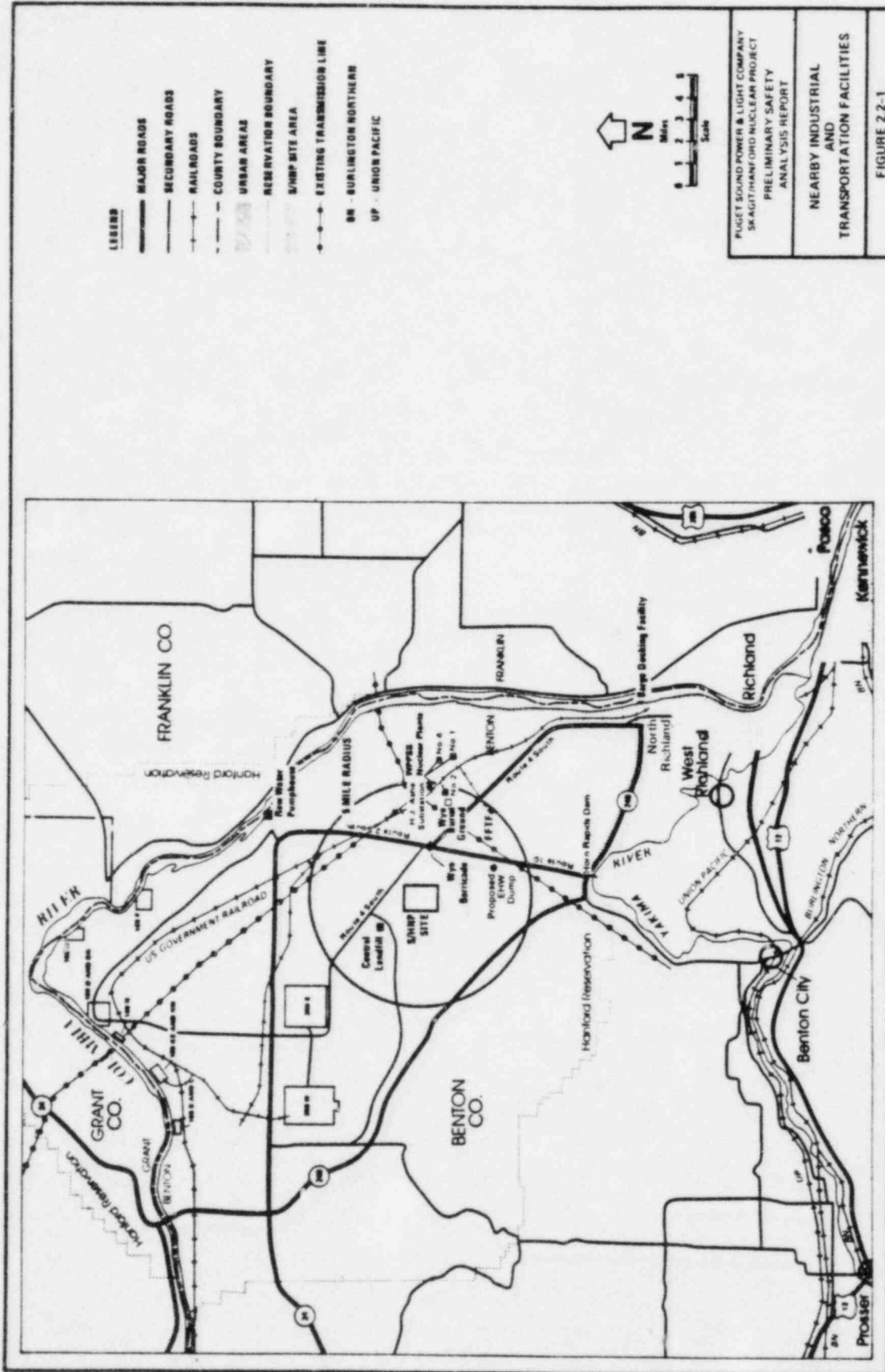
A-62

SKAGIT/HANFORD NUCLEAR PROJECT NEARBY FACILITIES EVALUATED

- **FFTF**
- **WNP-2**
- **WYE RADIOACTIVE WASTE BURIAL GROUND**
- **PROPOSED SITE FOR HAZARDOUS WASTE DISPOSAL**
- **ROADS AND RAILROADS**
- **COLUMBIA RIVER**
- **AIR TRAFFIC**
- **PIPELINES**

CONCLUSION:

- **PLANT IS ADEQUATELY PROTECTED IN ACCORDANCE WITH THE GUIDANCE OF SRP SECTIONS 2.2, 3.5.1.5 AND 3.5.1.6 AND GDC 4, "ENVIRONMENTAL AND MISSILE DESIGN BASIS"**
- **CONTROL ROOM HABITABILITY DESIGN MEETS THE GUIDANCE OF NUREG-0718 (REV. 2), ITEM III. D.3.4 AND 10 CFR 50, APPENDIX A, GDC 19**



A64

**SKAGIT/HANFORD NUCLEAR PROJECT
METEOROLOGY**

- **DIFFUSION OF EFFLUENTS DOMINATED BY TOPOGRAPHICAL FEATURES GREATER THAN 10 MILES FROM SITE**
- **WNP-2 DATA DETERMINED TO BE APPLICABLE**

A-65

**SKAGIT/HANFORD NUCLEAR PROJECT
HYDROLOGY**

COLUMBIA RIVER PMF — 80 FEET BELOW TOP-OF-BASEMAT

LOCAL PMF — 1 FOOT BELOW TOP-OF-BASEMAT

LOW WATER — RIVER REGULATED MINIMUM FLOW IS 36,000 CFS

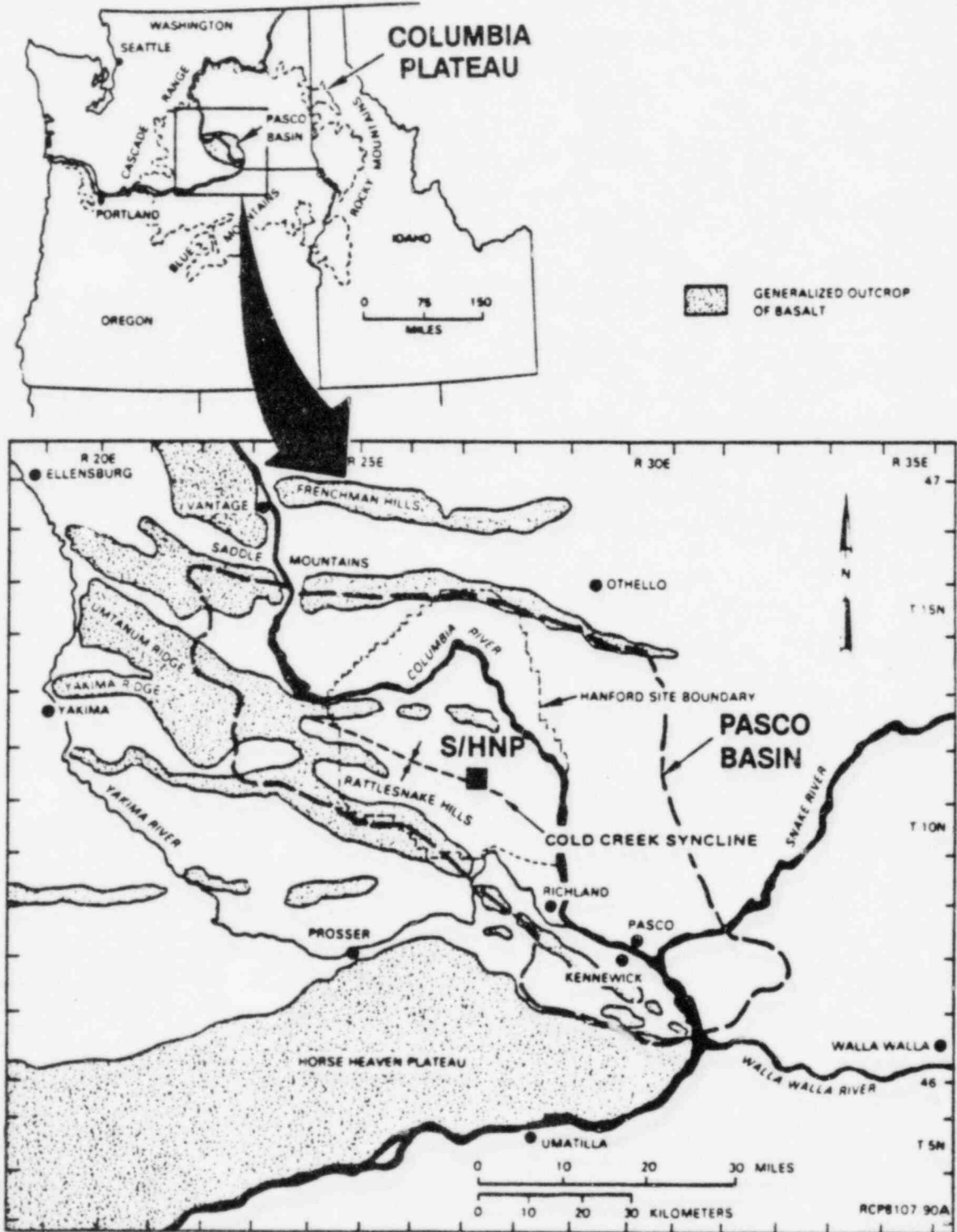
DEPTH TO GROUNDWATER — 125 FEET

CONCLUSIONS:

**SITE AND FACILITIES MEET THE REQUIREMENTS OF 10 CFR 20,
10 CFR 50 AND 10 CFR 100 AND THE GUIDANCE OF SRP
SECTIONS 2.4.1 THROUGH 2.4.14 WITH RESPECT TO
HYDROLOGICAL ENGINEERING**

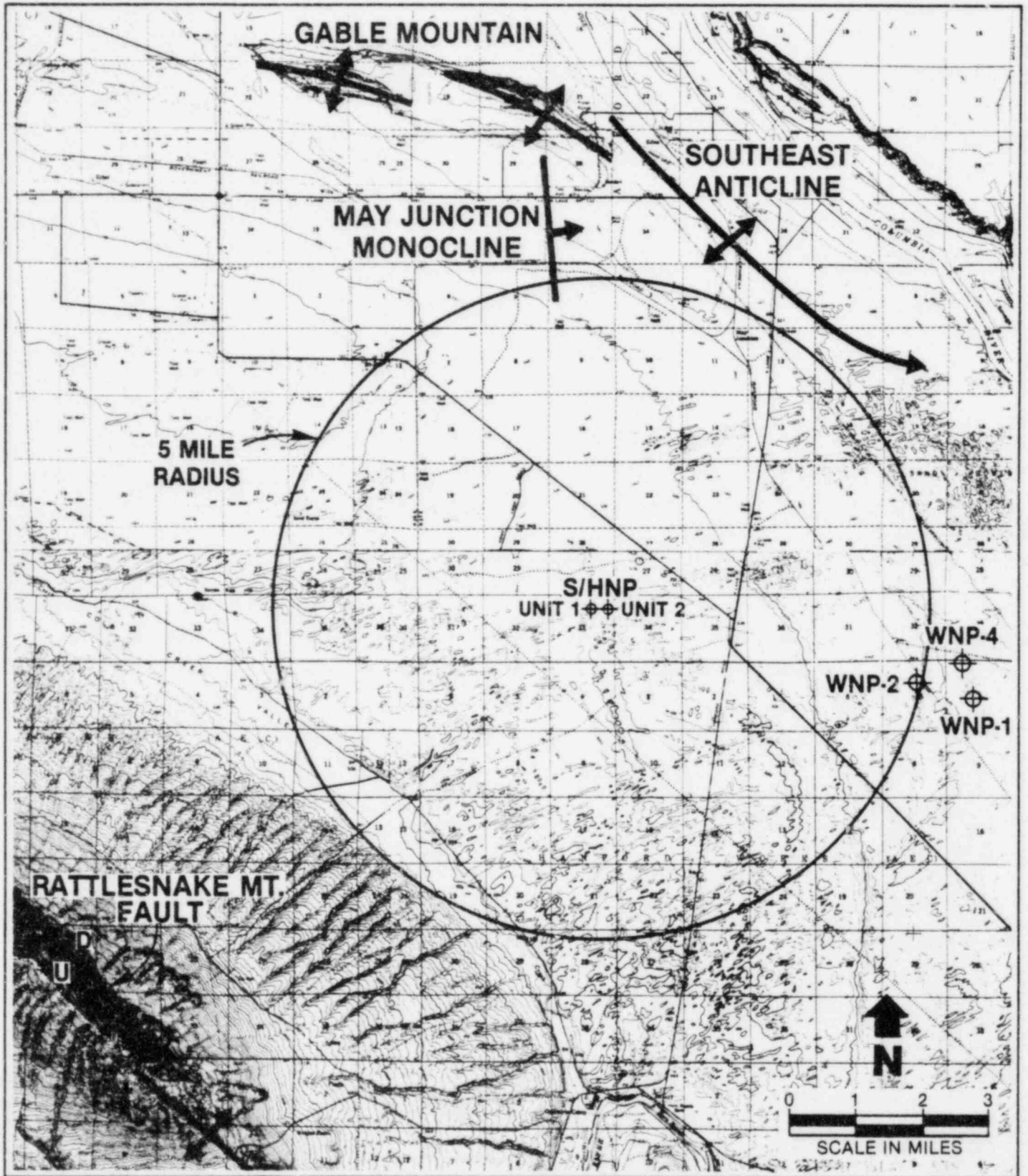
A-66

SKAGIT/HANFORD NUCLEAR PROJECT LOCATION MAP, COLUMBIA PLATEAU, PASCO BASIN, HANFORD SITE AFTER ROCKWELL INTL., 1981



A-67

SKAGIT/HANFORD NUCLEAR PROJECT NEARBY GEOLOGIC STRUCTURES



A-68

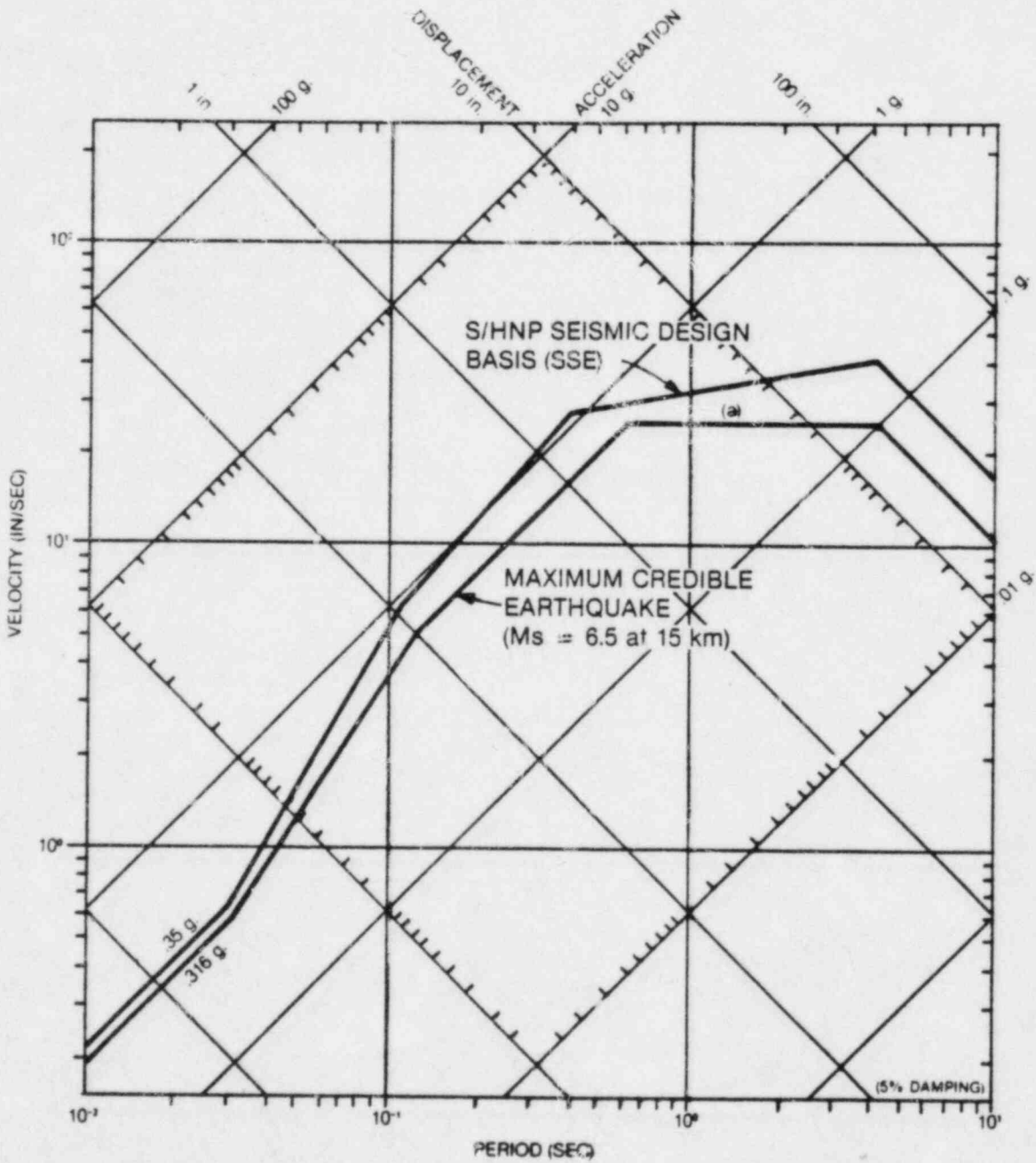
**SKAGIT/HANFORD NUCLEAR PROJECT
ASSUMED EARTHQUAKE SOURCES**

- **SWARM-TYPE EARTHQUAKE**
ML = 4.0 AT 9.0 KM
- **RATTLESNAKE-WALLULA ALIGNMENT**
MS = 6.5 AT 15.0 KM *
- **GABLE MOUNTAIN**
MS = 5.0 AT 10.2 KM
- **LARGEST HISTORIC EARTHQUAKE IN PROVINCE
OCCURRING NEAR THE SITE**
ML \approx 6.1 AT \leq 25 KM

* (CRITICAL EVENT FOR SEISMIC DESIGN)

A-69

SKAGIT/HANFORD NUCLEAR PROJECT COMPARISON OF S/HNP SEISMIC DESIGN BASIS AND MAXIMUM CREDIBLE EARTHQUAKE



EXPLANATION

(a) 84TH PERCENTILE GROUND MOTION VALUES
MEDIAN AMPLIFICATION FACTORS

A-70

SKAGIT/HANFORD NUCLEAR PROJECT
GEOLOGY AND SEISMOLOGY CONCLUSIONS

- 1) **SITE AND APPLICANTS INVESTIGATIONS MEET CRITERIA OF 10 CFR 100 APPENDIX A**
- 2) **REGION OF LOW SEISMIC ENERGY RELEASE AND SCATTERED, LOW MAGNITUDE EARTHQUAKES**
- 3) **MOST DEFORMATION TOOK PLACE PRIOR TO 5 MYBP**
- 4) **MAY JUNCTION MONOCLINE IS A SIMPLE MONOCLINAL FOLD**
- 5) **GABLE MOUNTAIN AND RATTLESNAKE-WALLULA ALIGNMENT CONSIDERED CAPABLE**
- 6) **S/HNP SEISMIC DESIGN CRITERIA (RG 1.60 AT 0.35 G) EXCEEDS THE EFFECTS OF ALL MAXIMUM CREDIBLE EARTHQUAKES**

A-71

**SKAGIT/HANFORD NUCLEAR PROJECT
DESIGN CONSIDERATIONS**

**DENNIS B. HACKING
PROJECT ENGINEER
NORTHWEST ENERGY SERVICES COMPANY**

APPENDIX X
DESIGN CONSIDERATIONS

A-72

**SKAGIT/HANFORD NUCLEAR PROJECT
UNIQUE CRITERIA FOR
S/HNP SITE**

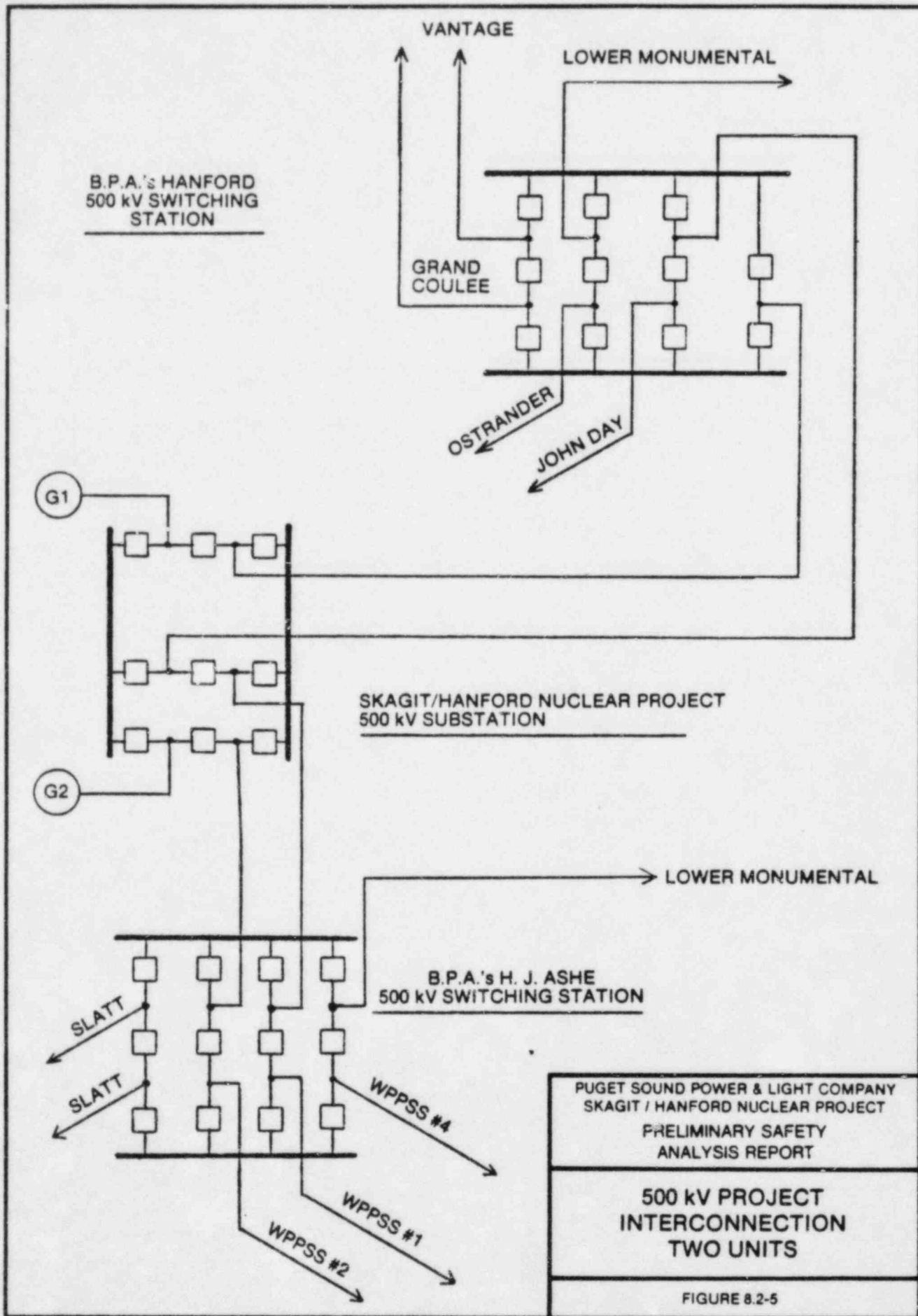
- **METEOROLOGY**
- **SOILS/SITE CHARACTERISTICS**
- **RAW WATER SUPPLY**
- **PLANT LIQUID DISCHARGE**
- **ELECTRICAL TRANSMISSION INTERFACE**

A-73

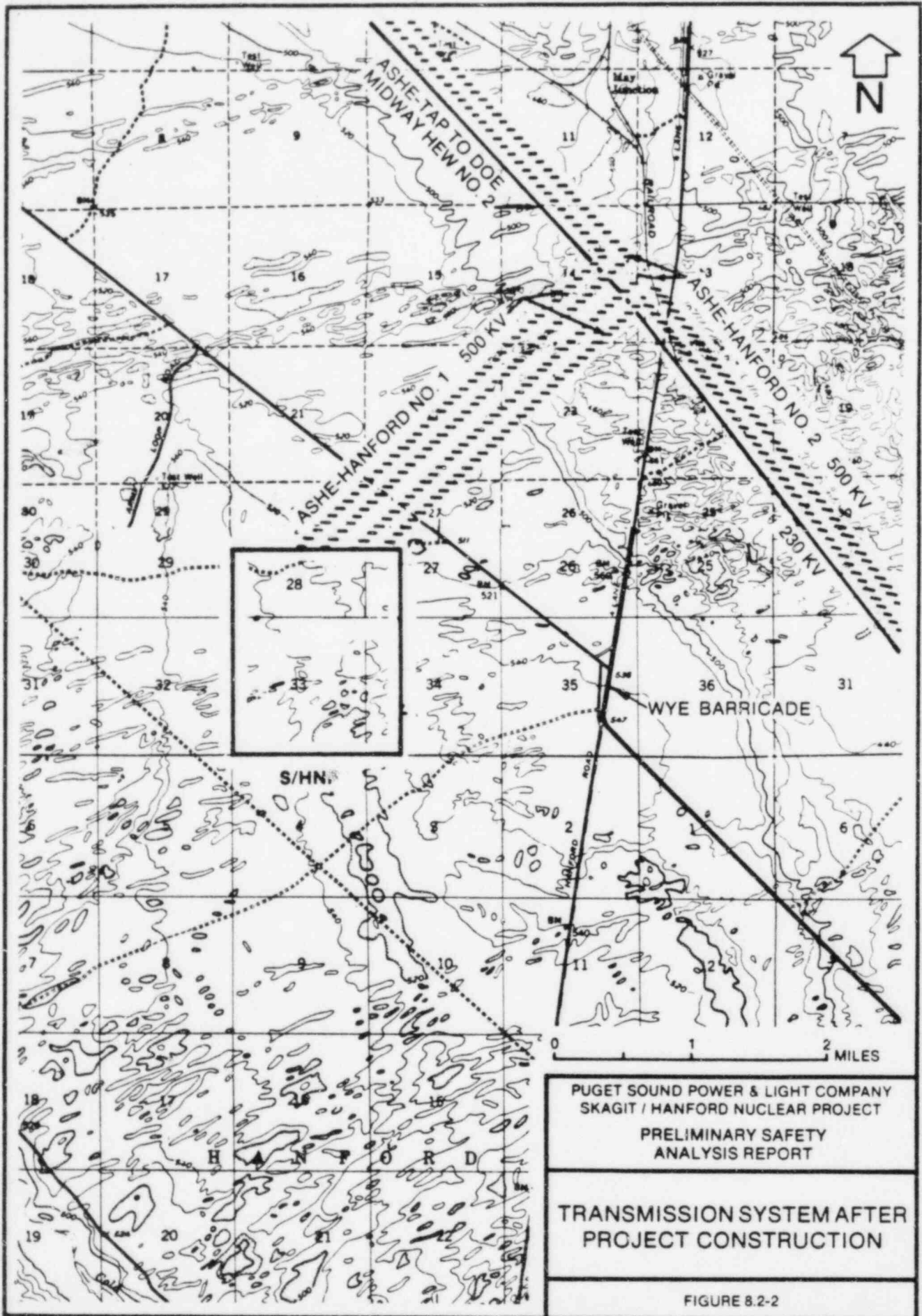
SKAGIT/HANFORD NUCLEAR PROJECT SITE-RELATED DESIGN CHANGES

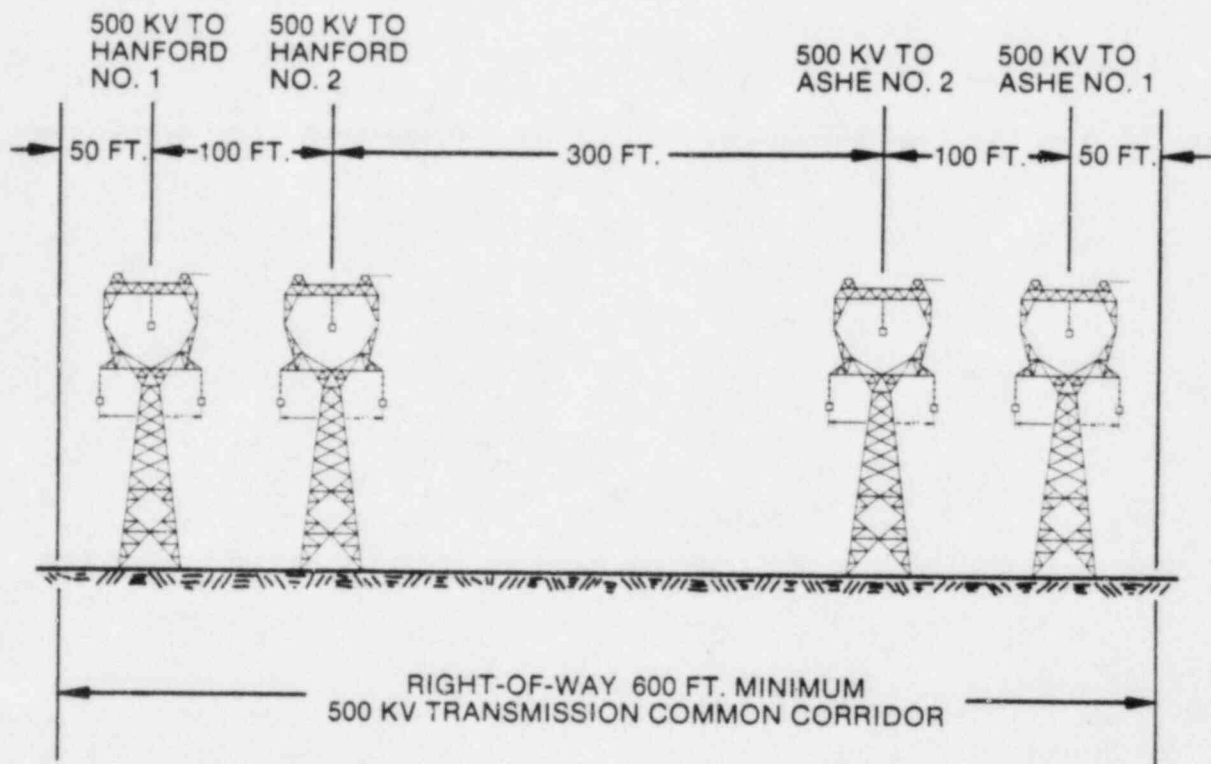
- COOLING TOWERS
- HVAC
- FOUNDATION DESIGN - 20' thick basemat
- ULTIMATE HEAT SINK DIMENSIONS
- RAW WATER SUPPLY
- PLANT LIQUID DISCHARGES
 - IN-RIVER DISCHARGE DESIGN
 - LIQUID RADWASTE RELEASE
 - SANITARY WASTES
- ELECTRICAL
 - PLANT LOAD
 - TRANSMISSION INTERFACE
- SITE ACCESS ROADS AND RAILROADS

19-74



A-75





PUGET SOUND POWER & LIGHT COMPANY SKAGIT / HANFORD NUCLEAR PROJECT ENVIRONMENTAL REPORT
500 KV LINES TYPICAL CROSS-SECTION PROJECT RIGHT-OF-WAY
FIGURE 8.2-3

A-77

**SKAGIT/HANFORD NUCLEAR PROJECT
FUTURE DESIGN CONSIDERATIONS**

- **FEEDBACK OF INDUSTRY EXPERIENCE**
- **EVOLVING REGULATORY REQUIREMENTS**
- **PROBABILISTIC RISK ASSESSMENT (PRA)**

A-78

THE FOLLOWING PAGES A-79 THRU A-87 HAS BEEN DELETED AS:

DELETION

1

STAFF REVIEW OF PSAR CHAPTER 2

- o STAFF DISCUSSED HYDROLOGY, GEOLOGY, SEISMOLOGY, GEOGRAPHY IN NUREG-0736 SITE SUITABILITY REPORT FOR THE CLINCH RIVER BREEDER REACTOR PLANT.
- o STAFF REVIEWERS HAVE COMPLETED SER SECTION FOR THE CHAPTER 2 REVIEW.
- o THE SRP IS APPLICABLE TO CRBR FOR THE CHAPTER 2 REVIEW.
- o STAFF CONCLUSION - NO OPEN ITEMS.

CRBRP BRIEFING FOR
ADVISORY COMMITTEE ON
REACTOR SAFEGUARDS (ACRS)

**ACCOMMODATION OF NATURAL
PHENOMENA IN CRBRP DESIGN**

A-89

Presented by

ROBERT E. PALM
CIVIL/STRUCTURAL ENGINEERING MANAGER
BURNS AND ROE, INC.
ORADELL, NEW JERSEY

FEBRUARY 11, 1983

APPENDIX XIII
ACCOMMODATION OF NATURAL PHENOMENA IN
CRBRP DESIGN

NATURAL PHENOMENA

- TORNADO

- PRECIPITATION

- FLOOD

- EARTHQUAKE

DESIGN BASIS TORNADO

- SAFETY RELATED STRUCTURES DESIGN TO WITHSTAND TORNADO EFFECTS
- DESIGN TORNADO IN ACCORDANCE WITH REGULATORY GUIDE 1.76 - REGION I
- TORNADO EFFECTS COMBINED WITH OTHER LOADS
- WIND VELOCITY = 360 MPH
 - ROTATIONAL VELOCITY = 290 MPH
 - TRANSLATIONAL VELOCITY = 70 MPH
- PRESSURE DROP = 3.0 PSI
- VELOCITY PRESSURES DETERMINED IN ACCORDANCE WITH ANSI A58.1

A-91

TORNADO MISSILE PROTECTIVE DESIGN

- SPECTRUM OF MISSILES IDENTIFIED
- MINIMUM THICKNESS OF EXTERIOR CONCRETE = 2'-3"
 - GREATER THAN MINIMUM 2'-0" REQUIRED BY SRP
- MISSILE PROTECTIVE STRUCTURES PROVIDED AT CRITICAL OPENINGS
- METHOD OF ANALYSIS DESCRIBED IN PSAR SECTION 3.5
 - PENETRATION INTO STEEL AND CONCRETE STRUCTURES
 - PREVENTION OF SCABBING IN CRITICAL AREAS
 - OVERALL AND LOCALIZED STRUCTURAL RESPONSE EVALUATED TO ASSURE STRUCTURAL INTEGRITY

A-92

DESIGN FOR MAXIMUM PRECIPITATION

- DRAINAGE FACILITIES DESIGN FOR 100 YEAR STORM
 - 3.5 INCHES PER HOUR MAXIMUM
- CRBRP DESIGN EVALUATED FOR EFFECTS OF PROBABLE MAXIMUM PRECIPITATION (PM)
 - MOST CRITICAL STORM FOR LOCAL SITE CONDITIONS
 - 14 INCHES PER HOUR MAXIMUM
 - 29.5 INCHES IN 8 HOURS
- 8 INCH MAXIMUM LOCAL FLOODING ALLOWED IN PLANT AREA
 - BUILDING ENTRIES 12 INCHES ABOVE GRADE
- 8 INCH MAXIMUM PONDING ON ROOFS
 - EXCESS DISCHARGED BY OVERFLOWS TO GRADE
 - CURBS PROVIDED AROUND ROOF OPENINGS
- EQUIVALENT 80 INCH SNOWFALL DEPTH ACCOMMODATED IN DESIGN
 - 40 PSF ROOF LOAD

A-93

DESIGN FOR FLOODS

- PROBABLE MAXIMUM FLOOD (PMF)
 - MAXIMUM ELEVATION = 779.8 FT. INCLUDES 40 MPH WIND AND WAVE RUNUP
- MAXIMUM FLOOD LEVEL AT SITE = 809.2 FT.
 - BASED ON UPSTREAM DAM FAILURE COMBINED WITH 1/2 PMF
 - (DETAILS TO BE PRESENTED LATER BY TVA)
- PLANT GRADE AT ELEVATION 815 FT.
- STRUCTURES DESIGNED FOR MAXIMUM GROUNDWATER LEVEL OF 809 FT.
 - HYDROSTATIC EFFECTS
 - WATERTIGHTNESS

A-94

EARTHQUAKE DESIGN

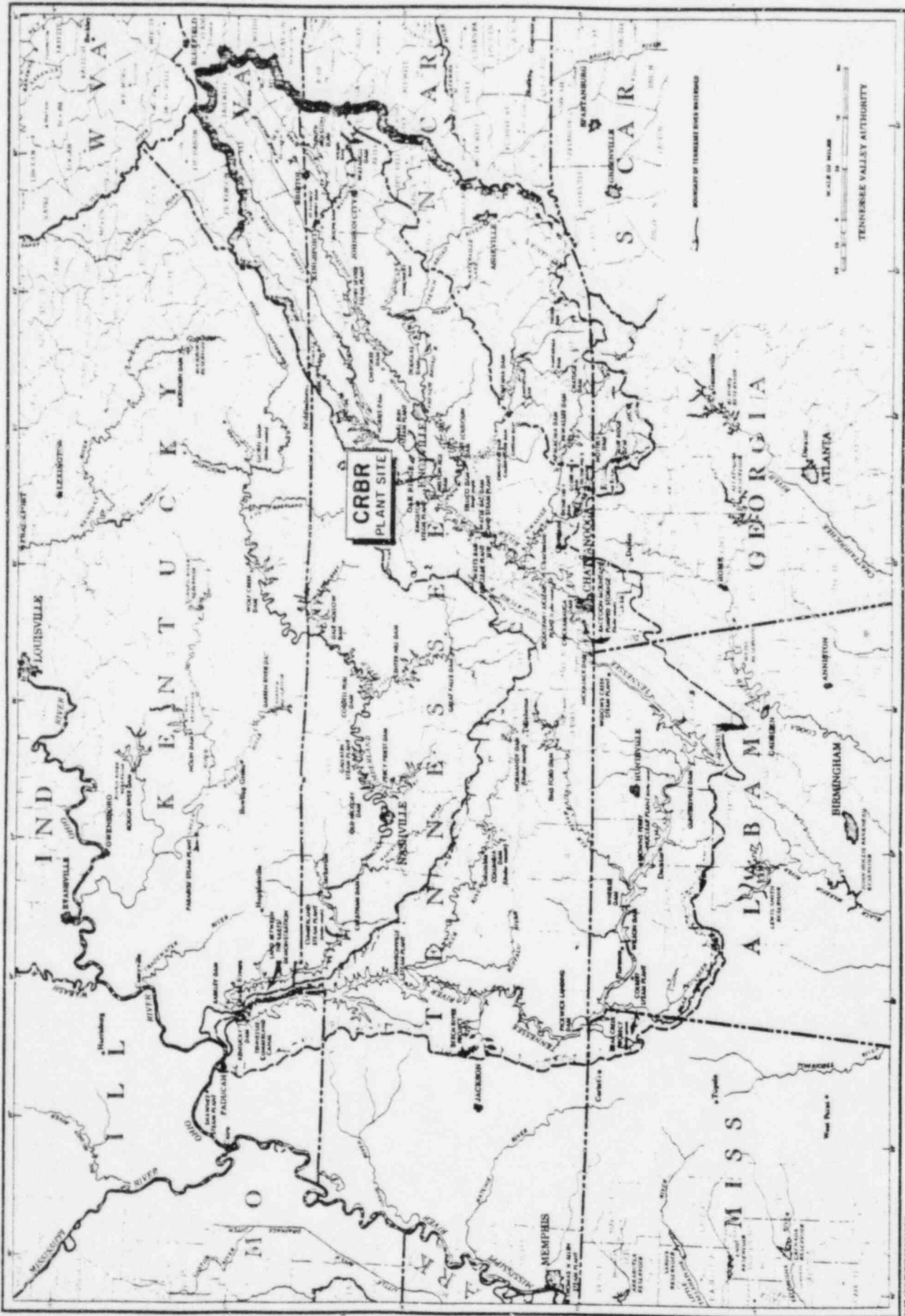
- TECTONIC PROVINCE APPROACH FOR DETERMINATION OF SSE
 - IN ACCORDANCE WITH IOCFR100, APPENDIX A
- LARGEST HISTORICAL EARTHQUAKE IDENTIFIED AS GILES COUNTY, VIRGINIA, 1897
 - NRC CLASSIFIED THIS EARTHQUAKE AS INTENSITY VIII
- CORRELATION OF INTENSITY TO ACCELERATION RESULTS IN SSE = 0.25 G
- EARTHQUAKE ASSUMED TO OCCUR AT THE CRBRP SITE
- OBE = 1/2 SSE = 0.125 G
- SEISMIC DESIGN OF STRUCTURES, COMPONENTS AND SYSTEMS IN ACCORDANCE WITH APPLICABLE CODES, REGULATORY GUIDES AND SRP

A-95-

SUMMARY AND CONCLUSIONS

- **CONSERVATIVE DESIGN BASES HAVE BEEN ESTABLISHED FOR POTENTIAL EVENTS FROM NATURAL PHENOMENA.**
- **THE CRBRP DESIGN ACCOMMODATES EACH OF THESE EVENTS**

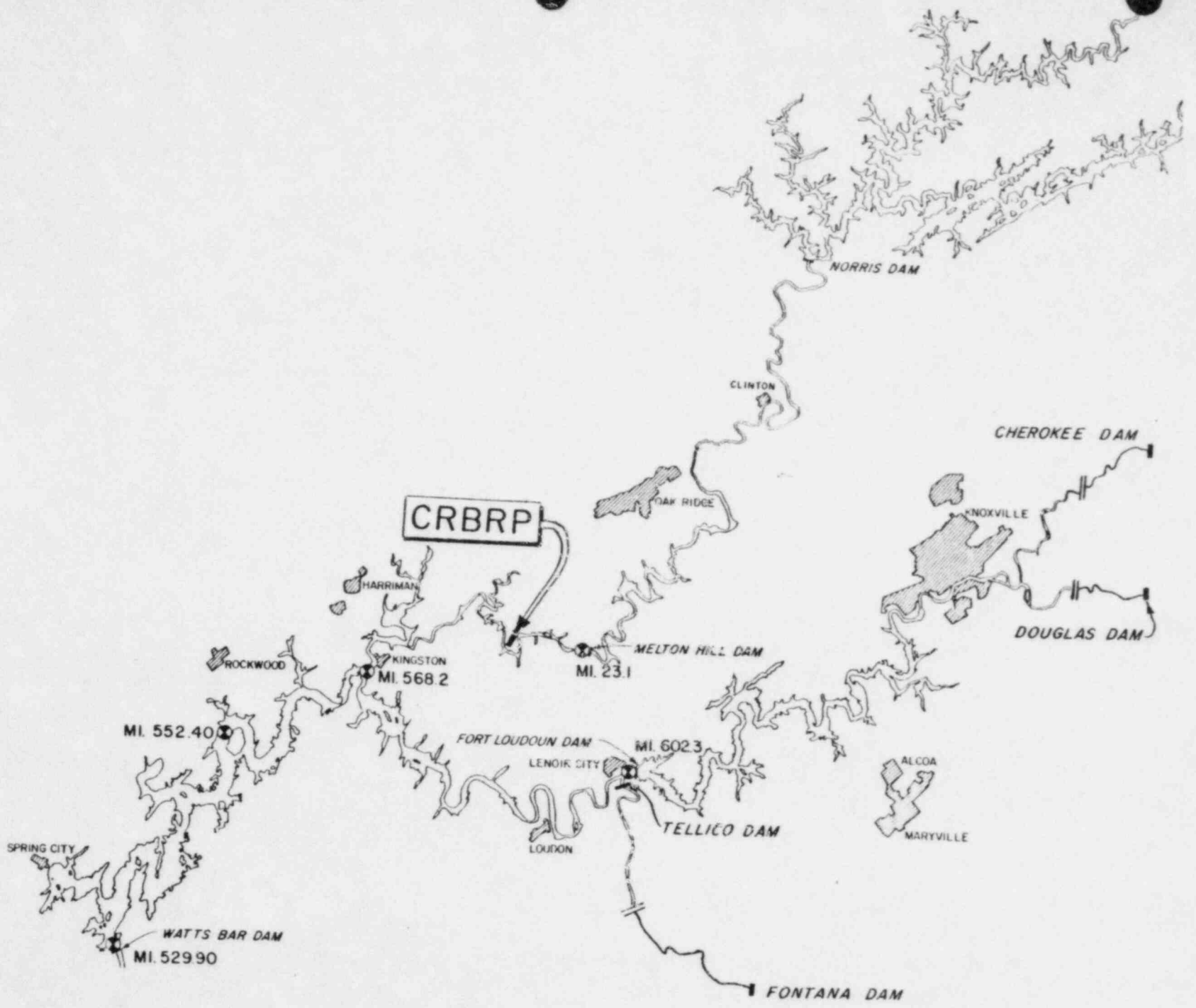
A-96



A-97

Donald Newton, TVA

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WATERSHED

POTENTIAL SOURCES OF FLOODING

EXAMINED IN DETAIL

- STORMS -

PRIMARY WATERCOURSE - CLINCH RIVER

ADJACENT WATERCOURSE - TENNESSEE RIVER

- SEISMIC-INDUCED DAM FAILURE - *controlling*

NOT EXAMINED IN DETAIL

- SNOW MELT/ICE JAMS

-- TEMPERATE CLIMATE --

- LAND SLIDES

-- SLIDE VOLUME POTENTIAL LIMITED --

7

DEFINITIONS

PMP - RAINFALL DEPTH
FOR A PARTICULAR SIZE BASIN
APPROACHES THE UPPER LIMIT
FOR A SPECIFIED DURATION
PRESENT CLIMATE CAN PRODUCE

PMF - MOST SEVERE FLOOD
CAN REASONABLY BE PREDICTED
OCCUR FROM HYDROMETEOROLOGICAL CONDITIONS
ASSUMES
OCCURRENCE OF PMP CRITICALLY CENTERED
SEQUENCE OF RELATED METEOROLOGIC AND HYDROLOGIC FACTORS
TYPICAL OF EXTREME STORMS

A-100

PMP

9 DAY STORM

*3-DAY ANTECEDENT STORM	6.9 INCHES
*3-DAY DRY PERIOD	0
*3-DAY MAIN STORM	<u>17.2 INCHES</u>
*TOTAL	24.1 INCHES

*AVERAGE ON 17,310 SQUARE-MILE WATERSHED ABOVE WATTS BAR DAM

NRC CRITERIA
FLOODS FROM SEISMIC EVENTS

ALTERNATIVE 1 - DAM FAILURE CAUSED BY SAFE SHUTDOWN
EARTHQUAKE (SSE)
COINCIDENT WITH 25-YEAR FLOOD

ALTERNATIVE 2 - DAM FAILURE CAUSED BY OPERATING BASIS
EARTHQUAKE (OBE)
COINCIDENT WITH $\frac{1}{2}$ PMF

A-102

NORRIS BACKGROUND INFORMATION

CONCRETE GRAVITY DAM
COMPLETED IN 1936
LENGTH - 1860 FEET
HEIGHT - 265 FEET

OVERFLOW SPILLWAY
SLUICES
NONOVERFLOW SECTIONS ON EACH SIDE

ORIGINALLY DESIGNED FOR AN EARTHQUAKE ACCELERATION OF 0.1g
THROUGHOUT ITS HEIGHT

A-103

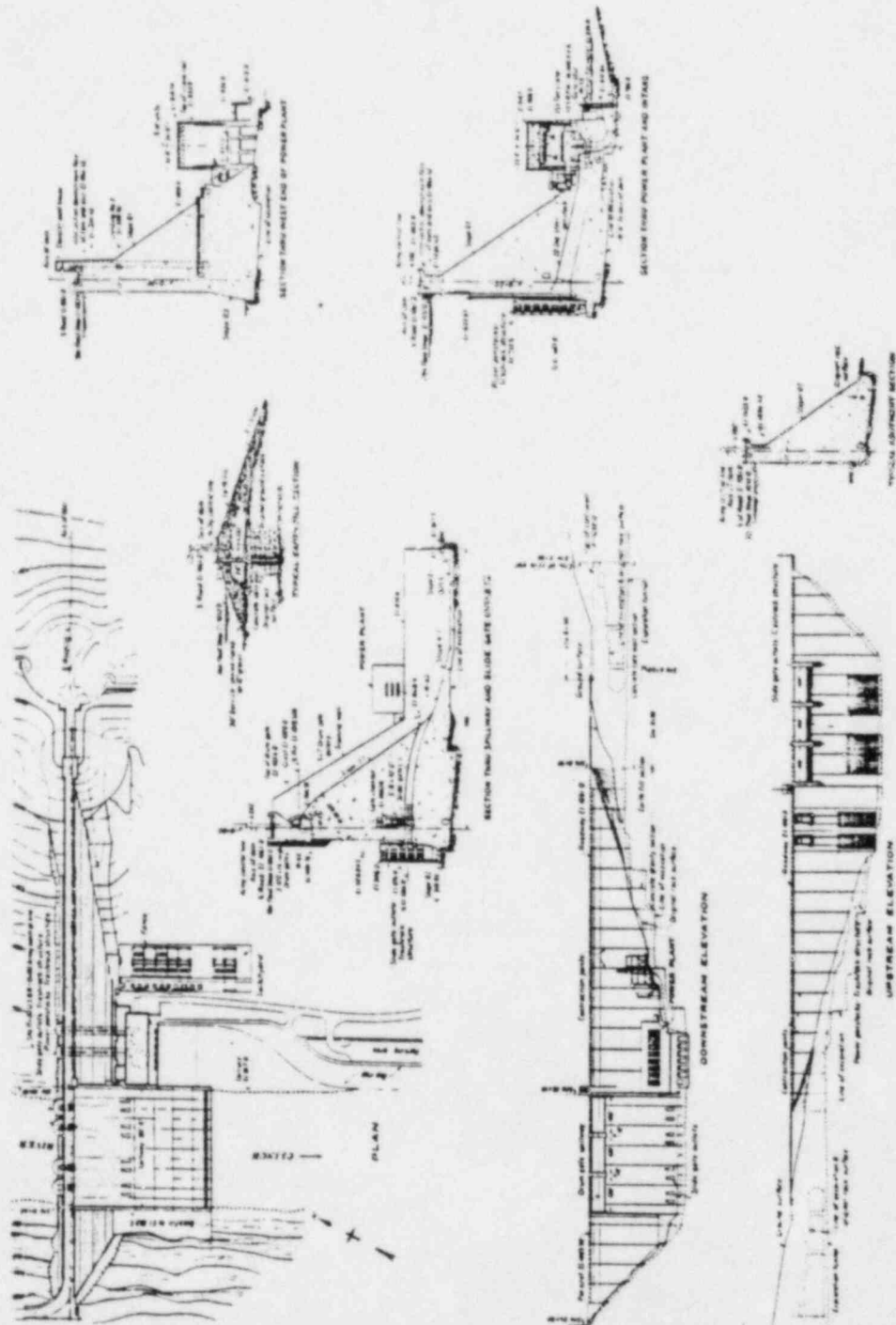


Figure 2.4.28 Norris Dam - Plan Elevations and Sections

6/50/39

A-104

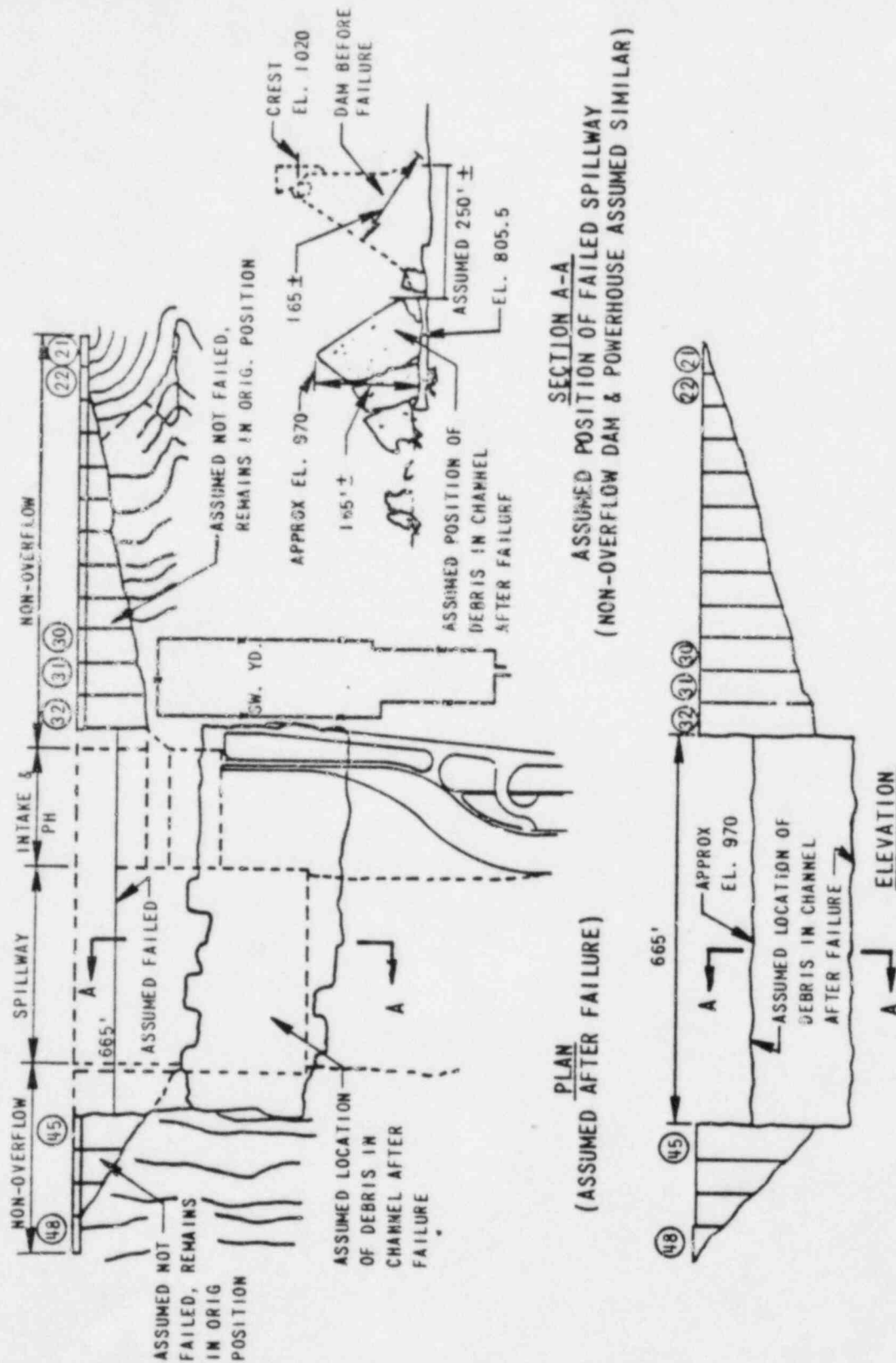
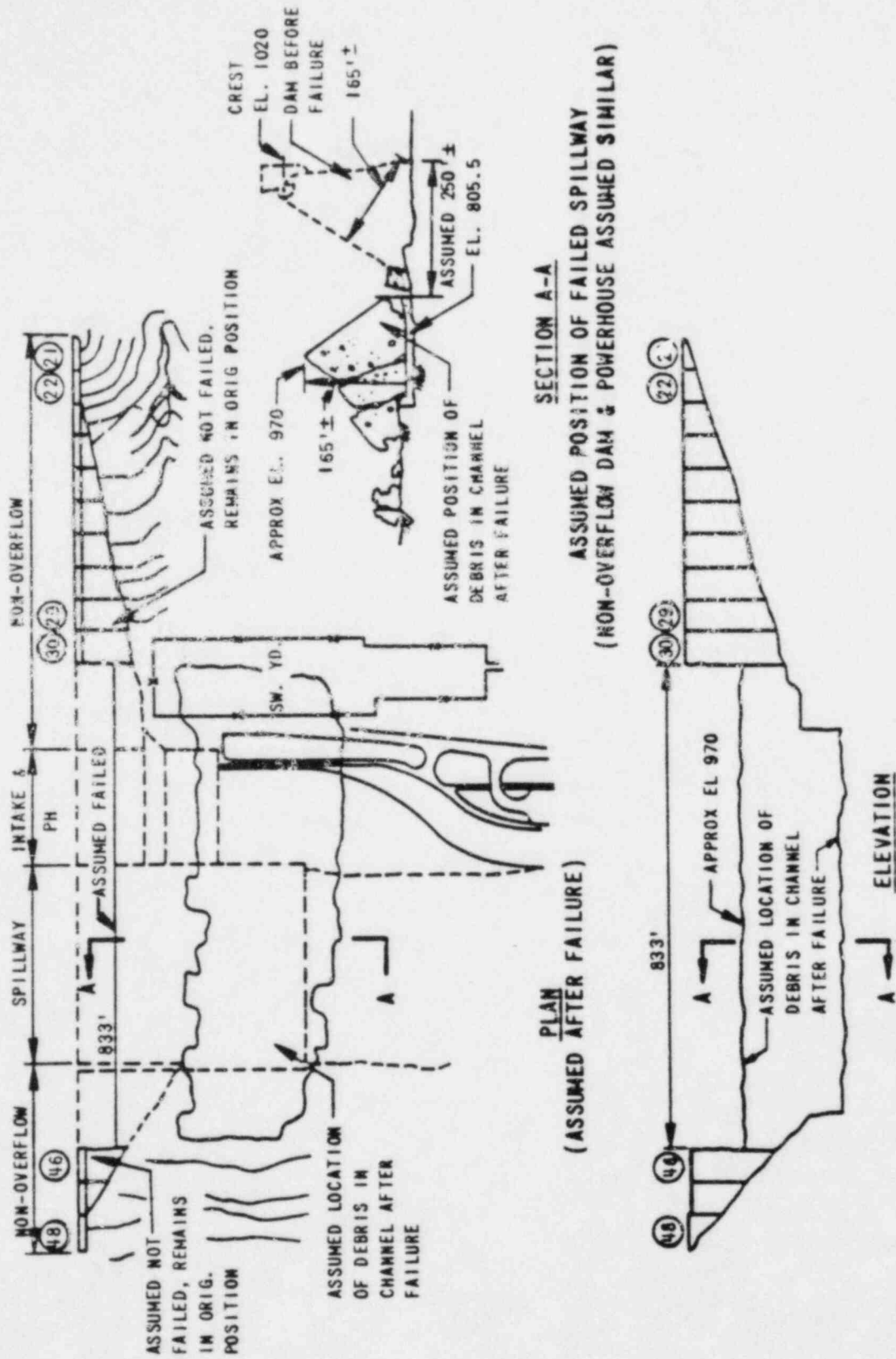


Figure 2.4-30 Norris Dam - Analysis for OBE & One Half IMP-Assumed Condition of Dam After Failure

6650-41

2.4-150

A-105



6650-42

2.4-151

A-106

Figure 2.4-31 Norris Dam-SSE + 25 Year Flood Judged Condition of Dam After Failure

MAJOR ELEMENTS

NORRIS FAILURE FLOOD ANALYSIS

WATERSHED FLOWS IN $\frac{1}{2}$ PMF OR 25-YEAR FLOOD

-- WATERSHED MODEL --

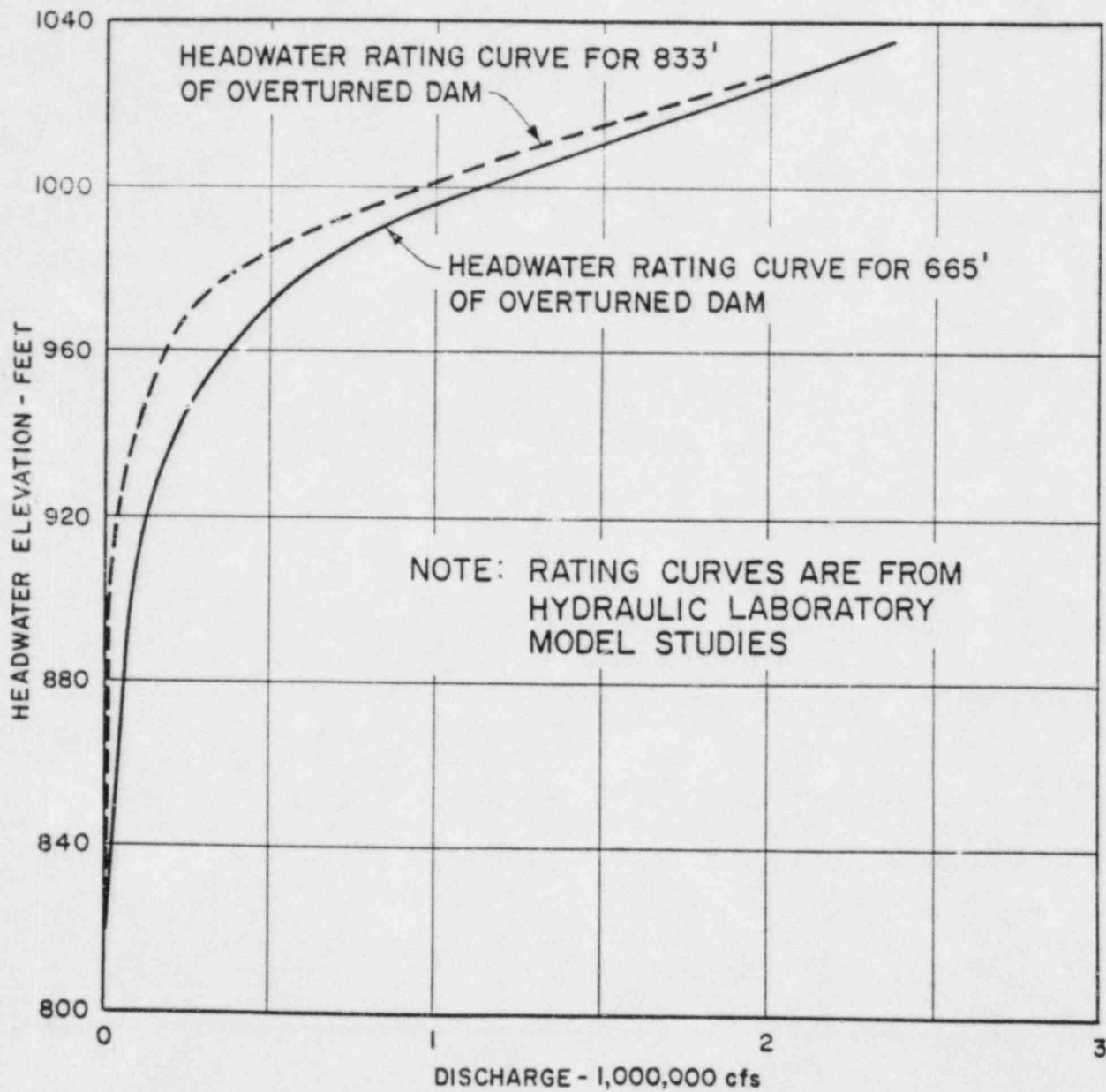
OUTFLOW FROM BREACHED NORRIS DAM

-- RATING CURVES --

COMBINED FLOWS AT SITE

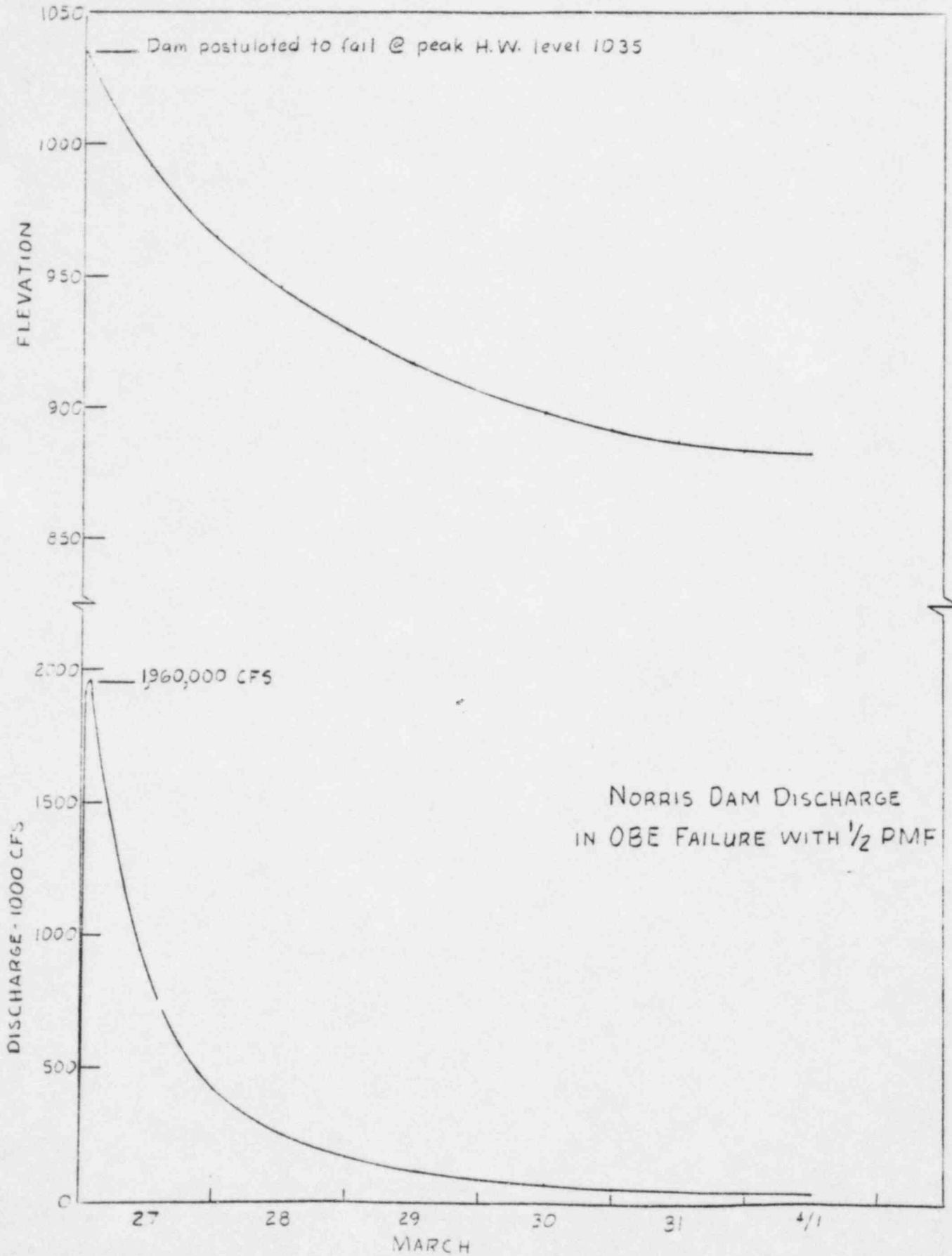
-- UNSTEADY FLOW ANALYSIS --

A-107



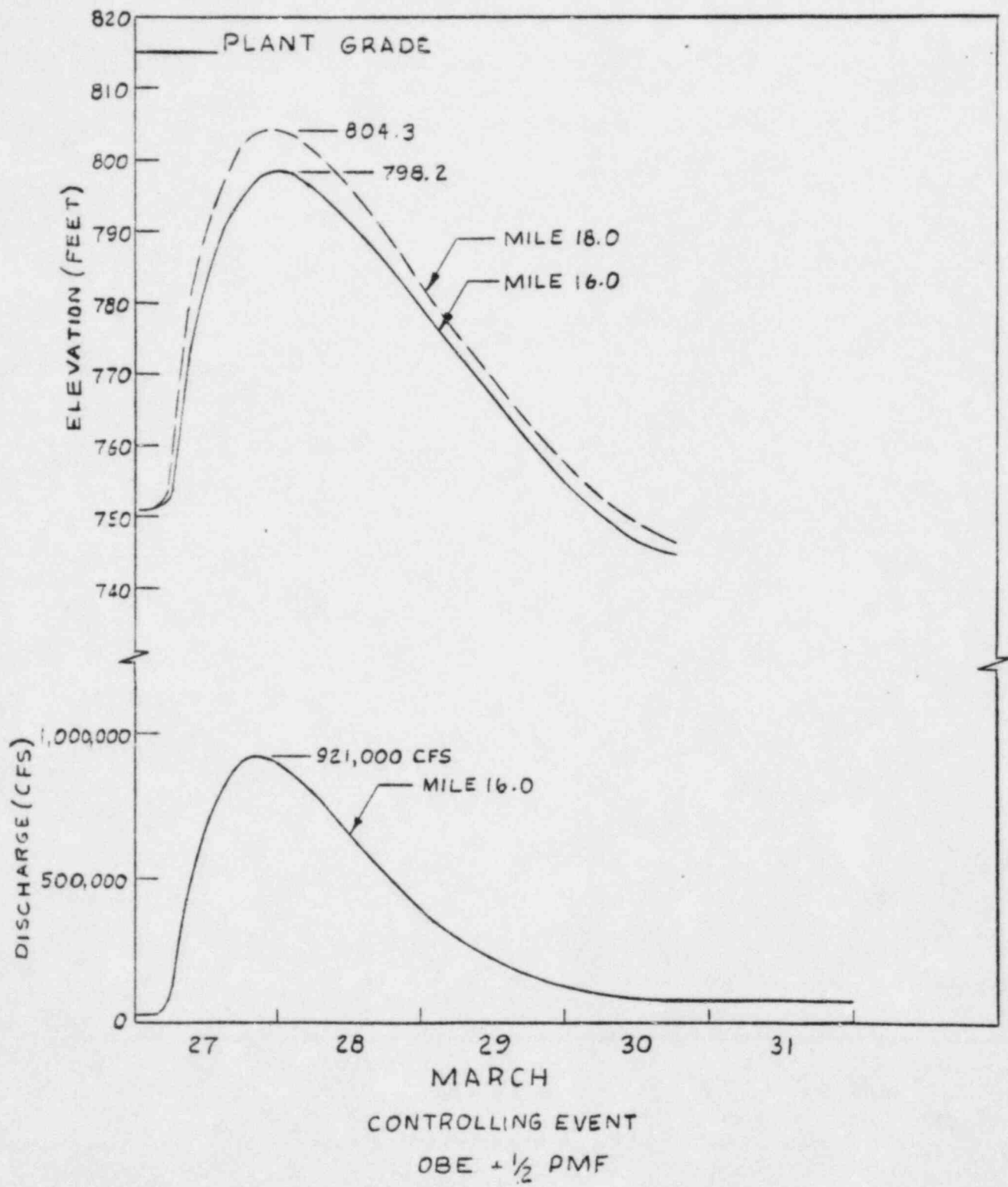
Headwater Rating Curves - Norris Dam

A-108



NORRIS DAM DISCHARGE
IN OBE FAILURE WITH 1/2 PMF

A-109



A-110

FLOOD ELEVATIONS

PLANT GRADE ELEVATION = 815

<u>EVENT</u>	<u>CRBR ELEVATION</u>	
	<u>MILE 16</u>	<u>MILE 18</u>
PMF	777.2	778.8
OBE FAILURE WITH $\frac{1}{2}$ PMF	798.2	804.3
SSE FAILURE WITH 25-YEAR FLOOD	790.5	796.3

A-111

SENSITIVITY ANALYSIS

<u>POSTULATED FAILURE MODE</u>	<u>CRBR ELEVATION</u>	
	<u>MILE 16</u>	<u>MILE 18</u>
OBE CONDITIONS WITH $\frac{1}{2}$ PMF		
VANISHMENT OF 3 BLOCKS (38-40) TO GROUND LEVEL (168-FOOT WIDTH)	802.2	808.4
OVERTURNING OF BLOCKS 37-43 (370-FOOT WIDTH) WITH 925 DEBRIS LEVEL	805.3	811.9
OVERTURNING OF BLOCKS 33-44 (665-FOOT WIDTH) WITH 945 DEBRIS LEVEL	802.6	808.9
INSTANT VANISHMENT OF ENTIRE DAM (NO DEBRIS)	811.0	818.0

A-112

Tony Marrone

CRBRP RESERVE SEISMIC MARGINS

ADVANCED REACTORS DIVISION
WESTINGHOUSE ELECTRIC CORPORATION
MADISON, PENNSYLVANIA 15663-0158

A-113

February 11, 1983

 **ARD**

APPENDIX XV
CRBRP RESERVE SEISMIC MARGINS

8228-16

CRBRP RESERVE SEISMIC MARGINS

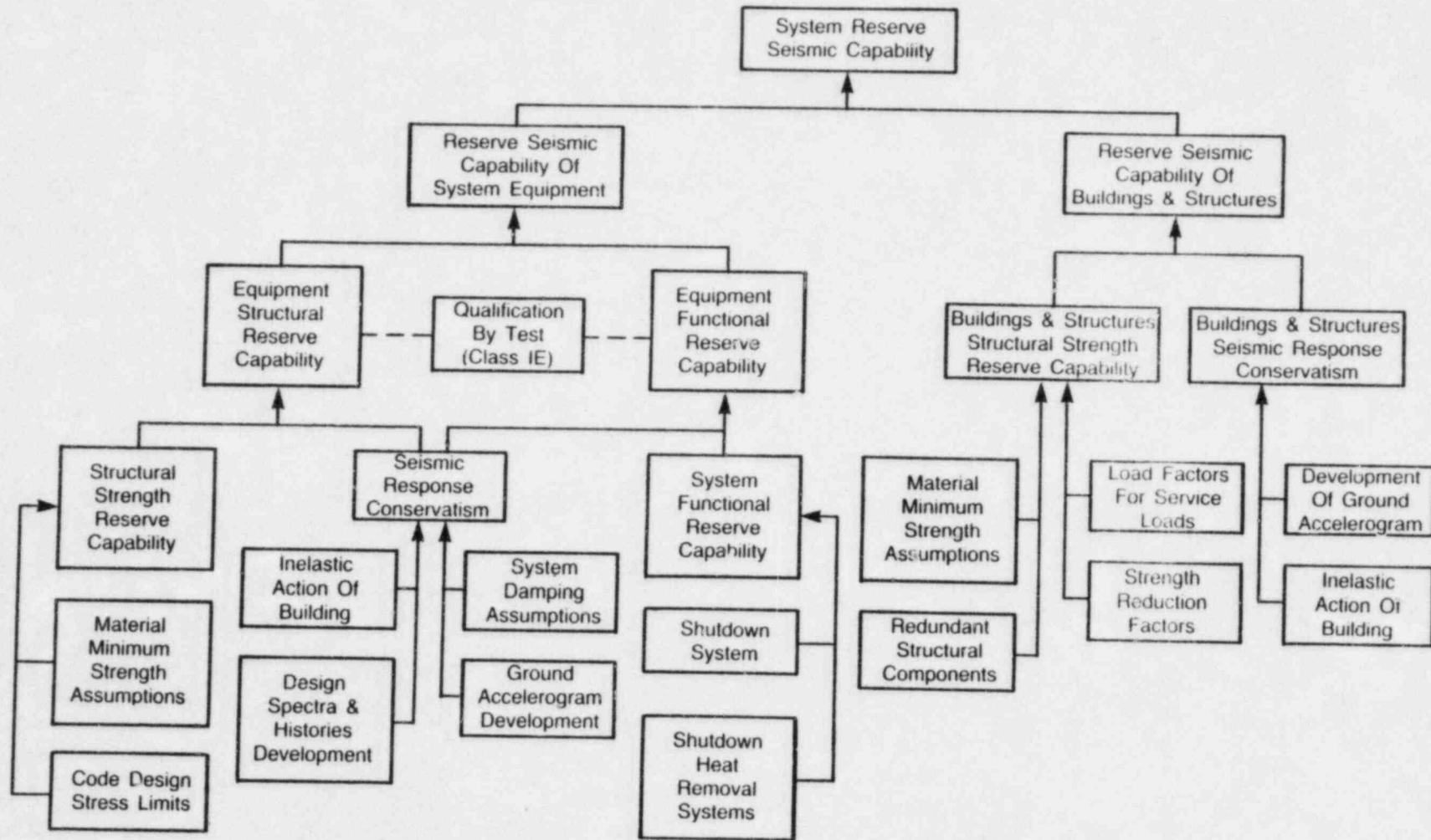
- Reserve seismic margin: seismic reserve strength/capability available when calculated effects (stress, functional performance) due to all loadings equal allowable limits (code, performance)
- Nominal margin: S_u/S_a when $S_a = \sigma_s + \sigma_n$
- Reserve margin earthquake: 0.25g x reserve seismic margin

Sources:

- Conservative predictions of building and equipment response
- Conservative definitions of structural and functional performance limits

A-114

RESERVE SEISMIC CAPABILITY OF CRBRP SYSTEM EVALUATION PROCEDURE



A-115

EQUIPMENT STRUCTURAL RESERVE CAPABILITY STRUCTURAL STRENGTH RESERVE CAPABILITY

- Material minimum strength assumptions:
 - Code minimum strength
 - Average strength for seismic
 - Ratio of average to minimum 1.20
- Code design stress limits
 - Service Limit Level D allowable membrane tensile stress = $0.7 S_u$
 - Ratio of ultimate strength to allowable stress 1.43

STRUCTURAL STRENGTH NOMINAL MARGIN = 1.72

A-11c

EQUIPMENT STRUCTURAL RESERVE CAPABILITY SYSTEM SEISMIC RESPONSE CONSERVATISM

- System damping assumptions:
 - R.G. 1.61 3% damping value
 - Test results, 5% damping value
 - Peak response ratio 3% versus 5% 1.2
- Development of ground accelerogram:
 - NRC SRP rule on spectra enveloping
 - Artificial response spectra conservatism 1.05
- Reduction of floor response spectra due to inelastic action of building 1.05
- Development of design response spectra:
 - Envelop upper and lower bounds of soil moduli
 - Peaks widened and higher due to uncoupling
 - Spectra smoothed to eliminate valleys and spectral fluctuations 1.1
- Development of design histories:
 - Possible frequency variations of building
 - Vary Δt , compress and expand history
 - Develop spectra-consistent histories 1.1

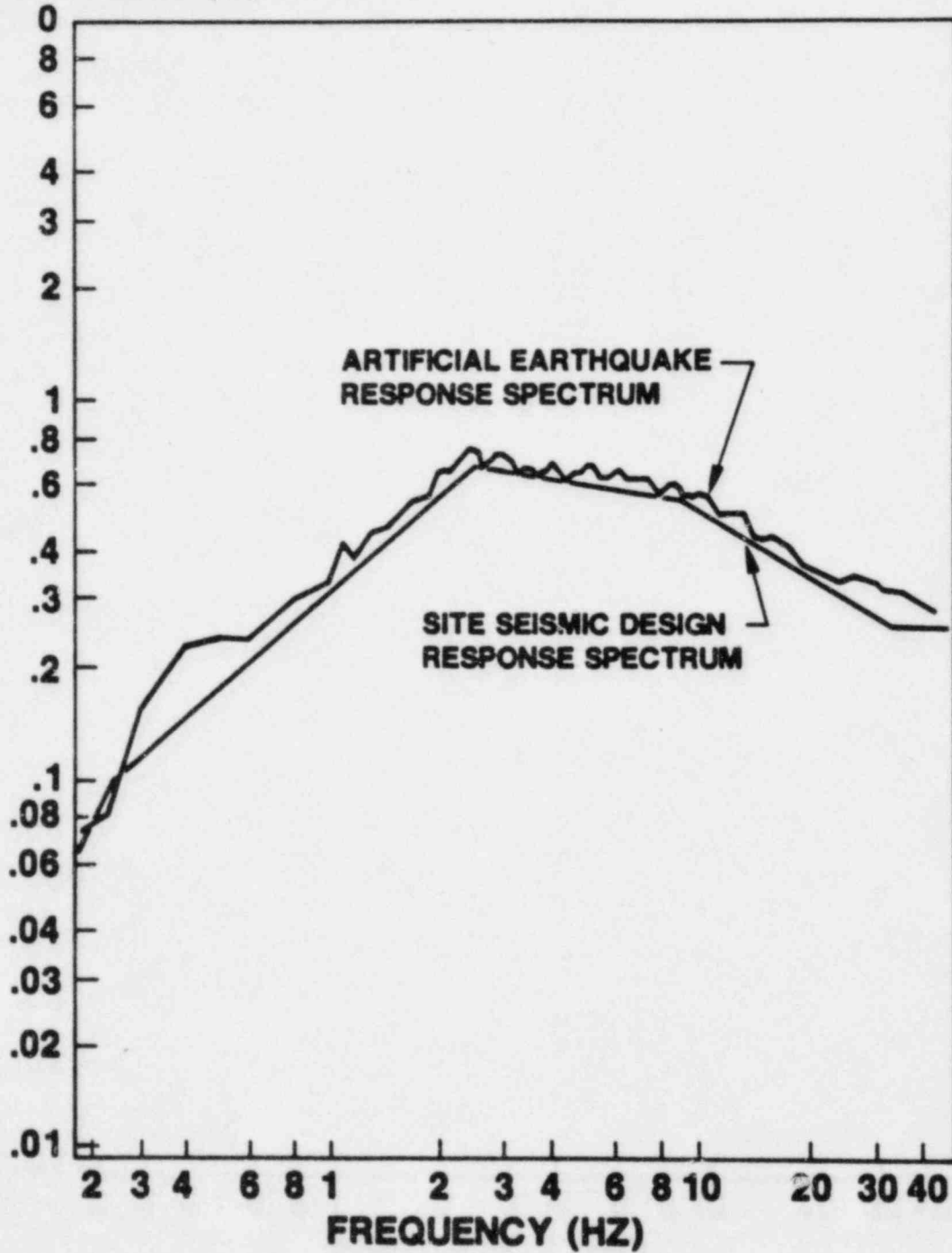
SYSTEM SEISMIC RESPONSE CONSERVATISM:

$$(1.2)(1.05)^2(1.1) = \underline{1.45}$$

A-117

CRITERIA RESPONSE SPECTRUM ENVELOPING WITH HORIZONTAL E-W MOTION, SSE-7% DAMPING

ACCELERATION (G)

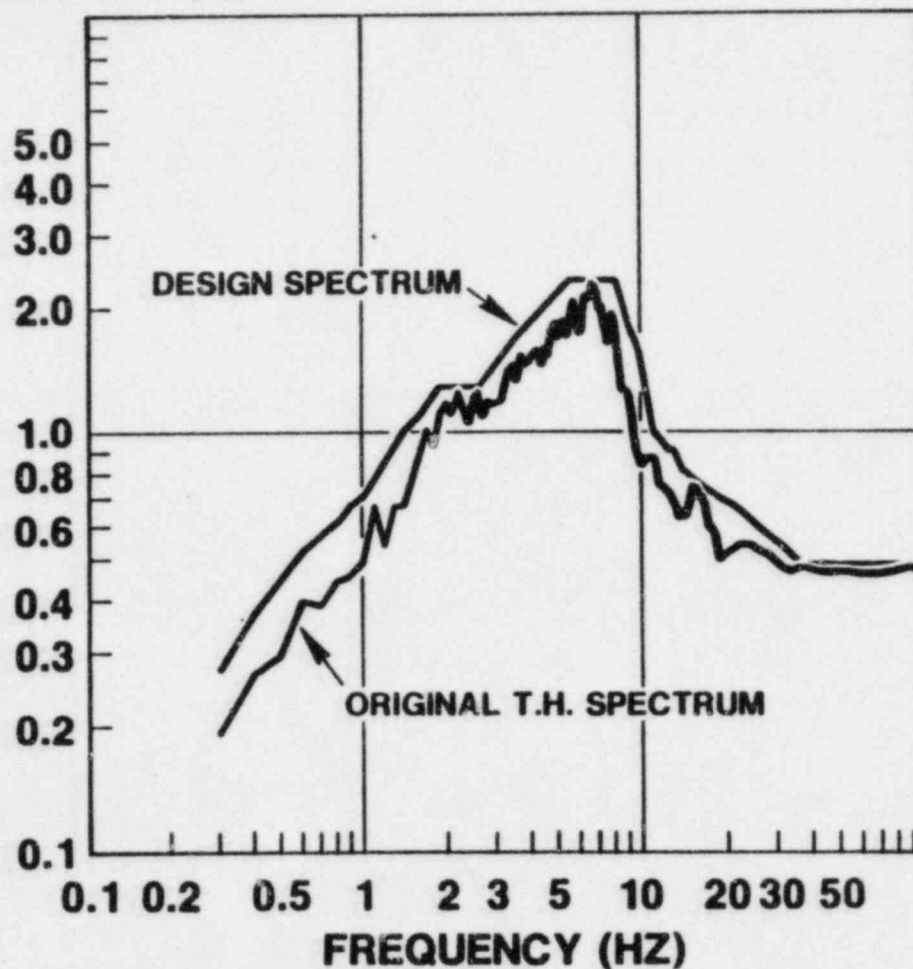


A-118

SSE E-W HORIZONTAL + TORSIONAL COMBINED — DESIGN AND ORIGINAL T.H. RESPONSE SPECTRA AT R.V. SUPPORTS, EL. 800 FT.

(3% CRITICAL DAMPING)

ACCELERATION (G)



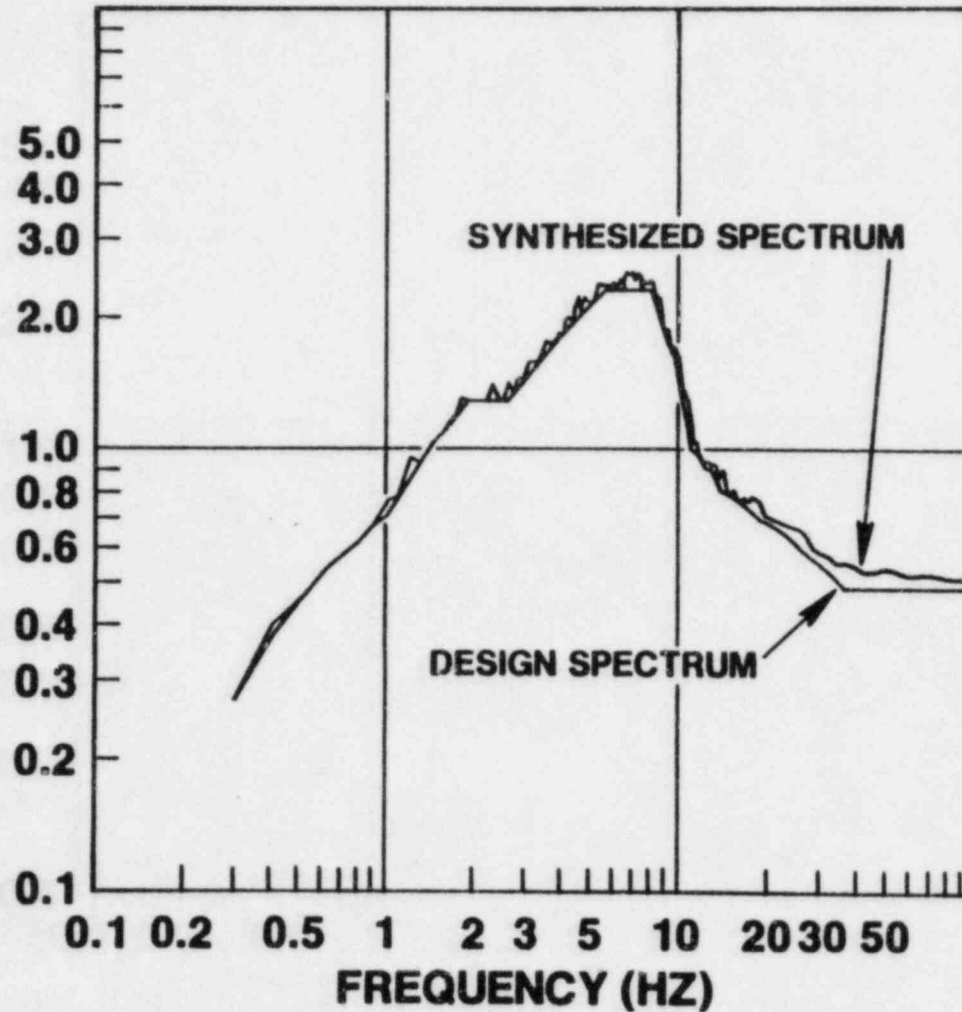
A-119

SSE EW COMBINED HORIZONTAL AND TORSION- DESIGN AND SYNTHESIZED RESPONSE SPECTRA



(3% CRITICAL DAMPING)

ACCELERATION (G)



A-120

EQUIPMENT STRUCTURAL RESERVE CAPABILITY STRUCTURAL RESERVE SEISMIC MARGIN

- NUREG/CR-2137:
 - Nominal margin (NM) = $S_u/S_a = S_u/\sigma_s + \sigma_n$
 - Seismic - only margin = M_s
 - $M_s = (S_u - S_a)/\sigma_s + 1 = 1/k (NM-1) + 1$
- Structural strength nominal margin = 1.72
- Conservative assumption of $k = \sigma_s/S_a = 60\%$ to 90%
- Structural strength reserve seismic margin:
 $1/0.6 (1.72-1) + 1 = 2.2$ for $k = 60\%$; $1/0.9 (1.72-1) + 1$
 $= 1.8$ for $k = 90\%$
- Seismic response conservatism = 1.45

EQUIPMENT STRUCTURAL RESERVE SEISMIC MARGIN
= 2.61 to 3.19

A-121

EQUIPMENT STRUCTURAL RESERVE CAPABILITY CONTAINMENT STRUCTURAL RESERVE SEISMIC MARGIN

- Nominal margin (NM) on buckling = 1.9
- Seismic - only margin, $M_s = 1/k (NM-1) + 1$
- Ratio of seismic to total loadings, $k = 70\%$
- Containment buckling strength reserve seismic margin
= $1/0.7 (1.9-1) + 1 = 2.29$
- System seismic response conservatism = 1.45

EQUIPMENT STRUCTURAL RESERVE
SEISMIC MARGIN = 3.32

**EQUIPMENT FUNCTIONAL RESERVE CAPABILITY
SHUTDOWN SYSTEM FUNCTIONAL
RESERVE SEISMIC MARGIN**

- Design capacity in excess of requirements:
 - Scram insertion performance evaluated for SSE of 0.33g 1.32
- Conservative system response requirements:
 - Worst case rod positions and minimum rod worths 1.10
- Friction coefficient (1.0 versus 0.45) 2.2
- Impact damping 1.07
- Shutdown system functional reserve seismic margin = 3.42
- System seismic response conservatism = 1.45

**EQUIPMENT FUNCTIONAL RESERVE
SEISMIC MARGIN = 5.0**

A-123

EQUIPMENT FUNCTIONAL RESERVE CAPABILITY RUPTURE DISCS FUNCTIONAL RESERVE SEISMIC MARGIN

- Evaluation based on worst loop
- Zero time rupture disc rating = 339 psi
- Five year aging effects (creep, corrosion, stress relieving) = 43 psi
- Rupture disc rating after five years = 296 psi
- Steady-state operating pressure = 219 psi
- Allowable pressure for seismic = 77 psi
- Pressure due to 0.25g SSE = 45 psi
- Rupture discs functional reserve seismic margin = $1 + 32/45 = 1.71$
- Seismic response conservatism = $1.2 (1.05)^2 = 1.32$

EQUIPMENT FUNCTIONAL RESERVE SEISMIC MARGIN = 2.26

A-124

EQUIPMENT FUNCTIONAL RESERVE CAPABILITY DIRECT HEAT REMOVAL SERVICE (DHRS) COMPONENTS

- Overflow Heat Exchanger
- EVS (Ex-Vessel Storage Sodium Cooler)
- Air Blast Heat Exchanger
- EM Pumps*
- NaK Expansion Tank
- Sodium Piping
- Critical valves (evaluation in progress)

*Limiting component

A-125

EQUIPMENT FUNCTIONAL RESERVE CAPABILITY DHRS EM PUMPS FUNCTIONAL RESERVE SEISMIC MARGIN

- Calculated design margin based on yield criterion 1.01
- Material minimum strength assumptions 1.20
- Structural strength functional margin
- = $1.01 (1.2) = 1.21$
- Ratio of seismic to total loadings, $k = 32\%$
- EM Pumps functional reserve seismic margin
- = $1/0.32 (1.21-1) + 1 = 1.66$
- System seismic response conservatism = 1.45

EQUIPMENT FUNCTIONAL RESERVE SEISMIC MARGIN = 2.41

A-126

SEISMIC TESTING FOR CLASS 1E EQUIPMENT

- Qualify to IEEE std. 344-1975
- Single frequency tests
- Multiple frequency tests
- Single frequency plus multiple frequency
- Multiple frequency and recommended single frequency

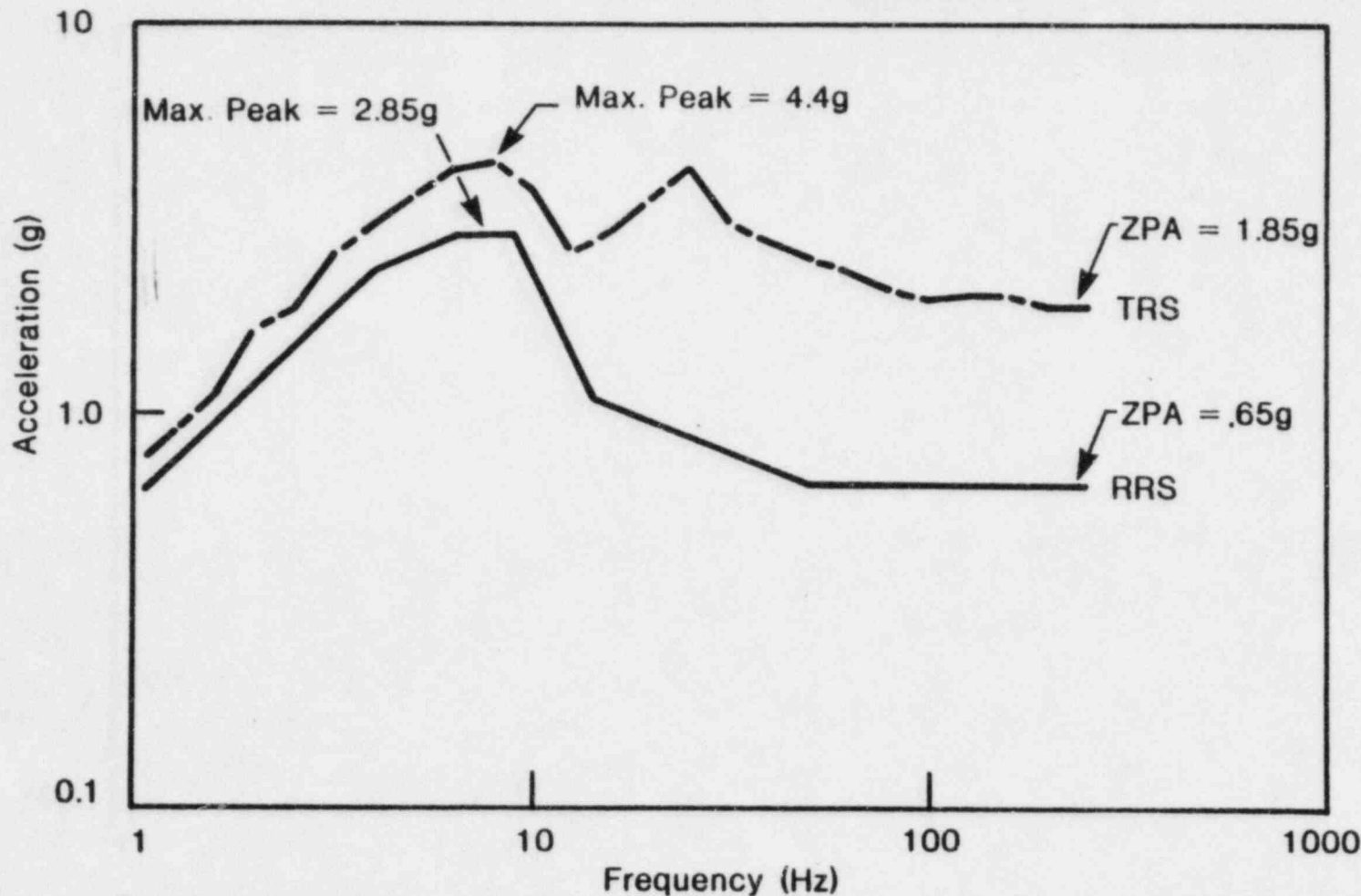
A-127

EXAMPLE OF COMPARISON OF TRS/RRS FOR TESTED EQUIPMENT

- Reactor shutdown and isolation equipment
- Housed in cabinets and whole cabinet shake table tested
- Both sine beat unidirectional and multiple frequency biaxial motion
- Cabinet rotated 90°
- Functioned properly during and after testing
- TRS conservatively enveloped RRS
- Additional conservatism by enveloping horizontal RRS, 10% IEEE-323 margin and use of design spectra

A-128

PRIMARY REACTOR SHUTDOWN SYSTEM COMPARATOR/BUFFER CABINET AND LOGIC CABINET ASSEMBLIES

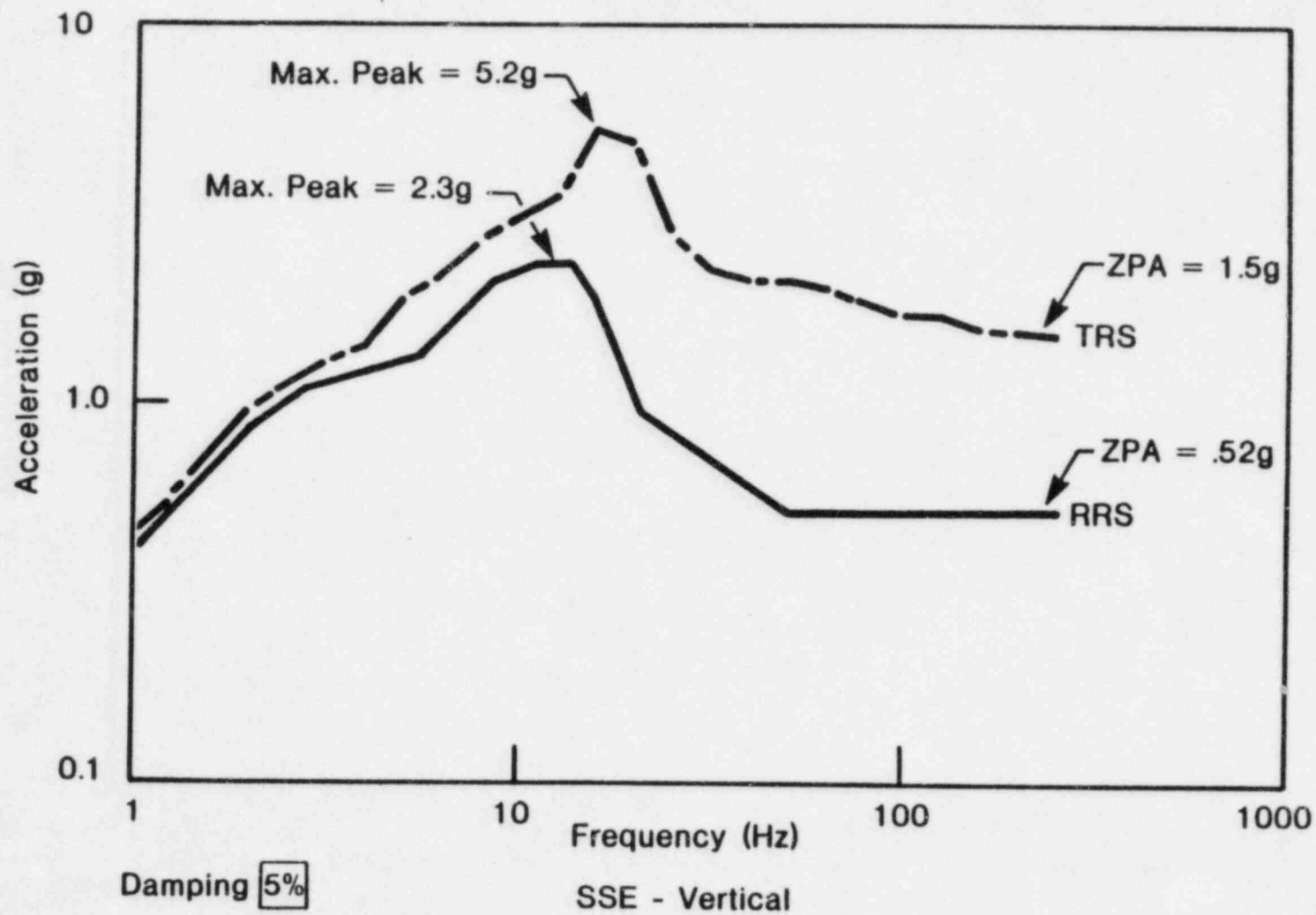


A-129

Damping 5%

SSE - Horizontal

PRIMARY REACTOR SHUTDOWN SYSTEM COMPARATOR/BUFFER CABINET AND LOGIC CABINET ASSEMBLIES



A-130

EXAMPLE OF RESERVE SEISMIC MARGIN FOR TESTED EQUIPMENT

- Seismic response conservatism for testing:
 - Development of ground accelerogram 1.05
 - Reduction of floor response spectrum 1.05
 - Development of required response spectra 1.1
 - IEEE-323 margin 1.1
- Total seismic response conservatism = 1.33
- Margin from TRS/RRS enveloping:
 - Ratio of ZPA = 2.85
 - Ratio of maximum peak = 1.54

RESERVE SEISMIC MARGIN on
ZPA = 3.79 x margin to fragility
RESERVE SEISMIC MARGIN on
peak = 2.05 x margin to fragility

A-131

BUILDINGS AND STRUCTURES RESERVE SEISMIC CAPABILITY STRUCTURAL STRENGTH RESERVE SEISMIC MARGIN

- Load factors for service loads (OBE):
 - OBE load factor in load combination = 1.9 (1.0 for SSE)
 - Design controlled by service loads
 - Loading produced by OBE > 50% SSE
 - Result in reserve strength at least 1.05
- Strength reduction factors:
 - ACI Code limits below ultimate capacity
 - Reduction factors range from 0.75 to 0.90
 - Result in reserve strength at least 1.11
- Material minimum strength assumptions:
 - Reinforcing steel yield strength 5% to 15% higher than specified
 - Concrete design based on 28 day strength
 - 25% concrete strength increase due to aging in one year
 - Result in reserve strength at least 1.12
- Redundant structural components:
 - Interconnected buildings on common foundation mat
 - Multiple interconnected cells
 - Estimated margin due to redundant path load 1.05

STRUCTURAL STRENGTH RESERVE SEISMIC MARGIN = 1.37

A-13a

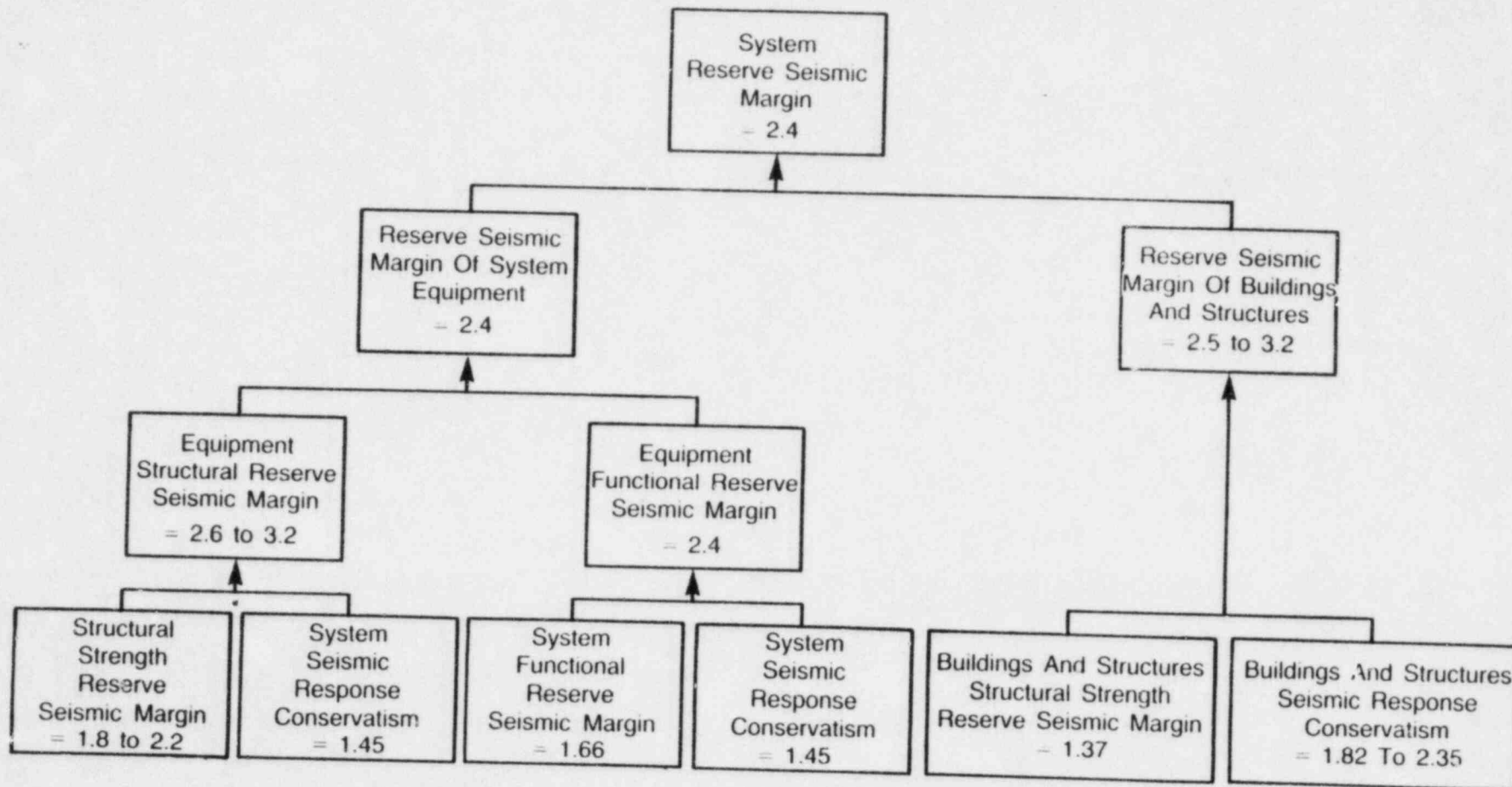
BUILDINGS AND STRUCTURES RESERVE SEISMIC CAPABILITY SEISMIC RESPONSE CONSERVATISM

- Development of ground accelerogram 1.05
- Reduction of response spectrum due to inelastic action:
 - Substantial reserve strength in inelastic range
 - Energy absorption due to concrete cracking and yielding of reinforcing steel
 - Newmark's inelastic design spectra (NUREG/CR-0098)
 - Reduction of spectral accelerations below 33 Hz
 - Reduction is function of ductility factor and frequency
 - NUREG/CR-0098 ductility factor (μ) between 2 and 3 for structures housing Class I equipment
 - Reduction for 2Hz to 8Hz range = $1/(2\mu-1)^{1/2}$
 - Elastic input accelerations reduced by 45% to 58%
 - Results in reserve margin of 1.73 to 2.24

BUILDINGS AND STRUCTURES SEISMIC RESPONSE CONSERVATISM = 1.82 to 2.35

A-133

RESERVE SEISMIC CAPABILITY OF CRBRP RESERVE SEISMIC MARGINS



A134

CONSERVATISM IN RESERVE SEISMIC CAPABILITY

- Assumption of calculated stress equal to allowable stress for equipment
- Design of most equipment controlled by OBE
- OBE = 50% SSE but OBE equipment loads > 50% SSE
- Use of linear-elastic dynamic and stress analyses
- Reduction of floor response spectra due to inelastic action of building
- Reduction for ductility factor of equipment
- Envelope spectra for multiple-support system
- Response spectrum versus time history analysis
- Exclusion of non-structural elements
- Redundance of structural elements
- Ground response spectra with high amplifications
- Absolute combination of seismic loads with other loads
- Conservatism by designer action and duplication for design simplification
- Load factors on dead and live loads for buildings
- Building serviceability requirements (shielding, stiffness, TMBDB, tornado missile)

A-135

CONCLUSIONS

- Reserve Seismic Capability of CRBRP System Equipment:
 - Structural Reserve Seismic Margin = 2.6 to 3.2
 - Reserve Margin Earthquake = 0.65g to 0.80g
 - Functional Reserve Seismic Margin = 2.4
 - Reserve Margin Earthquake = 0.60g
 - Reserve Seismic Capability of CRBRP Buildings and Structures:
 - Reserve Seismic Margin = 2.5 to 3.2
 - Reserve Margin Earthquake = 0.62g to 0.80g
- CRBRP SEISMIC CAPABILITY = AT LEAST 0.60g

**CLINCH RIVER BREEDER
REACTOR PLANT**



BRIEFING FOR:

**ADVISORY COMMITTEE ON
REACTOR SAFEGUARDS (ACRS)
FULL COMMITTEE**

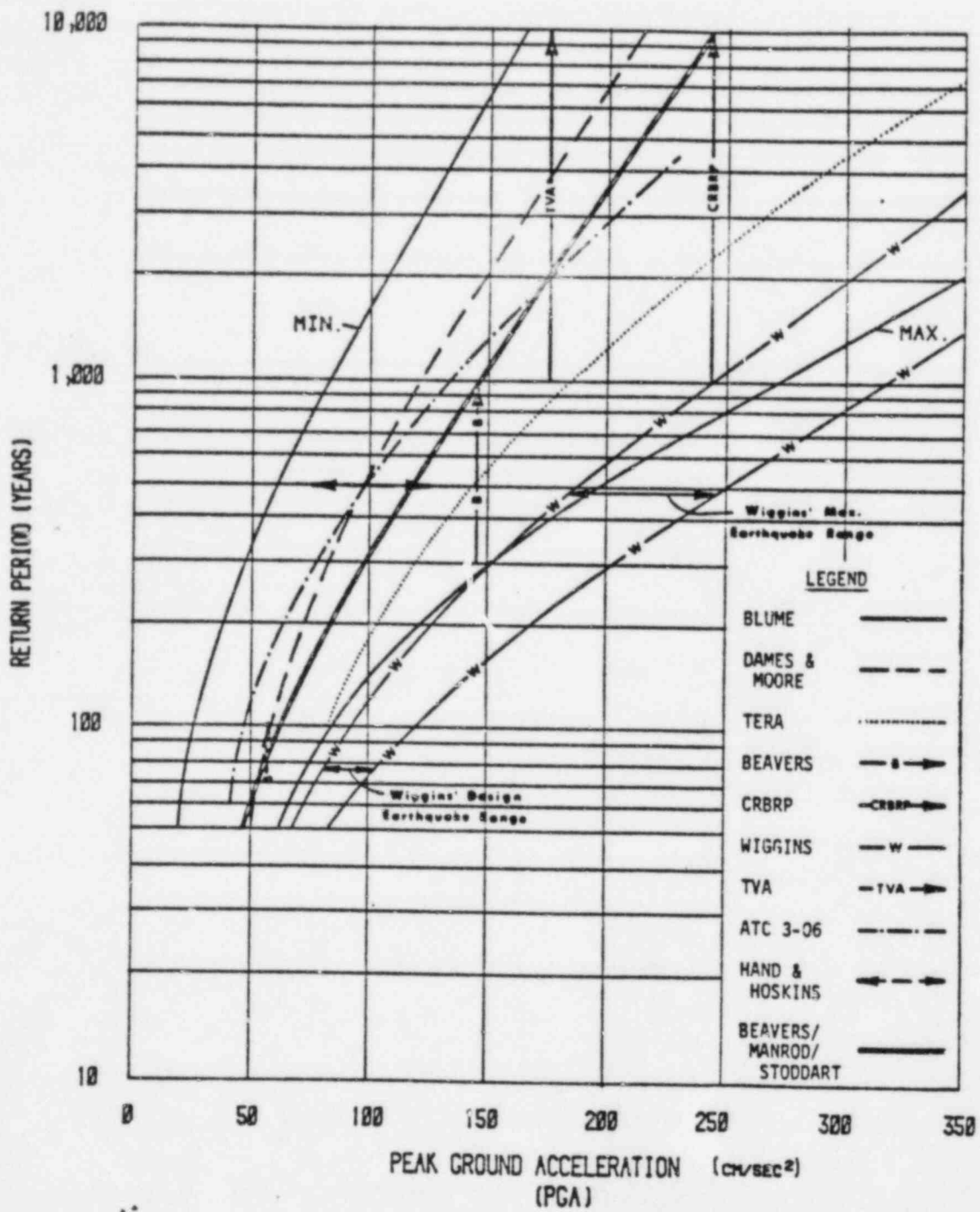
SEISMIC MARGIN

PRESENTED BY:

**G. H. CLARE
LICENSING MANAGER,
CRBRP PROJECT
WESTINGHOUSE
ADVANCED REACTORS DIVISION
OAK RIDGE SITE**

FEBRUARY 11, 1983

A-137



SUPERIMPOSED RESULTS FOR OAK RIDGE

FIGURE 10

SEISMIC MARGIN

- ESTIMATES OF 0.25g SSE RECURRENCE FREQUENCY RANGE FROM 10^{-3} TO 10^{-4} PER YEAR
- AN EARTHQUAKE WITH ACCELERATION TWICE THAT OF THE SSE WOULD HAVE A RECURRENCE FREQUENCY SIGNIFICANTLY LESS THAN 10^{-4} PER YEAR
- MARGIN ASSESSMENTS INDICATE CRBRP COULD BE SHUTDOWN AND MAINTAINED IN A SAFE CONDITION FOR EARTHQUAKES WITH A RECURRENCE FREQUENCY SIGNIFICANTLY LESS THAN 10^{-4} PER YEAR

A-139

CRBR FUEL, BLANKET AND CONTROL ASSEMBLY
MECHANICAL DESIGN

PRESENTATION TO ACRS - 2/11/83

BY - M. TOKAR - NRC
- R. BAARS - LANL

A-140

APPENDIX XVII
CRBR FUEL, BLANKET AND CONTROL
ASSEMBLY MECHANICAL DESIGN

SCOPE OF STAFF REVIEW

- o MECHANICAL DESIGN OF FUEL, BLANKET AND CONTROL PINS AND ASSEMBLIES, INCLUDING:
 - DESIGN CRITERIA/LIMITS
 - DESIGN METHODS
 - STEADY STATE CONDITIONS
 - TRANSIENT CONDITIONS

- o DEVELOPMENT TESTING, INCLUDING
 - IN-REACTOR
 - EX-REACTOR
 - STEADY STATE
 - TRANSIENT

- o REVIEWED BY LANL

A-141

ACCEPTANCE CRITERIA

- o CONFORMANCE WITH CRBR PRINCIPAL DESIGN CRITERIA:
 - #8 - REACTOR DESIGN

- o CONFORMANCE WITH INTENT OF SRP 4.2 "FUEL SYSTEM DESIGN"

- o COMPLETENESS AND ADEQUACY (BASIS) OF APPLICANTS':
 - DESIGN CRITERIA/LIMITS
 - DESIGN METHODS
 - CONCEPTUAL DESIGN

- o ADEQUATE DEVELOPMENT TESTING TO SUPPORT THE DESIGN/CRITERIA/LIMITS/METHODS

A-142

FAVORABLE FACTORS
FOR SUCCESS OF SYSTEM

- o MASSIVE LMFBR TEST PROGRAM SHOWS MIXED OXIDE FAILURES
VERY RARE FOR CRBR GOAL EXPOSURE
- o OPERATION IS FAR FROM COOLANT SATURATION, LESSENING
THE CHANCE OF COOLING DISCONTINUITY
- o PROPOSED SCRAM TRIP SETTINGS TERMINATE ABNORMAL
OCCURRENCES FAR SHORT OF SIGNIFICANT FUEL DAMAGE
OR DISRUPTION
- o LOW SMEAR DENSITY OF FUEL (85%) - ABOUT TWICE THE
RELATIVE VOLUME TO ACCOMMODATE RADIAL EXPANSION
AS LWR FUELS
- o FALLBACK POSITIONS OF REDUCED POWER, EXPOSURE AND
OPERATING TEMPERATURE ARE AVAILABLE
- o OPERATING DATA ON SIMILAR (FFTF) SYSTEM AVAILABLE
BY FSAR

A-143

CRITERIA ISSUES
COOLABLE GEOMETRY LIMITS

- o NO BASIS PROVIDED TO SUPPORT CLADDING MELTING LIMIT FOR ENSURING COOLABLE GEOMETRY

- o VIOLABLE NO-BOILING GUIDELINE INADEQUATE - NO INFORMATION AS TO HOW CASES INVOLVING BOILING WOULD BE EVALUATED

- o NEITHER CLADDING NOR COOLANT TEMPERATURE BASED LIMITS ADEQUATELY GUARD AGAINST MOLTEN FUEL EXPULSION FOR OVER POWER CONDITIONS

RESOLUTION: APPLICANTS HAVE COMMITTED TO ADDRESS ALL OF THESE ISSUES AND DOCUMENT A COMPREHENSIVE BASIS FOR COOLABLE GEOMETRY LIMITS FOR REVIEW BY THE STAFF PRIOR TO FSAR SUBMITTAL.

A-144

METHODS ISSUES
FUEL EVALUATION MODELS

- o CUMULATIVE DAMAGE FUNCTION MODEL
 - MODEL HAS NOT BEEN QUALIFIED TO INTEGRAL ROD TEST DATA
 - MODEL DOES NOT ADDRESS FUEL ADJACENCY EFFECT
 - STATISTICAL APPROACH DOES NOT COVER DATA VARIANCE

- o DUCTILITY LIMITED STRAIN MODEL DLS
 - MODEL SHOULD BE REQUALIFIED TO INTEGRAL ROD TEST DATA
 - MARGIN TO FAILURE NOT ESTABLISHED
 - MODEL UNCERTAINTIES NOT ESTABLISHED

RESOLUTION: APPLICANT HAS COMMITTED TO ADDRESS CDF ISSUES BY SUBMITTAL OF THE FSAR.

DATA BASE ISSUES

- o ATYPICAL FACTORS
 - FLUENCE/BURNUP
 - SHORT RODS
 - TRANSIENT TEST RADIAL POWER DEPRESSION
 - NO PRECONDITIONING IN TRANSIENT TESTS

- o COVERAGE
 - 32% PLUTONIUM
 - BLANKET RODS
 - SLOW OVERPOWER
 - UNDERCOOLING AT END-OF-LIFE

- o CLADDING
 - FUEL ADJACENCY EFFECT
 - RESPONSE AT HIGH FLUENCE AND HIGH TEMPERATURE

RESOLUTION: APPLICANT HAS ACTIVE COMPREHENSIVE PROGRAM TO ADDRESS THESE ISSUES. THESE ISSUES ARE ENUMERATED AS THE PRESENT STATUS OF THE DATA BASE FOR WHICH WE HAVE DOCUMENTATION.

A-146

CONCLUSION

PROSPECTS FOR SUCCESS OF THE CRBR FUEL SYSTEM JUSTIFY ISSUANCE OF CONSTRUCTION PERMIT.

HOWEVER, ABILITY TO CLEARLY DEMONSTRATE ACCEPTABILITY OF THE SYSTEM FOR AN OPERATING LICENSE WITHOUT RESORTING TO FALLBACK POSITIONS DEPENDS ON ADDRESSING IDENTIFIED ISSUES.

A-147

BASIS FOR CONCLUSIONS

- o PREVIOUSLY ENUMERATED FAVORABLE FACTORS.
- o ALL OF THE FOREGOING ISSUES ARE PRIMARILY RELEVANT TO THE ABILITY TO EVALUATE FUEL PERFORMANCE, NOT TO FUEL PERFORMANCE ITSELF.
- o PROGRAMS ARE UNDER WAY, OR HAVE BEEN COMMITTED BY THE APPLICANT, TO RESOLVE THE ISSUES BY FSAR SUBMITTAL.
- o THE AVAILABILITY OF FALLBACK POSITIONS ALLOWS DEFERRAL OF RESOLUTION TO THE FSAR.

A-11/8

CRBR NUCLEAR DESIGN

SER SECTION 4.3

AERS MEETING

FEBRUARY 11, 1983

W. L. BROOKS

CORE PERFORMANCE BRANCH

USNRC

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SAFETY EVALUATION REPORT

SECTION 4.3

DESIGN BASES

• PRINCIPAL DESIGN CRITERIA

DESIGN DESCRIPTION

REACTIVITY CONTROL SYSTEM

POWER DISTRIBUTIONS

REACTIVITY COEFFICIENTS

INSTRUMENTATION

CORE STABILITY

ANALYTICAL METHODS

PRINCIPAL DESIGN CRITERIA AFFECTING THE CORE

PDC 8 - REACTOR DESIGN

PDC 9 - INHERENT REACTOR PROTECTION

PDC 10 - SUPPRESSION OF REACTOR POWER OSCILLATIONS

PDC 11 - INSTRUMENTATION AND CONTROLS

PDC 18 - PROTECTION SYSTEM FUNCTION

PDC 23 - PROTECTION SYSTEM REQUIREMENTS FOR
REACTIVITY CONTROL MALFUNCTIONS

PDC 24 - REACTIVITY CONTROL SYSTEM REDUNDANCY
AND CAPABILITY

PDC 25 - COMBINED REACTIVITY CONTROL SYSTEMS
CAPABILITY

PDC 57 - REACTIVITY LIMITS

PDC 58 - PROTECTION AGAINST ANTICIPATED
OPERATIONAL OCCURRENCES

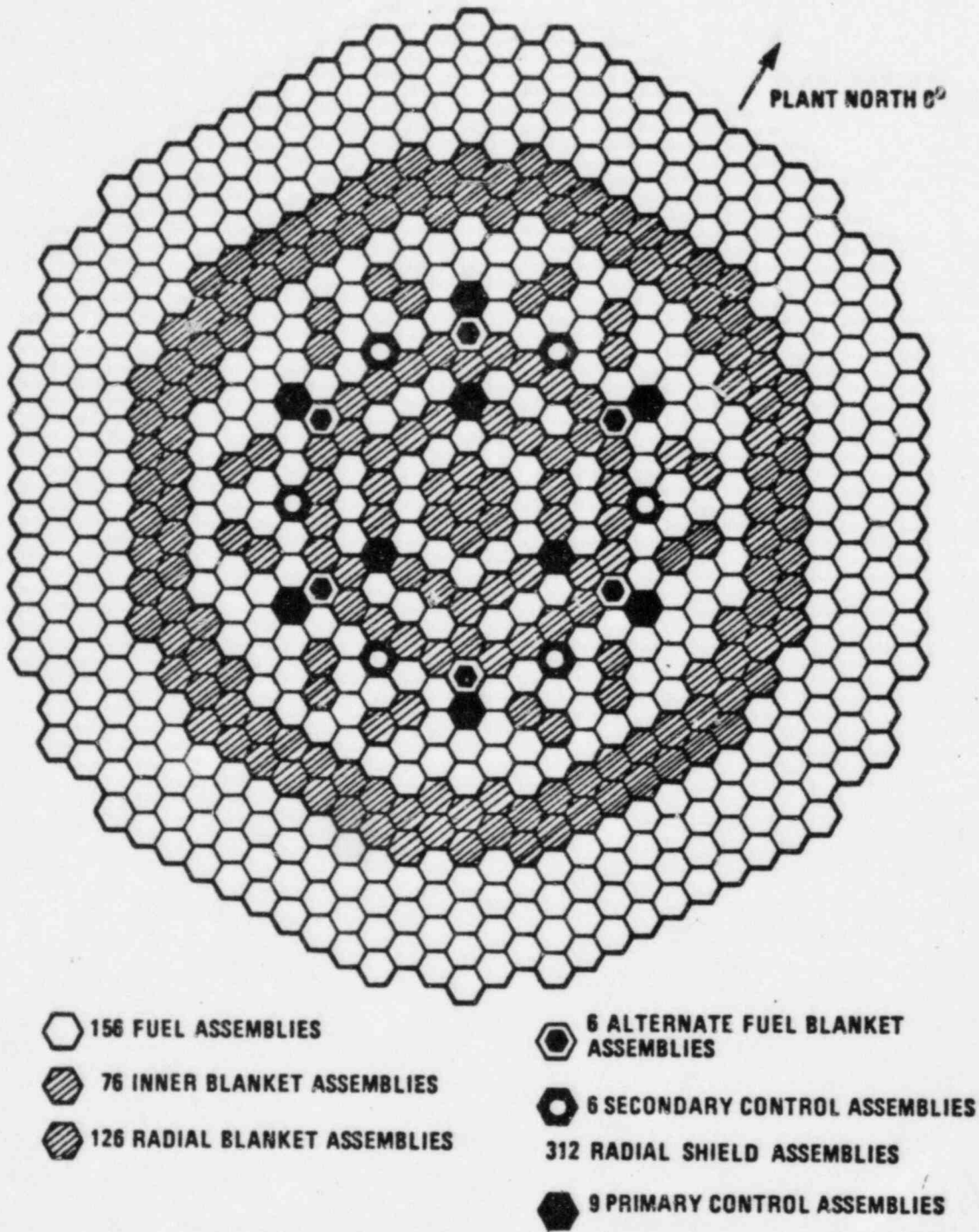


FIGURE 4.3-1. Clinch River Breeder Reactor Core Layout

5894-22

4.3-150

Amend. 64
Jan. 1982

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REACTIVITY CONTROL SYSTEM

RELEVANT CRITERIA

- 23
- 24
- 25
- 57
- 58

DESIGN BASES

CALCULATION METHODS

RESULTS AND CONCLUSION

POWER DISTRIBUTIONS AND INSTRUMENTATION

RELEVANT CRITERIA

- 8
- 11
- 18

DESIGN BASES

CALCULATION METHODS

RESULTS AND CONCLUSIONS

REACTIVITY COEFFICIENTS AND CORE
STABILITY

RELEVANT CRITERIA

- 9
- 10

DOPPLER COEFFICIENT

OTHER COEFFICIENTS

CORE STABILITY

CALCULATION METHODS

EFFECT OF BOWING

A-155

ANALYTICAL METHODS

SUMMARY OF METHODS

COMMITMENTS

A-156

CRBR REACTOR THERMAL - HYDRAULIC DESIGN

PRESENTATION TO ACRS - 2/11/83

BY T. KING - NRC

A-157

SCOPE OF STAFF REVIEW

- 1) THERMAL/HYDRAULIC DESIGN OF IN-VESSEL COMPONENTS, INCLUDING:
 - DESIGN CRITERIA/LIMITS
 - DESIGN METHODS
 - STEADY STATE CONDITIONS
 - TRANSIENT CONDITIONS

- 2) DEVELOPMENT AND STARTUP TESTING
 - STEADY STATE
 - TRANSIENT

- 3) REVIEW AND INDEPENDENT ANALYSIS BY:
 - BNL
 - ANL
 - BARTHOLD & ASSOC.

A-158

ACCEPTANCE CRITERIA

- CONFORMANCE WITH CRBR PRINCIPAL DESIGN CRITERIA:
 - #8 - REACTOR DESIGN
 - #60- FLOW BLOCKAGE

- CONFORMANCE WITH SRP SECTION 4.4 "THERMAL HYDRAULIC DESIGN"

- COMPLETENESS AND ADEQUACY OF APPLICANTS':
 - o DESIGN CRITERIA/LIMITS
 - o DESIGN METHODS
 - o CONCEPTUAL DESIGN

- ADEQUATE DEVELOPMENT TESTING TO SUPPORT THE DESIGN/CRITERIA/LIMITS/METHODS

- CONFIRMATION OF APPLICANTS' ANALYSIS BY SELECTED INDEPENDENT OVERCHECKS

A-159

MAJOR SAFETY FEATURES OF DESIGN

- o PROVIDE FOR DECAY HEAT REMOVAL VIA NATURAL CIRCULATION

- o PREVENTS SIGNIFICANT GAS ENTRAINMENT BY:
 - VENTING POTENTIAL GAS COLLECTION AREAS
 - SUPPRESSING VORTEX FORMATION AND TURBULANCE IN THE UPPER PLENUM

- o MINIMIZES THE POTENTIAL FOR FLOW BLOCKAGE BY:
 - PROVIDING DISCRIMINATION FEATURES TO PREVENT ASSEMBLY PLACEMENT IN A CORE LOCATION OF HIGHER POWER THAN WHAT IT IS ORIFICED FOR.
 - PROVIDING MULTIPLE FLOW PATHS TO THE ASSEMBLY INLET NOZZLES.
 - PROVIDES CORE INLET STRAINERS WHICH WILL FILTER OUT PARTICLES LARGER THAN 1/4 INCH.
 - PROVIDING INLET NOZZLE OPENINGS WHICH ALLOW ASSEMBLY VERTICLE MOTION WITHOUT CUTTING OFF FLOW.

- o PROVIDES MONITORING INSTRUMENTATION FOR CORE ASSEMBLY OUTLET TEMPERATURES.

- o REQUIRES PREVENTION OF INADVERTENT CONTROL ROD FLOATATION DURING REFUELING.

- o REQUIRES SUFFICIENT FLOW TO ALL PERMANENT AND REMOVEABLE CORE COMPONENTS TO MAINTAIN THEM WITHIN THEIR STRUCTURAL LIMITS FOR ALL STEADY STATE AND TRANSIENT OPERATION

- o ORIFICING DESIGN WHICH PROVIDES SHIELDING TO CORE SUPPORT STRUCTURE.

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ITEMS TO BE RESOLVED AS PART OF
FINAL DESIGN

- o PRIMARY CONTROL ROD FLOATATION - *not enough margin*
- o AFFECT OF OBSERVED FFTF CORE ΔP
INCREASE ON CRBR DESIGN
- o AFFECT OF LATEST POWER TO MELT DATA
ON CRBR FUEL DESIGN
- o CORRECT METHODOLOGY FOR APPLICATION
OF HCF's.

Hot Channel Factors

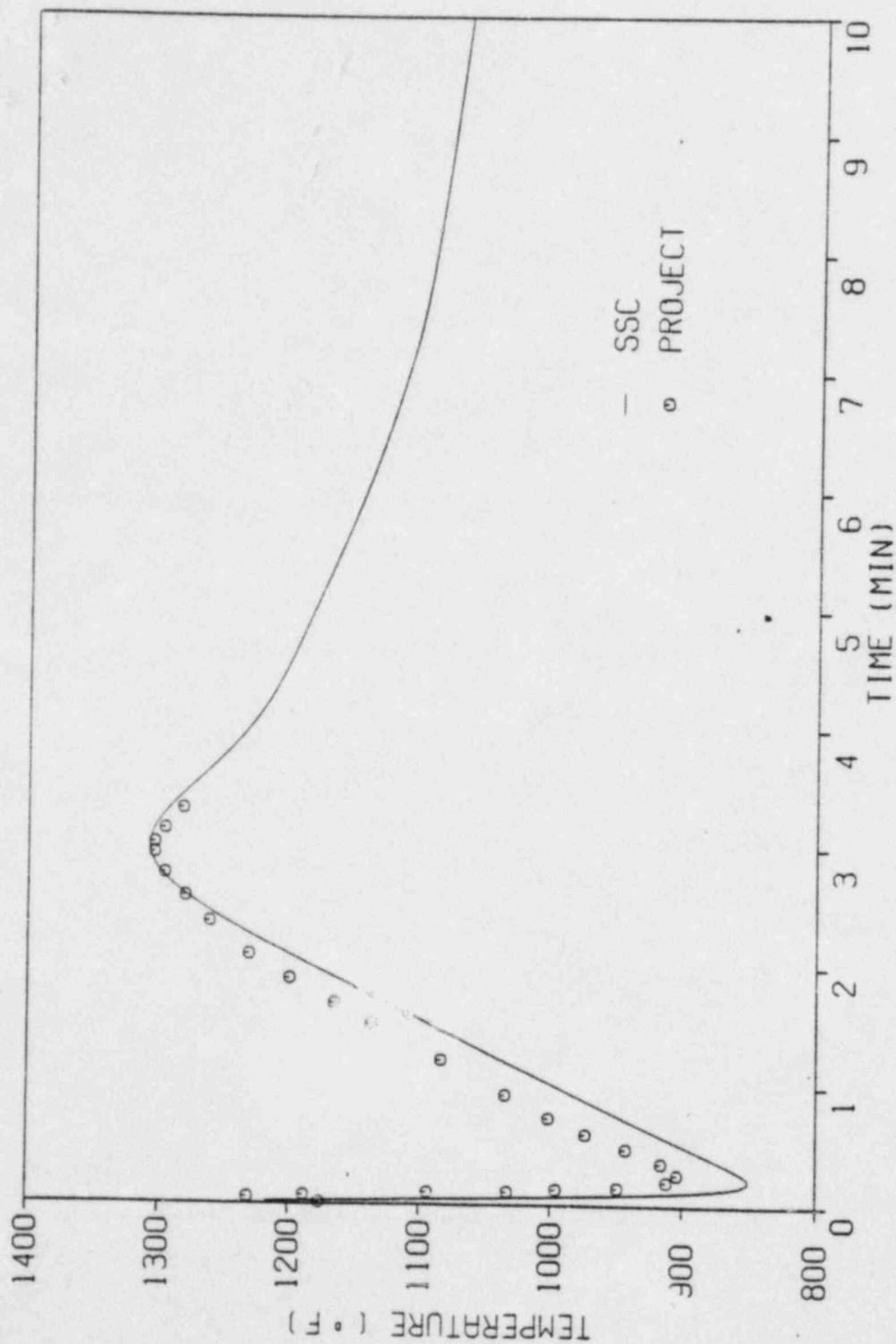
INDEPENDENT OVERCHECK ANALYSIS

- o STEADY STATE, FULL POWER CORE CONDITIONS

- o NATURAL CIRCULATION:
 - COMPARISON WITH APPLICANTS' BASE CASE
 - COMPARISON WITH FFTF RESULTS

- o DHRS:
 - COMPARISON WITH APPLICANTS' BASE CASE
 - COMPARISON WITH FFTF DATA

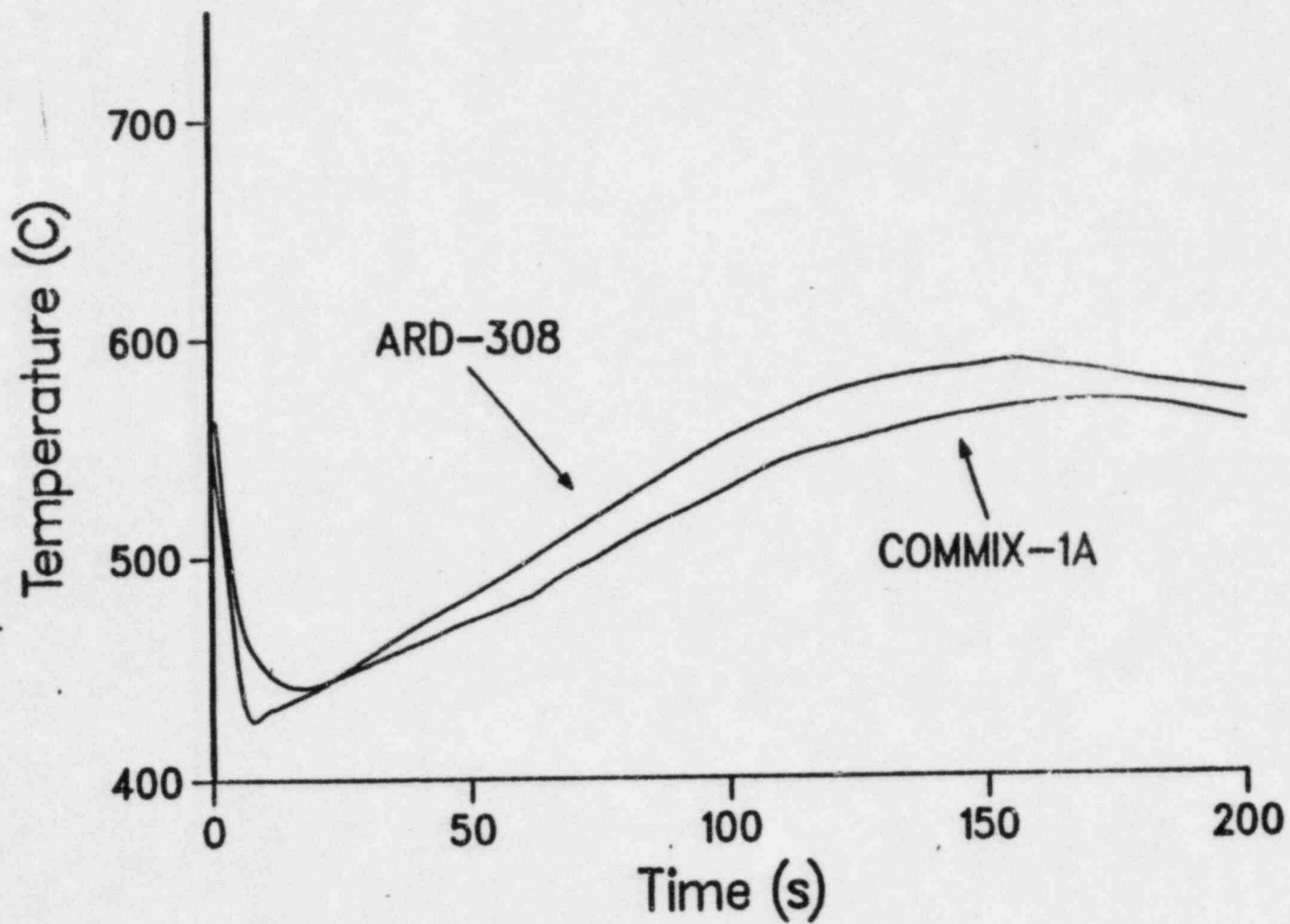
- o FOLLOW ON WORK IN SUPPORT OF OL REVIEW:
 - SENSITIVITY STUDY ON BASE CASE
NATURAL CIRCULATION CALCULATIONS
 - SENSITIVITY STUDY ON BASE CASE DHRS
CALCULATIONS
 - ANALYSIS OF NATURAL CIRCULATION TRANSIENT
FROM REFUELING CONDITIONS



STATION BLACKOUT - COOLANT TEMPERATURE FOR HOT FUEL PIN - NATUKAN CIRC CASE

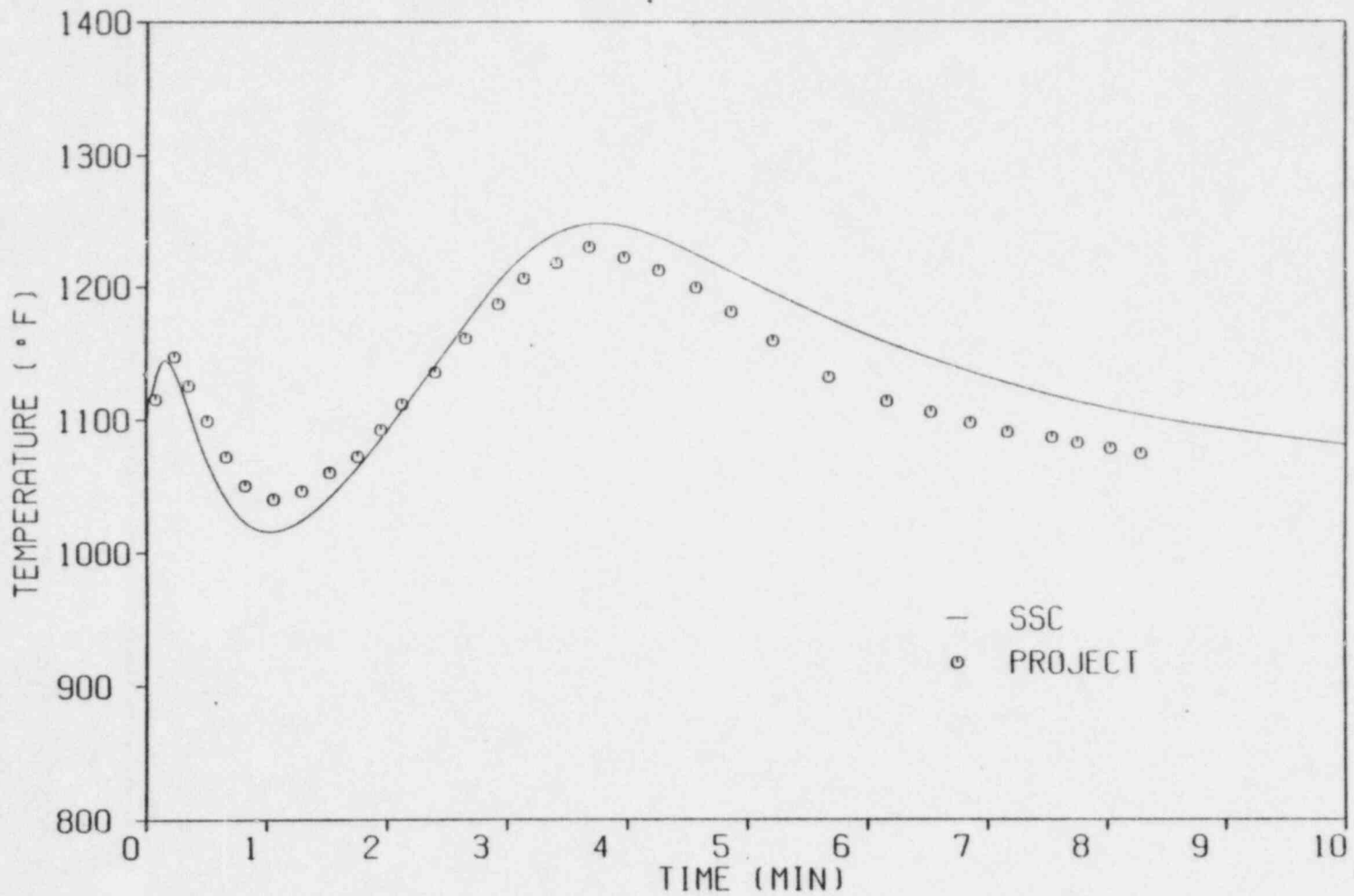
A-164

Fuel Assembly Outlet Temperature



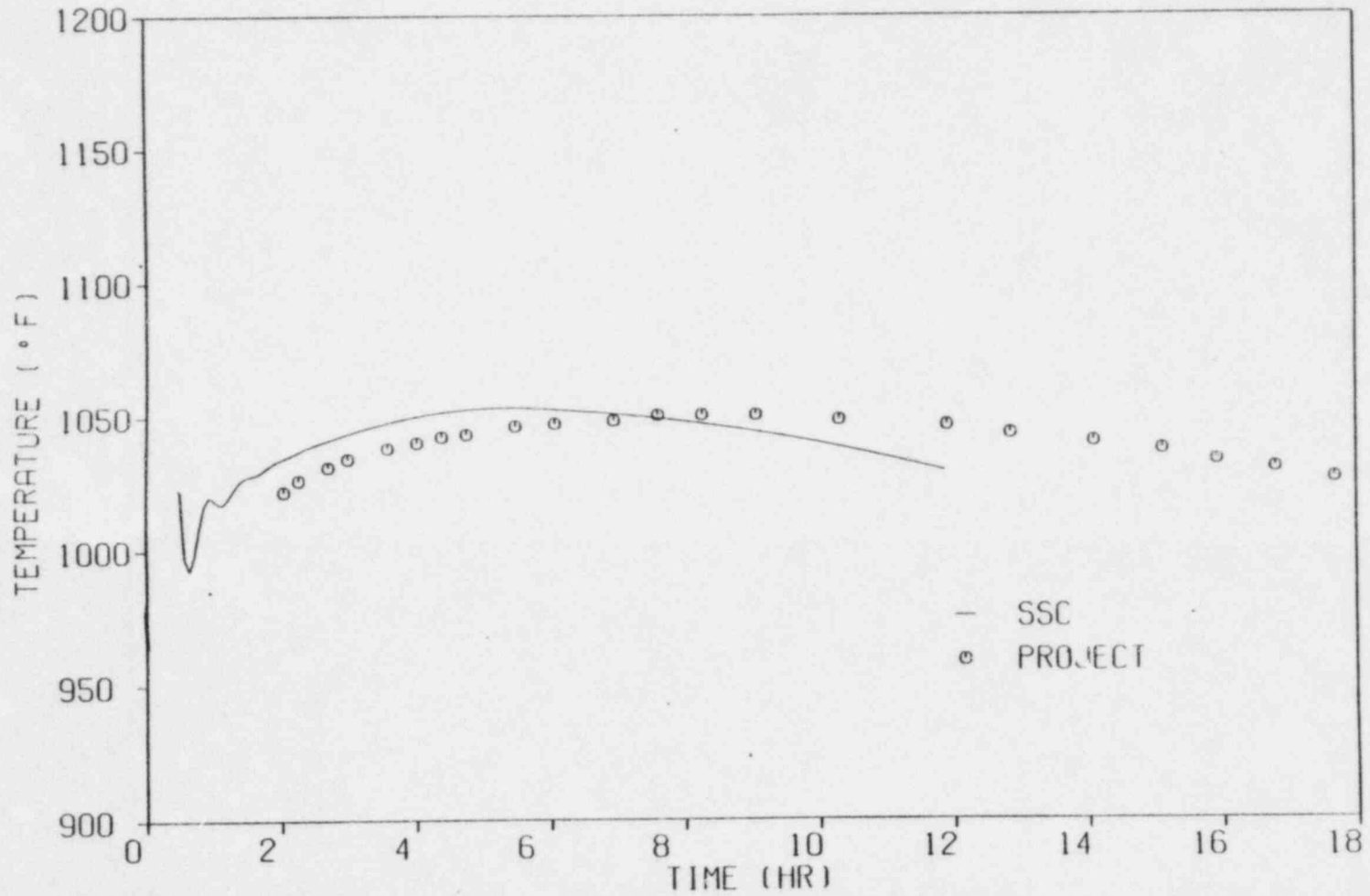
A-165

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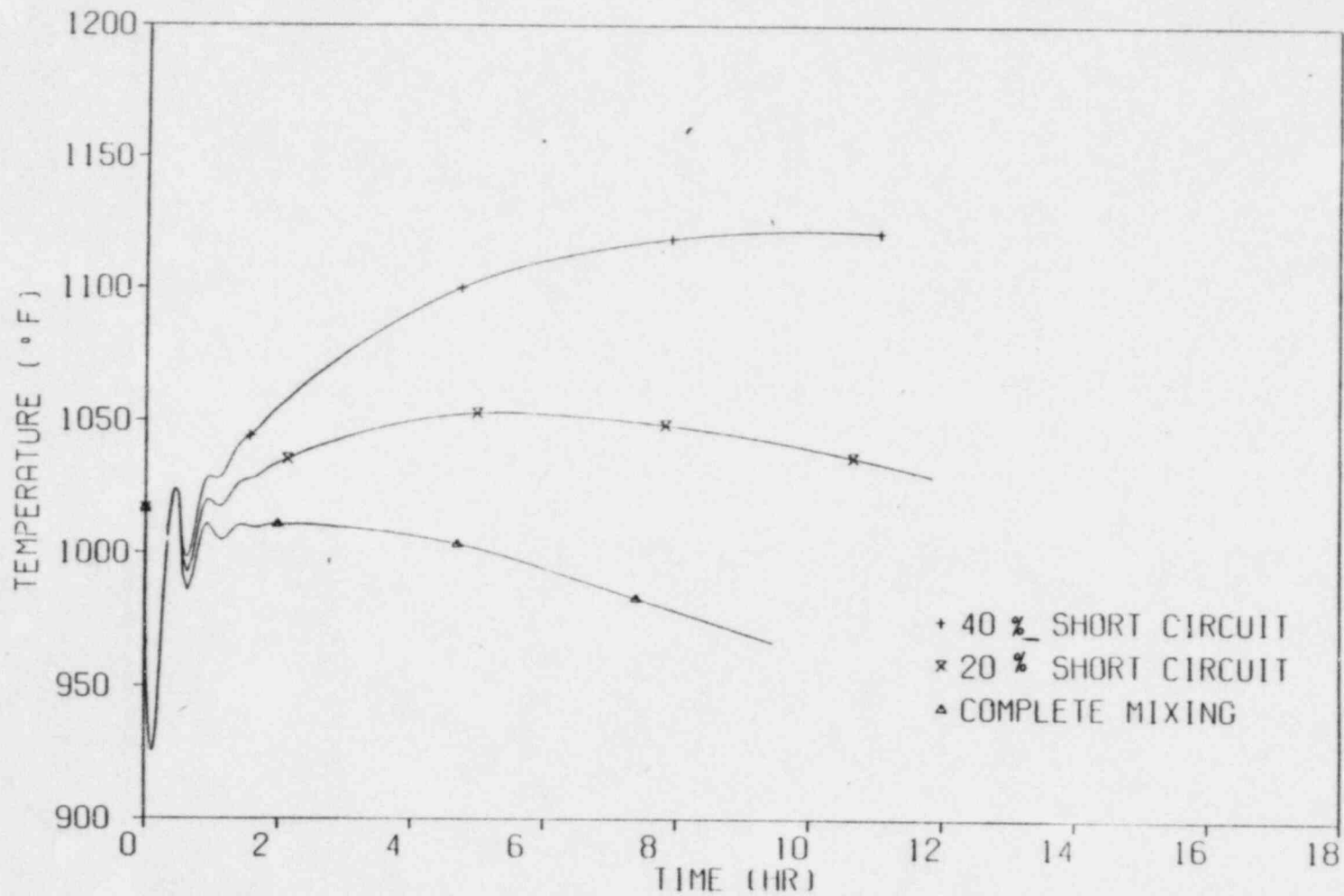
STATION BLACKOUT - COOLANT TEMPERATURE FOR HOT INNER BLANKET PIN

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DIBS DESIGN BASIS ACCIDENT - BULK UPPER PLENUM SODIUM TEMPERATURE

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DHS EVENT - SENSITIVITY OF BULK UPPER PLENUM SODIUM TEMPERATURE TO VARIATIONS IN "SHORT CIRCUIT" FLOW FRACTION

CONCLUSION

- o DESIGN HAS HIGH PROBABILITY MEETING CRITERIA.

- o FALLBACK OF REDUCED POWER, FLOW OR BURNUP EXIST IF COMPLICATIONS ARISE DURING FINAL DESIGN.

- o THEREFORE, STAFF CONSIDERS DESIGN ACCEPTABLE FOR CP.

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FACTORS WHICH INDICATE DESIGN IS ACCEPTABLE FOR CP

- o INCORPORATES FEATURES TO:
 - MINIMIZE THE POTENTIAL FOR FLOW BLOCKAGE
 - PREVENT SIGNIFICANT GAS ENTRAINMENT
 - MONITOR ASSEMBLY OUTLET TEMPERATURES
 - ALLOWS DECAY HEAT REMOVAL VIA NATURAL CIRCULATION
- o FLOW DISTRIBUTION, ΔP 's FRICTION FACTORS, GAS ENTRAINMENT ARE SUPPORTED BY EXTENSIVE WATER AND SODIUM DEVELOPMENT TESTING.
- o FFTF FUEL DESIGN AND IN-VESSEL THERMAL HYDRAULICS DESIGN IS SIMILAR TO CRBR AND CONTINUED FFTF OPERATION WILL PROVIDE DATA DIRECTLY APPLICABLE TO CRBR.
- o STAFF'S INDEPENDENT CALCULATIONS INDICATE THAT APPLICANTS' DESIGN METHODS PROVIDE A REASONABLE ESTIMATE OF SYSTEM PERFORMANCE.
- o APPLICANT HAS COMMITTED TO TESTING DURING INITIAL STARTUP TO:
 - CONFIRM NATURAL CIRCULATION PREDICTION
 - CONFIRM DHRS PERFORMANCE
 - MEASURE SELECTED IN-VESSEL TEMPERATURE AND VIBRATIONS.
- o PRELIMINARY SAFETY ANALYSIS HAS BEEN DONE WITH CONSERVATIVE ASSUMPTIONS:

- ADDITIONAL DECAY HEAT
- HCF
- ADDITIONAL ΔP
- THDV + 20 F CONDITIONS FOR PERMANENT COMPONENTS
- UPPER BOUND ON PHYSICAL PROPERTIES
- ETC.

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CRBRP REACTOR DESIGN

Presented To ACRS
Washington, DC
February 11, 1983

Westinghouse Electric Corporation
Advanced Reactors Division
Madison, PA 15663

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ARD

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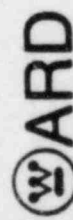
APPENDIX XX
CRBRP REACTOR DESIGN PRESENTATION BY
WESTINGHOUSE

REACTOR TOPICS

- | | |
|---|--|
| 1. Introduction | Mr. Robert M. Vijuk
Manager, Nuclear Systems
Engineering |
| 2. Reactor Vessel and Internals
Design | Dr. Frank J. Baloh
Manager, Reactor Enclosure and
Lower Internals |
| 3. Core Nuclear Design | Mr. Richard A. Doncals
Manager, Nuclear Analysis |
| 4. Core Thermal and Hydraulic
Design | Mr. Robert A. Markley
Manager, Thermal and Fluid
System Engineering |
| 5. Fuel and Blanket Design | Mr. Ambrose L. Schwallie
Manager, Fuel and Removable
Assembly Design |

**REACTOR VESSEL AND
INTERNAL DESIGN**

8254-3



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PRESENTATION OUTLINE

0 GENERAL OVERVIEW

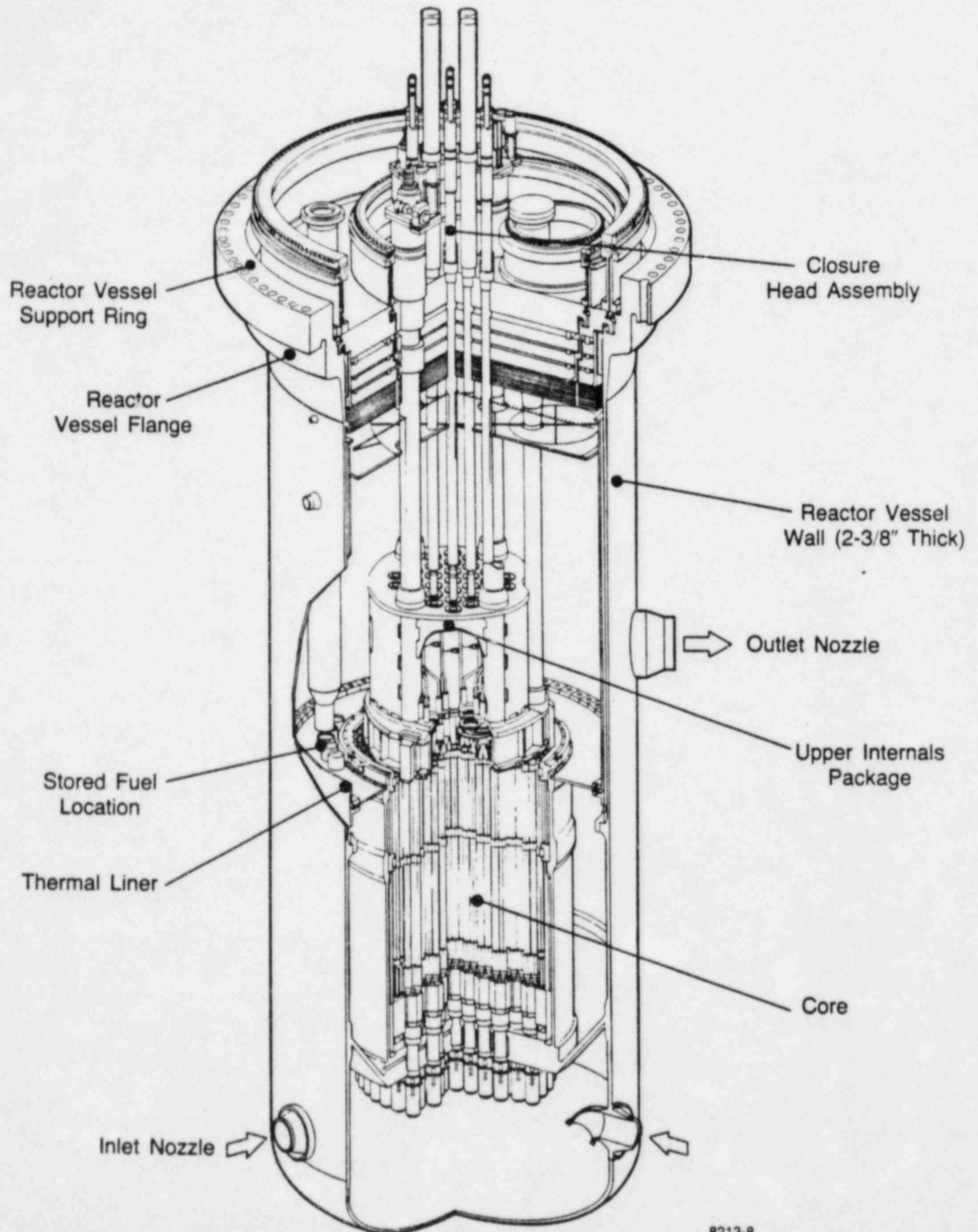
- CLOSURE HEAD (5 MIN)
- REACTOR VESSEL (5 MIN)
- LOWER INTERNALS (5 MIN)

0 UIS DESIGN (15 MIN)

- FUNCTIONAL REQUIREMENTS
- DESIGN DESCRIPTION
- PERTINENT DESIGN CONSIDERATIONS

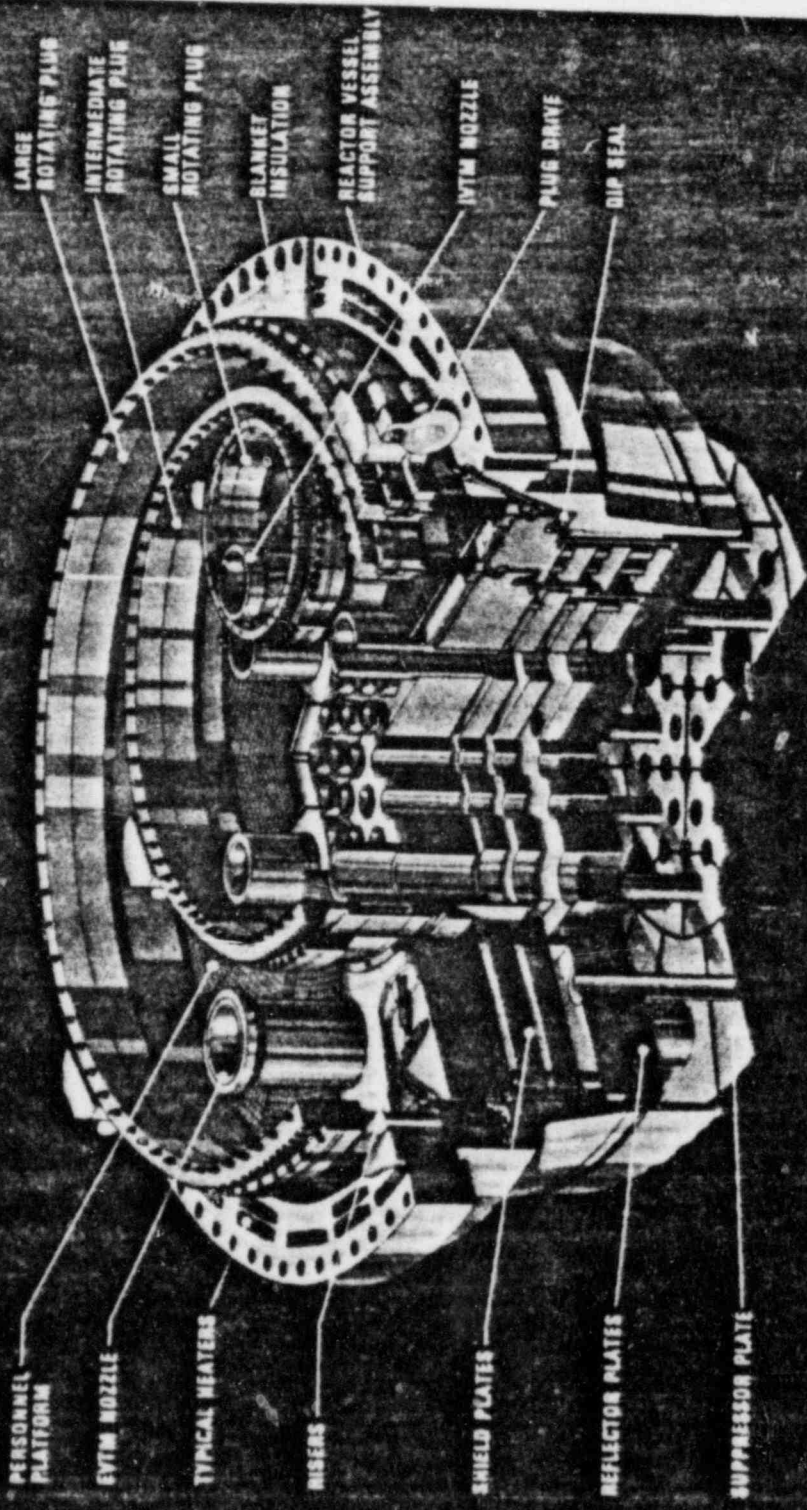
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CRBRP REACTOR VESSEL



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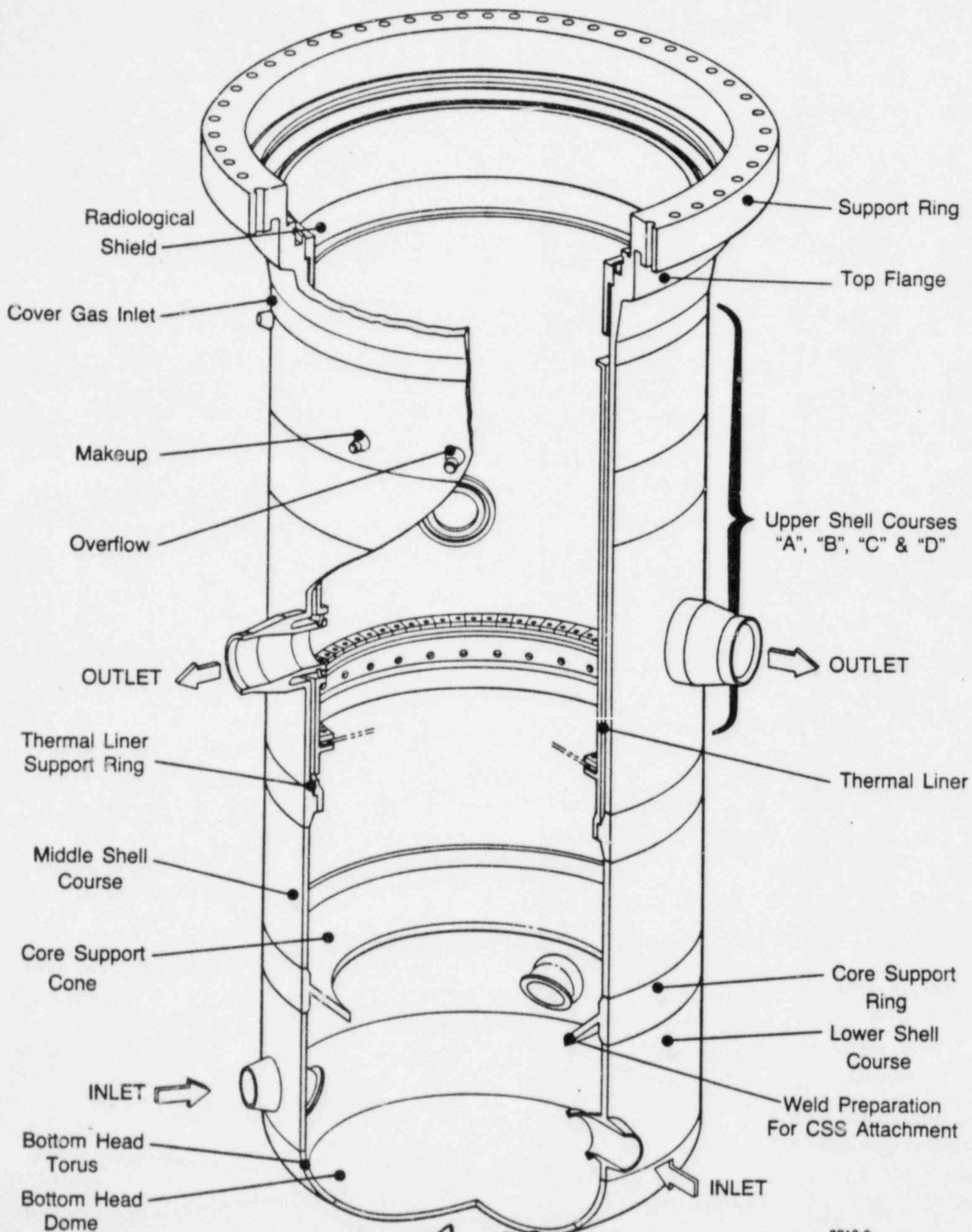
REACTOR CLOSURE HEAD ASSEMBLY

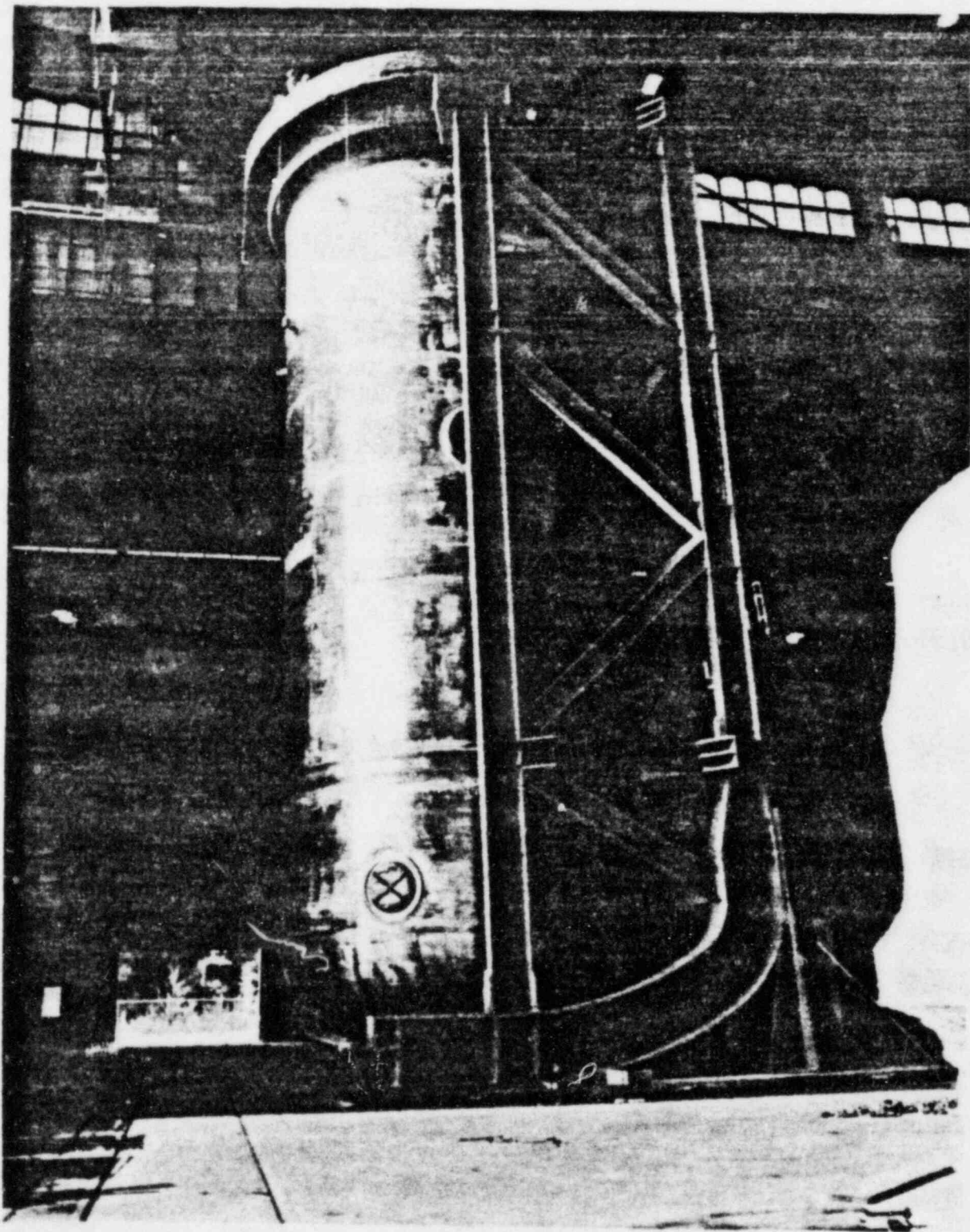


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REACTOR VESSEL

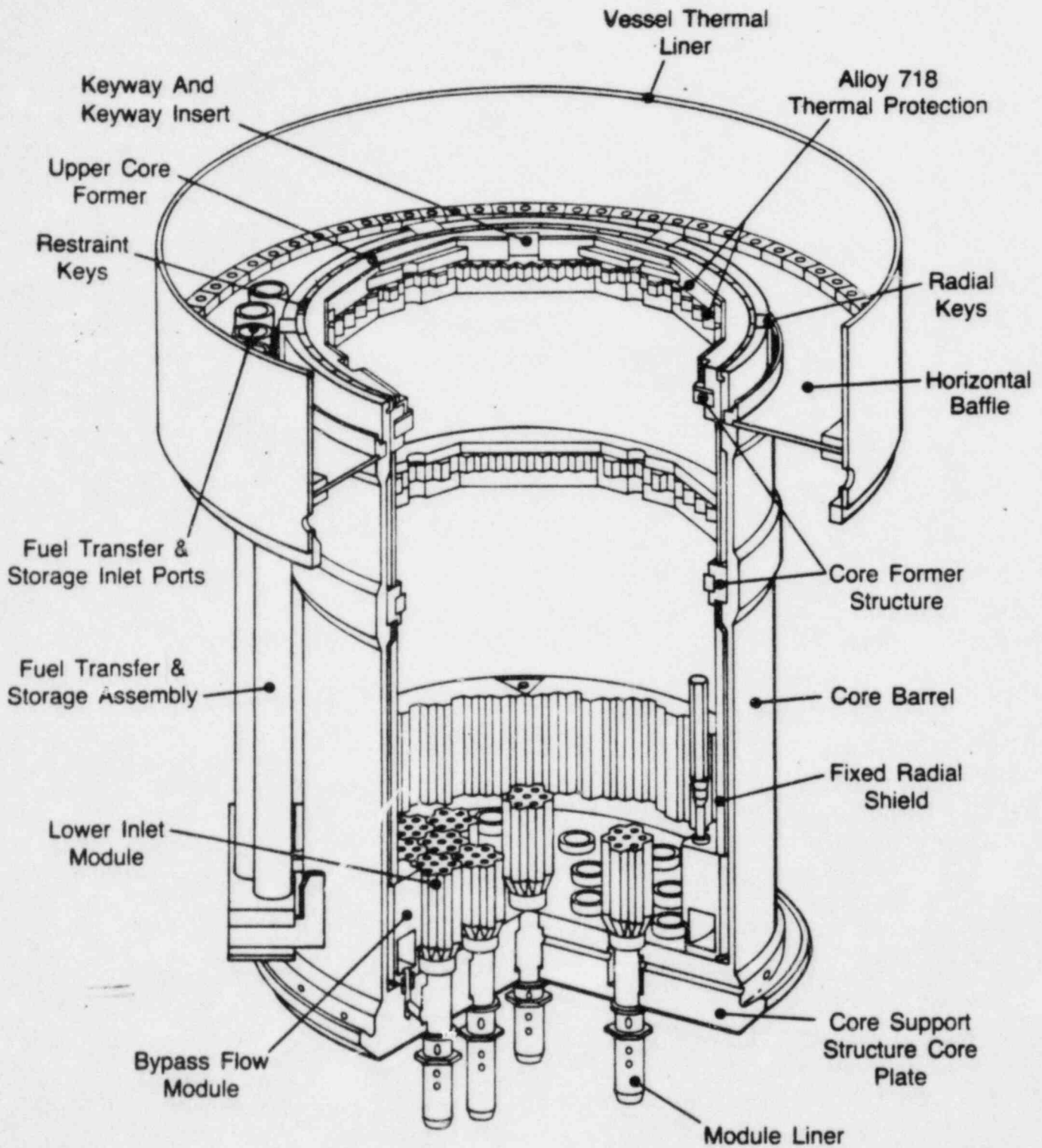
WARD





A-179

LOWER INTERNALS SYSTEM CORE SUPPORT STRUCTURE



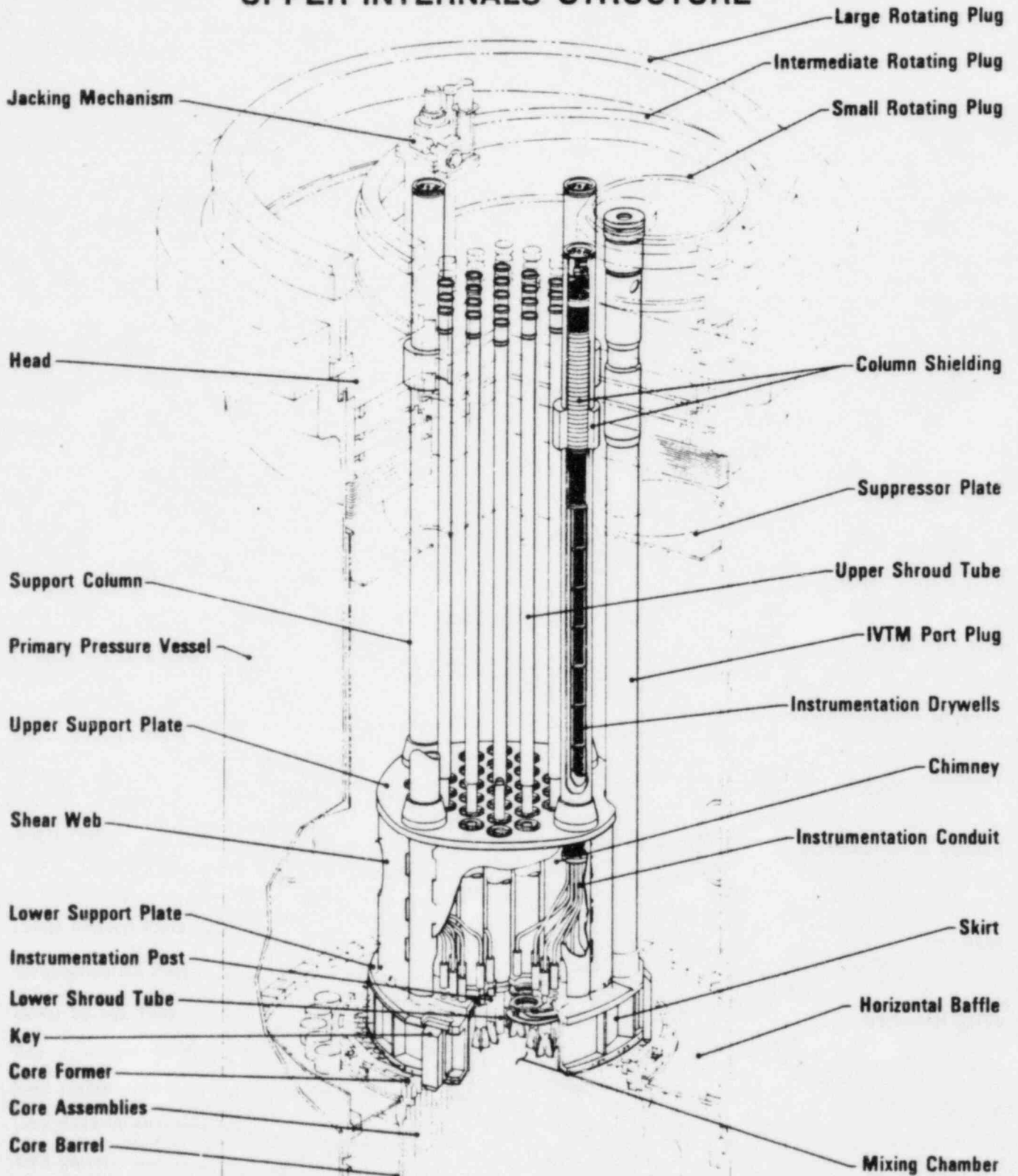
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A-180

WHAT DOES IT DO? UIS FUNCTIONAL REQUIREMENTS

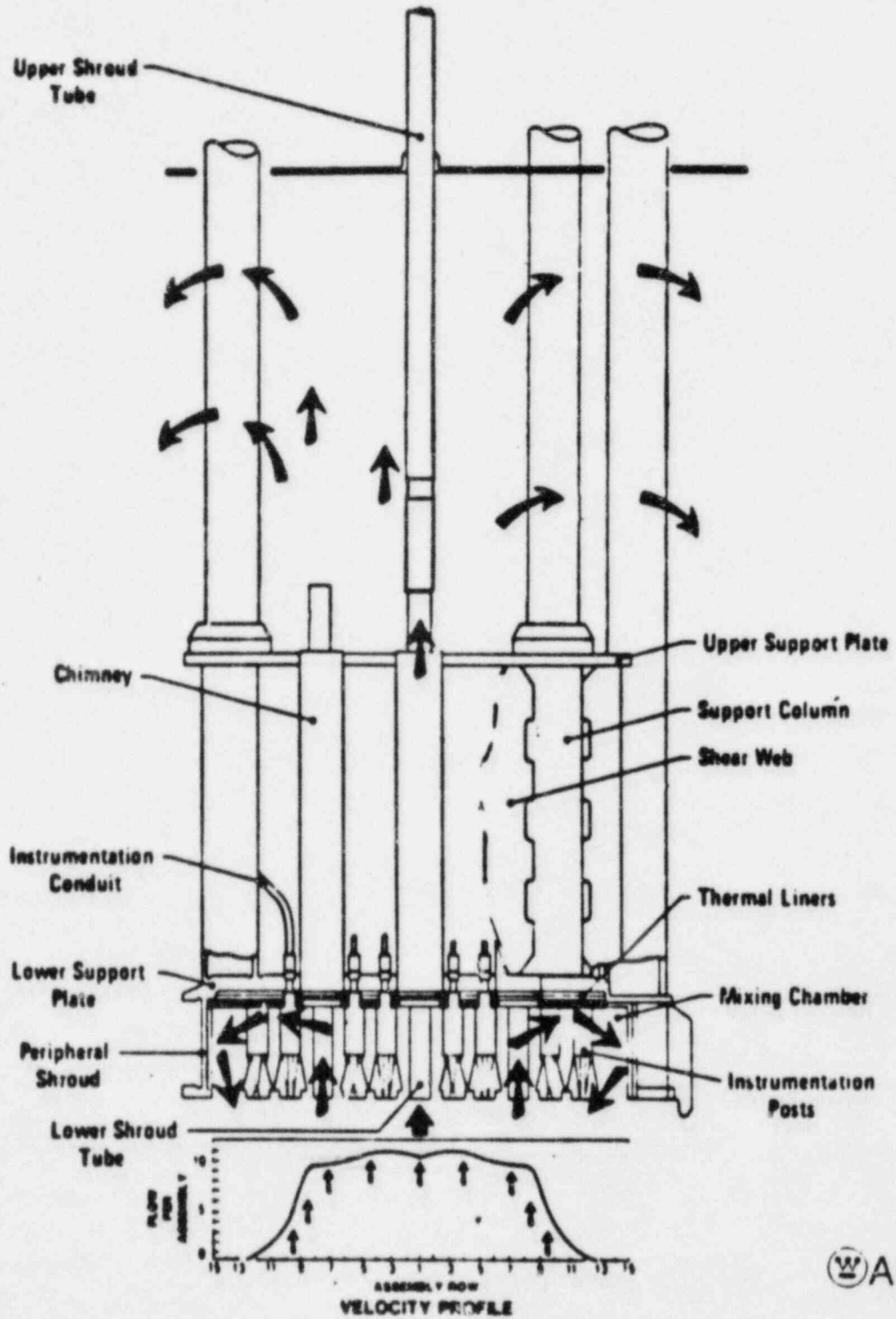
- Maintain control rod alignment with core
- Provide cross flow protection for control rod drivelines
- Mix core outlet flow
- Mitigates transients in PHTS hotleg
- Provide secondary core holddown
- Position and support above-core instrumentation

UPPER INTERNALS STRUCTURE



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ELEVATION SCHEMATIC OF THE UPPER INTERNALS STRUCTURE

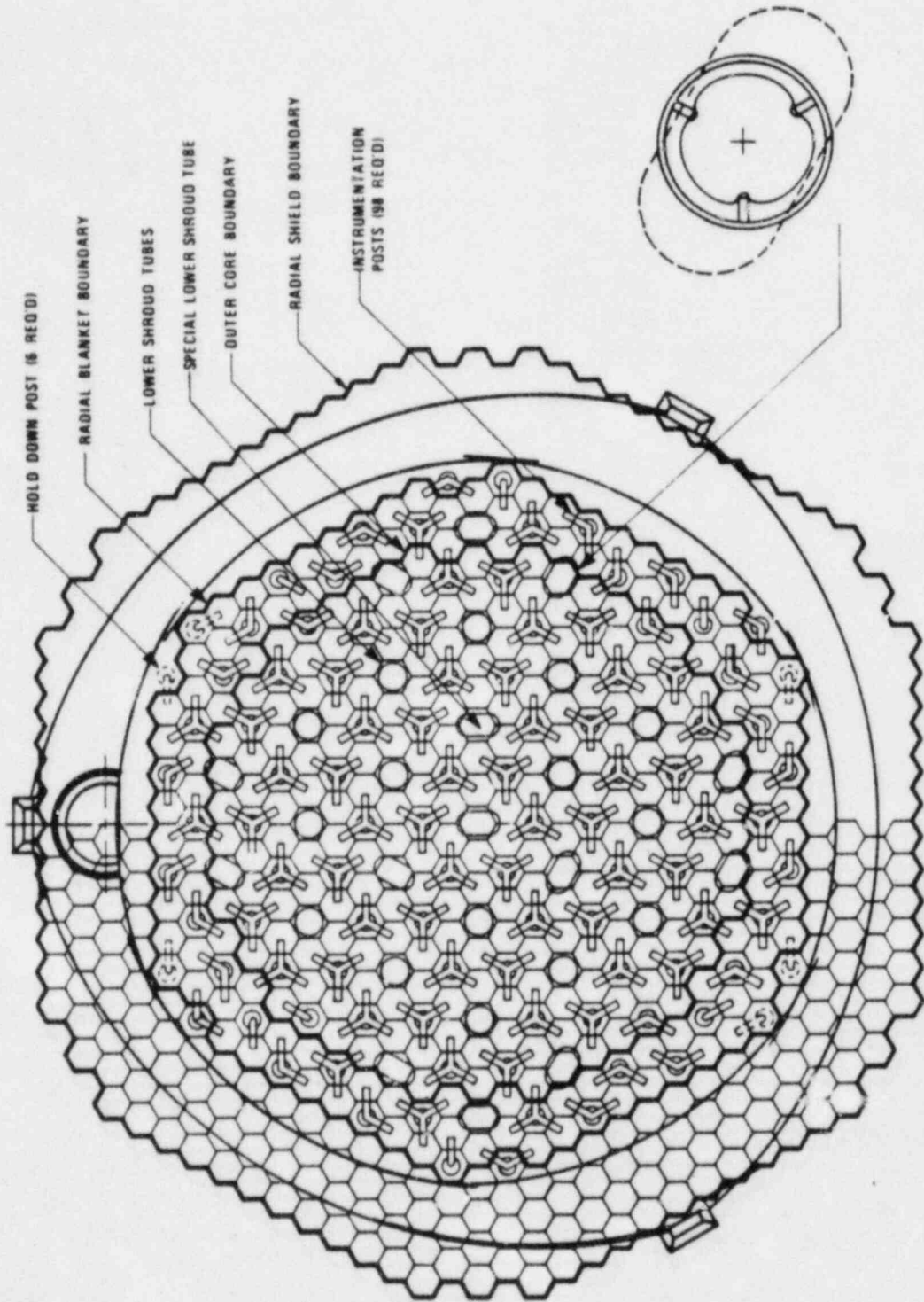


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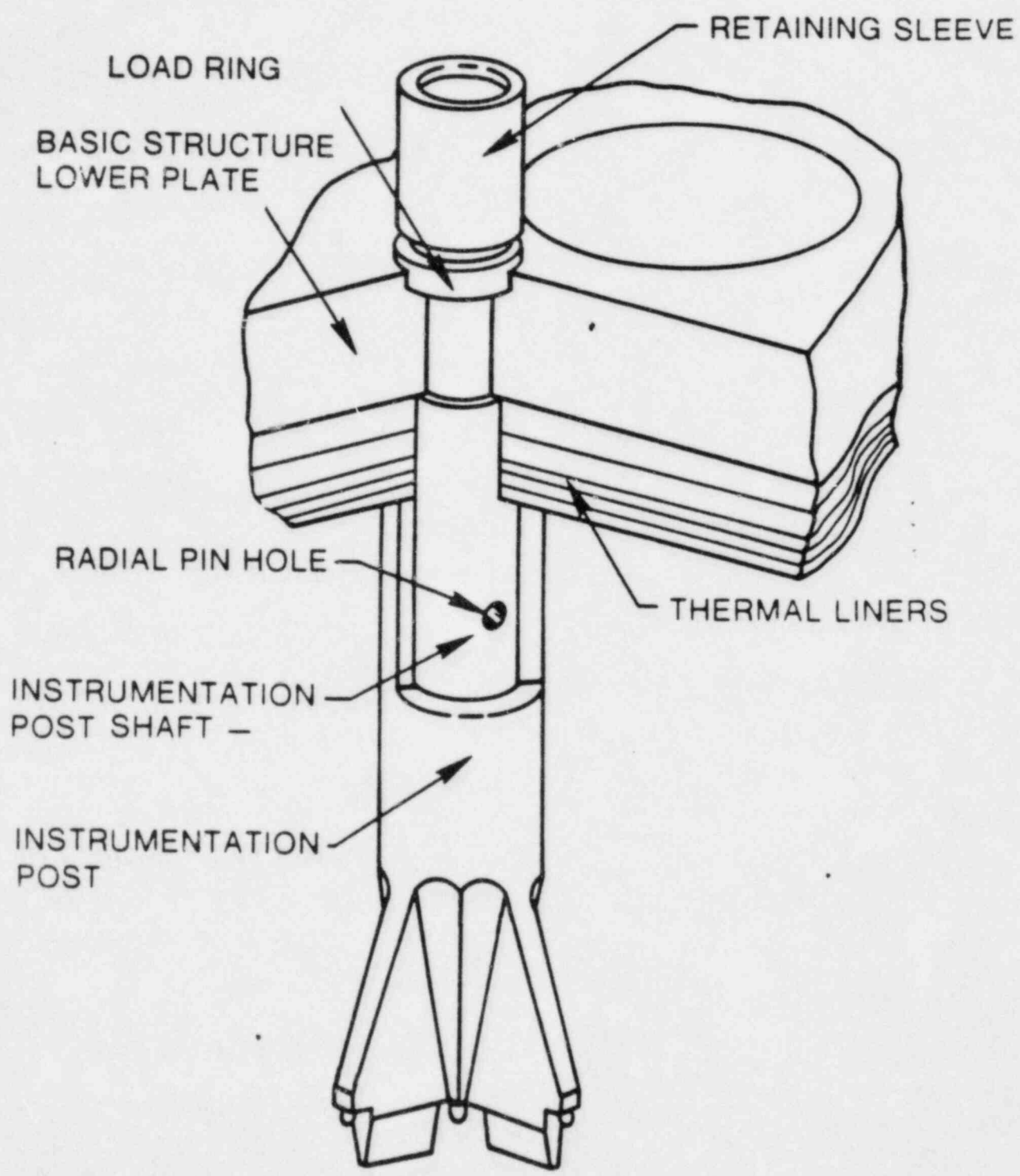
WARD



Core Secondary Holddown, a View Looking up into the Mixing Chamber with a Core Map Superimposed

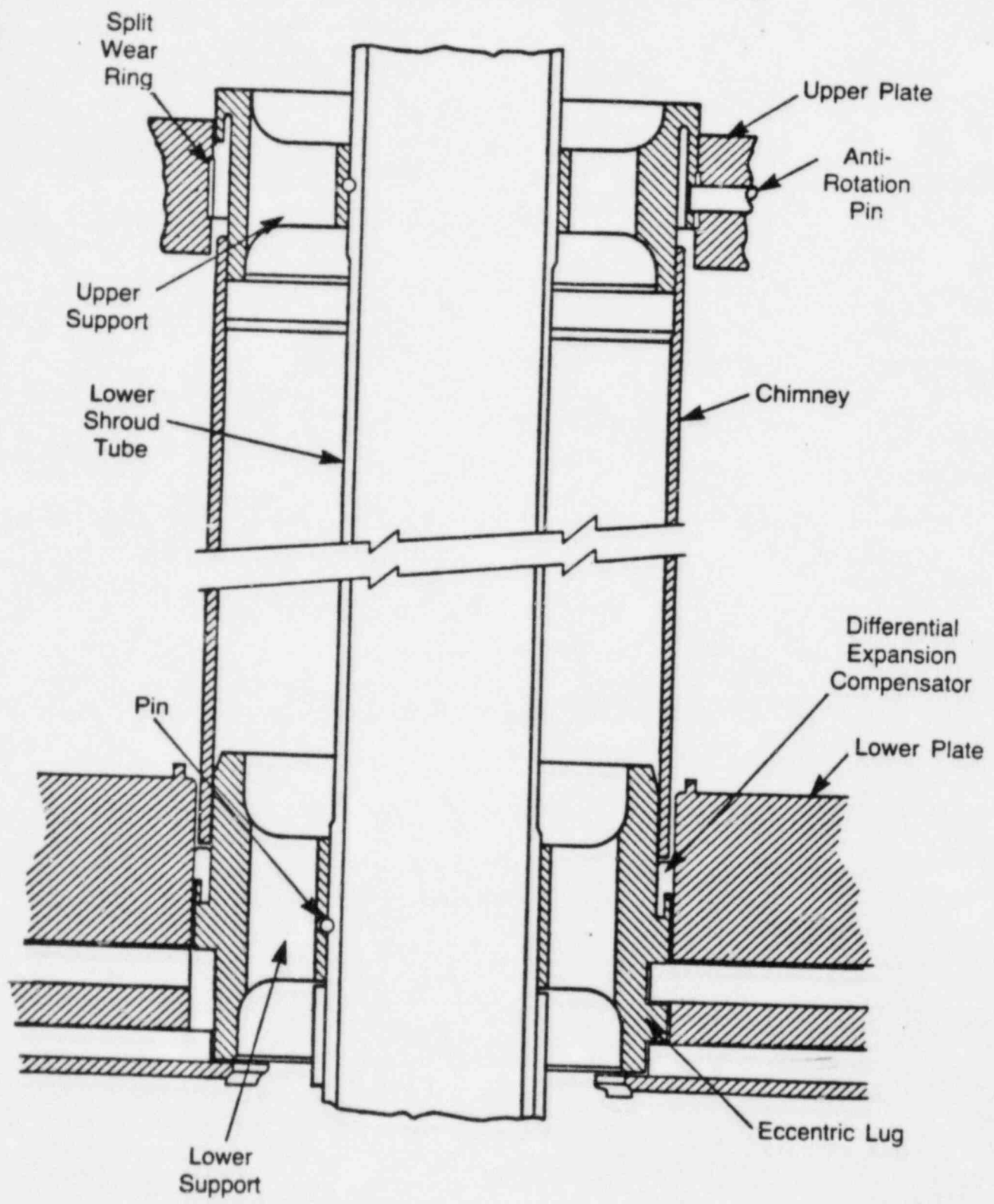
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UIS CHIMNEY MECHANICAL SUPPORT BETWEEN THE LOWER AND UPPER PLATES



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Figure 10

A-18C

UIS MATERIALS SELECTION

WARD

- 316 stainless steel
 1. Compatibility with liquid sodium
 2. Well developed fabrication technology
 3. Creep rupture allowable superior to that for 304 SS
- Alloy 718
 1. Compatibility with liquid sodium
 2. High fatigue strength at high cycles (10^8 to 10^9) at high temperature
 3. Commercially available ;in product forms required
 4. Essentially no cobalt
 5. Adequate material property data base
 6. Fabricable into required configurations

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HANDOUT
MATERIAL
ONLY

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REACTOR T&H DEVELOPMENT TESTING

INLET REGION

<u>TEST TITLE</u>	<u>SUPPORTING INFORMATION</u>	<u>STATUS</u>
● HEDL INLET PLENUM FEATURE TEST - 1/4 SCALE	CHARACTERIZATION OF INLET PLENUM AND LOWER INTERNAL T&H PERFORMANCE	COMPLETED
● HEDL INLET PLENUM FEATURE MODEL PARTICLE MOBILITY AND BUBBLE DISPERSION TESTS	PARTICLE TRANSPORT AND BUBBLE BREAKUP CHARACTERISTICS	COMPLETED
● WARD INLET PLENUM FEATURE TEST - 1/21 SCALE	VISUALIZATION OF INLET PLENUM FLOW PATTERNS - DETERMINATION OF MIXING AND TRANSPORT TIMES	COMPLETED
e HEDL PISTON RING LEAKAGE TESTS	PISTON RING LEAKAGE RATES	COMPLETED
● WARD LIM ORIFICING TESTS	FLOW CONTROL TO BLANKET ASSEMBLIES, REMOVABLE RADIAL SHIELDS AND BYPASS	80% COMPLETED
● WARD LIM CHARACTERIZATION TESTS	FLOW DISTRIBUTION AND PRESSURE DROP IN LIM	COMPLETED
● WARD LIM ORIFICE LIFE TEST	ORIFICE LIFETIME CHARACTERISTICS	COMPLETED
● HEDL RPSA ORIFICE TESTS IN WATER	CHARACTERIZATION OF ORIFICE PLATES	COMPLETED

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REACTOR T&H DEVELOPMENT TESTING
OUTLET REGION

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<u>TEST TITLE</u>	<u>SUPPORTING INFORMATION</u>	<u>STATUS</u>
● HEDL INTEGRAL REACTOR FLOW MODEL, OUTLET PLENUM FEATURE FLOW AND VIBRATION TEST - PHASE I TESTING	PLENUM VELOCITY PATTERNS, MIXING AND ΔP CHARACTERISTICS, VIBRATION, GAS ENTRAINMENT AND STRIPING	COMPLETED
● HEDL INTEGRAL REACTOR FLOW MODEL, OUTLET PLENUM FEATURE FLOW AND VIBRATION TEST - PHASE II TESTING	HYDRAULIC AND VIBRATION CHARACTERISTICS OF UPPER INTERNALS	HYDRAULIC COMPLETED VIBRATION IN FABRICATION
● BCL OUTLET PLENUM STRATIFICATION TEST	FLOW DISTRIBUTION AND TEMPERATURE RESPONSE TO TRANSIENT OPERATION	COMPLETED
● ANL 1/10 SCALE OUTLET PLENUM TESTS	TEMPERATURE DISTRIBUTION AND RESPONSE AT STEADY STATE AND TRANSIENT OPERATION	COMPLETED
● ANL 1/15 SCALE OUTLET PLENUM TESTS	TRANSIENT TESTS IN WATER AND SODIUM	COMPLETED
● ANL CHIMNEY VIBRO-IMPACT TESTS	FULL-SCALE FLOW INDUCED VIBRATION OF UIS CHIMNEY	80% COMPLETED
● HEDL FUEL TRANSFER AND STORAGE ASSEMBLY	HEAT TRANSFER CHARACTERISTICS OF STORED FUEL ASSEMBLY	COMPLETED

REACTOR T&H DEVELOPMENT TESTING
STRIPING TESTS

<u>TEST TITLE</u>	<u>SUPPORTING INFORMATION</u>	<u>STATUS</u>
● HEDL IRFM STRIPING TESTS	STRIPING DATA ON: CHIMNEY AND INSTRUMENT POST, CONTROL ROD SHROUD TUBE, UPPER INTERNALS STRUCTURE AND BYPASS, REMOVABLE RADIAL SHIELD, BLANKET AND FUEL NOZZLES, CORE BARREL, FORMER RINGS, HORIZONTAL BAFFLE, LINER AND SUPPRESSOR PLATE, OUTLET NOZZLES, ETC.	COMPLETED
● ANL STRIPING TESTS	STRIPING DATA ON: MIXING TEES, SEVEN NOZZLE ASSEMBLY WITH PORTION OF UPPER INTERNALS	COMPLETED IN PROGRESS
● WARD STRIPING TESTS	STRIPING DATA ON: SEVEN ASSEMBLY OUTLET NOZZLE FEATURE TEST, SEVEN ASSEMBLY OUTLET NOZZLES TEST, LOCAL INTERSTITIAL FLOW STRIPING TEST, INTERSTITIAL FLOW-WATER TABLE TESTS, THERMAL STRIPING TESTS IN SODIUM - DUNK AND ROTATING CYLINDER	COMPLETED 30% COMPLETED COMPLETED COMPLETED COMPLETED

A-191

CORE NUCLEAR DESIGN

ARD

8254-4

A-192

CRBRP NUCLEAR DESIGN

Outline

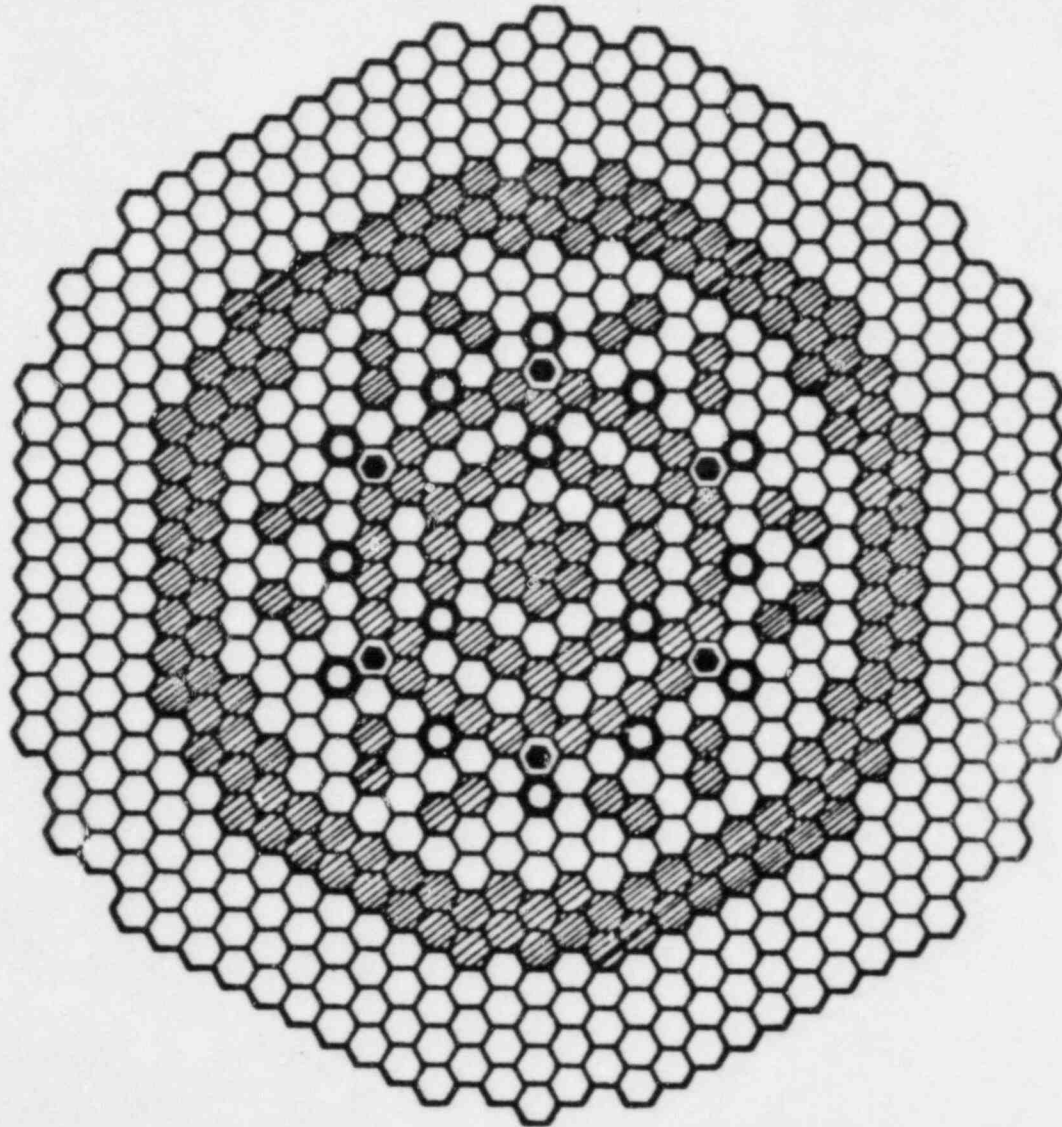
- Reactor description and design basis
- Critical experimental program
- Reactor design areas supported by critical experiments
- Summary

8256-2

A-193

CLINCH RIVER BREEDER REACTOR CORE LAYOUT

WARD



○ 168 FUEL ASSEMBLIES

▨ 78 INNER BLANKET ASSEMBLIES

▩ 126 RADIAL BLANKET ASSEMBLIES

⊕ 6 ALTERNATE FUEL BLANKET ASSEMBLIES

⊖ 15 CONTROL ASSEMBLIES

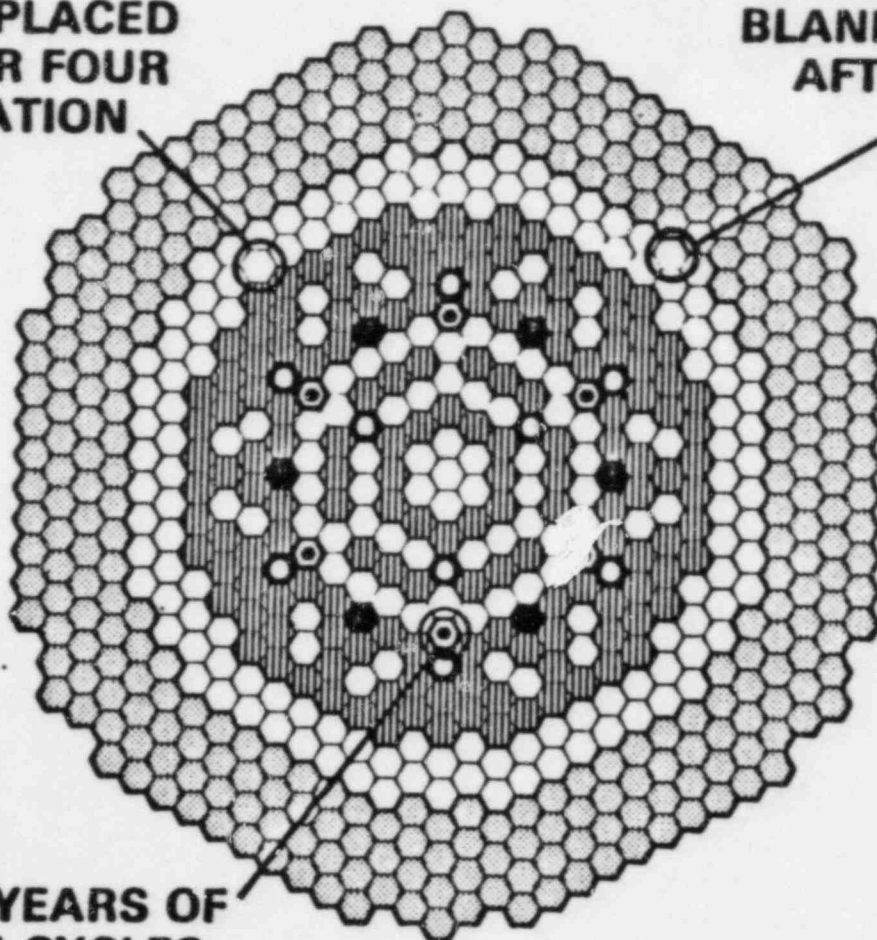
⊙ 312 RADIAL SHIELD ASSEMBLIES

A-194

CRBRP FUEL MANAGEMENT

FIRST ROW OF RADIAL BLANKETS ARE REPLACED AS A BATCH AFTER FOUR YEARS OF OPERATION

SECOND ROW OF RADIAL BLANKETS ARE REPLACED AFTER FIVE YEARS OF OPERATION

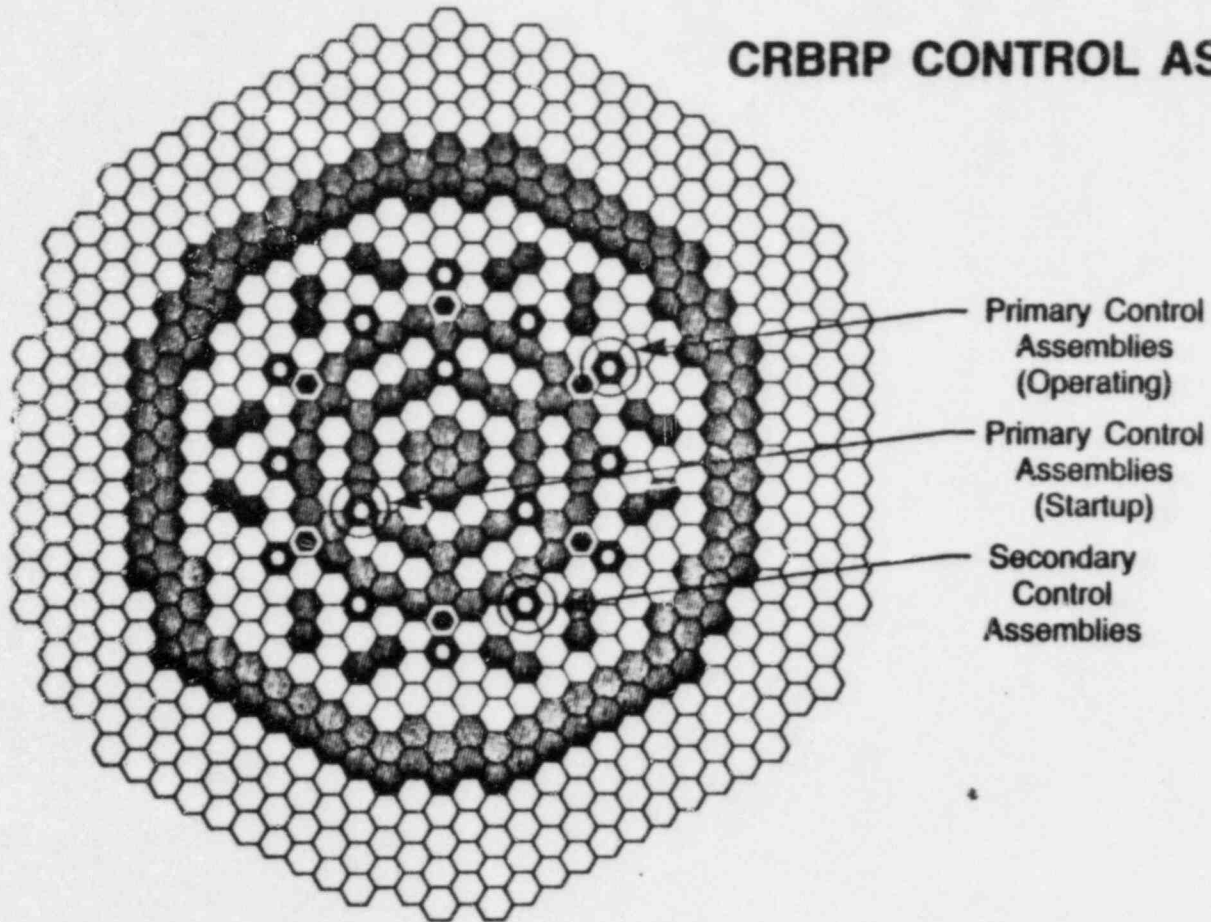


IN ALTERNATING YEARS OF THE EQUILIBRIUM CYCLES, THESE SIX INNER BLANKET ASSEMBLIES ARE REPLACED WITH SIX FRESH FUEL ASSEMBLIES

ALL FUEL AND INNER BLANKET ASSEMBLIES REPLACED AS A BATCH AT TWO YEAR INTERVALS

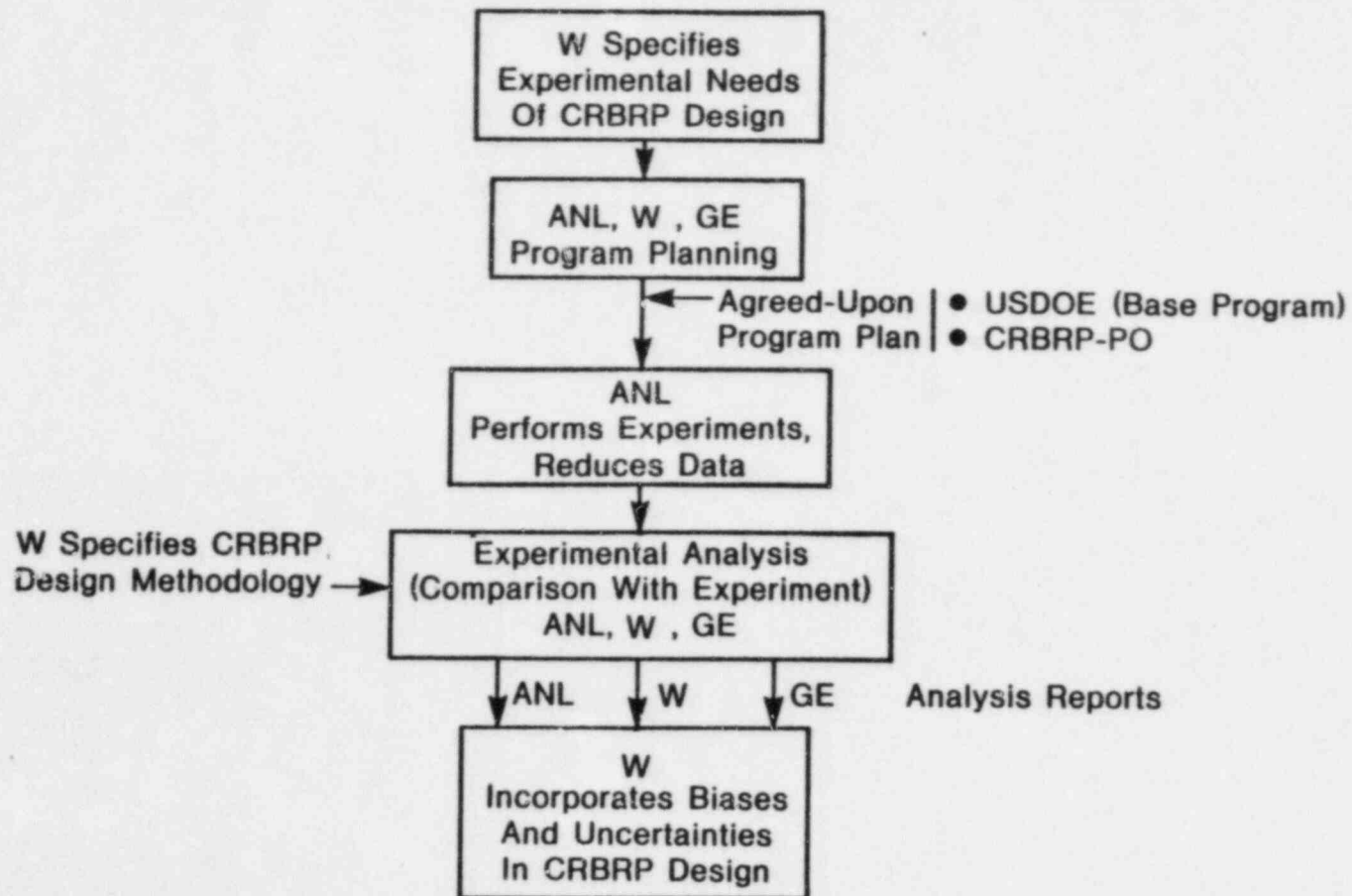
A-195

CRBRP CONTROL ASSEMBLIES



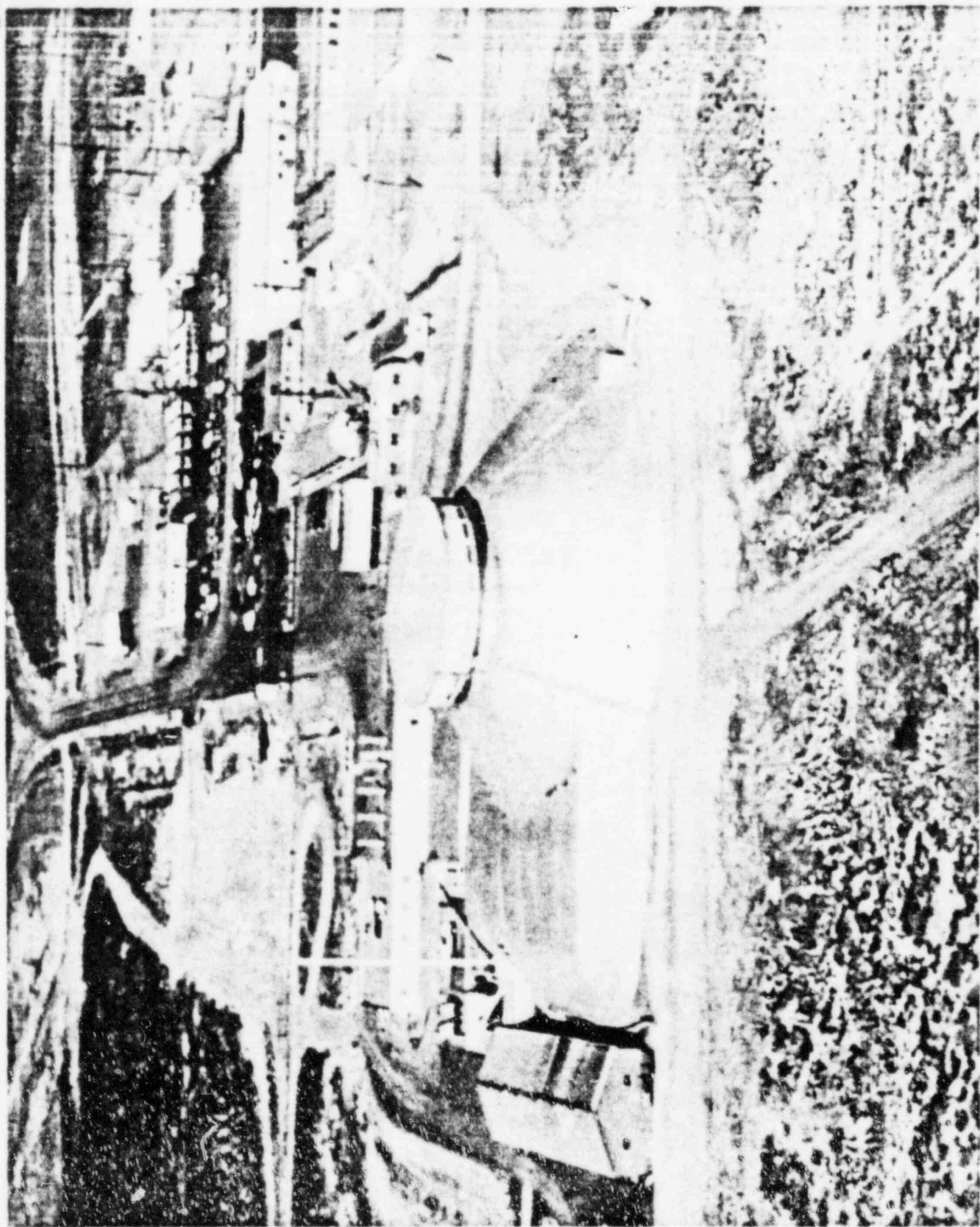
A-196

CRBRP NUCLEAR EXPERIMENTAL PROGRAM



A-197

WARD



A-198

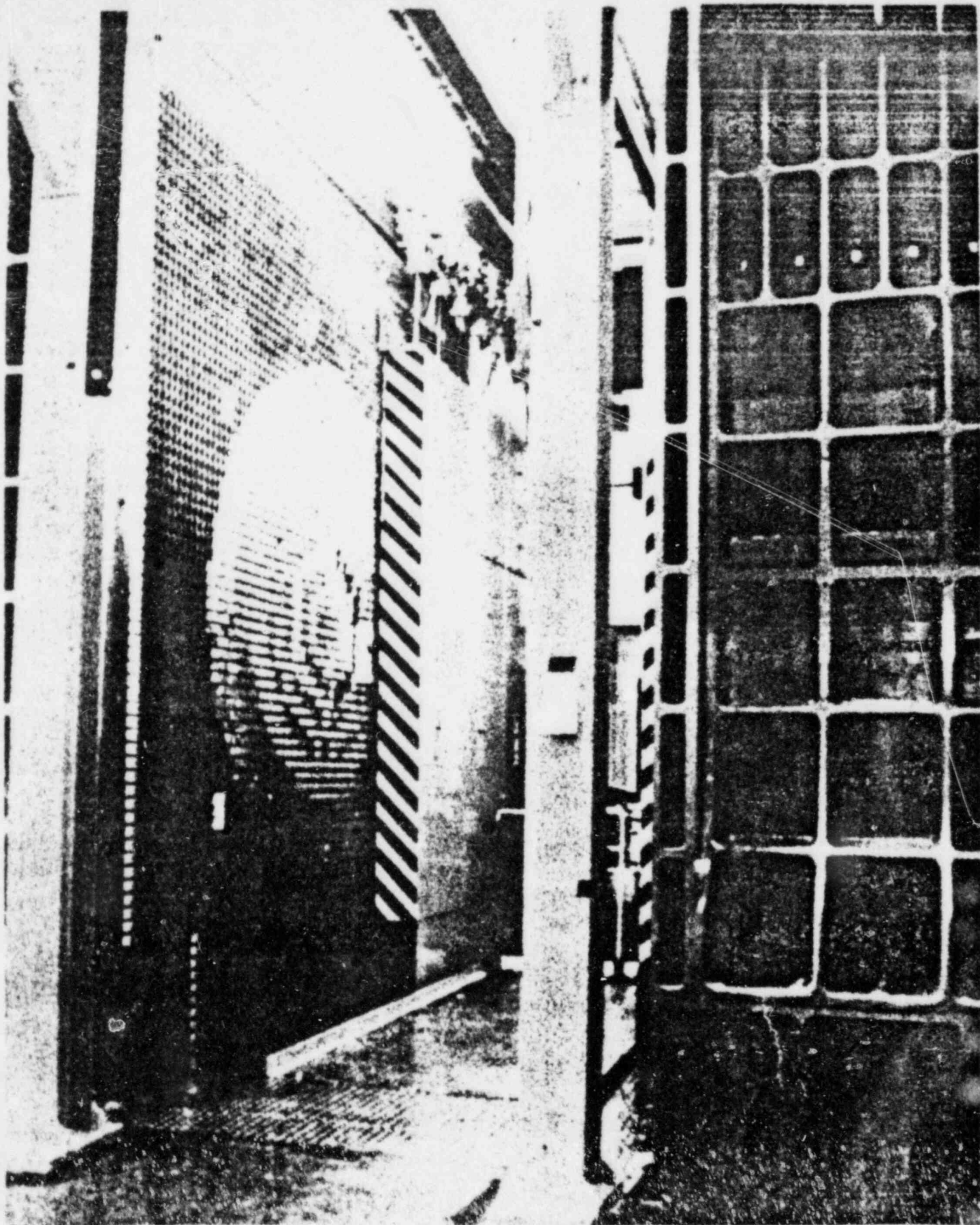


Figure 14 Zero Power Plutonium Reactor

H-199

WARD

REACTOR DESIGN AREAS SUPPORTED BY CRITICAL EXPERIMENTS

Power Reactor Design Parameter

- Fuel enrichment
- Power distribution
- Control rod margin
- Reactivity coefficient
 - Doppler
 - Sodium void
 - Core restraint (expansion)
 - CDA-related
- Other performance data
 - Breeding ratio
 - Temperature defect
 - Ex-core detector capability
 - Fast flux/influence

Critical Experiment Data Source

Critical fuel loading, Doppler and core expansion worth, core conversion ratio

Isotopic fission and capture rate distributions, gamma heating, blanket spiking studies

Control rod subcritical reactivity worth

Small heated-sample U²³⁸ Doppler worth

Large zone-voiding reactivity worth

Small-sample worth distributions

Sodium void worth, fuel and steel slumping worth

C²³⁸/F²³⁹

Doppler worth, core expansion worth

Control rod worth with ex-core detectors

Neutron energy spectrum, spectral indices

A-200

FUEL ENRICHMENT PHILOSOPHY

Guarantee that the reactor can be maintained at hot-full-power conditions throughout each design burnup cycle

Nominal excess reactivity:

- Cold-critical eigenvalue, K_{EFF}
- Cold-to-hot temperature defect
- Fuel burnup reactivity deficit
- Mid-term refueling reactivity addition

Uncertainties:

- Criticality prediction
- Fuel burnup reactivity swing
- Temperature defect
- Fissile loading and core geometry tolerances
- Impurities
- Refueling worth

A-201

**CRITICAL EIGENVALUE PREDICTIONS
VERSUS EXPERIMENTAL VALUES**

	Calculated k_{eff}	Experimental k_{eff}	C/E
ZPPR-7A	0.99019	1.00045	0.9897
ZPPR-7B	0.98924	1.00083	0.9884
ZPPR-7C	0.99089	1.00161	0.9893
ZPPR-7D	0.99347	1.00110	0.9924
ZPPR-7F	0.98873	1.00079	0.9880
ZPPR-7G	0.98858	1.00075	0.9878
ZPPR-8F	0.99156	1.00090	0.9907

Mean = 0.9895
 $1\sigma = \pm 0.0016$

A-202

CRBRP FUEL ENRICHMENTS

Cycles	Pu/(Pu + U)
1 & 2	32.8
Equilibrium	33.0

Beginning of Life Fissile Plutonium Inventory, 1498 kg

A-203

POWER CALCULATION COMPONENTS

$$\text{Linear power (kW/ft)} = \frac{\text{Reactor power (kW)} \cdot \text{region power fraction}}{\text{no. of rods} \cdot \text{length of rod (ft.)}} \cdot F_R^N \cdot F_Z^N \cdot 1.15 \cdot (1 + 3\sigma)$$

Where F_R^N is the normalized radial power distribution

F_Z^N is the normalized axial power distribution

1.15 is a 15% overpower-margin multiplier

$1 + 3\sigma$ represents the 3σ power envelope

A-204

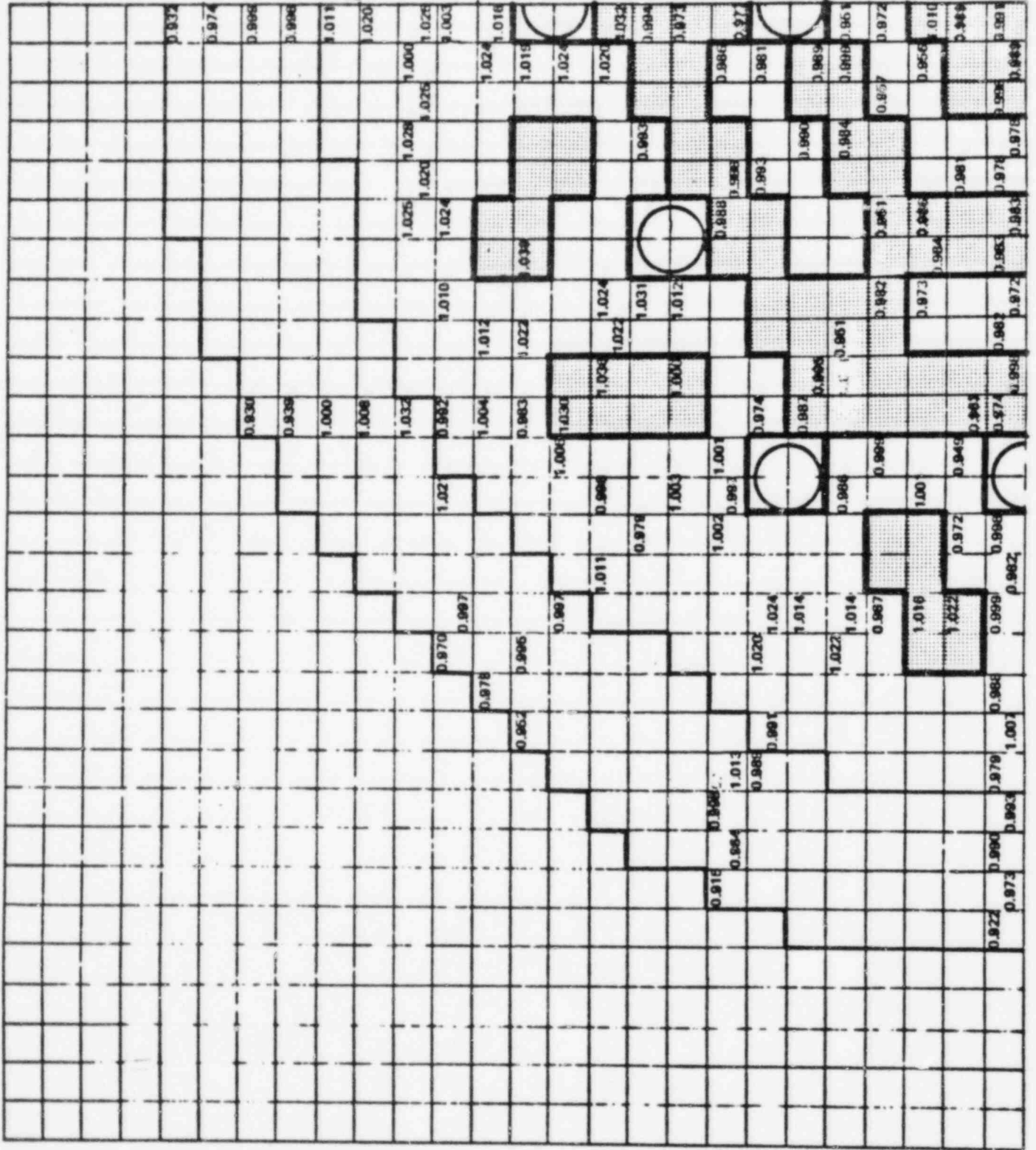


Figure 6.4. ZPPR-11 Phase B Midplane Calculation-to-Experimental Ratio for 235 U (n, f)

REACTION RATE CALCULATION TO EXPERIMENT RATIOS

<u>Reaction</u>	<u>ZPPR-11B Beginning Of Life C/E $\pm 1\sigma$</u>	<u>ZPPR-11C End Of Life C/E $\pm 1\sigma$</u>
Fuel		
Pu ²³⁹ (n,f)	1.000 \pm .019*	1.000 \pm .019
U ²³⁵ (n,f)	1.057 \pm .026	1.043 \pm .026
U ²³⁸ (n,f)	0.879 \pm .034	0.922 \pm .034
Inner Blanket		
Pu ²³⁹ (n,f)	1.014 \pm .023	0.983 \pm .023
U ²³⁵ (n,f)	1.050 \pm .026	1.022 \pm .026
U ²³⁸ (n,f)	1.093 \pm .041	0.983 \pm .032
U ²³⁸ (n,capt)	1.055 \pm .025	1.088 \pm .025

*Uncertainty includes statistical deviation in foil C/E's plus estimated systematic uncertainty in measurement

A-206

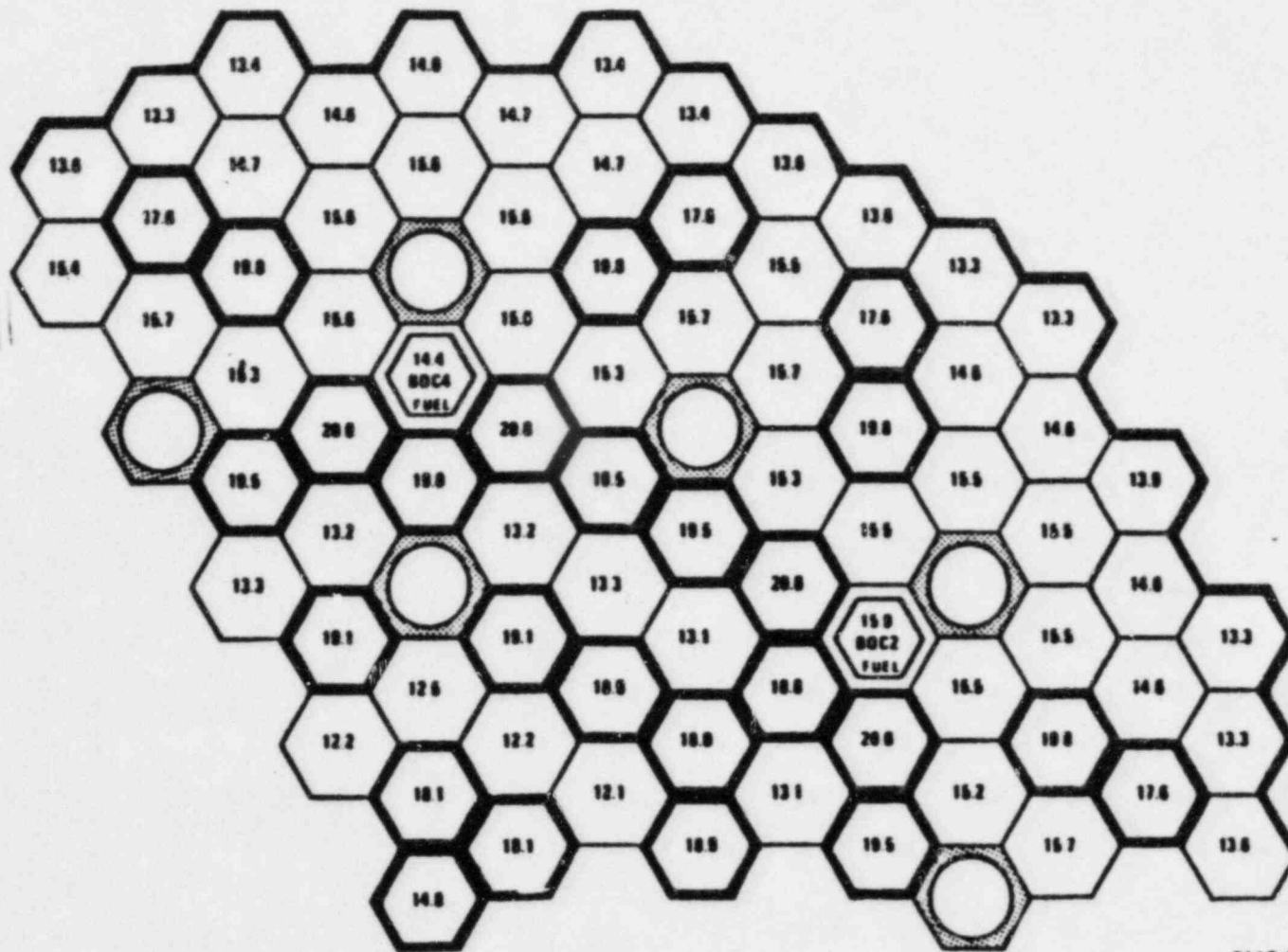
FUEL REGION POWER UNCERTAINTY FROM
REACTION RATE UNCERTAINTIES

Component	1 σ (%)	Power Fraction
Pu ²³⁹ fission	$\pm 1.9\%$.765
U ²³⁵ fission	2.6	.005
U ²³⁸ fission	3.4	.065
Other fission	5.0	.065
Gamma heating	8.0	.10

Resulting 3 σ uncertainty is $\pm 5.5\%$

A-207

**PEAK LINEAR POWER DISTRIBUTION (KW/FT)
 (3σ + 15% OVERPOWER CONDITIONS) FUEL AT BOC1
 (EXCEPT REFUEL CHANNELS) INNER BLANKETS AT EOC4
 (NOTE: THESE VALUES DO NOT OCCUR SIMULTANEOUSLY)**



AP-208

SUMMARY OF USE OF ZPPR CONTROL ROD WORTH DATA IN CRBRP DESIGN

<u>Experiment</u>	<u>Application</u>
3R4, 6R7F, 6R7C bank worths in ZPPR-11B	Bias factors
Asymmetric-group rod worths	Verify that control rod worth bias is not substantially different in faulted (stuck rod) shutdown configuration
Pin control rod mockup	Pin versus plate extrapolation effects, evaluate B ¹⁰ enrichment effects
Pin bunching	Evaluate capability of relatively simple central-rod calculational model to account for control rod worth reduction associated with absorber-pin bunching
Axial worth profile	Verify RZ calculations and chopped cosine approximation
Fuel/blanket interchange worth	Assess CRBRP mid-term refueling worth uncertainty

WARD

A-209

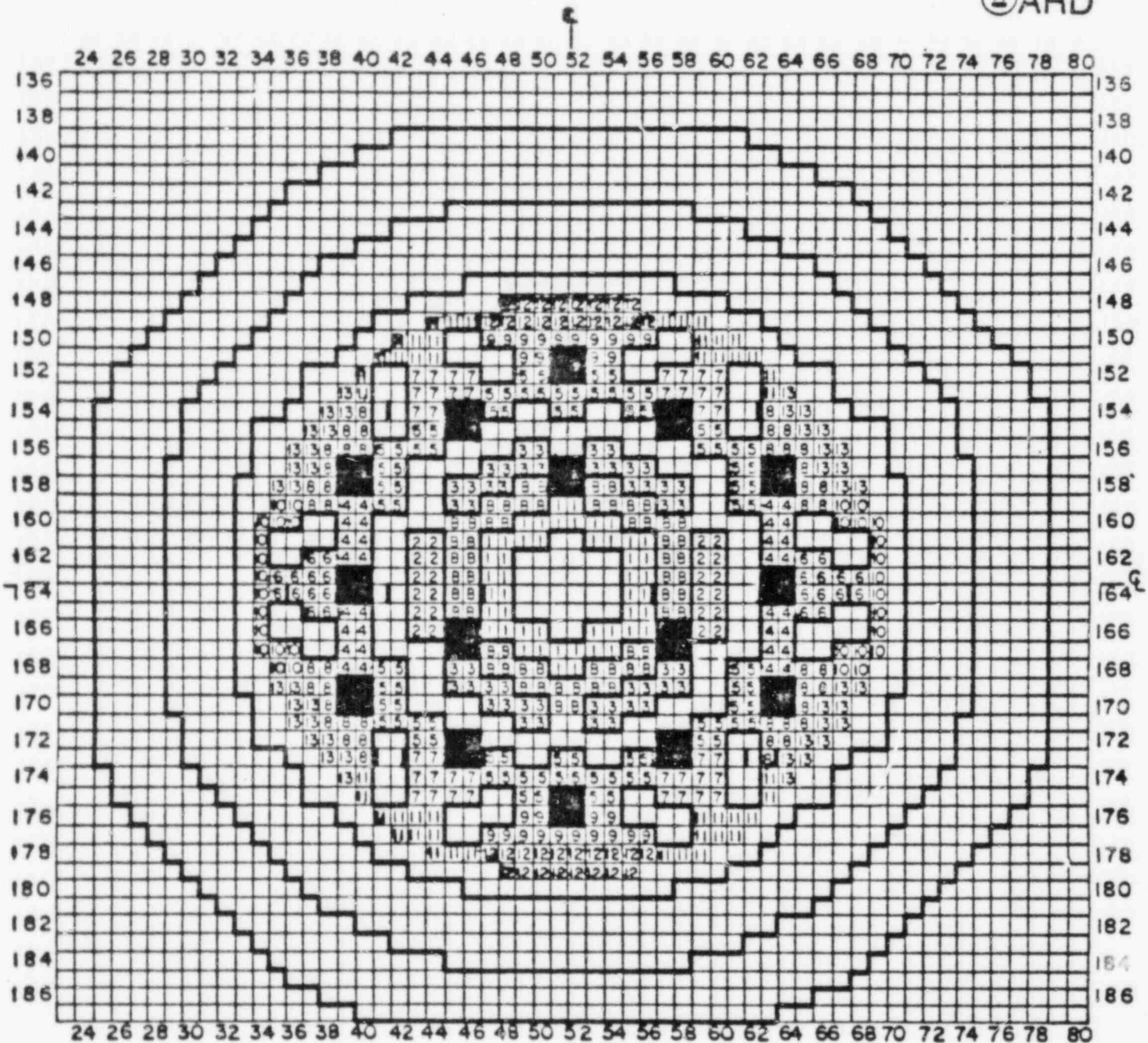
ZPPR-11 CONTROL ROD BANK WORTHS

	ZPPR-11B Beginning Of Life			ZPPR-11C End Of Life		
	Calculated*	Measured	C/E	Calculated*	Measured	C/E
	Worth \$	Worth \$		Worth \$	Worth \$	
3R4	3.33	3.34	0.997	6.17	6.27	0.984
6R7F	12.97	12.42	1.044	15.81	15.36	1.029
6R7C	16.95	16.28	1.041	16.71	16.19	1.032

*Calculations with 4 mesh per ZPPR-drawer

⊙β_{EFF} = 0.003426 (ZPPR-11B)
0.003540 (ZPPR-11C)

A-210



1-13 Zone 1 through Zone 13
B Blanket Ring 1

Fig. 3.1 ZPPR-11E Radial Sodium Void Zones

A-211

HETEROGENEOUS CRBRP SODIUM VOID REACTIVITY (\$) END OF CYCLE FOUR

FLOWING SODIUM ONLY (APPROXIMATELY 82% OF THE TOTAL)

	ENDF/B-3	ENDF/B-3 BIASED	ENDF/B-4	ENDF/B-4 BIASED	UNCERTAINTY $\pm 1 \sigma$
36- inch fuel	1.15\$	1.50	1.90	1.49	$\pm .28$
Lower axial blanket	-.17	-.19	-.15	-.14	$\pm .03$
Upper axial blanket	<u>-.17</u>	<u>-.19</u>	<u>-.16</u>	<u>-.16</u>	$\pm .03$
Total	.81	1.12	1.59	1.19	

A-212

ZPPR-11B FUEL U²³⁸ DOPPLER CONSTANT
-T dk/dT

Measured fuel U ²³⁸ Doppler	-0.00332
Calculated Doppler	-0.00327
C/E	0.986

A-213

WARD

8255-6

SUMMARY

Bias factors and uncertainties in calculated CRBRP nuclear parameters are based on an extensive zero power critical experimental data base

Experiments include:

- Critical fuel loading
- Power distribution parameters
- Control rod worth characteristics
- Reactivity feedback effects

A-214

**CORE THERMAL AND
HYDRAULIC DESIGN**

WARD

8254-5

A-215

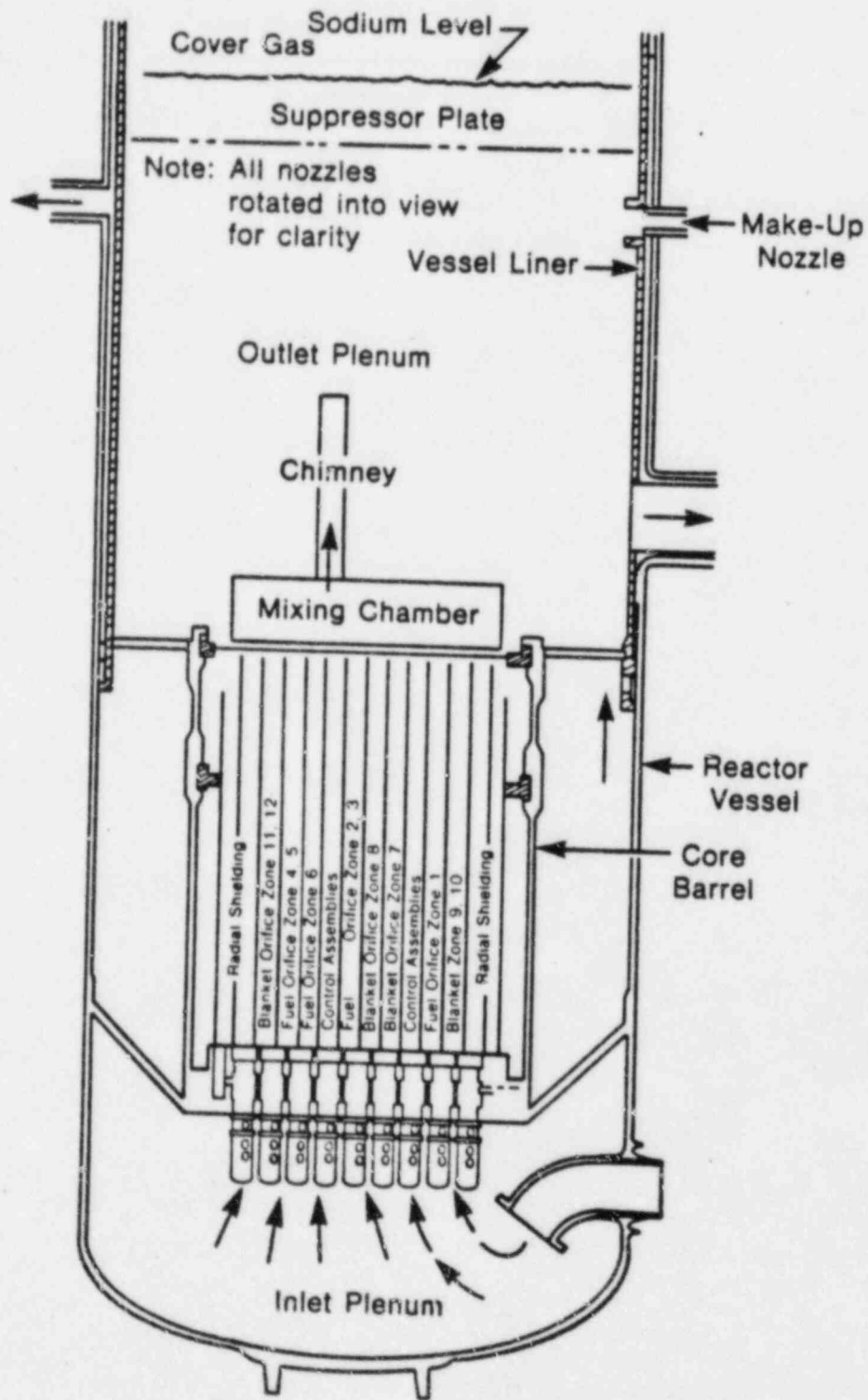


CRBRP CORE T&H ANALYSIS AND DESIGN OUTLINE

- CORE T&H DESCRIPTION AND BASES
 - FLOW PATHS
 - DESIGN DATA
 - FLOW ALLOCATIONS
- PERFORMANCE PREDICTIONS
 - STEADY STATE
 - DESIGN TRANSIENTS
- T&H DEVELOPMENT TEST PROGRAMS/DATA
- CONCLUSIONS

A-216

CRBRP SCHEMATIC FLOW PATHS



6990-13

A-217



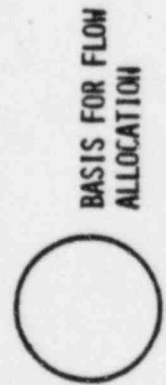
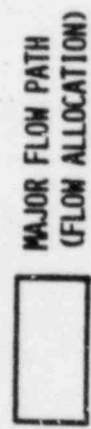
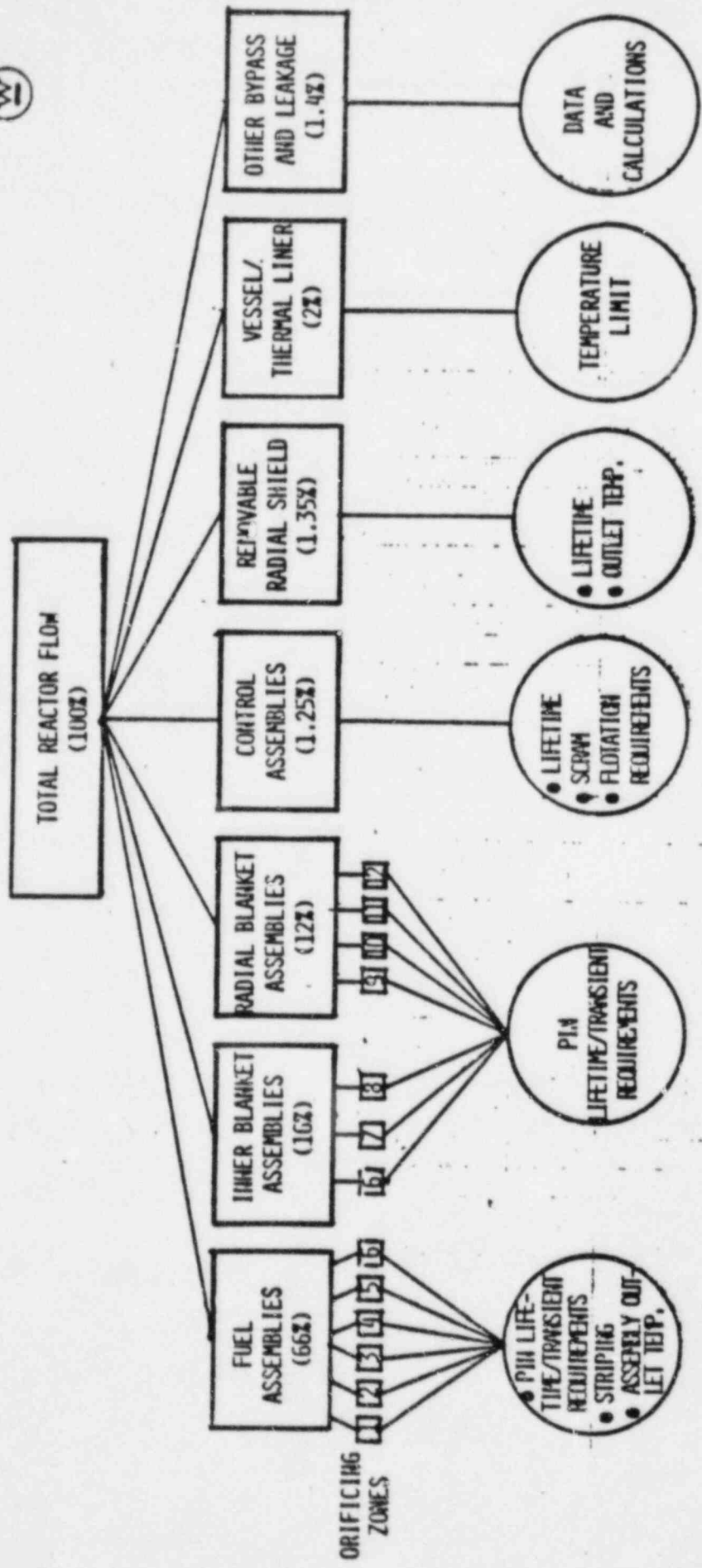
CRBR PRINCIPAL CORE T&H DESIGN DATA

	Fuel	Blanket
Rods per assembly	217	61
Rod diameter (in.)	0.230	0.506
Pitch-to-diameter ratio	1.25	1.07
Wire wrap axial pitch (in.)	12	4
Axial lengths (in.):		
Lower axial blanket	14	} 64
Active core	36	
Upper axial blanket	14	
Fission gas plenum	48	48

A-218



CRBRP FLOW ALLOCATION





CRBR PRINCIPAL CORE T&H PERFORMANCE DATA

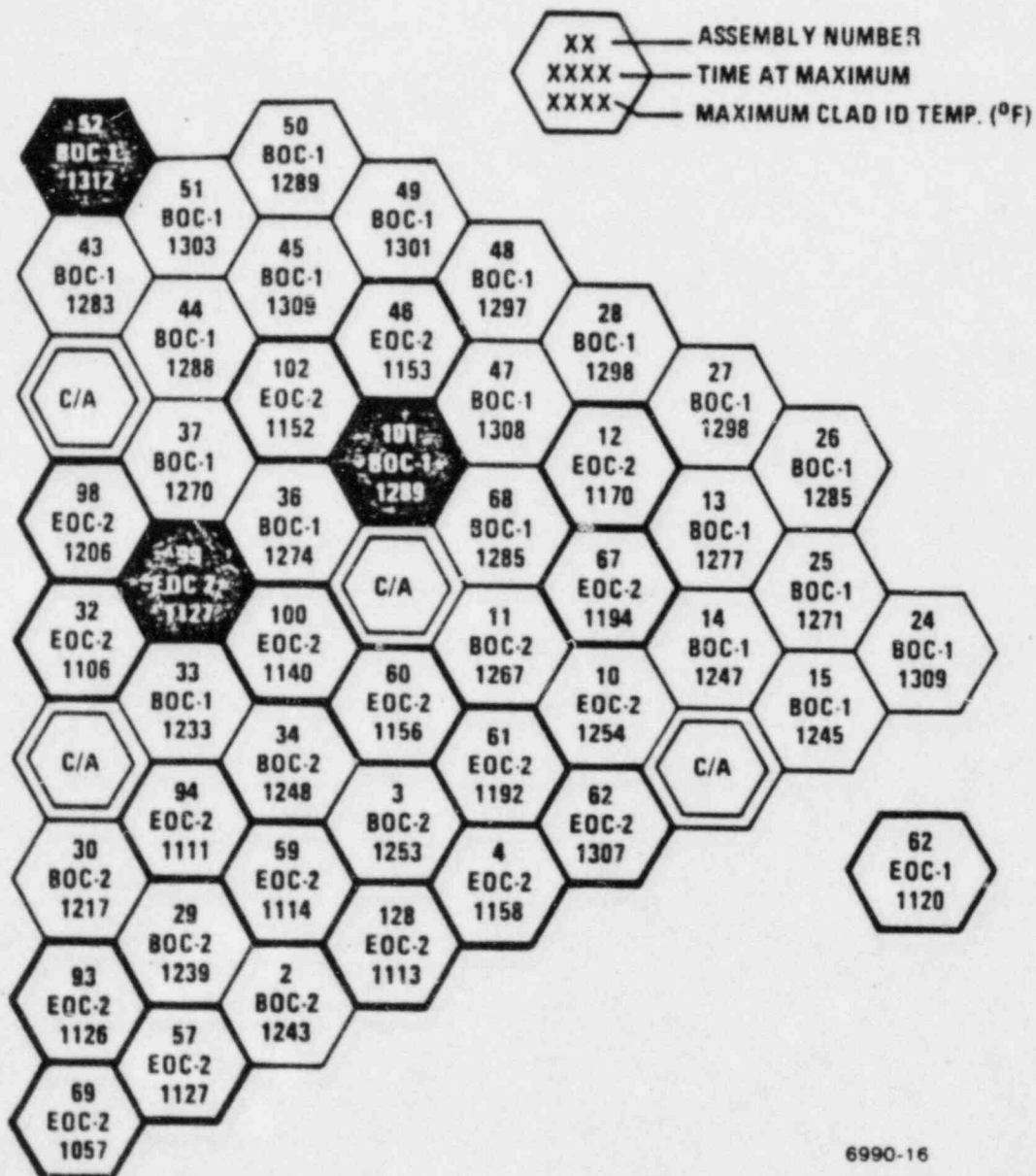
REACTOR INLET TEMPERATURE 730°F
 REACTOR OUTLET TEMPERATURE 995°
 REACTOR DESIGN FLOW 41.446 x 10⁶ LB/HR
 REACTOR VESSEL NOZZLE-TO-NOZZLE PRESSURE DROP 123 PSI

	<u>FUEL</u>	<u>INNER BLANKET</u>	<u>RADIAL BLANKET</u>
NUMBER OF ORIFICING ZONES	5 - 6	3 - 2	4
RANGE OF MAXIMUM HOT ROD CLADDING TEMPERATURES (2σ), °F	1201 - 1312	1057 - 1262	989 - 1228
MAXIMUM FISSION GAS PRESSURE (2σ), PSIA	962	249	273
MAXIMUM FLOW VELOCITY IN BUNDLE (FT/SEC)	23	18	13
MAXIMUM MIXED MEAN EXIT TEMPERATURE (NOMINAL), °F	1123	1029	1003
MAXIMUM TEMPERATURE GRADIENT (NOMINAL), °F	273 (FUEL/RADIAL BLANKET)		

A-220

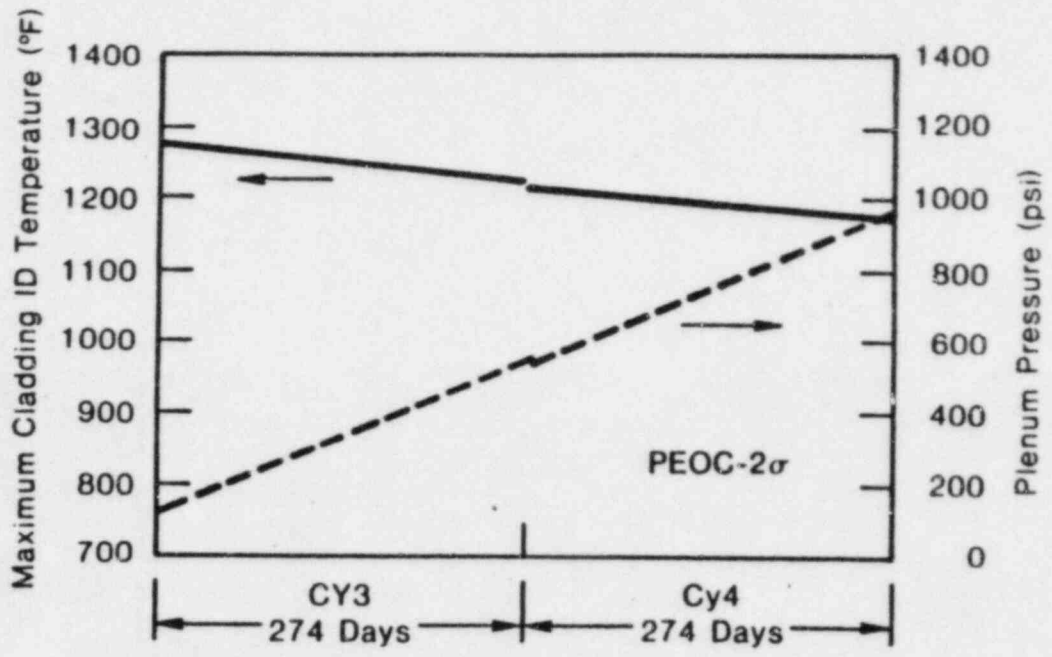


ENVELOPE OF FUEL, INNER BLANKET
MAXIMUM CLADDING ID
TEMPERATURES FOR FIRST
CORE (PEOC-2 σ)





CLADDING TEMPERATURE/PRESSURE HISTORY IN F/A #101, O. Z. 1



A-223

DESIGN TRANSIENTS
WORST CASE UNDERCOOLING EVENT
CRBRP THREE-LOOP NATURAL CIRCULATION
TRANSIENT - MAXIMUM CLADDING/COOLANT TEMPERATURE (°F)
AND TIME OF OCCURRENCE (SEC.)

Ⓜ

• PRESENTED IN CRBRP-ARD-0308

ASSEMBLY	NOMINAL		3 σ	
	TEMP.	TIME	TEMP.	TIME
FA-52	1299	178	1565	180
IB-99	1229	222	1544	239
RB-203	1279	275	1556	389

ACCEPTANCE CRITERION: $T_{MAX} < \text{BOILING}$

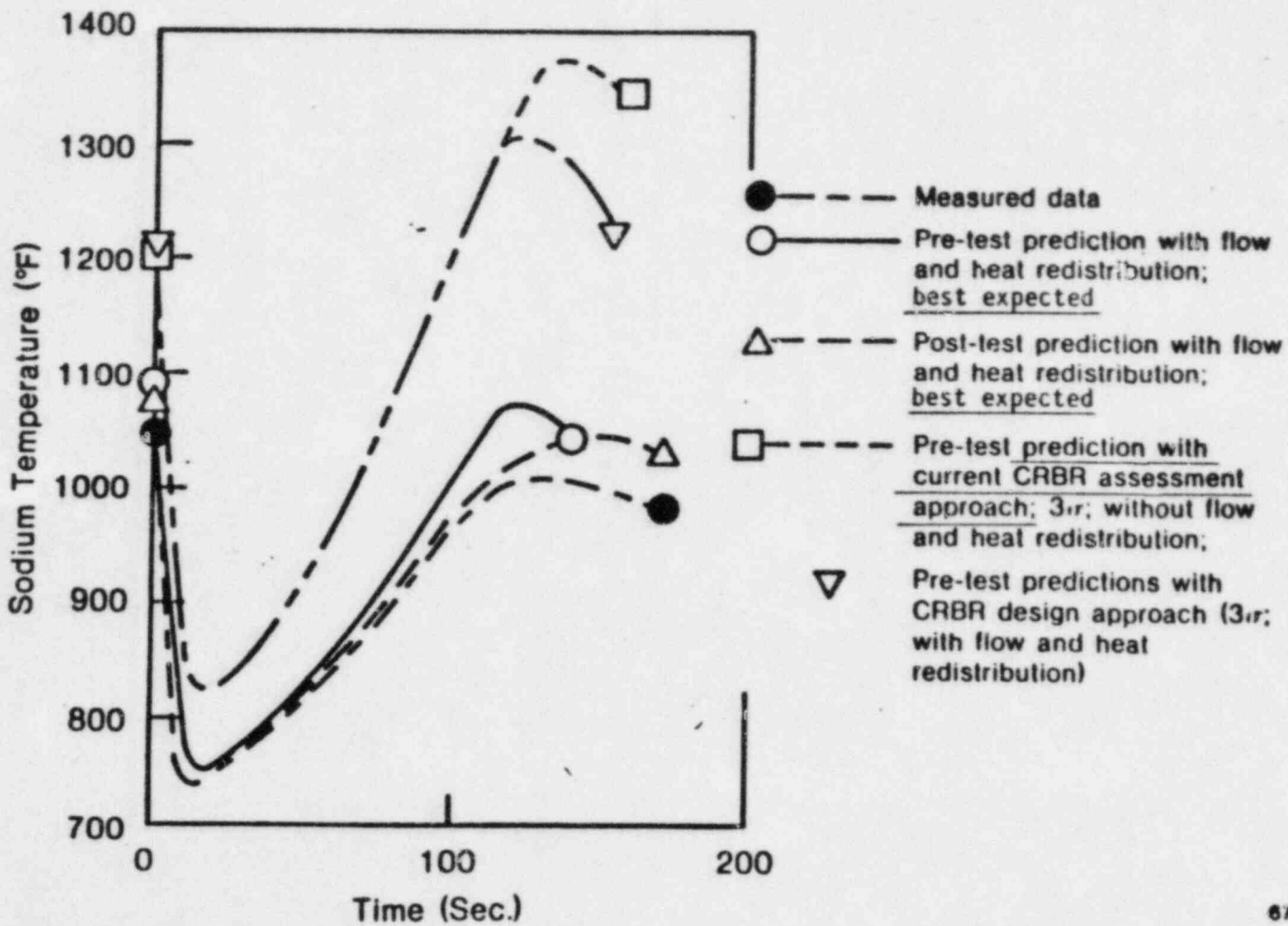
$T_{SAT.} = 1720^{\circ}\text{F}$
{

- AT TOP OF FUEL ACTIVE REGION
- ZERO FLOW
- ZERO COVER GAS PRESSURE
- MINIMUM OPERATION POOL LEVEL

A-22Y



**MEASURED AND PREDICTED SODIUM TEMPERATURES AT TOP
OF THE FUEL SECTION, TX1016, FOR ROW 2 FOTA-FFTF
(Test Initiated From 100% Power/100% Flow)**



A-225



TRANSIENT REACTOR/CORE DESIGN REQUIREMENTS SUMMARY

- PROPER INTERFACE REQUIREMENTS HAVE BEEN ESTABLISHED
- COMPATIBLE STEADY STATE OPERATING CONDITIONS HAVE BEEN ESTABLISHED (E.G., THROUGH ORIFICING)
- ALL DESIGN BASIS ACCIDENTS (OVERPOWER AND UNDERCOOLING) HAVE BEEN EVALUATED ON A CONSERVATIVE BASIS AND MEET THE DESIGN GUIDELINES OF:
 - NO BOILING
 - NO CLAD MELTING
 - ACCEPTABLE LIFETIME/STRUCTURAL INTEGRITY

A-226



CORE T&H DEVELOPMENT TEST PROGRAMS

- FUEL ASSEMBLY
- BLANKET ASSEMBLY
- CORE PRESSURE DROP
- EXAMPLES OF DATA

A-227

OUT-OF-PILE T&H DEVELOPMENT TESTING
FOR FUEL ASSEMBLIES

(W)

<u>TEST TITLE</u>	<u>SUPPORTING INFORMATION</u>	<u>STATUS</u>
● ORNL 19 AND G1-ROD BUNDLE HEAT TRANSFER - SODIUM	W/W BUNDLE TEMPERATURE DISTRIBUTION OVER WIDE OPERATING RANGE, INCLUDING TRANSIENTS	COMPLETED
● HEDL 217-ROD LOW FLOW HEAT TRANSFER - SODIUM	LOW FLOW BUNDLE TEMPERATURE DISTRIBUTION	COMPLETED
● HEDL 217-ROD BUNDLE MIXING - H ₂ O	DETAILED BUNDLE MIXING	COMPLETED
● ANL 91-ROD BUNDLES MIXING - H ₂ O	BUNDLE SWIRL AND MIXING	COMPLETED
● MIT FUEL BUNDLE T&H	FLOW SPLIT, ΔP, FLOW DISTRIBUTION AND MIXING	IN PROGRESS
● WARD 11:1 SCALE WIRE WRAP BUNDLE AIR FLOW	DETAILED S/C AXIAL AND CROSS FLOW CHARACTERIZATION AND MIXING	COMPLETED
● HEDL CRBR ASSEMBLY FLOW AND VIBRATION	VERIFICATION OF FLOW AND VIBRATION CHARACTERISTICS	COMPLETED
● HEDL FFTF ASSEMBLY/BUNDLE FLOW	BUNDLE PRESSURE DROP	COMPLETED
● HEDL INLET/OUTLET NOZZLE AND ORIFICE FLOW	CAVITATION AND ΔP CHARACTERIZATION	90% COMPLETED
● EBR-II ORIFICE CAVITATION PROOF TEST	FLOW CONTROL ORIFICE LIFETIME/CAVITATION	IN PROGRESS
● HEDL ASSEMBLY OUTLET NOZZLE INSTRUMENTATION	CORRELATE T/C OUTLET TEMPERATURE MEASUREMENTS	TESTING COMPLETE

A-228

W

OUT-OF-PILE T&H DEVELOPMENT TESTING
FOR BLANKET ASSEMBLIES

<u>TEST TITLE</u>	<u>SUPPORTING INFORMATION</u>	<u>STATUS</u>
● WARD FULL SCALE 6I-ROD ASSEMBLY HEAT TRANSFER - SODIUM	W/W BUNDLE TEMPERATURE DISTRIBUTION OVER WIDE OPERATING RANGE, INCLUDING TRANSIENTS	95% COMPLETED
● MIT BLANKET BUNDLE T&H - H ₂ O	FLOW SPLIT, ΔP, FLOW DISTRIBUTION AND MIXING	IN PROGRESS
● WARD 5:1 SCALE WIRE WRAP BUNDLE AIR FLOW	DETAILED S/C AXIAL AND CROSS FLOW CHARACTERIZATION	COMPLETED
● HEDL ASSEMBLY FLOW AND VIBRATION - H ₂ O	VERIFICATION OF ΔP AND VIBRATION CHARACTERISTICS	COMPLETED
● WARD FULL SCALE BUNDLE PRESSURE DROP - SODIUM AND WATER	BUNDLE ΔP OVER WIDE FLOW RANGE	COMPLETED
● WARD BLANKET FLOW ORIFICING CHARACTERIZATION	PRESSURE DROP CHARACTERIZATION	PLANNED
● HEDL ASSEMBLY OUTLET NOZZLE CHARACTERIZATION	CORRELATE T/C OUTLET TEMPERATURE MEASUREMENT	TESTING COMPLETE

A-229



WARD BLANKET ASSEMBLY HEAT TRANSFER TEST

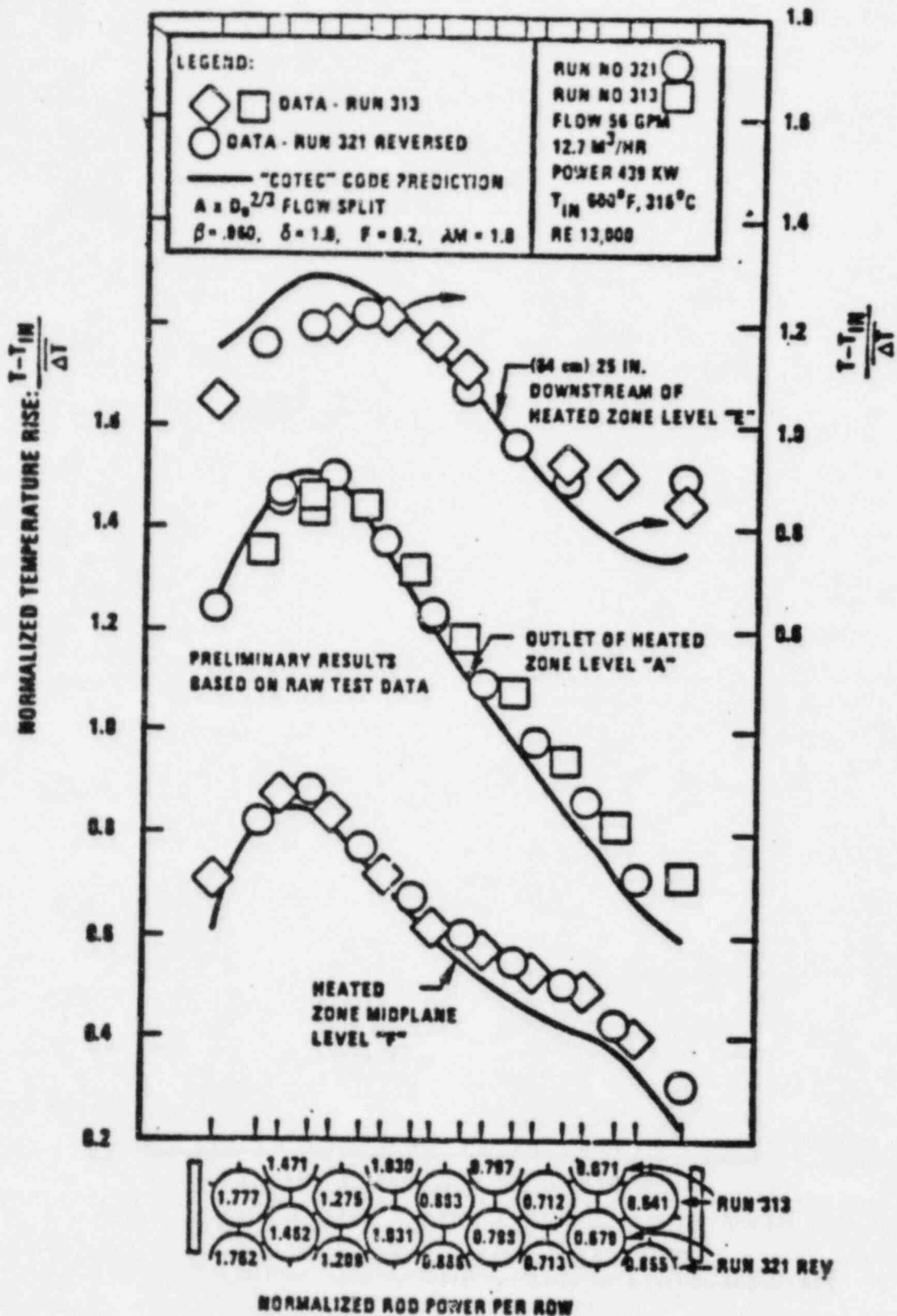
RANGE OF TEST PARAMETERS

● POWER INPUT	17 TO 880 Kw
● FLOW	2 TO 140 GPM
● REYNOLDS NUMBER	500 TO 26000
● POWER-TO-FLOW RATIO	100 TO 300°F
● POWER INPUT GRADIENT	1:1 TO 4.6:1 (MAX:MIN)

CONDITIONS SIMULATED

- ADIABATIC BOUNDARIES
- INTER-ASSEMBLY HEAT TRANSFER EFFECTS:
 - AUXILIARY COOLING
 - AUXILIARY HEATING
- TRANSIENT AND NATURAL CIRCULATION

A-230

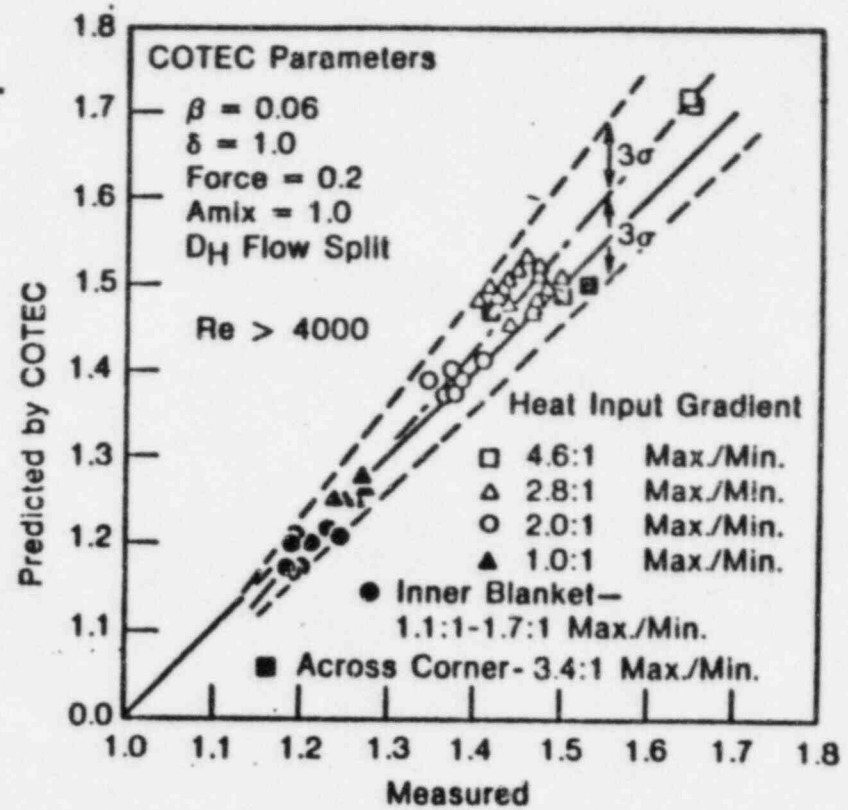


Predicted Vs. Measured Temperature Profiles - Input 2.8/1 Gradient - 440 KW
 Re 13,000



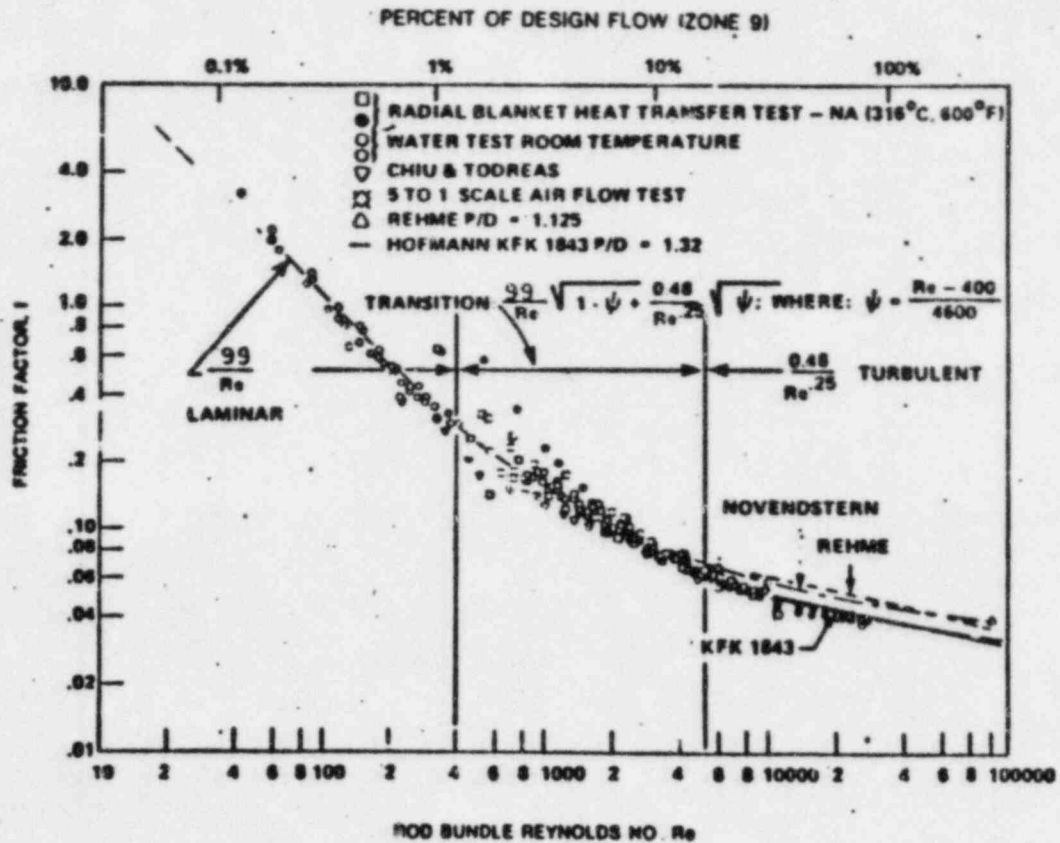
BLANKET HEAT TRANSFER TEST
PREDICTED VS.
MEASURED PEAK
NORMALIZED TEMPERATURE
RISE

A-232



(W)

FRICTION FACTOR TEST DATA FOR TIGHT PITCH TO DIAMETER ROD BUNDLES WITH 4 IN. WIRE WRAP SPACER LEAD



A-233



CORE PRESSURE DROP TEST RESULTS

- RANGE OF DATA AND STATUS
- TYPICAL EXAMPLES OF TEST DATA/CORRELATIONS/RESULTS

A-234

CORE PRESSURE DROP TESTING - STATUS



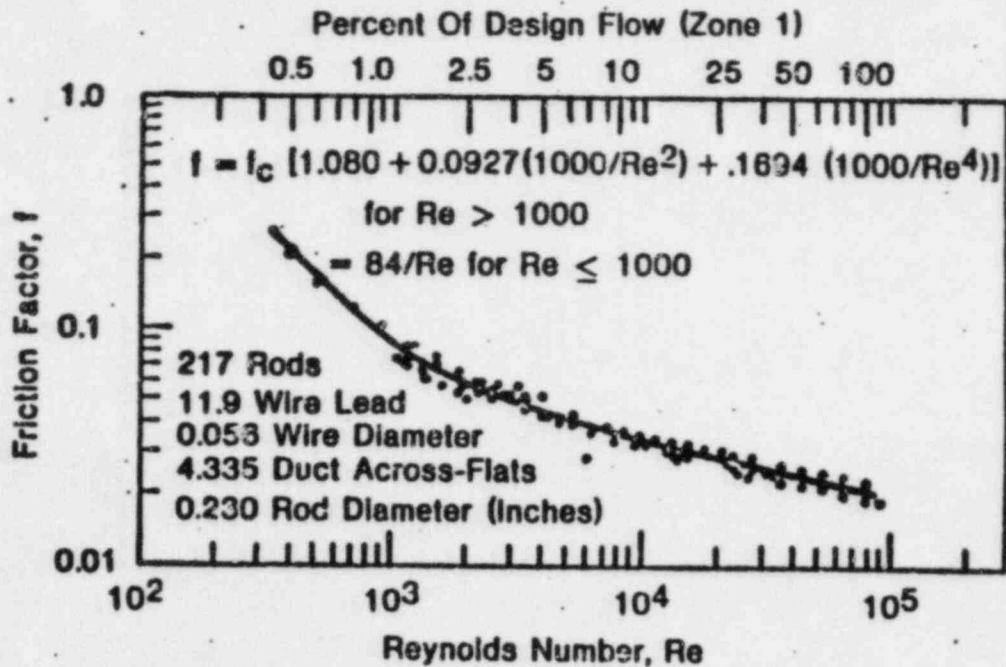
COMPONENT	ΔP AT 100% FLOW (Psi)	RANGE OF TEST DATA (%)	TEST STATUS
<u>CORE</u>			
FUEL: INLET-ORIFICE-SHIELD	35.5	1.5 - 120	COMPLETE
ROD BUNDLE	58.4	0.5 - 120	COMPLETE
ROD BUNDLE INLET AND OUTLET	1.8	1.5 - 120	COMPLETE
OUTLET NOZZLE	1.8	1.5 - 120	COMPLETE
INNER BLANKET: INLET-ORIFICE-SHIELD	37.7	2 - 120	PLANNED
ROD BUNDLE	60.4	0.2 - 100	COMPLETE
ROD BUNDLE INLET AND OUTLET	1.4	2 - 120	COMPLETE
OUTLET NOZZLE	0.9	2 - 120	COMPLETE
RADIAL BLANKET: INLET-ORIFICE-SHIELD	63.5	2 - 120	PLANNED
ROD BUNDLE	32.6	0.15 - 135	COMPLETE
ROD BUNDLE INLET AND OUTLET	0.7	2 - 120	COMPLETE
OUTLET NOZZLE	0.4	2 - 120	COMPLETE
PRIMARY CONTROL: INLET-ORIFICE-SHIELD	94	2 - 200	COMPLETE
ROD BUNDLE	3.0	2 - 200	COMPLETE
ROD BUNDLE INLET AND OUTLET	0.9	2 - 200	COMPLETE
OUTLET NOZZLE	7.1	2 - 200	COMPLETE
SECONDARY CONTROL: INLET-ORIFICE-SHIELD	75	18 - 125	COMPLETE
ROD BUNDLE	2.5	18 - 125	COMPLETE
OUTLET	28	18 - 125	COMPLETE
REMOVABLE RADIAL SHIELD: OVERALL	30	30 - 120	COMPLETE
PISTON RINGS	100	30 - 120	COMPLETE

A-235

A-236

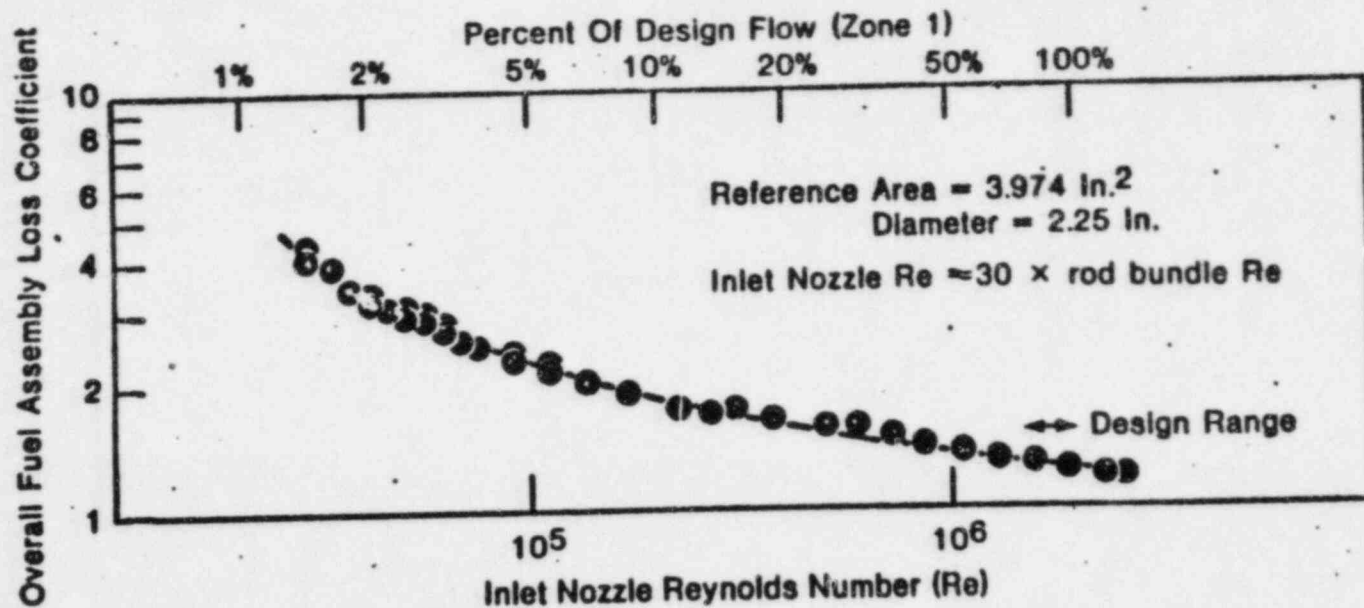
W

FRICITION FACTOR DATA AND CORRELATION FOR 217 PIN WIRE WRAP SPACED FUEL ASSEMBLY





OVERALL FUEL ASSEMBLY LOSS COEFFICIENT AS A FUNCTION OF REYNOLDS NUMBER FROM CRBRP FUEL ASSEMBLY FLOW AND VIBRATION TEST



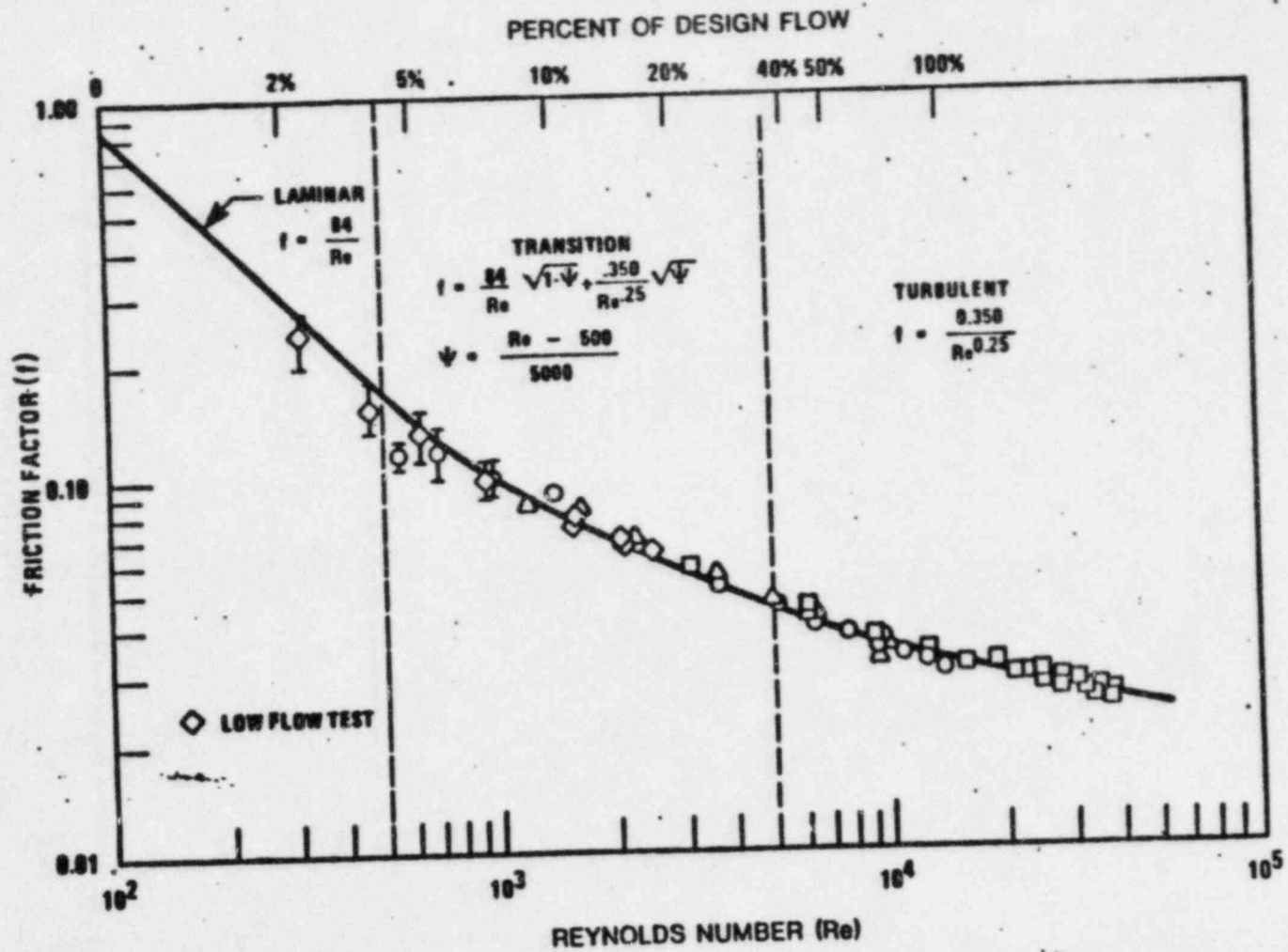
A-237

PRIMARY CONTROL ASSEMBLY ROD BUNDLE FRICTION FACTOR



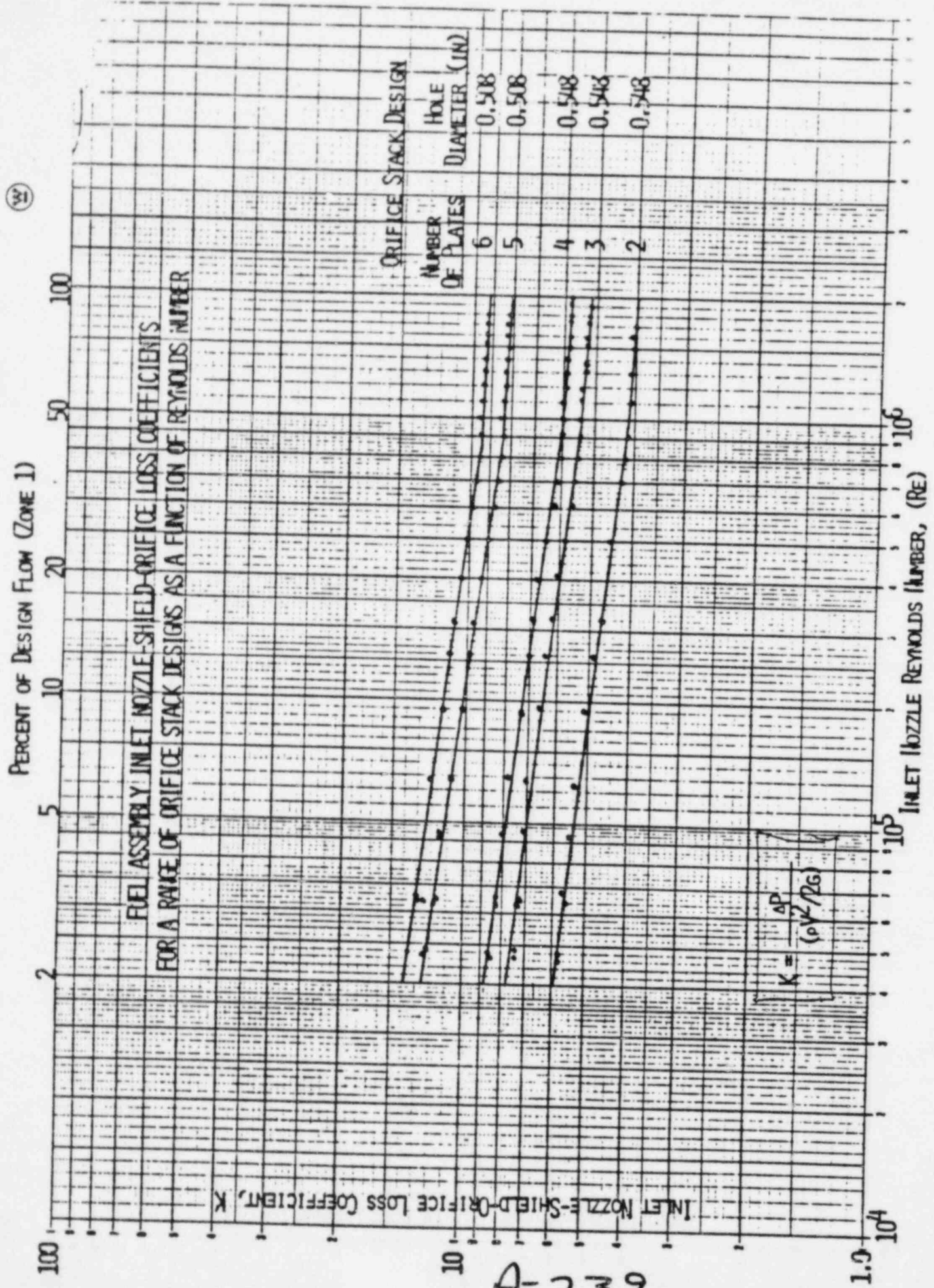
66601

A-238



(17)

FUEL ASSEMBLY INLET NOZZLE SHIELD-ORIFICE LOSS COEFFICIENTS
FOR A RANGE OF ORIFICE STACK DESIGNS AS A FUNCTION OF REYNOLDS NUMBER



A-239



CORE T&H DEVELOPMENT TESTING
CONCLUSIONS

- 1) LARGE CORE T&H DATA BASE AVAILABLE
- 2) DATA ON ALL REACTOR COMPONENTS - OVER WIDE RANGE OF OPERATION, E.G., ΔP , HEAT TRANSFER DATA
- 3) UNCERTAINTIES USED FOR PSAR BASED ON AVAILABLE EXPERIMENTAL DATA
- 4) ALL DATA WILL BE FACTORED INTO FSAR INPUT

A-240



CONCLUSIONS

- REACTOR FLOW DISTRIBUTION MEETS COMPONENT DESIGN REQUIREMENTS
- COOLING FLOW PATHS WELL CHARACTERIZED, ORIFICE CONTROLLED, TESTED, MODELED
- LARGE COMPONENTS T&H DEVELOPMENT DATA BASE
- COMPREHENSIVE DESIGN WITH CONSERVATIVE, YET REALISTIC, LIMITS
- ANALYTICAL METHODS VERIFIED WITH LARGE DATA BASE

A-241

FUEL AND BLANKET DESIGN

A-242

WARD

8254-6

**CRBRP CORE MECHANICAL DESIGN
FUEL, BLANKET, SHIELD**

- Bases
- Description
- Evaluations
- Testing programs

A-213

DAMAGE SEVERITY LIMITS

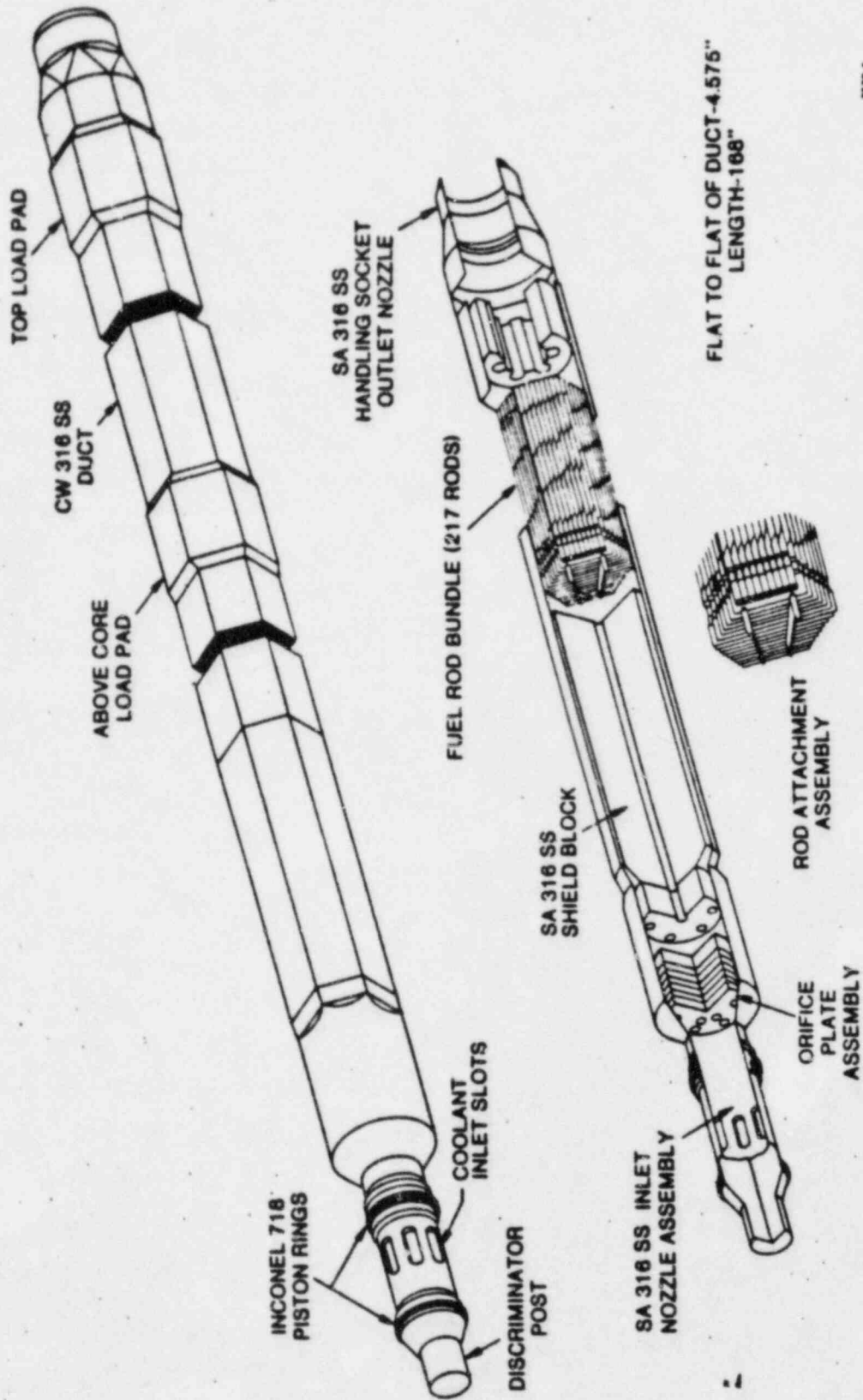
<u>Event Category</u>	<u>Damage Severity Level (RDT C-16-1)</u>	<u>Design Limit</u>
Normal operation	No significant loss of effective lifetime	Ductility limited strain $\leq 0.2\%$ (normal creep & plasticity) Power-to-melt Proportional elastic limit One wire diameter-flow channel closure
Anticipated events (Upset)	No reduction of effective lifetime below the design values	Ductility limited strain $\leq 0.3\%$ Cumulative damage function ≤ 1.0 (creep rupture, plasticity, fatigue damage)
Unlikely events (Emergency)	A general reduction in the fuel burnup capability and, at most, a small fraction of fuel rod cladding failures	
Extremely unlikely events (Faulted)	Maintain coolable configuration	Cladding solidus, no Na boiling*

*PSAR guideline

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CRBRP FUEL ASSEMBLY



A-245



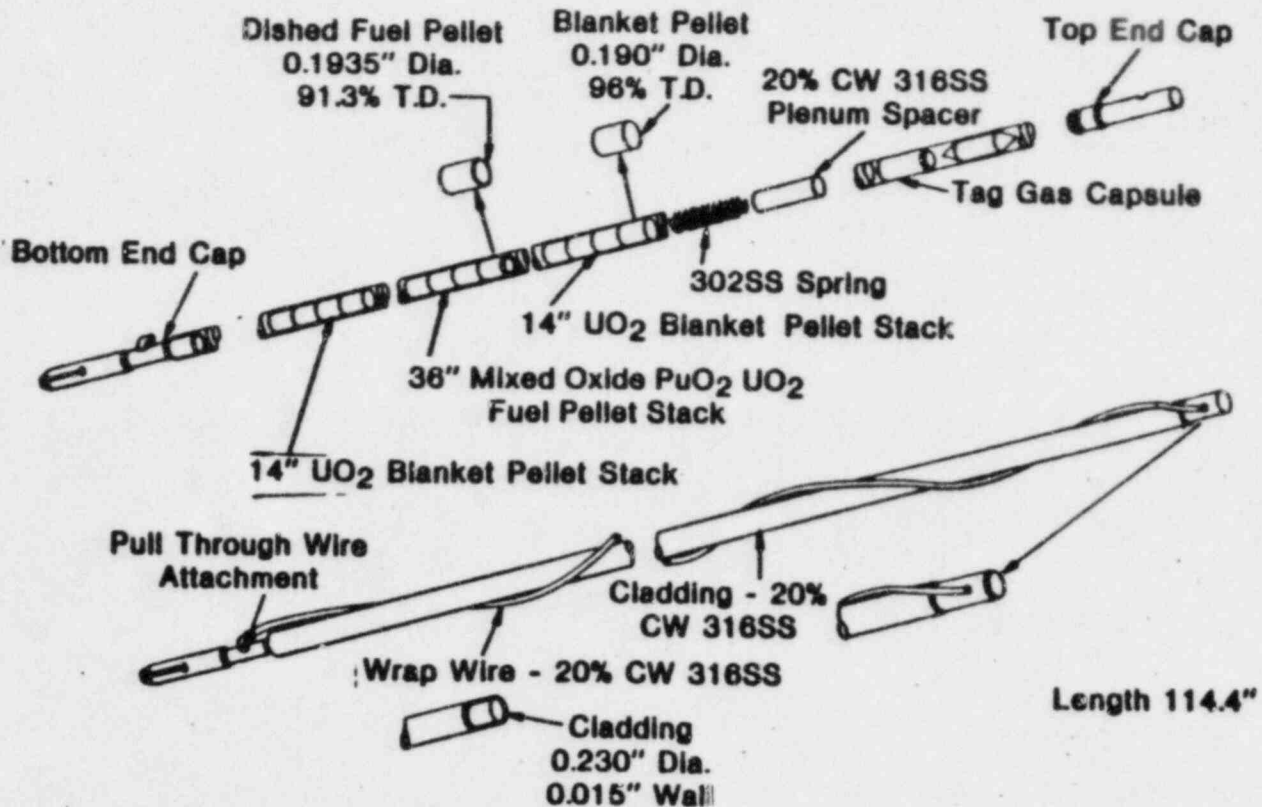
CRBRP FUEL ASSEMBLY COMPARISON WITH FFTF

<u>Design Parameter</u>	<u>CRBRP Value</u>	<u>FFTF Value</u>	<u>Reason for Difference</u>
Types of discriminators (orificing zones)	6	3	Core arrangement and core size
Lower shielding length (inches)	20.0 (1 piece)	21.5 (3 piece)	FFTF closed loop cooling not required in CRBRP
Duct load pad (inches):			
-Outside dimension	4.745	4.715	Accommodate larger seismic loads in larger core
-Wall thickness	0.205	0.190	} Provide more space for irradiation induced deformation in higher burnup reloads
Fuel rod growth clearance (inches)	2.10	1.00	
Type of top load pad (outlet nozzle)	Fixed	Floating collar	} Evolution of creep and swelling equations for core restraint
Misaligned grapple pickup capability (inches)	1.75	1.25	

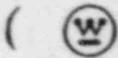
A-246



CRBRP FUEL ROD



A-277



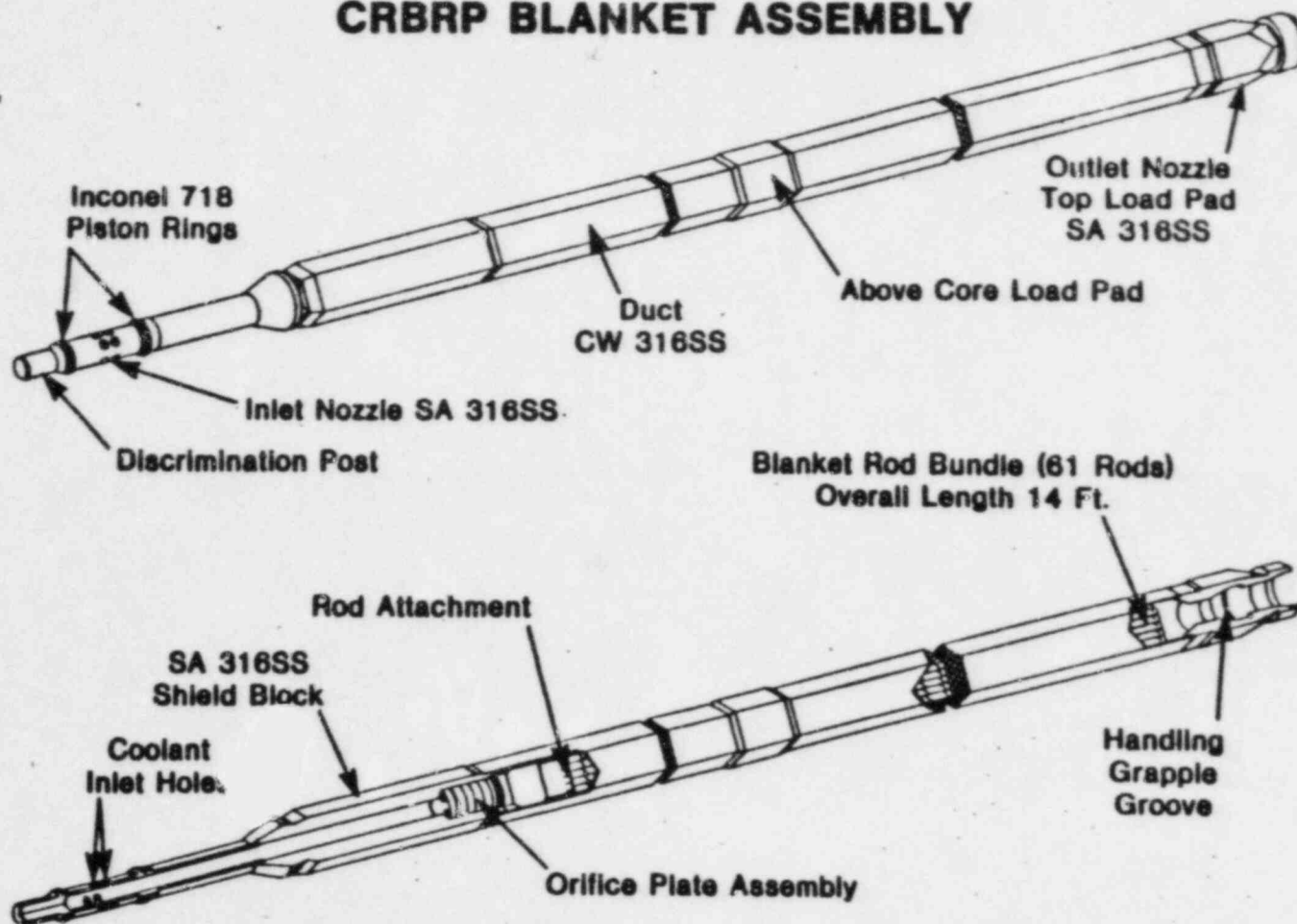
CRBRP FUEL ROD COMPARISON WITH FFTF

<u>Design Parameter</u>	<u>CRBRP Value</u>	<u>FFTF Value</u>	<u>Reason for Difference</u>
Pellet PuO ₂ content	0.33	0.225/0.275	More power per assembly in CRBRP heterogeneous core
Pellet density (percent of theoretical)	91.3	90.4	} Reduced FCMI for same smeared density
Pellet diameter (inch)	0.1935	0.1945	
Axial blanket stack lengths (inch)	14.0	0.8	Breeding requirements of CRBRP
Inconel reflector lengths (inch)	0.0	5.7	Shielding provided by axial blankets
Fission gas plenum length (inch)	48.0	42.0	Provide more space for accomodation of fission gas in higher burnup reloads
Overall rod length (inch)	114.4	93.4	As above

A-248-



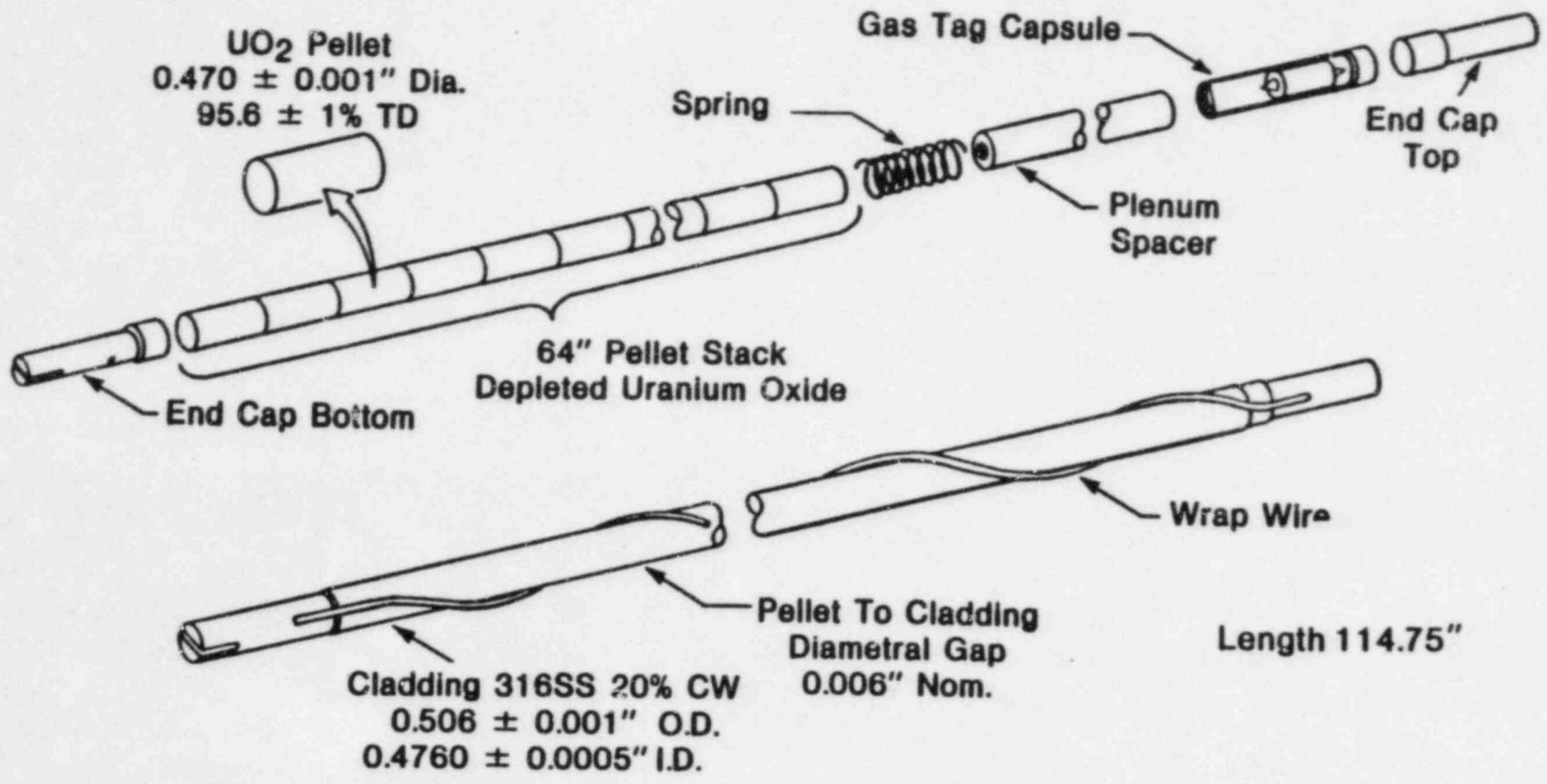
CRBRP BLANKET ASSEMBLY



A-249

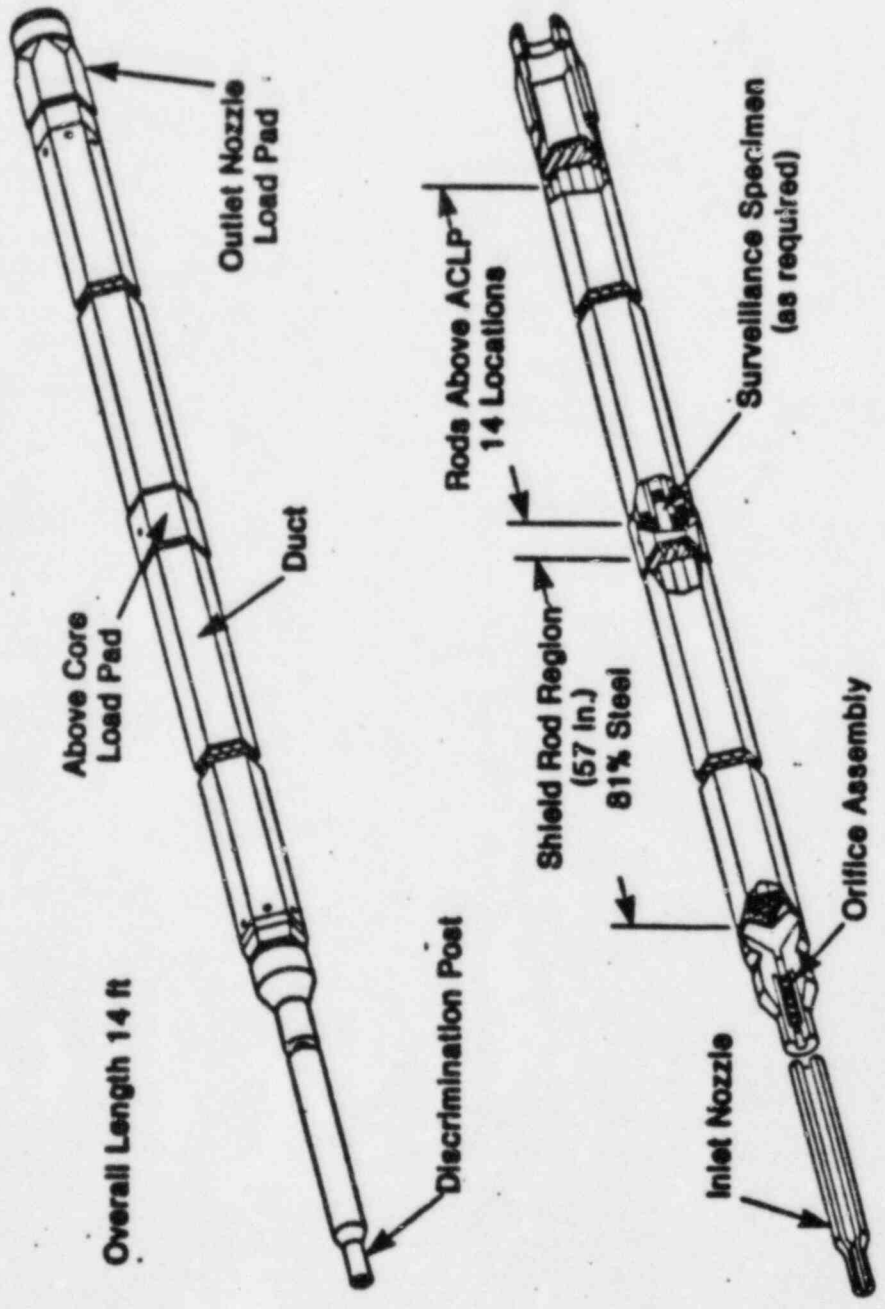


CRBR BLANKET ROD



A-250

REMOVABLE RADIAL SHIELD ASSEMBLY



A-251

DESIGN EVALUATIONS - KEY FUEL RESULTS

Cladding damage

- Cladding damage is within design limits
 - 35 percent margin on steady-state cumulative damage
 - 75 percent margin on steady-state ductility limited strain
 - 2 percent margin on steady-state and transient ductility limited strain
 - 8 percent margin on steady-state and transient ductility limited strain

Wire wrap

- Maximum wire wrap stress and strain are below limits of 21 ksi and 0.6%
- Maximum wire slack is 0.1 inch; acceptable

Bundle/duct interaction

- Maximum bundle/duct interference of 0.020 inches below limit of 0.056 inches
- The maximum bundle/duct clearance of 0.04 inches is less than the 0.054 inches (6 mils/ring) limit

Duct dilation

- The maximum duct dilation is ~ 80 mils which is less than the limit of 108 mils

DESIGN EVALUATIONS - KEY BLANKET RESULTS

Cladding damage

- Cladding damage is within design limits
 - 68 percent margin on steady-state cumulative damage (Radial)
 - 250 percent margin on steady-state ductility limited strain (Radial)
 - 9 percent margin on steady-state and transient ductility limited strain (Inner)
 - 600 percent margin on steady-state and transient ductility limited strain (Radial)
 - Margins are not reduced due to FCMI from a mid-life power jump

Wire wrap

- Maximum wire wrap stress and strain are below limits of 21 ksi and 0.3%
- Maximum wire slack is < 0.1 inch

Bundle/duct interaction

- Maximum bundle duct interference of ~ 0.013 inches is below the design guideline 0.033 inch
- Maximum bundle/duct clearance of ~ 0.065 mils. Adequate based on testing
- Adequacy of design due to unique blanket features (stiffness) to be obtained from EBR-II and FFTF irradiation testing (WBA-40, 41, 45)

Duct dilation

- The maximum duct dilation is 67 mils for the IBA and 82 mils for the RBA which is less than the limit of 108 mils

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DEVELOPMENT TESTING FOR FUEL SUPPORT

<u>Title</u>	<u>Supporting Information</u>	<u>Status</u>
Assembly flow and vibration	Verification of flow, vibration characteristics	Complete
Inlet/outlet nozzle feature tests	Verification of design adequacy	Complete
Fuel transient performance	Verification of transient performance	EBR-II/TREAT testing partially completed. FFTF and CRBRP testing to be done in EBR-II and TREAT
Fuel steady-state irradiation	Verification of steady-state performance	EBR-II testing complete, FFTF testing initiated
Reference cladding/duct material	Irradiation induced swelling, in-reactor deformation, post-irradiation tensile properties, post-irradiation fracture, cumulative damage	EBR-II testing essentially complete; FFTF testing planned
Run beyond cladding breach	Establish feasibility and allowable operating time of breached rods/assemblies	EBR-II irradiations in progress

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STATUS OF DEVELOPMENT TESTING FOR BLANKET SUPPORT

<u>Title</u>	<u>Supporting Information</u>	<u>Status</u>
R.B. heat transfer test	Verification of heat transfer behavior	Testing > 90% complete
Blanket rod irradiation testing in EBR-II	Verification of steady-state performance	Two tests complete, post-test evaluations complete
Blanket assembly irradiation testing in FFTF	Verification of steady-state performance	Two experiments in FFTF, instrumented blanket test being fabricated
Blanket flow control testing	Provide orificing data	Testing complete
Blanket bundle compaction test	Verification of rod bundle behavior	Testing complete
Blanket mechanical testing	Verification of design adequacy	Testing complete
Blanket assembly flow and vibration testing	Verification of flow vibration characteristics	Testing complete
Duct load pad strength and bending stiffness test	Verification of duct behavior	Testing 80% complete
Cladding rupture test	Verification of cladding behavior	Testing complete
EBR-II duct crushing test	Verification of irradiated duct behavior	Testing complete

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KEY FUEL AND BLANKET ONGOING DEVELOPMENT TESTING

- Effects of axial blankets on fuel pins
 - CRBR-1, CRBR-3, CRBR-5, D9-4, AB-1
- 33% Pu content in CRBRP fuel
 - PIE of ANL-08 (30-40% Pu)
 - CRBR-3 and CRBR-5 experiments
 - FFTF reload fuel ~ 30% Pu
- Link FFTF data base to EBR-II data base
- Slow overpower transient response
 - WSA-10 and WBA-24 tests completed
 - Operational reliability testing program in EBR-II
 - Slow ramp rate FCTT testing
 - TREAT transient testing
- RBCB testing in EBR-I
- FFTF blanket confirmatory testing
 - WBA-40, WBA-41, WBA-45/46

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SUMMARY OF DEVELOPMENT PROGRAMS

- EBR-II fuel and blanket steady-state testing completed
- TREAT testing of reference EBR-II fuel rods completed
- Major FCTT testing completed - testing to link different heats of materials is ongoing
- Slow overpower and RBCB testing in EBR-II (ORT) ongoing
- Future TREAT testing of FFTF and CRBRP prototype rods is planned and ongoing

A-25-7

CONCLUSION

- The fuel and blanket design limits have been derived from damage severity limits
- Analysis and testing to date have shown that core design limits are met
- Major testing programs are complete. Extension of the EBR-II and TREAT data base to CRBRP specific design is ongoing

A-25-8

**CLINCH RIVER BREEDER
REACTOR PLANT**



BRIEFING FOR:

**ADVISORY COMMITTEE ON
REACTOR SAFEGUARDS (ACRS)
FULL COMMITTEE**

FLUID SYSTEM INTERFACES

PRESENTED BY:

**G. H. CLARE
LICENSING MANAGER,
CRBRP PROJECT
WESTINGHOUSE
ADVANCED REACTORS DIVISION
OAK RIDGE SITE**

FEBRUARY 11, 1983

APPENDIX XXI
FLUID SYSTEM INTERFACE

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**PRIMARY SODIUM
COOLANT SYSTEM**

**N₂ ENVIRONMENT
IN RCB CELLS**

- PASSIVE BOUNDARY
- Na LEAKAGE DETECTION
- LEAK ACCOMMODATION
- N₂ ISOLATED FROM COOLING WATER BY
 - PASSIVE BOUNDARY
 - ISOLATION VALVES
 - H₂O LEAKAGE DETECTION (MOISTURE DETECTOR AND LEVEL DETECTOR)
 - LEAKAGE COLLECTION (DRAIN LINES FROM COOLERS)

**INTERMEDIATE
SODIUM COOLANT
SYSTEM**

- PASSIVE BOUNDARY (IHX)
- (P)IHTS > (P)PHTS
- LEAK DETECTION
- LEAK ACCOMMODATION

**NaK COOLANT
SYSTEMS - DHRS
AND COLD TRAPS**

- PASSIVE BOUNDARY (OHX AND COLD TRAPS)
- (P)NaK > (P)Na
- LEAK DETECTION
- COLD TRAP NaK ISOLATED FROM COOLING WATER BY DOWTHERM COOLANT LOOP

A-260

SODIUM - NaK COMPATIBILITY

- NaK IS 22 W/O Na AND 78 W/O K (EUTECTIC MIXTURE)
 - MELTING TEMPERATURE $\sim 9^{\circ}\text{F}$
 - BOILING TEMPERATURE (1 ATM) $\sim 1518^{\circ}\text{F}$
- MIXING OF Na AND NaK WOULD RESULT IN
 - NO CHEMICAL REACTION
 - NO ADVERSE EFFECT ON PROCESS EQUIPMENT
 - INCREASE IN NaK MELTING TEMPERATURE
 - DECREASE IN Na MELTING TEMPERATURE

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**INTERMEDIATE
SODIUM COOLANT
SYSTEM**

**AIR ENVIRONMENT
IN SGB CELLS**

- PASSIVE BOUNDARY
- LEAK DETECTION
- CATCH PANS
- FIRE SUPPRESSION DECKS
- LOOP SEPARATION
- CELL PRESSURE RELIEF
- AEROSOL MITIGATION
 - EQUIPMENT QUALIFICATION

**STEAM/WATER
SYSTEM**

- PASSIVE BOUNDARY (SG MODULES)
- LEAK DETECTION
- LEAKAGE ACCOMMODATION
 - EXPANSION TANK RUPTURE DISKS
 - MAIN RUPTURE DISKS
 - REACTION PRODUCT SEPARATION SYSTEM
 - WATER DUMP SYSTEM
 - SAFETY RELIEF VALVES

**N₂ ENVIRONMENT
IN RCB CELLS**

- PASSIVE BOUNDARY (PIPING)
- Na LEAKAGE DETECTION
- LEAK ACCOMODATION
- N₂ ISOLATED FROM COOLING WATER BY
 - PASSIVE BOUNDARY
 - ISOLATION VALVES
 - H₂O LEAKAGE DETECTION (MOISTURE DETECTOR AND LEVEL DETECTOR)
 - LEAKAGE COLLECTION (DRAIN LINES FROM COOLERS)

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EVST SODIUM COOLANT SYSTEM

N₂ ENVIRONMENT IN RCB CELLS

- PASSIVE BOUNDARY
- Na LEAKAGE DETECTION
- LEAK ACCOMADATION
- N₂ ISOLATED FROM COOLING WATER BY
 - PASSIVE BOUNDARY
 - LEAKAGE DETECTION (MOISTURE DETECTOR AND LEVEL DETECTOR)
 - LEAKAGE COLLECTION (DRAIN LINES FROM COOLERS)

NaK COOLANT SYSTEMS

- PASSIVE BOUNDARY (SODIUM COOLERS)
- (P)NaK > (P)Na
- LEAK DETECTION
- LEAK ACCOMMODATION
- NaK ISOLATED FROM N₂ ENVIRONMENT BY
 - PASSIVE BOUNDARY
 - LEAK DETECTION
 - LEAK ACCOMODATION
- NaK ISOLATED FROM AIR ENVIRONMENT BY
 - PASSIVE BOUNDARY
 - LEAK DETECTION
 - LEAK ACCOMMODATION

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ARGON COVER GAS

PRIMARY SODIUM COOLANT SYSTEM

- DIRECT INTERFACE WITH Na COOLANT FREE SURFACE
- (P) ARGON > 1 ATM (EQUAL TO THE SODIUM PRESSURE AT FREE SURFACE)
- PURITY MONITORING
- RADIOACTIVE ARGON PROCESSED TO REMOVE FISSION GAS

INTERMEDIATE SODIUM COOLANT SYSTEM

- DIRECT INTERFACE WITH Na COOLANT FREE SURFACE
- (P) ARGON > 1 ATM (EQUAL TO THE SODIUM PRESSURE AT FREE SURFACE)
- PURITY MONITORING
- NON-RADIOACTIVE

FUEL HANDLING CELL

- DIRECT INTERFACE WITH Na COOLANT FREE SURFACE
- (P) ARGON > 1 ATM
- ATMOSPHERE PURIFICATION UNIT REMOVES O₂ AND H₂O

EVST SODIUM COOLANT SYSTEM

- DIRECT INTERFACE WITH Na COOLANT FREE SURFACE
- (P) ARGON > 1 ATM (EQUAL TO THE SODIUM PRESSURE AT FREE SURFACE)
- PURITY MONITORING

A-264

**CLINCH RIVER BREEDER
REACTOR PLANT**



BRIEFING FOR:

**ADVISORY COMMITTEE ON
REACTOR SAFEGUARDS (ACRS)
FULL COMMITTEE**

STEAM GENERATOR LEAKS

PRESENTED BY:

**G. H. CLARE
LICENSING MANAGER,
CRBRP PROJECT
WESTINGHOUSE
ADVANCED REACTORS DIVISION
OAK RIDGE SITE**

FEBRUARY 11, 1983

ACRS

APPENDIX XXII
STEAM GENERATOR LEAKS

THE INDIRECT EFFECTS OF STEAM GENERATOR TUBE LEAKS COULD POTENTIALLY IMPACT SAFETY

- REACTOR SHUTDOWN WITH LESS SHUTDOWN HEAT REMOVAL CAPACITY
- MECHANICAL LOADINGS ON THE PRIMARY AND INTERMEDIATE COOLANT BOUNDARIES
- HYDROGEN GENERATION

MULTIPLE HTS HEAT REMOVAL PATHS AND OPERATOR FLEXIBILITY TO ISOLATE, REPAIR, OR REPLACE A LEAKING STEAM GENERATOR MODULE AND THE DHRS (INDEPENDENT OF STEAM GENERATORS) MITIGATE THE EFFECTS OF SG TUBE LEAKS ON SHRS CAPABILITY.

A-266

THREE LEVELS OF PROTECTION ARE PROVIDED AGAINST THE EFFECTS OF SG TUBE LEAKS

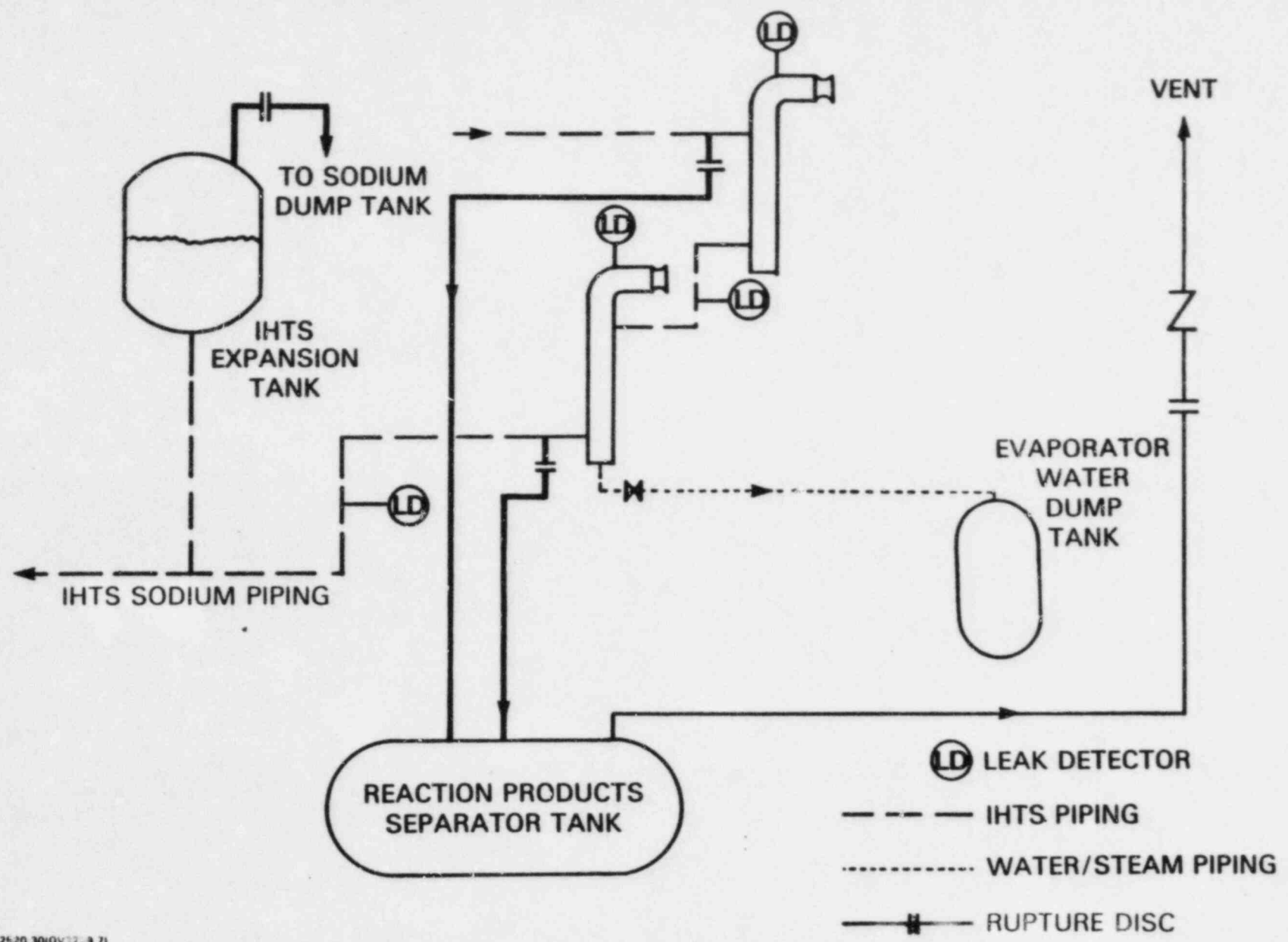
- LEAK DETECTION WITH MANUAL REACTOR SHUTDOWN
- EXPANSION TANK RUPTURE DISKS WITH AUTOMATIC WATER DUMP
- MAIN RUPTURE DISKS WITH AUTOMATIC REACTOR SHUTDOWN AND WATER DUMP

SODIUM WATER REACTION PRESSURE RELIEF SYSTEM (SWRPRS)

A-267

CRBRP SODIUM WATER REACTION PRESSURE RELIEF SYSTEM

A-268



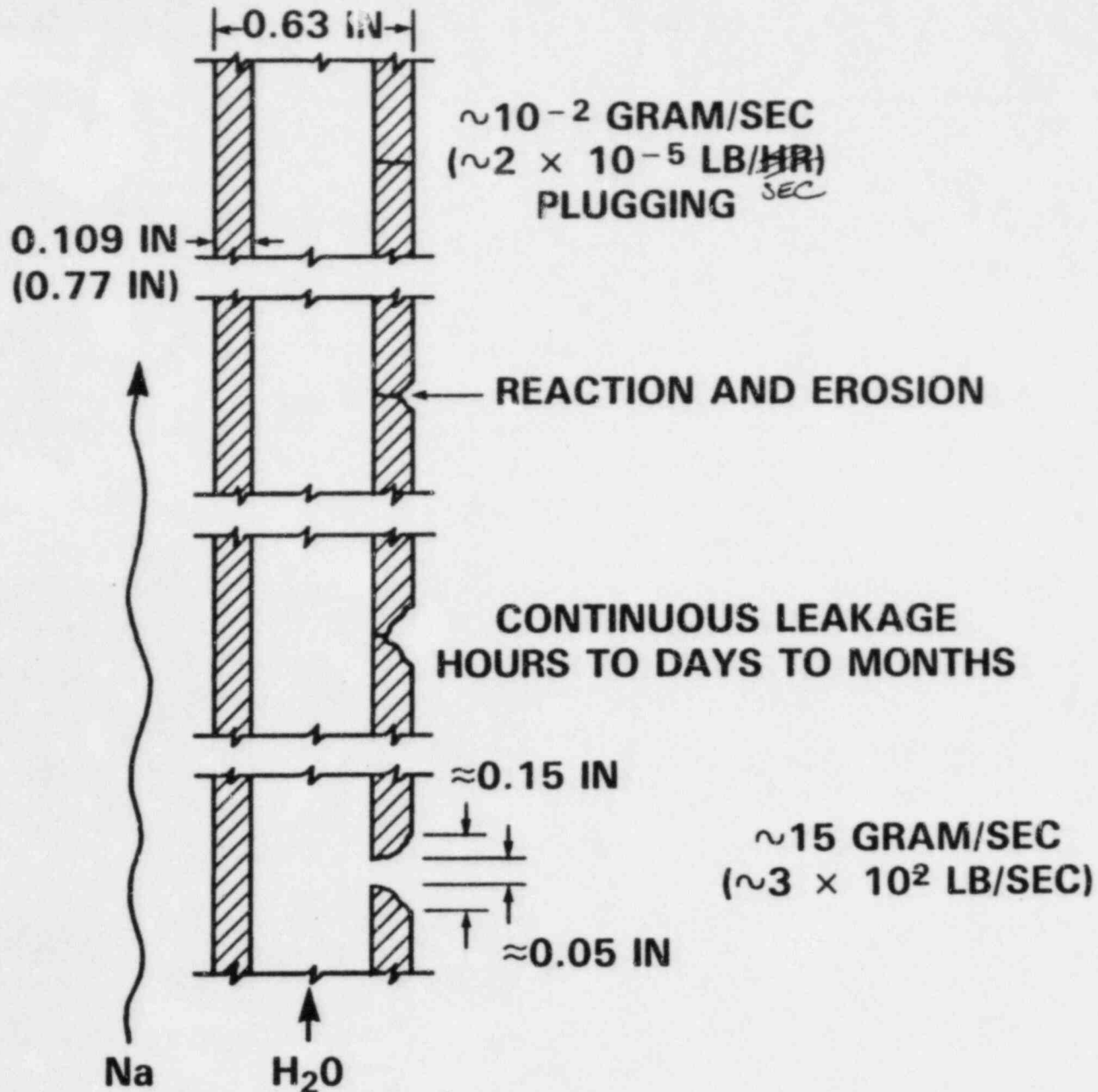
**THE DESIGN BASIS ACCIDENT FOR SWRPRS
AND THE PRIMARY AND INTERMEDIATE
COOLANT BOUNDARIES WAS SELECTED
USING CONSERVATIVE ENGINEERING
JUDGEMENT CONSIDERING REACTOR
EXPERIENCE, EXPERIMENTAL DATA, AND
ANALYSIS RESULTS**

- SIZE OF LEAK(S)
- NUMBER OF LEAKS
- TIMING

**ONLY EXTREMELY RAPID EVENT
PROPAGATION IS PERTINENT
DUE TO RAPID PRESSURE RELIEF
(FEW SECONDS)**

A-269

DEVELOPMENT OF SWR PRECURSOR



A-270

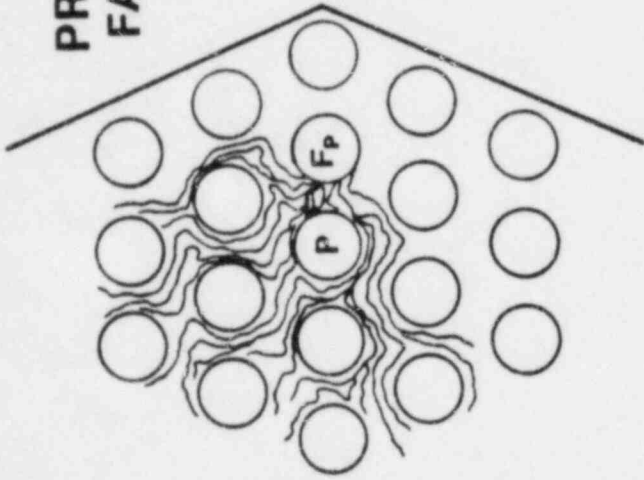
THREE MECHANISMS CAN CAUSE TUBE-TO-TUBE FAILURE PROPAGATION

- WASTAGE
 - CORROSION
 - STRESS RUPTURE (OVERHEATED TUBE)
- EXPERIMENTAL -
TENS OF SECONDS
- EXPERIMENTAL - ≈ 10 SECONDS
 - BOUNDING ANALYSIS - ≈ 1 SECOND

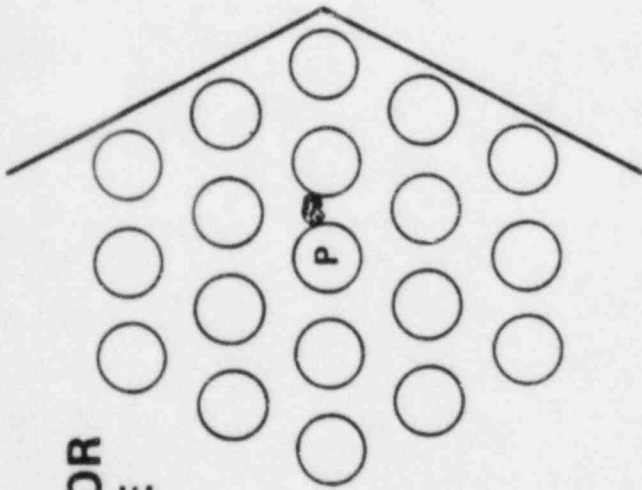
**STRESS RUPTURE FAILURES ARE LIMITED
IN SIZE: 45° GAP, 1 1/2 INCHES LONG,
LESS THAN 50% DEG.**

A-271

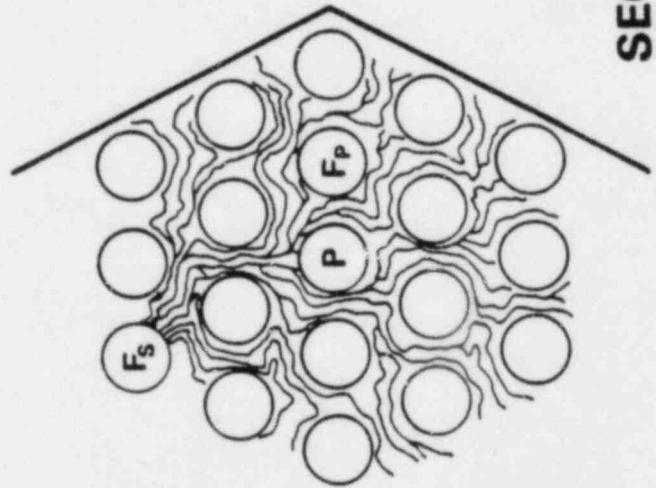
PRIMARY
FAILURE



PRECURSOR
FAILURE



SECONDARY
FAILURE



A-272

SWR EXPERIMENT SUMMARY

- 63 LARGE LEAK TESTS
- SECONDARY FAILURE IN 4 TESTS ONLY
- NINE U.S. TESTS (LLTR) SPECIFICALLY CRBRP PROTOTYPIC—TWO TESTS PRODUCED SECONDARY FAILURES - *stress failures - erosion corrosion*
- SECONDARY FAILURES OCCURRED IN TENS OF SECONDS

A-223

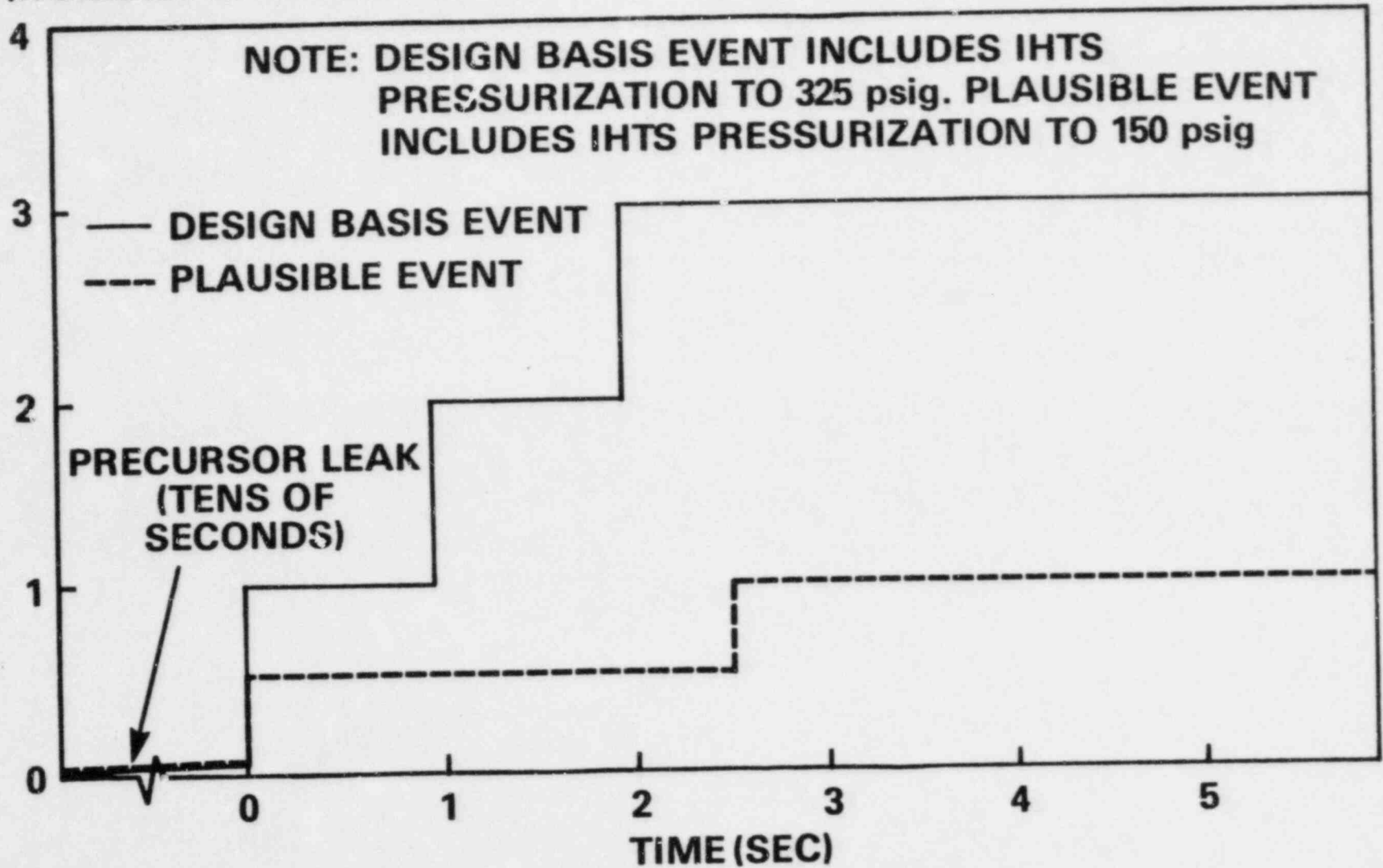
DESIGN BASIS SODIUM WATER REACTION EVENT

- PRECURSOR - SODIUM PRESSURE - 325 PSIG
- PRIMARY FAILURE - 1 EDEG @ $T = 0$
- SECONDARY FAILURE - 1 EDEG @ 1 SEC.
- TERTIARY FAILURE - 1 EDEG @ 2 SEC.

A-274

PLAUSIBLE EVENT VS DESIGN BASIS EVENT

WATER INJECTION
(NUMBER OF TUBES - EDEG)



A-275

COMPARISON WITH FOREIGN SWR DESIGN EVENTS

COUNTRY	FAILURE SIZE	NUMBER OF FAILURES	INTERVAL BETWEEN FAILURES
• UK	1 EDEG	3*	1 SEC
• GERMANY	1 EDEG	1	NA
• FRANCE	1 EDEG	1	NA
• JAPAN	1 EDEG	4**	UNKNOWN
• US	1 EDEG	3	1 SEC

*NOT A LICENSING DESIGN BASIS ACCIDENT

**ONLY (1) ONE FOR LICENSING PURPOSES

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LARGE SWR EVENTS ARE CONSERVATIVELY EVALUATED USING THE TRANSWRAP COMPUTER CODE

- WORST LEAK LOCATION AND INITIAL CONDITIONS BASED ON SENSITIVITY STUDIES (EVAPORATOR AFTER LOSS OF OFFSITE POWER)
- LEAK RATES ESTABLISHED USING RELAP 4/MOD 5
- ASSUMED HYDROGEN YIELD OF 65% AND 1700°F REACTION ZONE TEMPERATURE WHICH BOUNDS EXPERIMENTAL RESULTS
- DYNAMIC ELASTIC-PLASTIC RUPTURE DISK RESPONSE MODEL BASED ON EXPERIMENTAL RESULTS

A. 277

**MECHANICAL LOADINGS FROM SWR
EVENTS ARE CONSERVATIVELY
PREDICTED USING TRANSWRAP**

- SODIUM COMPRESSIBILITY MODEL
- ONE-DIMENSIONAL "SODIUM
HAMMER" MODEL
- FRICTION EFFECTS MODEL
- ENERGY CONSUMED IN PIPING
STRAIN IS NOT ACCOUNTED FOR

**VALIDATED USING EXPERIMENTAL
DATA FROM THE LARGE LEAK TEST
RIG PROGRAM.**

A-278

SUMMARY

- THE DESIGN BASIS SWR EVENT IS CONSERVATIVE RELATIVE TO EXPERIMENTAL & ANALYTICAL EVIDENCE
 - PRECURSOR PRESSURE
 - SIZE OF FIRST FAILURE
 - TIMING AND SIZE OF SECOND FAILURE
 - EXISTENCE OF THIRD FAILURE
 - COMPARED WITH FOREIGN DESIGN BASIS EVENTS
- THE TRANSWRAP COMPUTER CODE IS USED TO CONSERVATIVELY MODEL THE CONSEQUENCES OF THE DESIGN BASIS SWR EVENT
 - LEAK RATE
 - REACTION PRODUCTS
 - MECHANICAL LOADS

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STEAM GENERATOR MODULE FAILURE RATE ESTIMATES

- THE STEAM GENERATOR MODULE ARE FIRST-OF-A-KIND COMPONENTS, AND THERE IS NOT EXTENSIVE OPERATIONAL NOR TESTING DATA FROM SIMILAR COMPONENTS IN SIMILAR ENVIRONMENTS.

BASIS

- THE FOLLOWING TYPES OF UNITS WERE INCLUDED IN THE REVIEW OF HISTORICAL EXPERIENCE OF TUBE FAILURES:
 - FOSSIL-FUELED PLANTS
 - LWR PLANTS
 - SODIUM-HEATED STEAM GENERATORS, INCLUDING BOTH THERMAL AND FAST-REACTOR POWERED UNITS, AND VARIOUS TEST UNITS.
- ENGINEERING JUDGEMENT WAS USED TO DERIVE THE CRBRP STEAM GENERATOR FAILURE PARAMETERS FROM THE HISTORICAL DATA.

A-280

CRBRP STEAM GENERATOR MODULE FAILURE RATE ESTIMATES FOR RELIABILITY STUDIES

- WATER-TO-SODIUM LEAKAGE
 - SMALL LEAK: $\lambda = 7.0 \times 10^{-6}$ HR-MODULE;
LEAK RATE LESS THAN .01 LB/SEC *one/27*
 - MEDIUM LEAK: $\lambda = 1.4 \times 10^{-6}$ HR-MODULE;
LEAK RATE BETWEEN .01 AND 5 LB/SEC *one/107*
 - LARGE LEAK: $\lambda = 0.28 \times 10^{-6}$ HR-MODULE;
LEAK RATE GREATER THAN 5 LB/SEC *one/407*

19-2-81



UNITED STATES
NUCLEAR REGULATORY
ADVISORY COMMITTEE ON REAC
WASHINGTON, D. C. 20545

APPENDIX XXIII
ACRS REPORT ON SECY-82-1B: PROPOSED
COMMISSION POLICY STATEMENT ON SEVERE
ACCIDENTS AND RELATED VIEWS ON NUCLEAR
REACTOR REGULATION

January 10, 1983

Honorable Nunzio J. Palladino
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Dr. Palladino:

SUBJECT: ACRS REPORT ON SECY-82-1B: PROPOSED COMMISSION POLICY STATEMENT ON SEVERE ACCIDENTS AND RELATED VIEWS ON NUCLEAR REACTOR REGULATION

During its 273rd ACRS meeting, January 6-8, 1983, the Advisory Committee on Reactor Safeguards discussed SECY-82-1B, "Proposed Commission Policy Statement on Severe Accidents and Related Views on Nuclear Reactor Regulation," dated November 24, 1982. We also considered the memorandum of October 25, 1982, Samuel J. Chilk, SECY, to William J. Dircks, EDO, "Staff Requirements - Discussion of Severe Accidents - Policy Statement and Research Plan...." In our review, we had the benefit of a Subcommittee meeting held on December 21, 1982. The Committee has commented on earlier drafts of this SECY paper in reports dated February 8, 1982 and September 14, 1982.

As a result of the October 25, 1982 memorandum, S. J. Chilk to W. J. Dircks, the ACRS arranged a series of three Subcommittee meetings to discuss the proposed NRC research program in support of a regulatory approach for dealing with severe accidents as described in "Nuclear Plant Severe Accident Research Plan," NUREG-0900. The first of these meetings was held on December 21, 1982. You may recall that in our report of August 18, 1982 on NUREG-0900 and in our report of September 14, 1982 on SECY-82-1A, "Proposed Commission Policy Statement on Severe Accidents and Related Views on Nuclear Reactor Regulation," dated July 16, 1982, we expressed a number of concerns about what we considered to be the lack of a coherent and workable approach to dealing with severe accidents in the licensing of new plants and in the regulation of existing plants. We concluded that we could not judge the appropriateness or the adequacy of the research program without having examined one or several feasible approaches to which a research program could be related.

With these comments in mind, we requested the NRC Staff to present, during the Subcommittee meeting of December 21, 1982, whatever additional information had been developed on approaches to deal with severe accidents. We were surprised when we were informed that SECY-82-1B was, in the Staff's view, what the Commission is likely to adopt as its policy. The substance of SECY-82-1B is, so far as we can see, little different from that of SECY-82-1A.

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In its statement of purpose, the policy statement is said to have been "revised to reflect Commission and ACRS comments." In our opinion, the policy statement of SECY-82-1B does not reflect the comments we have made in previous reports to the Commission.

Our comments on the various drafts of SECY-82-1 are summarized below together with some further recommendations. Additional details can be found in the attached excerpts from several previous ACRS reports.

1. As we understand the proposed policy, judgment as to whether an applicant for a license has dealt appropriately with severe accidents will depend heavily on the results of probabilistic risk assessment (PRA). Decisions will involve comparison of the results of the PRA with the numerical guidelines suggested in Revision 1 of "Safety Goals for Nuclear Power Plants," NUREG-0880. There is general agreement that large uncertainties exist in our ability to predict both the probabilities and the consequences of severe accidents. Furthermore, there is no generally agreed upon method for comparing the results of a PRA with the guidelines given in NUREG-0880.
2. For existing plants, it appears that some as yet undefined set of plant specific and generic PRAs will be used to draw generic conclusions about groups of plants. An effort will then be made to draw conclusions about specific plants. The process to be used is not yet defined, nor is it clear what methods will be used to define it. Indeed, we observe that experience gained with PRAs suggests that it may be inappropriate to use generic results in the evaluation of individual plants.
3. No specific guidance is given as to an appropriate balance between prevention and mitigation of severe accidents. Except for some rather general comments about the need to explore the behavior of containment systems, and some equally general comments about filtered vented containment systems and core retention devices, mitigation is largely ignored. It appears that in principle, under the proposed policy, only an appeal to prudent engineering practice or the use of ALARA in risk reduction could be used to generate containment specifications, for example, and requirements for other mitigation systems important to public health and safety.
4. We have in several reports expressed reservations about a strong dependence on PRA alone in decisions dealing with severe accidents. We note, however, that the Commission policy as expressed in SECY-82-1B would use PRA as a principal criterion in detecting and correcting weaknesses in design. We recommend that before issuing a policy statement on severe accidents, the Commission give consideration to the possibility of including more specific directions for systems or approaches for dealing with severe accidents. As examples we suggest:

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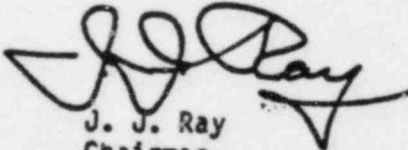
January 10, 1983

- (a) A statement that effort will be made to specify the performance of containment systems including subsystems for heat removal. It may not be feasible to do this at present, but an effort to do so can guide research that may be needed to determine if it is possible.
- (b) Specifying improved performance for decay heat removal systems.
- (c) Giving direction to a licensee that a plant design must include specific consideration of features to decrease the probability of damage from sabotage.

It appears to us that because of the close relationship that must exist among a safety goal, a policy on severe accidents, and a siting policy, a much more integrated approach is needed.

We recognize the considerable effort that has gone into the various drafts of SECY-82-1 and associated documents. We understand that the task is difficult. We nevertheless consider SECY-82-1B to be seriously flawed.

Sincerely,


J. J. Ray
Chairman

Attachment:

List of Relevant Comments from Previous ACRS Reports

References:

1. SECY-82-1B from W. J. Dircks, Executive Director for Operations, to NRC Commissioners, Subject: Proposed Commission Policy Statement on Severe Accidents and Related Views on Nuclear Reactor Regulation, dated November 24, 1982.
2. SECY-82-203A, from W. J. Dircks, Executive Director for Operations, to NRC Commissioners, Subject: Revisions to Nuclear Plant Severe Accident Research Plan, NUREG-0900 (Draft), dated August 30, 1982.

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- "With regard to future plants, we believe that the NRC should examine and evaluate the safety-related changes now proposed or underway for LWRs in countries like France, the Federal Republic of Germany, Japan, Sweden, and the United Kingdom before arriving at its own judgment on what is appropriate for the U.S. For existing nuclear power plants, it is premature to assume that the available PRAs provide a generic basis for decision-making. On the contrary, despite their uncertainties, the PRAs indicate the existence of important plant-specific differences which need to be factored into the formulation of policy. Again, the specific backfitting approaches currently underway or contemplated for LWRs in other countries should be examined and evaluated for their relevance to U.S. policy." (Ref. 5, p. 3)
- "In our recent reports specific attention was called to the need for organizing the research under this Decision Unit to answer questions likely to arise in connection with the Commission's stated intention to modify the licensing process to take specific account of accidents more serious than those generally identified as Design Basis Accidents." (Ref. 2, p. 9)
- "However, there is still a lack of definition of even one approach to deal with the severe accident issue. Considering the difficulty of the problem, effort should probably be made to define several alternatives." (Ref. 2, p. 9)
- "We find that the NRC program, as proposed, is not responsive to [previous] recommendations [that funding be reallocated to provide the information needed for the severe accident rulemaking]. The programs ... should be restructured so that the primary priority is to provide the information needed for decision-making concerning features to mitigate the consequences of accidents involving severe core damage or core melt, for reactors in operation and under construction and for reactors yet to be designed. This would allow the elimination of a substantial portion of the longer-term experimental and code development work." (Ref. 1, p. 9)
- "A focused priority effort is needed with respect to risk contributors such as seismic events, design errors, operator errors of commission, sabotage, and systems interactions to provide a methodology suitable for incorporation into PRAs on a trial basis or to identify and evaluate sources of uncertainty which make this impractical and to suggest regulatory approaches in light of these uncertainties." (Ref. 2, pp. 8-9)
- "Insofar as feasible, all accident initiators and risk contributors (other than sabotage) should be included in PRAs and in benefit/cost analysis. If the uncertainties are such as to make a meaningful

Attachment to January 10, 1983 ACRS Report on SECY-82-1B - List of Relevant
Comments from Previous ACRS Reports

- "We believe that, before embarking on the course proposed for future CPs in SECY 82-1A, a concerted effort should be made by the NRC Staff and the ACRS to develop policy guidance on as many of the relevant safety issues as are tractable, and to propose an alternate approach to the Commission in which such policy guidance is provided to applicants for future standard plant designs." (Ref. 5, p. 2)
- "With regard to existing plants, we believe it would be productive for the NRC Staff to draft alternate positions on the most significant safety issues and to establish what would be needed in order to evaluate the alternatives." (Ref. 5, p. 3)
- "Neither the original nor the revised version of NUREG-0900 contains a delineation of an approach for dealing with severe accidents. This is needed to judge the appropriateness of the proposed research program. We continue to urge that the work necessary to provide one or more approaches be carried out. We look for requirements that might be placed on components or systems required to deal with severe accidents, description of what is now known about these, specifications of what, if any, information is required to describe system performance with the necessary accuracy, some indication of whether the information can be obtained from research in the time and with the resources available, and what research is planned to obtain the needed information." (Ref. 3, p. 1)
- "As an example, we note that, in the draft Implementation Plan for Safety Goals (July 16, 1982) provided to us, the NRC Staff concludes that it is not now feasible to specify the performance of containment systems. The NRC Staff further expressed an opinion that the information and approach needed for such a specification should be developed. We, therefore, looked at NUREG-0900 for a description of what new information is needed to specify performance of the various kinds of containments and containment systems now in use or proposed. Although there are elements of the program that could certainly contribute to more accurate specification of containment performance, we find no systematic descriptions of what information is needed or what part of the proposed program is designed to provide the information." (Ref. 3, p. 2)
- "We recommend that alternate containment performance criteria be developed and evaluated for existing nuclear power plants as part of the trial implementation program. A separate set of alternate trial containment performance criteria should be developed and evaluated during the trial period for plants yet to be designed." (Ref. 4, p. 2)

quantification for some initiator or contributor impossible, this should be documented in sufficient detail and an allocation of risk to this contributor justified." (Ref. 4, p. 3)

- "We believe that, in view of the continuing uncertainties to be expected in the art of PRA and a continuing inability to satisfactorily treat all initiators and other contributors to core melt frequency, and in view of the potentially very large differences in release magnitudes among different core melt accidents, containment performance design objectives are needed and should be developed expeditiously." (Ref. 6, p. 5)

Related ACRS Reports:

1. "Review and Evaluation of the Nuclear Regulatory Commission, Safety Research Program for Fiscal Year 1983," NUREG-0864, dated February 1982
2. "Comments on the NRC Safety Research Program Budget for Fiscal Years 1984 and 1985," NUREG-0875, dated July 1982
3. "ACRS Comments on Nuclear Plant Severe Accident Research Plan," NUREG-0900 (Draft), dated August 18, 1982
4. "ACRS Report on the Draft Action Plan for Implementing the Commission's Proposed Safety Goals for Nuclear Power Plants," dated September 15, 1982
5. "ACRS Report on SECY 82-1A: Proposed Commission Policy Statement on Severe Accidents and Related Views on Nuclear Reactor Regulation," dated September 14, 1982
6. "ACRS Comments on the NRC Staff Questions to the Commission Concerning the Policy Statement on Safety Goals for Nuclear Power Plants," dated September 15, 1982

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THE FOLLOWING PAGES A-288 THRU A-321 HAS BEEN DELETED AS:

DELETION 1

STATEMENT

of

BILLIE PIRNER GARDE
Government Accountability Project

Presented to

ADVISORY COMMITTEE ON REACTOR SAFETY

at

Washington, D. C.
February 10, 1983

Gentlemen, I appreciate the opportunity to speak to you about the situation at the Midland Nuclear Power Plant in Midland, Michigan.

The Government Accountability Project (GAP) of the Institute for Policy Studies is currently conducting an investigation into worker allegations about problems at the Midland plant. Our investigation of the Midland facility is far from complete, but the Midland picture has started coming together.

During the last two weeks we have talked to over a dozen additional workers, and are completing our investigation of those allegations now. Our findings are consistent with those that the Region III Staff discovered in their recent investigation into the diesel generator building. This investigation led to the proposed \$120,000 fine levied against Consumers Power Company announced two days ago in Midland. I have included the letter of notification with the information I have provided you today.

Regional Administrator James Keppler announced the fine at an all-day public meeting. During the evening session, close to 400 people crowded into the public meeting about the plant. Local newspaper and television coverage of the event reported that, as one Midland community member put it, Consumers Power Company and Bechtel are not "'going to get any more credibility out of this community' without... proof of the plant's proper construction."

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In a community of scientists and engineers this loss of confidence indicates a serious change in the public's attitude about the Midland plant. One Dow engineer noted that "even our forefathers had enough sense to put pilings under the Cathedral of Notre Dame in the year 1000." This public meeting had only a few people who misconceived the meeting as a debate on nuclear power; the rest were there to listen and ask questions of the NRC Staff about the construction disaster in their backyard.

I have included some of the newspaper articles covering these meetings. It is critical that you realize the serious loss of public confidence in the utility and in the NRC itself. The spokeswoman for the Saginaw City Council asked WHO would guarantee the safety of the plant. Darrell Eisenhut, director of the NRC's Division of Licensing, responded that no one can guarantee the plant's safety. His explanation was that, "All we can do is assure there is a sufficiently low risk from the plant. That responsibility principally lies with the utility." This response awakened the community to the limitations of its protectors.

The Midland subcommittee has left its foot in the door -- withholding final approval until the Staff has given its assurance that the plant's "as built" condition can be certified in an audit. As a spokesperson for the Lone Tree Council, for dozens of concerned citizens, and for the numerous workers who will never be heard, I implore you to open the door on the Midland plant once again and modify your letter to Chairman Palladino to make very clear that Midland's third party review must be comprehensive.

In the light of the recent fine, the ongoing investigations, and the loss of public confidence, it appears the only reasonable option. Perhaps even more important to you may be the realization that, as Zimmer has crumbled at 97% complete into a rubble of controversy and industry embarrassment, the nuclear power community is watching to see whether our agonizing process of licensing has any legitimacy. As attachment 4 I have included a series of articles from England's Construction News about the results of Bechtel's performance at Zimmer and Midland.

Consumers has proposed a Construction Completion Plan (CCP) to remedy its construction woes. Our analysis of that plan (Attachment 3) reveals the most basic flaws in its solutions -- at best the CCP is a beginning.

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Attachment 1

Midland Daily

Vol. 125, No. 239

Wednesday, February 9, 1983, Midland, Michigan

News

25c Per Copy

Consumers probably won't fight NRC fine

Related story, page 3

By PAUL RAU
Daily News staff writer

Consumers Power Co. likely will pay without protest a \$120,000 fine levied Tuesday by the U.S. Nuclear Regulatory Commission for violations at the Midland nuclear plant.

The NRC said its inspection in late 1982 of equipment in the plant's diesel generator building revealed numerous items of noncompliance with federal Quality Assurance (QA) requirements.

The NRC said the violations represent another breakdown in the Midland plant's QA program. The proposed fine is for two alleged violations, each carrying a \$60,000 penalty.

Consumers Power said in a news release that it is "disappointed" at the size of the fine, but will not appeal it "unless our review of the inspection report reveals significant factual errors of which we are not now aware." The utility agreed that the NRC has valid reasons for assessing the penalty.

The first violation is for multiple examples of plant personnel failing to follow procedures, drawings and specifications in the installation of equipment.

In one instance, the NRC said, an inspection program was not established to ensure the segregation of electrical cables in accordance with design requirements. In other cases, changes in drawings or

specifications were made without proper authorization.

The second violation stems from orders from plant Quality Control (QC) supervisors to QC inspectors to suspend inspections when excessive numbers of deficiencies were found, the NRC said.

The construction work being inspected was then turned back to the construction staff for rework. The intent was to improve construction quality prior to the QC inspections, the agency said.

In some cases, follow-up QC inspections focused only on the previously identified deficiencies, providing no assurance that unreported deficiencies were later identified or repaired. The NRC said reinspection will be required for those areas where this practice was used.

The practice also resulted in incorrect data being fed into Consumers' Trend Analysis Program, inhibiting the utility's ability to determine the root cause of deficiencies and to prevent their recurrence.

In a letter to Consumers announcing the proposed fine, NRC Region III Administrator James G. Keppler said the violations demonstrate the utility's "failure to exercise adequate oversight and control" of Bechtel Power Corp., the prime contractor which was responsible for executing the QC program.

Since the violations were discovered in November and December, Consumers has reorganized its quality programs depart-

ment to give it full responsibility and control of the QA and QC functions.

Keppler said the QA breakdown was partly the reason Consumers halted most safety-related construction work at the plant last December. More than 1,000 Bechtel workers were laid off when the work was halted.

The violations also provided part of the stimulus for Consumers to write its Construction Completion Plan (CCP), which calls for the work halt, a reinspection of safety-related systems, third-party reviews to monitor the plant's construction quality and the QA/QC organizational change.

Keppler announced the fine while attending a meeting in Midland on the CCP document.

Consumers must now tell the NRC how it plans to correct the problems and to prevent their recurrence, and report to what extent QC supervisors told inspectors to ignore construction problems.

The utility apparently is foregoing its option to protest the fine by March 10.

Consumers said it plans to immediately correct the problems and to assure itself they cannot be repeated. It said the violations are both severity level 3. Levels range from 1 (most severe) to 6.

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Officials defer action on completion plan

By PAUL RAU
Daily News staff writer

Only truly independent third-party reviews can restore the public's confidence in the troubled Midland nuclear plant project, top government nuclear officials agreed Tuesday.

More than two dozen U.S. Nuclear Regulatory Commission officials spent most of the day Tuesday listening and asking questions as Consumers Power Co. described how it plans to finish — and assure the quality of — the twin-unit plant under construction here.

Because of repeated breakdowns in quality assurance (QA) programs at the Midland plant, NRC representatives refused to give their unqualified endorsement to Consumers Power Co.'s new plan to finish and inspect the nuclear plant, called the Construction Completion Plan or CCP.

But they said they are optimistic — once again — that the utility seems to be taking steps to improve the quality of the plant's construction.

James G. Keppler, administrator of NRC's Region III office in Illinois, said agency officials "feel the types of changes made in the QA program sound like steps in the right direction."

"But we have felt optimistic before ... and don't want to be let down by implementation," Keppler cautioned.

THE UTILITY'S COMPLETION plan calls for a halt to work on most safety-related systems, which necessitated the lay-off of more than 1,000 Bechtel Power Corp. workers last December. For the next several months, the plan calls for teams of inspectors to determine the quality of installed work.

Then, the construction force will be reformed and the plant, now about 85 percent complete, will be finished. The plan also calls for a multi-tiered system of audits of both construction and design by outside or third-party contractors.

NO ACTION was taken on the plan Tuesday. NRC officials commented on the plan's features and said many details must be provided by Consumers Power.

"We want to reflect on this," Keppler told utility officials. "My feeling is that while many of the things we're interested in are being addressed, don't lock into anything on the third-party reviews without touching base with us first."

Both Keppler and Darrell Eisenhut, director of the NRC's Division of Licensing and the ranking agency official at the meeting, agreed that the third-party audits are the key feature of the completion plan.

The independent audits are vital to restoring confidence within not only the public but also the NRC and Consumers Power, Eisenhut said.

Keppler told reporters after the meeting that due to past "lapses" in quality assurance programs, more audits are being required of the Midland plant's design and construction than for any other nuclear plant in the nation.

"The need for these is all based on past performance," Keppler said. "We're going to assure, through other organizations, that the work will be done right."

THE PROPOSED third-party reviews include:

- An audit of the type recommended by the Institute for Nuclear Power Operations, a nuclear industry group. This was performed last year by the Management Analysis Corp., although the results have

not yet been released. Despite positive features, the NRC does not consider this a truly independent look at the plant's quality.

This audit apparently suggested some improvements; Consumers said Tuesday corrective actions are underway.

- An independent design verification of the plant's auxiliary feedwater system and another system to be selected by the NRC. Consumers Power proposes that the Tera Corp. conduct this audit of two safety systems.

- A six-month independent installation implementation overview of work on safety related systems at the plant. This review could be extended if needed.

Although not included in the CCP plan, another audit is being done of work to correct soils problems at the plant. This effort already is underway by Stone & Webster, an engineering company, but the NRC cautioned that it has not yet approved any of the contractors for the third-party audits.

QUESTIONS ASKED by NRC officials were about qualifications of supervisory personnel and what Consumers Power has learned from past construction problems.

James W. Cook, the Consumers vice president in charge of the Midland project, stressed that the utility halted the safety-related work and proposed the completion plan in response to both internal and external concerns, and not entirely because of negative findings from an NRC inspection late last year.

"You have our attention," Cook told the NRC, and pledged to implement the program to improve the Midland project.

Donald B. Miller, site manager for Consumers at the plant, said poor craftsmanship by workers "is not the problem and never has been." Rather, the projects deficiencies have stemmed from improper implementation of quality programs, he said.

John D. Selby, president of Consumers Power, said he thought the NRC reacted favorably to the proposed completion

plan. "We have a lot of work to do in the next 60 days on details, but I think we're going to get it (the project) back under way," he said.

Asked why extreme emphasis is being placed on third-party audits of the Midland plant, Selby said: "It just makes sense to get another set of eyes looking at it other than the ones doing it (the construction work). Under the circumstances, with the plant 85 percent done, we can't afford a misstep."

IN A COMMENT period Tuesday afternoon, five persons made statements to the utility and NRC officials — and only four comments supportive of the nuclear project drew applause.

"We get paid good money for what we do, and we do good work," said one plant worker. "You tell us what you want done, and we'll do it the way it's supposed to be done."

Oswald Anders of Midland noted that Dow Chemical Co.'s local manufacturing plants are depending on nuclear-generated steam. Without the nuclear plant, he said, Dow's chemical plants will be phased out and Midland will "revert to a ghost town with no future."

He said he has visited the nuclear plant four times and has been impressed by workers' attention to detail. Anders said nuclear construction codes are much more stringent than others, and that people shouldn't be surprised that NRC inspectors still find some mistakes.

"Who can expect that constant surveillance of excellent work will not result in some non-compliance ...?" Anders said near the end of his statement, which drew heavy applause from the crowd containing many plant workers.

Both Keppler and Darrell Eisenhut, director of the NRC's Division of Licensing and the ranking agency official at the meeting, agreed that the third-party audits are the key feature of the completion plan.

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Wednesday, February 9, 1983
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Hundreds at nuclear plant session

Federal nuclear officials wanted comments on the Midland nuclear plant from Midland area residents Tuesday night, and they got an earful.

It was a night when the motives of citizen intervenors and the credibility of Consumers Power Co. both were questioned, along with the motives of the U.S. Nuclear Regulatory Commission for holding the public meeting in such a small room.

A crowd that might have contained up to 400 persons overflowed Conference Room E at the Quality Inn, where utility and regulatory officials had gathered to field questions. The room is designed to hold 225 persons, and perhaps 150 or more spent two and a half hours standing outside three doorways and listening.

Applause was showered nearly equally on those expressing pro- and anti-nuclear sentiments, with the crowd perhaps favoring persons who said they want the plant to open.

But even Mary Sinclair, well-known in Midland for opposition to the plant, left the podium to cheers when she concluded her statement, saying she hopes the growing awareness of the nuclear plant in the Midland community continues.

SISTER ARDETH PLATTE, representing the Saginaw City Council, led off the night by asking who will guarantee the nuclear plant's safety, and whether planned third-party audits of the plant's construction quality will be truly independent.

Darrell Eisenhut, director of the NRC's Division of Licensing, said no one can guarantee the plant's safety. "All we can do is assure there is a sufficiently low risk from the plant. That responsibility principally lies

with the utility," he said.

Eisenhut said the NRC's precautions to make sure workers conducting the quality audits are not connected to Consumers include prohibitions on stock ownership and a requirement to sign certificates stating they or their families have not and do not work for the utility.

Sister Ardeth told him the \$120,000 fine levied on Consumers Power Tuesday by the NRC is a "slap on the wrist in comparison with what happens if the plant is not constructed safely."

Thomas Herron, chairman of the anti-nuclear Lone Tree Council, said he's lost confidence in the NRC and that "even the most avidly pro-nuke zealots are embarrassed" by the condition of the Midland plant.

In answer to Herron's question, Consumers Power vice president James W. Cook said that in no case has any fine levied on the utility been passed on to ratepayers.

The fine isn't much punishment because Consumers Power is such a large utility, said NRC Region III Administrator James G. Keppler. But he claimed the "public embarrassment" caused by such fines acts as a deterrent.

THEN COMPLAINTS began about the crowded room. One man said an emergency evacuation would create a disaster because the room's three exits all were blocked, and another compared the NRC's lack of action on the complaint to the agency's regulatory performance.

That man also claimed the NRC was trying to discourage public participation in the meeting by choosing a small room.

Keppler apologized for the over-

crowding, and said the NRC did not expect the large turnout.

THOMAS DEVINE, legal director of the Government Accountability Project (GAP), a Washington-based group investigating the nuclear project, read and then gave the NRC an affidavit in which plant worker Richard Letherer claimed that the NRC colludes with Bechtel Power Corp. by revealing the time and subject of supposedly unannounced inspections.

A number of NRC officials denied that allegation, but promised to check into it.

PRO-NUCLEAR viewpoints then emerged, with one man saying that the nuclear industry's problems are not insurmountable and that Consumers Power is "definitely on the right track" in correcting problems at the Midland plant.

The pro-nuclear position was perhaps best expressed by Midland resident Tracy Parsons, who said in a reference to GAP that "Midland seems to be suffering from an infusion of outside interest groups operating under the pretense of being watch-dog groups."

Parsons added, "GAP does not represent the view of Midland. I believe nuclear plants can be built and operated safely."

John Catenacci, a Dow Chemical Co. engineer, claimed that no one inside Dow "believes in" Consumers Power any longer. He said he doesn't know if that feeling is deserved, but stressed that assurances of the plant's quality must be provided by third-party, independent reviews of the plant.

"I really don't think you're going to

get any more credibility out of this community" without such proof of the plant's proper construction, he added.

Mrs. Sinclair countered claims that her intervention in the licensing process has delayed the nuclear project, saying delays associated with the soil hearing and the recent halt of safety-related work are the utility's own doing.

GAP official Billie Garde denied that the group is trying to shut the Midland plant. She blamed the project's troubles on work supervisors, and said the bottom line is that "Consumers has not been able to implement their plans, no matter how well they work."

Keppler closed the meeting by noting the large attendance and said the NRC will "seriously consider" conducting another evening meeting.

CONSUMER'S COOK was asked after the meeting to respond to the comments that his company now lacks credibility among Midlanders.

"We'll have to let our actions and activities in completing the plant speak for themselves," Cook said.

Later, he said he worries that the public may not be getting a complete understanding of the many complex issues associated with the plant.

"It clearly evident there is a considerable amount of confusion in the public mind, based on the number of extremely complex technical, procedural and political currents in the discussions going on in public.

"We have been unable to articulate clearly what's going on out here. I believe we've contributed to the confusion," Cook added. He pledged to renew the utility's efforts to communicate with the public and media.

By PAUL RAU

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STANDING ROOM ONLY — There wasn't enough room Tuesday night to accommodate all the people who wanted to ask questions make comments and listen to a discussion on the Midland nuclear

plant. Some persons stood for more than two hours at the Nuclear Regulatory Commission meeting. (Daily News photo by Terry L. Tanner)

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Consumers won't fight nuke plant federal fine

BY DAVE SEDGWICK
News Staff Writer

MIDLAND — Consumers Power Co. officials say they will not fight a \$120,000 fine for construction flaws at the Midland Nuclear Plant.

The Nuclear Regulatory Commission announced the penalty at a public hearing Tuesday after unveiling the results of its intensive investigation of the diesel-generator building last fall.

The facility provides emergency electricity to the plant's safety equipment in case of a power failure.

As a result of problems that the probe turned up, the utility drastically cut back construction and laid off 1,100 workers last December.

The main problem the NRC cited in ordering the fine involved the way Bechtel Corp., Consumers Power's main contractor at the Midland project, handled inspections of construction work.

When quality control personnel began reporting a large number of construction flaws last year, Bechtel supervisors called off inspectors.

Construction crews were supposed to fix the problems and call inspectors back for approval of their work. Most of those reinspections were incomplete, NRC officials charged, and that meant the company can't guarantee the work was properly completed.

Quality control inspectors are supposed to make sure workers use the right materials, diagrams and construction techniques.

In a written statement, Consumers Power Vice President James W. Cook acknowledged the NRC charges are accurate.

"We agree that the NRC has a valid basis for assessing a civil penalty," said Cook in a prepared statement. "We are disappointed at the size of the penalty, but we do not expect to appeal it."

The utility will not pass along the fine to customers, Cook told 200 on-lookers who jammed a Midland motel conference room for the hearing.

The NRC intended the fine to be a "public embarrassment" to force Consumers Power to upgrade quality control, said James G. Keppler, the federal agency's regional administrator.

"We want to send a signal to (the utilities) that we will not accept continued problems," Keppler told the audience.

The NRC said it fined the utility for the following breakdowns in quality control:

- Managers allowed a backlog of nearly 16,000 incomplete inspection tasks to build up.
- Workers sometimes failed to follow blueprints and proper construction procedures.
- Electrical cables were packed too tightly into cable trays, which increased the risk of fire.

A citizens' watchdog group accused the NRC of limiting public debate by concealing its inspection results until late Tuesday.

"I resent the fact that the NRC waited until today's meeting to release this. They kept us ignorant of the specifics," said Thomas Devine, an attorney for the Washington-based Government Accountability Project. The citizens group investigates complaints of construction

problems at nuclear power plants. Without that information, Devine charged, citizens were unable to evaluate the utility's plan to improve quality control.

Consumers Power Co. offered a laundry list of proposed reforms in its quality control program Tuesday. The critical ingredient is that quality control will be guaranteed by outsiders.

The utility must hire three consulting firms to play the role of "watchdog," to make sure the plant is properly built.

The company agreed to hire those consultants after NRC officials made it clear they do not trust the utility to carry out its proposals. Though Consumers Power will run its own quality control program, the independent consultants will evaluate everything they do.

Consumers Power President John D. Selby agreed the audits are needed. "We're making a lot of changes in the way things are done. It makes sense to have someone watching us," he said.

At Tuesday's session, the utility outlined its plan to improve quality control:

- Consumers Power will test the qualifications of the Bechtel Corp.'s inspectors. Consumers Power also will oversee the work of Bechtel's inspectors. A number of inspectors already have taken the new tests.

• Consumers Power will re-examine a sampling of construction work which unqualified quality control inspectors had approved. Critics say the utility should re-examine all the work, not just a sample. The NRC has not yet ruled on that complaint.

• Three independent firms will conduct audits of different aspects of the construction program. Two companies already are working, and Consumers Power has yet to select a third.

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Explaining new quality control

Top officials of Consumers Power Co. and its chief contractor at the Midland Nuclear Plant gathered Tuesday to explain their plan to improve project quality control. From left, Bechtel Corp. Project Manager John Rutgers, Bechtel Vice President William Henry, Consumers Power President John D. Selby and Consumers Vice President James W. Cook. (Saginaw News Photo by Cliff James)

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Workers blame poor morale for nuclear plant difficulties

BY DAVE SEDGWICK
News Staff Writer

The Bechtel Corp.'s personnel policies have caused confusion and demoralization among workers — part of the reason for the massive breakdown in quality control that resulted in federal fines against Consumers Power Co., workers claim.

Three construction workers told The News Bechtel often hired inexperienced workers to handle quality control inspections.

They charge that Bechtel supervisors ordered installation of equipment without a proper go-ahead from inspectors, fired workers for trivial reasons and allowed a costly waste of construction materials.

Richard Letherer — a former shop steward for Local 85 of the Plumbers and Steamfitters union — detailed some of his charges in an affidavit to the Nuclear Regulatory Commission.

Letherer, a Zilwaukee resident and a pipefitter with 27 years of experience, claimed the following:

- Inspectors from the Nuclear Regulatory Commission tipped off Bechtel supervisors on the equipment they would check, so that construction foremen could get the suspect areas cleaned up.

- Quality Control inspectors were hired virtually "off the street," and had little or no experience in the construction crafts.

- Bechtel Corp.'s supervisors switched foremen and workers from task to task seemingly at random, forcing delays while workers learned their new assignments.

- Workers often were ordered to install equipment without proper quality control documentation.

Then they would have to tear out pipes, pumps and cables when inspectors discovered the paperwork error. This led to "gross waste" and large cost overruns, Letherer said.

- Bechtel supervisors harassed

workers by firing them for trivial reasons, such as opening a lunch bucket a minute early. As a result, workers' morale plummeted.

Two laid-off workers — both members of Local 85 — told The News they could back up all Letherer's charges except the first.

And it was that first charge — aired at Tuesday night's public hearing — that led to a heated exchange between the Government Accountability Project and the NRC.

Thomas Devine, an attorney for GAP, repeated Letherer's accusations to agency officials.

The NRC bluntly denied the charge. "We do not tell them what we are going to look at," replied Wayne Shafer, chief of the NRC's Midland team.

The agency sometimes tells the utility in advance that it will make an inspection. "But the exact specifics are not known to the licensee," said NRC inspector Ron Cook.

Letherer contends that workers usually installed equipment properly and that welders performed high-quality work. But due to paperwork snafus and a backlog of inspections, quality control personnel could not prove the work was done properly.

Pipefitter Charles E. Roots said inexperienced quality control inspectors created construction bottlenecks. "When it came to welding, some had book knowledge but no experience. It's hard to have someone check something if he never did it before," he said.

Roots, a 33-year-old Vietnam veteran who is studying to become a minister, has more than ten years' experience as a pipefitter. Laid off last December, Roots spent roughly four years at the Midland plant site.

Foremen often told workers to install equipment without the proper quality control documentation.

"Sometimes they would tell you to get started, and they'll get the paperwork later. Then the QC guy asks you

what are you doing, so you have to tear it out," Roots said.

These policies led to substantial waste of costly pipes and other materials. "You've got dumpsters full of just about anything. I sometimes wonder where it all goes," Roots added.

Bechtel's policy of firing workers takes away workers' incentive to do their jobs properly, said Mike Gentry, a 37-year-old welder from Sanford. "If you hurt morale like that, everything starts going downhill," Gentry said.

Quality control inspectors often were not as experienced as the workers they were checking, Gentry said. "They'll hire a guy with a two-year junior degree from school, start him as a quality control inspector, and let him work his way up. I don't see why they do that. It's a hindrance," Gentry said.

Gentry said he has nearly 20 years' experience as a welder. The Oklahoma native spent several years at the Midland Plant before he was laid off in December.

Consumers Power spokesman Norm Saari said 247 quality control inspectors at the Midland site are trained according to established standards.

"There are instances when QC inspector-candidates possessing proper educational requirements, are hired directly off the street for entry-level jobs. This is in total accord with national standards..." Saari noted in a prepared statement.

"However, before they are allowed to perform inspections on (safety) systems, they must undergo a training program and pass certification tests to qualify them to perform specific inspections."

Saari noted that workers often are reassigned to different parts of the plant according to the work-load. Saari declined comment on Bechtel's alleged policy of firing workers for trivial reasons.



Richard Letherer



Charles Roots



Michael Gentry



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

Attachment 2

FEB 8 1983

Docket No. 50-329
Docket No. 50-330
EA 83-3

Consumers Power Company
ATTN: Mr. John D. Selby
President
212 West Michigan Avenue
Jackson, MI 49201

Gentlemen:

This letter refers to the special inspection conducted by the Office of Special Cases, Midland Section, of this office on October 12 - November 25, 1982, and on January 19-21, 1983 of activities at the Midland Nuclear Power Plant, Units 1 and 2, authorized by NRC Construction Permits No. CPPR-81 and No. CPPR-82. The results of the inspection were discussed with you on November 10 and 23, 1982, on January 21, 1983 at the conclusion of the inspection and on January 18, 1983 in the Region III office during an enforcement conference between you and others of your staff and me and others of the NRC staff.

The inspection was primarily a physical inspection of installed equipment to verify conformance to approved drawings and specifications. The results of the inspection indicate a breakdown in the implementation of your quality assurance program as evidenced by numerous examples of noncompliance with nine of the eighteen different criteria as set forth in 10 CFR 50, Appendix B. The breakdown was caused by personnel who failed to follow procedures, drawings, and specifications; by first line supervisors and field engineers who failed to identify and correct unacceptable work; by construction management who failed to call for quality control inspections in a timely manner, allowing a backlog of almost 16,000 inspections to develop; and by quality assurance personnel who failed to identify the problems and ensure that corrective actions were taken. As a result, you failed to fulfill your primary responsibility under Criterion 1 of Appendix B to 10 CFR 50 to assure the execution of a quality assurance program. In addition, of particular concern to the NRC is the fact that quality control (QC) supervisors instructed QC inspectors to suspend inspections if excessive deficiencies were found during the performance of inspections. Consequently, not all observed deficiencies were reported, and complete inspections were not performed by all QC inspectors after the reported deficiencies were corrected.

I understand that, because of our findings, you have inspected other areas of the plant and found similar deficiencies. As a result of our findings, your findings, and your assessment of the overall project, you halted certain safety-related work at the Midland site, reduced the work force by approximately 1100

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

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people, committed to building cleanup and system layup, committed to organize teams of construction and engineering personnel responsible for the completion of one or more plant systems, and committed to reinspect safety-related systems. I expect that you will also conduct an inspection to determine the extent to which QC supervisors at the Midland site have been instructing QC inspectors to limit findings of deficiencies and the extent to which QC inspectors have been conducting reinspections based only on reported deficiencies.

To emphasize the need for CPCo management to ensure implementation of an effective quality assurance program that identifies and corrects construction deficiencies, we propose to impose civil penalties for the items set forth in the Notice of Violation that is enclosed with this letter. The violations in the Notice have been categorized as Severity Level III violations in accordance with the General Statement of Policy and Procedure for Enforcement Actions, Appendix C of 10 CFR 2. The base value for a Severity Level III violation is \$40,000. However, as a result of your past enforcement history involving quality assurance and the multiple examples of QC deficiencies for the areas inspected, the base civil penalty for each violation is being increased by fifty percent.

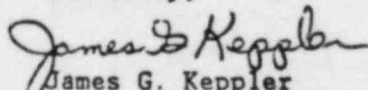
After consultation with the Director of the Office of Inspection and Enforcement, I have been authorized to issue the enclosed Notice of Violation and Proposed Imposition of Civil Penalties in the cumulative amount of One Hundred Twenty Thousand Dollars (\$120,000).

You are required to respond to this letter and should follow the instructions in the Notice when preparing your response. In your response you should describe the results of your inspections to determine the extent to which QC supervisors instructed QC inspectors to limit findings of deficiencies, the systems affected, and your corrective actions to ensure that all affected systems are adequately reinspected. Your reply to this letter and the results of future inspections will be considered in determining whether further enforcement action is appropriate.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter and the enclosures will be placed in the NRC Public Document Room.

The responses directed by this letter and the enclosed Notice are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, PL 96-511.

Sincerely,


James G. Keppler
Regional Administrator

Enclosure:
Notice of Violation and
Proposed Imposition of Civil Penalties

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ANALYSIS
of
CONSUMERS POWER COMPANY'S
PROPOSED CONSTRUCTION COMPLETION PLAN

By the
GOVERNMENT ACCOUNTABILITY PROJECT
CITIZENS CLINIC

On behalf of the
LONE TREE COUNCIL

Presented to the
NUCLEAR REGULATORY COMMISSION
AT MIDLAND, MICHIGAN

February 8, 1983

Prepared by:

Billie Pirner Garde, Director, Citizens Clinic
Thomas Devine, Legal Director
Marya C. Young, Investigative Staff

Government Accountability Project of the
Institute for Policy Studies
1901 Que Street, N. W.
Washington, D. C. 20009

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On behalf of the Lone Tree Council and concerned Michigan citizens and nuclear workers, the Government Accountability Project (GAP) recommends that the Nuclear Regulatory Commission (NRC or Commission):

- 1) withhold approval of the Construction Completion Plan (CCP) proposed by Consumers Power Company (Consumers) for the Midland Nuclear Power Plant until the Commission discloses the quality assurance (QA) violations that made the CCP necessary;
- 2) restructure the multiple proposed audits/third-party reviews into one comprehensive independent third-party review;
- 3) require a separate public meeting to deal specifically with the specific methodology and procedures to be used in the third-party review;
- 4) modify the Construction Permit to maintain suspension of all safety-related work until the entire third-party review program, including but not limited to third-party selection, scope, procedures and other methodological considerations, is approved and incorporated into the Construction Permit;
- 5) request Consumers to release the new cost and projected completion date estimates; and
- 6) immediately halt the ongoing soils work until the quality assurance implementation auditor is approved.

I. BACKGROUND

The Government Accountability Project is a project of the Institute for Policy Studies (IPS), Washington, D.C. The purpose of GAP's three clinics -- Federal Government Clinic, Citizens Clinic and Nuclear Clinic -- is to broaden the understanding of the vital role of the public employee, private citizen and nuclear worker, respectively, in preventing waste, corruption or health and safety concerns. GAP also offers legal and strategic counsel to whistleblowers, provides a unique legal education for law student interns, brings meaningful and significant reform to the government workplace, and exposes government actions that are repressive, wasteful or illegal, or that pose a threat to the health and safety of the American public. Presently, GAP provides a

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program of multi-level assistance for government employees, citizens and corporate employees who report illegal, wasteful or improper actions. GAP also regularly monitors governmental reforms, offers expertise to Executive Branch offices and agencies, and state and local governmental bodies, and responds to requests by Congress and state legislatures for analysis of legislation to make government more accountable to the public.

In March 1982, GAP's Citizens Clinic became actively involved with the Midland Nuclear Power Plant. The Lone Tree Council asked GAP to pursue allegations from workers of major problems at the Midland plant. After our preliminary investigation, we compiled six affidavits which we filed with the NRC on June 29, 1982. Since then we have filed four additional affidavits resulting from the heating/ventilation/air conditioning (HVAC) systems quality assurance breakdown revelations. We are also preparing an expanded affidavit from one of our original witnesses, Mr. E. Earl Kent, who has alleged serious welding construction problems at the Midland site. Other alarming allegations, ranging from security system breakdowns to worker safety problems, have come to our attention recently. As a result, we have expanded our investigation of the Midland plant.

In October and November 1982, GAP participated in two other public meetings at NRC offices in Bethesda, Maryland. These meetings dealt with Consumers' proposals to the NRC Staff on a soils remedial construction implementation audit and an independent review program that was to assure the Staff of construction quality and the "as-built" condition of the facility. GAP submitted its analysis of the September 17 and October 5 proposals in October 27 and November 11 letters, respectively. The GAP comments revealed substantial weaknesses in the programs, inadequate information to judge program adequacy, and basic lack of independence of the proposed main independent review contractors.

Following those meetings, the NRC Staff-- (1) rejected the Management Analysis Corporation (MAC) due to lack of independence; (2) requested that the Terra Corporation review a second safety system in its "vertical slice" plan; (3) requested expansion of the review of the "as-built" condition of the plant; and (4) failed to take a position on the Stone & Webster audit of soil underpinning work.

In late November the NRC Region III Special Section on the Midland plant completed an extensive inspection of the hardware and materials in the nuclear plant's diesel generator building. According to NRC public statements, this inspection revealed major

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problems related to the quality assurance of the plant and included an extensive backlog of quality assurance/quality control documentation, inability to provide materials traceability, unqualified and/or uncertified welders, and other serious problems.

Yet, in spite of the major revelations of inadequate construction practices, in late December the NRC Staff permitted soils remedial work to begin. It is GAP's position, well known to the Staff, that this premature approval violates the June 1982 request of the Advisory Committee on Reactor Safeguards (ACRS) to NRC Chairman Nunzio Palladino. The June 8 letter further states that ACRS would defer its own "recommendation regarding operation at full power until we have had the opportunity to review the plan for an audit of plant quality...." This assessment, according to the letter, should include "...Midland's design adequacy and construction quality with emphasis on installed electrical, control, and mechanical equipment as well as piping and foundation... design and construction problems, their disposition, and the overall effectiveness of the effort to assure appropriate quality."

Finally, in the past two months GAP has continued its attempt to determine the seriousness of the situation and the adequacy of proposed solutions for the Midland plant. Our efforts at working with the Office of Inspection and Enforcement (IE) and Office of Investigation (OI) staffs have been frustrating. For example, although NRC letters and public presentations responding to GAP's October 22 and November 11 requests were informative, they failed to provide the key methodology necessary to assess the adequacy of the program. When GAP investigators attempted to pursue the questions at the public meeting, they were told "to allow the NRC time to ask for those documents." (NRC Public Meeting, Bethesda, Maryland, November 5, 1982.) Subsequently, GAP repeated the request in its November 11 letter. Over two-and-one-half months after the original request, GAP finally received the NRC's response: "You may wish to request access to the documents from Consumers Power." (December 14, 1982 letter from James G. Keppies to Billie Garde.)

It is clear that the NRC Staff plans to evade or ignore public requests for the minimum information necessary to complete a responsible review of the proposed independent audit.

Our experiences at the William H. Zimmer plant in Ohio and at the LaSalle plant in Illinois have led us to be extremely skeptical of the NRC Staff's conclusions about the safety of nuclear power plants. In those cases the Staff either deliberately covered up or

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missed major QA violations at plants 97% and 100% complete, respectively. To illustrate, after the Staff virtually ignored GAP analysis and granted approval for full power operations at LaSalle, the plant was able to operate for less than 24 hours before being shutdown due to a hardware breakdown. At Zimmer, the Staff-approved Quality Confirmation Plan was so ineffective that on November 12, 1982 the Commission suspended all safety-related construction.

As a result, there is no basis for confidence in an NRC-approved CCP on faith. The basis for this extraordinary remedy must be full disclosed, as well as the methodology for an independent review. In order to accomplish this goal, the Regional Administrator should be suspending all construction until the above recommendations (infra, at l) are incorporated into the Construction Permit.

II. GROUND FOR SUSPENSION OF A CONSTRUCTION PERMIT

A. Legal Requirements

The law gives the Commission broad discretion to revoke, suspend or modify the construction permit of an NRC licensee. 42 U.S.C. §2236 states that:

A license or construction permit may be revoked, suspended or modified in whole or in part, for any material false statement in the application for license or in the supplemental or other statement of fact required by the applicant; or because of conditions revealed by the application for license or statement of fact or any report, record, inspection, or other means which would warrant the Commission to refuse to grant a license on an original application; or for failure to construct or operate a facility in accordance with the terms of the construction permit or license or the technical specifications in the application; or for the violation of or failure to observe any of the terms and provisions of this chapter or of any regulation of the Commission.

Part 50.100 of Title 10 of the Code of Federal Regulations states the same criteria for the revocation, suspension or modification of a construction permit.

The NRC has a mandatory duty to exercise this authority when necessary. According to the decision in Natural Resources Defense Council v. U.S. Nuclear Regulatory Commission, 582 F.2d 166 (2nd Cir. 1978), under the Atomic Energy Act of 1954, the NRC is required to determine that there will be adequate protection of the health and safety of the public. The issue of safety must be resolved before the Commission issues a construction permit. (Porter Cty. Ch. of Izaak Walton League v. Atomic Energy Commission, 515 F.2d

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513, 524 (7th Cir. 1975).)

B. Criteria to Exercise Discretion

According to 10 C.F.R. §2.202, the NRC "may institute a proceeding to modify, suspend, or revoke a license or for such other action as may be proper by serving on the licensee an order to show cause which will: (1) allege the violations with which the licensee is charged, or the potentially hazardous conditions or other facts deemed to be sufficient ground for the proposed action." As interpreted by the Proposed General Statement of Policy and Procedure for Enforcement Actions, published in the Federal Register, 44 Fed. Reg. 66754, Oct. 7, 1980 (10 C.F.R. §§2.202, 2.204), suspending orders can be used to remove a threat to the public health and safety, the common defense and security or the environment. More specifically, suspension orders can be issued to stop facility construction when further work would preclude or significantly hinder the identification and correction of an improperly constructed safety-related system or component; or if the licensee's quality assurance program implementation is not adequate and effective to provide confidence that construction activities are being properly carried out. Moreover, orders can be issued when the licensee has not responded adequately to other enforcement action or when the licensee interferes with the conduct of an inspection or investigation or for any reason not mentioned above for which license revocation is legally authorized. In order to help determine the significance of violations within this list, the Commission established "severity categories" ranging from the most fundamental structural flaws (Severity I), to minor technicalities (Severity VI). 44 Fed. Reg. at 66758-59.

Region III's enforcement criteria are consistent with these guidelines. For example, in a February 26, 1981 meeting on the Zimmer plant, Regional Administrator Keppler explained that if there is faulty construction and the program to control the problem is inadequate, there is no choice but to stop the project. This criterion was illustrated through the example of an across-the-board breakdown in a quality assurance program. (February 26, 1981 Transcript of Taped Meeting Between Members of the Region III Staff and Representative of the Government Accountability Project and Mr. Thomas Applegate, at 127, 129.)

C. Specific Bases for Suspension

The Region III Staff has characterized the problems at Midland as both extremely serious and directly relating to a quality assurance breakdown. (Detroit Free Press,

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December 5, 1982.)

In light of two previous amendments to Mr. Keppler's testimony before the Atomic Safety and Licensing Board and a pending third revision, it is apparent that the only course of action available to the NRC is to modify the construction permit now, before construction resumes.

1. Safety-related defects

GAP's review of inspection reports, interviews with nuclear workers, and review of the ASLB hearing testimony reveals an historical pattern of increasingly significant safety-related problems at Midland, including failures to comply with the law and NRC regulations, as well as to correct past non-compliances.

Although the GAP investigation and analysis of NRC records is far from complete, significant threats to the safety of the Midland plant include the following:

a. Welder qualification

10 C.F.R. 50, Appendix B, Criterion IX requires--

Measures shall be established to assure that special processes, including welding, heat treating, and nondestructive testing, are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements.

At Midland welder qualification problems are well known to the public. On December 2, 1982 Consumers laid off all of the welders of the Zack Company. They were trained by a vendor, Photon Testing, that was not NRC-approved. Although Consumers has publicly characterized this as "only a paper work problem" (Norman Saari to local NBC Channel 5 television, January 1982), it remains a serious unanswered question about the Midland plant. Until the public knows the extent of "uncertified/unqualified welders, it is virtually impossible to determine the adequacy of any plan -- short of a 100% reinspection of all unqualified welds performed by welders whose qualifications have not been verified.

2. Documentation and care of welding equipment

As seen above, Criterion IX requires careful verified maintenance of welding equipment. For example, portable ovens, or "caddies," must be plugged in at all times, except during transport to and from the rod shack. Affidavits submitted by GAP in June reveal serious problems with welding equipment, welding rods, and a failure to comply

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with either professional codes or NRC requirements.

In fact, the NRC's own report into the initial Zack allegations confirmed that the welding rods had not been adequately controlled by attendants. Attendants did not even know that the weld rods were to be heated. At least one caddy was slightly warm and another "relatively cold." The ovens apparently had been unplugged for "quite a while." The QC inspector also found welding equipment that was uncalibrated.^{*/}

3. Inadequate corrective action for welding violations

Of course, once violations are identified, the utility is legally obligated to correct them. 10 C.F.R. 50, Appendix B, Criterion XVI, requires, in part--

Measures shall be established to assure that conditions adverse to quality such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition.

It is all too clear that Consumers did not take seriously the \$38,000 fine for identified Zack deficiencies or the order to ensure compliance with the law. The December 1982 Zack welder lay-off may be prophetic of what the public can expect if Consumers is put in charge of the plant's completion.

4. Electrical cables

10 C.F.R. 50, Appendix B, Criterion XV requires--

Measures shall be established to control materials, parts, or components which do not conform to requirements in order to prevent their inadvertent use or installation. These measures shall include, as appropriate, procedures for identification, documentation, segregation, disposition, and notification to affected organizations. Nonconforming items shall be reviewed and accepted, rejected, repaired or reworked in accordance with documented procedures.

GAP witnesses revealed widespread inaccuracies in the use of electrical cables critical to safe operation of the plant, and shutdown in case of an accident. In September 1982 the NRC ordered 100% reinspection of all cables on site. Currently, the public has no idea how many nonconforming cables are being found on site. Witnesses inside the plant have reported to GAP that only a small percentage of those discovered are being

^{*/} NRC Region III investigation into allegations of Mr. Dean Darty, March 1979.

reported. In one affidavit, a witness reported that others have been replaced without documentation.

The violations summarized above provide only a few examples of the suspect safety components at Midland. Other whistleblowing disclosures to Region III referred to welding standards below ASME specifications; undersized welds; anchor bolts improperly installed; excessive weight on electrical conduits; hollow walls; corrosion in the small bore piping; unapproved design modifications; and other safety defects.

Even if management systems and security measures were sound, the physical deficiencies already documented at Midland justify a suspension of construction. Before permitting work to continue, the Commission should thoroughly assess the damage through independent tests; monitor the results of a comprehensive, independent audits; and modify the construction permit to include the changes.

D. Quality Assurance

A licensee's quality assurance program is its internal structure of checks and balances to guarantee safe operations. Every applicant for a construction permit is required by the provisions of 10 C.F.R. §50.34 to include in its preliminary safety analysis report a description of the quality assurance program to be applied to the design, fabrication, construction and testing of the structures, systems and components of the facility. Quality assurance comprises all those planned and systematic actions necessary to provide adequate confidence that a structure, system or component will perform satisfactorily in service. Each structure, system or component must be documented, inspected and periodically audited to verify compliance with all aspects of the quality assurance program.

The cause of the safety defects described above is an inadequate quality assurance program, which has been in shambles for a decade. In fact, in 1973 the original Midland licensing appeal board members felt so strongly about QA violations that the Director of Regulations pointed out that even though the Appeals Board could not take action on the IE findings--

[H]ad the construction permit proceeding still been before our Board at the time that the results of the November 6-8 inspection were announced, it is a virtual certainty that we would have ordered forthwith a cessation of all construction activities....

(November 26, 1973 Letter from L. Manning Muntzing, Director of Regulations, re: Quality Assurance Deficiencies Encountered at Midland Facility, p. 2.)

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The 1973 warning should have served as notice to both Bechtel and Consumers Power to resolve their QA problems. Quite the contrary, however, they ignored the notice. So did the NRC Staff: The QA problems at Midland continued unabated.

Both the 1979 and 1980 Systematic Assessment of Licensee Performance (SALP) reports give notice of further and expanded problems at Midland. The problems identified then (lack of qualifications of QC inspectors, continuation of work prior to corrective action) are similar to those cited as causes in the recent stop-work order. The reports also included acknowledgements of excessive QA backlogs and lack of timeliness. (SALP Report 1980.) Consumers' failure to learn from its mistakes passed the stage of accidental oversight long ago.

The lack of quality assurance at Midland has been a continuous concern to Region III. In the spring of 1982 at the release of the 1981 SALP rating, Mr. Keppler publicly reported that it was necessary to change previous testimony before the ASLB which had provided a "reasonable assurance" that the plant would be constructed in accordance with nuclear construction regulations. The revised testimony was submitted October 27, 1982. Although the original testimony was not modified substantially, it is clear that QA problems at Midland are unresolved.

Unfortunately, the Region III Staff seems satisfied with the basis upon which the Construction Completion Plan is developed: put Consumers in charge of the program.

The public already has had an opportunity to preview the results of Consumers' internal policy with the Zack debacle over the past three years. Its performance has been disappointing, at most.

Although the NRC fined Consumers \$38,000 for Zack's non-compliance with federal regulations and forced a major QA reorganization, further actions by the utility revealed a determination to hide problems -- regardless of the consequences. In fact, a December 22, 1982 NRC report about the revelations of a quality assurance breakdown at Zack headquarters acknowledges the role that Consumers played in the response to the 1979 citation:

On September 2, 1981, the services of a Senior Quality Assurance Engineer from Project Assistance Corporation (consultants) were retained by Consumers Power Company for assignment at Zack for the purposes of establishing a formal document control system and performing an indepth review of the conditions described by Zack in their September letter (Zack notified Consumers of [a] 10 CFR 50.55(e) on August 28, 1981).

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Consumers Power Company, unlike the two other utilities receiving materials from Zack, did not notify the NRC about the major problems in QA documentations. Those problems included falsified and altered documentation.

This example of the utility's response to the discovery of any major problems completely undermines the assumption upon which the Construction Completion Plan is based -- voluntary disclosure of QA violations. This assumption is both historically inaccurate and structurally flawed.

D. Maximizing Human Errors

"Human error" recently has been recognized as the Achilles Heel of even the most well-constructed plants. At Midland the phrase "comedy of human errors" would be more appropriate if the potential consequences were not so disastrous.

A key cause of human error is intoxication, which the NRC recognized last summer in proposed fitness-for-duty regulations. Our disclosures have reported widespread drunkenness on the job. Witness after witness has confirmed the routine of red-eyed employees who did their work under the handicap of an alcoholic stupor. Witnesses have also confirmed the frequent use of marijuana and stronger drugs. Intoxication weakens the capacity to install safety components, just as it debilitates the ability to drive or to engage in almost any other activity. At a minimum, the widespread use of drugs and liquor on-the-job increases the significance of a superficial quality control program. There are likely to be more defects! A nuclear plant constructed by drunken employees is likely to stagger into an accident.

III. RESTRUCTURE THE MULTIPLE AUDIT/THIRD-PARTY REVIEWS INTO ONE COMPREHENSIVE, INDEPENDENT REVIEW

In October and November 1982, two meetings were held to review Consumers proposed resolution for major quality assurance problems. These proposals and subsequent comments provided by GAP were made prior to completion of the major NRC inspection in November. Presumably, the audit suggested in the Construction Completion Plan (see CCP, at 16 and Figure 1.1) will incorporate those audits already discussed last fall. However, the CCP as proposed fails to resolve basic third-party review questions.

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The CCP states: "This section describes third party evaluations that have been performed and are planned to assess the effectiveness of design and construction activity implementation." Yet, closer scrutiny of the proposal shows that it fails to include even the most basic information about the promised third-party review. In fact, although the CCP states that an INPO evaluation has been completed, there is no indication of what that report revealed.

Most significant, the entire CCP is premature until all the third parties eventually chosen have completed their evaluations. The point of the third-party reviews is to define the QA violations and deficiencies at Midland. By rushing into the CCP before that process has begun in some areas, the utility is putting the cart before the horse. In effect, the utility's CCP is competing with the third-party program. At best, the two "reforms" will be operating simultaneously, stumbling over each other. Depending on the results of the outside reviews, CCP work may have to be redone -- consistent with the costly tradition at Midland of doing the same work over and over.

A. The INPO Construction Evaluation

This evaluation is limited by definition. It is only a "self-initiated evaluation." Neither the NRC nor GAP found the Management Analysis Corporation (MAC) adequately independent to provide a truly independent review of the problems at Midland. In fact, they have been involved in at least two other major audits of the plant -- neither of which turned up any of the significant construction deficiencies now facing Consumers.

A December 14, 1982 Region III letter to GAP underscored the NRC position on MAC:

The INPO and biennial QA audit are not an acceptable substitute for the third party review. ... Questions were raised concerning whether Management Analysis Company was sufficiently independent to assume lead responsibility for the independent review.

Although the MAC analysis may have provided a tool for Consumers to judge the quality of the plant, it simply is not an independent third-party evaluation. Instead, it was a test of INPO's ability to assess the "as-built" condition of the plant. Its adequacy is completely unknown, because the public does not even know if the INPO evaluation discovered the same flaws that the NRC found in its inspection.

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B. The Independent Construction Overview

This is the "meat" of the third-party review plan, yet it remains an ambiguous promise from Consumers to the NRC. Although the schedule (CCP, at 18) indicates that the scope has been defined and the consultant selected, this information has not yet been shared with the public. Until and unless the scope of the third-party review has been defined and the audit contractor selected, it is premature to make any judgments on the role and adequacy of the third-party review. Further, it is clearly inappropriate to indicate that a legitimate third-party review has been in place from the beginning of this reform effort, as Figure 1-1 suggests.

At Diablo Canyon the Commission set out very clear criteria by which an independent auditor would be chosen. ^{*/} At Zimmer GAP and the NRC are currently embroiled in a debate over the application of these guidelines in the selection of Bechtel for that role.

At Midland we again request that the NRC reestablish the fading legitimacy of the Commission's third-party reform efforts by requiring Consumers to provide the details of the selection process, the identification of the third party and the methodology by which it will accomplish its review.

We are alarmed that even in the sketchy details provided in the CCP, the proposed third-party review is only to be conducted for six months, "top management" will determine "what modification, if any, should be made to the consultant's scope of work." At a minimum, the NRC should recognize that any Construction Completion Plan must be based on the results of completed third-party findings, as well as an ongoing commitment for the duration of the project. The third-party review program must provide a comprehensive view of the as-built condition of the plant, and an independent assessment of all future construction. Nothing less will provide the public with any assurance that the Midland plant can operate safely.

^{*/} In a letter of February 1, 1982, Chairman Palladino explained to Congressmen Dingell and Ottinger the criteria according to which an independent auditor would be chosen at Diablo Canyon:

(1) Competence: Competence must be based on knowledge of and experience with the matters under review.

(2) Independence: "Independence means that the individuals or companies selected must be able to provide an objective, dispassionate technical judgment, provided solely on the basis of technical merit. Independence also means that the design verification program must be conducted by companies or individuals not previously involved with the activities...they will now be reviewing."

(3) Integrity: "Their integrity must be such that they are regarded as respectable companies or individuals."

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C. The Independent Design Verification (IDV)

The Tera Corporation already is conducting the "vertical slice" of the project. Because the auxiliary feedwater system selected by Tera has already been the subject of numerous audits, GAP suggested that it is not representative of potential problems at Midland. The NRC agreed and required Tera to review a second system.

Although that system has not yet been selected, we understand that Consumers has nominated three systems for review, of which one will be chosen by the NRC. Since October 22, GAP has recommended that the second system should be a safety system with a history of QA violations. Specifically GAP suggested the HVAC system. Certainly if the CCP's third-party review is to determine the plant's safety, it should be able to account for the most troubled systems.

In Mr. Keppler's October 12, 1982 letter to Billie Garde, he agreed with that position:

My decision regarding the independent audit of Zack work at Midland will be based on findings of [NRC inspections] and the licensee's third party independent assessments.

* * * * *

The fragmented and overlapping approach of the NRC, the utility and the "independent" auditors is self-defeating. It must stop, if Midland is to progress from a theoretical design to an operating plant. A truly independent, objective review must first be completed. Only then can a CCP begin to operate legitimately, with ongoing oversight from the outside auditors and the NRC.

IV. REJECT CONSUMERS' CONSTRUCTION COMPLETION PLAN

On April 8, 1981 Region III management overruled its investigative staff's recommendations to suspend construction at the William H. Zimmer Nuclear Power Station near Cincinnati, Ohio. Instead, the NRC issued an Immediate Action Letter which, inter alia, required the Cincinnati Gas & Electric Company to develop a Quality Confirmation Program (QCP). On November 12, 1982 the utter failure of the QCP forced the Commissioners to suspend all safety-related construction at Zimmer. Unfortunately, the Construction

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Completion Plan proposed for Midland bears a striking resemblance to the key flaws that doomed the QCP. In some cases, the CCP exacerbates the painful mistakes of Zimmer.

More specifically, the Construction Completion Plan-- (a) is permeated by an inherent conflict-of-interest; (b) institutionalizes a lack of organizational freedom for the quality assurance department; (c) fails to specify inspection procedures and evaluation criteria; and (d) is not comprehensive.

A. Inherent Conflict of Interest

The foundation of the CCP is to complete "integration of the Bechtel QC function into the Midland Project Quality Assurance Department (MPQAD) under Consumers Power Company management...." (CCP Executive Summary, at 3.)

Since Consumers has always played a significant role in the MPQAD, in effect the "reform" calls for the utility to second-guess its own previous decisions. This is the equivalent of the fox offering to do a better job of guarding the henhouse. If anything, the CCP intensifies the conflicts of interest in the QCP. At Zimmer the utility only imposed quality assurance violations clandestinely; at Midland the utility has openly participated in decisions to break the law.

B. Lack of Organizational Freedom for the Quality Assurance Department

The organizational premise of the CCP is a "team" concept that integrates construction, engineering and quality assurance personnel. The "team members will be physically located together to the extent practicable...." Although the proposal does not specify the identity of Team Supervisors, there is only one MPQAD representative among six specified in the plan. (CCP, at 8.)

The CCP supposedly is the reform to compensate for a quality assurance breakdown. Unfortunately, the plan would violate the criteria of 10 C.F.R. 50, Appendix B, Criterion I even for a healthy nuclear construction organization. The regulations require organizational freedom for QA functions. The QA department is required by law to serve as an independent check and balance on the construction program. The CCP turns that premise on its head by reducing QA representatives to a token minority on construction-dominated "teams."

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C. Failure to Specify Inspection Procedures and Evaluation Criteria

The proposal promises to develop and revise the procedures that will be used to conduct the reinspections. (CCP, at 8-9, 12.) Neither the procedures nor the evaluation criteria for the inspections are specified, beyond vague references to professional codes. This issue is the heart of the quality verification program. Unfortunately, at present the methodology of the program is a mystery. As a result, it is impossible to judge whether the CCP will represent a thorough reinspection or a superficial skimming. Further, the necessity to establish new QC procedures casts a shadow over all the current inspection procedures.

D. Lack of Comprehensiveness

CCP reinspections will only cover "accessible" completed construction, an undefined term. "Inaccessible" items will be handled by paperwork reviews. (CCP, at 10.) Further, the proposal defines-out from coverage "[t]hose activities that have demonstrated effectiveness in the Quality Program implementation...." (Id., at 20.) Included in this latter category are activities such as "HVAC Installation work being performed by Zack Company," and "[r]emedial [s]oils work which is proceeding as authorized by NRC."

This piecemeal approach effectively surrenders any pretensions that the CCP will provide a definitive answer to the Midland QA problems, even if the program were otherwise legitimate. To illustrate, the necessity for the reinspections in the first place is the inaccuracy of current quality records. Paperwork reviews will not contribute anything new.

The list of systems that have "demonstrated" quality effectiveness suggests the utility has completely lost touch with reality, or expects that the NRC Staff and the public have taken leave of their senses. Both the Zack HVAC and soils remedial work have been among the most scandal-ridden embarrassments of the Midland project. The crude deficiencies and violations have led to fines, multiple criminal investigations, and public humiliation for Consumers. The utility has only been able to continue soils remedial work by manipulating the public hearing process to circumvent NRC Staff enforcement orders. The list of "proven" systems proves only that Consumers is determined to impose the same nightmare on Midland that the Quality Confirmation Program represented at Zimmer. Hopefully, the NRC Staff will not be fooled again.

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D. Flaws in the CCP Program Implementation and Quality Program Review

By their terms, Section 5 (Program Implementation) and Section 6 (Quality Program Review) indicate that the CCP simply reflects the "status quo" attitude of Midland's management that propelled Consumers into this particular construction/regulation nightmare in the first place.

Although the CCP proposal is premature, inadequate, and fatally flawed, the language of the proposal reveals that management believes the Midland plant's QA program is "basically sound" (CCP, at 15), even in the face of deliberations by legal and advisory bodies on Consumers' ability to adequately implement any QA plan, no matter how sound.

The amount of management influence and interference has already been a subject of NRC concern. (See NRC Memorandum from C. E. Norelius and R. L. Spessard to James E. Keppler, June 21, 1982.) Yet, the CCP proposes as an answer to increase management involvement at every step of the implementation process (CCP, at 13-15). Further, the implementation fails to refer to how the inevitable conflicts between management officials watching the calendar and conscientious QA officials trying to do their jobs will be resolved.

The only clue that GAP has as to how Consumers plans to change the mindset of its demoralized workers is the Quality Improvement Plan (QIP) mentioned extensively in the fall proposals. This plan, referred to as the catalyst for ensuring new commitment and compliance to quality standards on the Midland site, is, according to the NRC officials familiar with it, an incentive-bonus concept for construction workers who "do the job right the first time." (NRC-GAP Telephone Conversation, January 27, 1983.) Like the Bechtel cost-plus contract, the Quality Improvement Plant is a series of rewards for doing the same job a worker was hired to do right in the first place. A quality improvement plan that bases critical construction adequacy on "prizes" given to its workers reveals a serious misunderstanding on the part of Consumers about the ultimate value of its work.

V. IMMEDIATELY HALT THE ONGOING SOILS WORK UNTIL THE QUALITY ASSURANCE IMPLEMENTATION AUDITOR IS APPROVED

Two significant milestones in the soils work have now been approved to proceed underneath the turbine building. This Staff approval is entirely inappropriate given the legal and advisory controversy over this operation. It is inexcusable to allow work to

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proceed without the independent audit upon which Mr. Keppler based his "reasonable assurance" testimony (October 27, 1982 Testimony to the Midland ASLB), and upon which the ACRS is depending to complete their own technical assessment before granting a full power license. Further, in light of administrative hearings which cover the adequacy of the soils quality assurance implementation (OM Proceedings), the NRC Staff approval is an insult to the court and to the citizen intervenors struggling to achieve a measure of fairness in the proceeding.

GAP's view on Stone & Webster, the proposed third-party for QA implementation audit, is documented in our October 22, 1982 letter. As an update and summary we believe that Stone & Webster meets only one of the three criteria for a legitimate third party. Yes, Stone & Webster has demonstrated economic independence from Consumers, disclosing other minor construction contracts with Consumers as well as their financial independence. But, Stone & Webster has not demonstrated its competence. Its long history of nuclear plant construction includes massive cost overruns, major Quality Control problems, significant design errors and poor construction management. Further, Stone & Webster's corporate integrity remains the subject of much skepticism, particularly in light of its six-month involvement on the Midland site without NRC approval of their work.

However, if the NRC is going to approve Stone & Webster -- as seems obvious -- and hold it responsible under 10 C.F.R. Part 21 for reporting violations or QA failures, then the Region should so so. Someone other than Consumers must watch the QA implementation of critical soils work.

VI. ENCOURAGE CONSUMERS TO RELEASE THE NEW COST ESTIMATE AND PROJECTED COMPLETION DATE INFORMATION

Although neither cost nor scheduling is an NRC concern, both are critical concerns of the residents of Central Michigan who must constantly balance the risks and costs of this nuclear plant. If public confidence is ever to be restored in the Midland facility, it will come after Consumers demonstrates candor and openness with the public. It would benefit everyone to have the yoke of the December 1984 "on-line target date" removed as

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soon as possible from the necks of the nuclear workers.

Likewise, the new cost projection is unknown by local residents. GAP sources indicate a \$4-billion-plus price tag, but that was an estimate which did not include the major stop-work order in December of last year.

If the plant is ever going to be included in the Michigan rate base, Consumers should begin today to adopt a new and candid approach to all of its problems. Public trust simply cannot be restored on anything less than honest admissions.

VII. CONCLUSION

There are too many questions about the Midland Nuclear Power Plant left unanswered at this time. These questions are forming the basis for growing public skepticism about the NRC's ability or willingness to regulate nuclear power. In Central Michigan this uneasiness and distrust have led previously inactive citizens and local government bodies to become involved in their own protection. The citizens' desire to be informed about the ultimate safety of the Midland plant led them to request assistance from the Citizens Clinic of the Government Accountability Project. Our investigation into worker allegations and analysis of the situation confirms the needs for a comprehensive answer.

Midland needs a verification program implemented by a truly independent company with no stake in the outcome of its audit. This independent third party is not serving a client's requirements, but rather the public interest in ensuring the quality of construction at the plant. That third party must be accountable only to the NRC and the public.

* * * * *

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2nd February 1983.

M/s Lynne Barnabei,
Government Accountability Project,
Institute for Policy Studies,
1901 Que Street, N.W.,
Washington, D.C. 20009.

Dear Lynne,

Many thanks for your most helpful response to my telephone inquiries last Monday. You asked to see any editorial comments in the paper arising from the Zimmer controversy and these are enclosed as follows:-

- (i) "Probe into claims of building defects at nuclear power site" - December 23 1982:
- (ii) "US nuclear row could reach UK" - January 20:
- (iii) "Clouds gathering over nuclear industry in US" - January 27:
- (iv) "Why US decisions may influence the Sizewell inquiry" - February 3. (This was written subsequent to our telephone conversation on January 31.)

As you will see, we are watching these developments closely and our reports are being followed with keen interest at top level in the UK construction industry. I would be most grateful if you will keep us informed on any further representations you may make; in particular, copies of letters etc. would be of great assistance. Perhaps you would kindly send invoices to cover any expenses in this respect.

Yours sincerely,

John D. Allen

JOHN D. ALLEN
Editor-in-Chief

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Probe into claims of building defects at nuclear power site

ALLEGATIONS of criminal negligence by contractors and client at a nuclear power station site near Moscow, 50km south east of Cincinnati, Ohio, where "thousands" of welds are said to be defective, are being investigated by a US Federal Grand Jury.

Construction of safety-related areas of the plant was stopped last month by the Nuclear Regulatory Commission when a number of irregularities were brought to its attention through a bizarre chain of events, including a safety probe by a local private investigator.

Other safety violations are claimed to involve missing or "doctored" construction records and charges of obstructive inspection officers while attempting to check areas of work vital to the plant's ultimate safety. Some officers claim they have been threatened while on site.

The Cincinnati Gas and Electric company owns a 60 per cent share in the William C. Zimmer plant which is said to be 97 per cent completed. American Electric and Dayton Power and Light own the remaining 60 per cent.

One factor in the puzzle that has surrounded the station's critics is how the plant was ever allowed to reach such an advanced stage of construction when so many defects have been claimed to be present for so long. Cincinnati Gas and Electric will admit to only a few administrative irregularities.

Investigations into CO&E's affairs and safety inspection at the Zimmer plant could have far-reaching implications for other nuclear power stations throughout the United States.

At present there are some 60 plants in various stages of construction in the USA, and as the NRC has readily admitted, it does not have the resources to investigate every safety aspect of every plant in the country. Many critics believe other plants in the process of construction could also conceal construction defects. An NRC spokesman near Chicago, whose area covers the Zimmer

plant, said the Commission generally relies on the contractor and the client to ensure that work is carried out in strict accordance with safety rules. The NRC simply does not have the manpower or other necessary resources to inspect every plant thoroughly.

Meanwhile a cloud of uncertainty hangs over the \$1,000 million Zimmer plant. While it is possible that the 840MW plant has too many defects ever to be licensed for generating power, there is a slim chance that CO&E might eventually shake it into shape to start operation.

Warnings that things had started to err in the Zimmer plant are said to date back to the mid 1970s when the NRC first received complaints about activities at the site. But it was not, ironically, until Thomas Applegate, a Cincinnati private investigator, came on the scene that the full catalogue of the plant's shortcomings came to the attention of the NRC.

Mr Applegate was hired by the wife of a worker employed at the Zimmer plant to investigate a domestic affair. During his inquiries the private investigator discovered that some workers at Zimmer were "fudging" timesheets.

So impressed was the utility's safety officers at the assiduous efforts of Mr Applegate at delving into the plant workers' "irregular dealings," that they later hired him to work for them at the plant. His employment lasted one month. While the utility claims it let him go as his work was finished, Mr Applegate himself says he was dismissed because the utility was "embarrassed" that he was uncovering construction faults at the site.

Mr Applegate, armed with a dossier of irregularities at the site which, he claims, included theft of materials and welding defects, approached the Nuclear Regulatory Commission which later, in November 1981, led to a \$125,000 fine against the utility, thought to be the biggest fine ever imposed in connection with a nuclear construction project.

So it took a personal campaign by Mr Applegate to bring to light the dubious activities at the site. In May, 1980, Mr

Applegate contacted the Government Accountability Project in Washington DC — a private body described as a "Ralph Nader-type organisation" — asking GAP to look into the site's dealings.

GAP, manned mostly by lawyers with an appetite for this kind of investigation, took up the challenge and gathered more evidence of malpractice at the site. The NRC started fresh investigations into the Zimmer plant and the \$125,000 fine was the result. NRC, in its report, cited 12 out of a possible 18 cases where safety criteria for building nuclear power stations had been violated.

In addition to charges of irregular paper work, defective welds and other safety-related faults, Cincinnati Gas and Electric refused claims of drug and alcohol abuse at the site. Gambling and the raffling of firearms were also denied.

GAP wanted all work stopped at Zimmer until the areas of work already completed at the site had been thoroughly checked and remedied if necessary by independent engineers.

In November, the NRC's five commissioners voted in favour of an immediate stoppage to construction at the Zimmer plant pending a full search into the station's growing list of irregularities.

Events at the Zimmer plant, and others at the much publicised Diablo Canyon nuclear station in California and another plant in south Texas operated by Houston Lighting and Power, have prompted growing fears that there could be many more stations, either in construction or in operation, where there are potentially dangerous inherent construction faults.

Documents released through the US Freedom of Information Act by the NRC show that in the early 1970s federal inspection reports were written for plants that were in various stages of construction.

Many critics of the system by which safety inspections are carried out at US nuclear power stations now feel they have the ammunition to lobby Congress for a major shake-up in the construction control agencies.

CONSTRUCTION INDICES

INDICES FOR USE WITH PRICE ADJUSTMENT FORMULAE
— DECEMBER 1982

Mechanical Engineering Labour Index L1
Electrical Engineering Labour Index L4
Steelwork Labour Index B1
Civil Engineering Steelwork Labour Index No 13

THE Memorandum of Agreement between the Engineering Employers' Federation and the Confederation of Shipbuilding and Engineering Unions dated October 1979 increased the annual holiday entitlement by one day during the period November 1, 1982 to October 31, 1983 bringing the total to 25 days.
The indices have been adjusted to include this change from and including November 1982.

Work Category 2A3 — Glass, Mirrors and Patent Glazing
The September index value for Work Category 2/A3 is being held provisional pending a review of one of the constituent material indices.

Any enquiries relating to the technical content of these indices but not on contractual matters may be made in writing to: Technical Secretariat, Working Group on Building and Civil Engineering Indices, Room 1333, Property Services Agency, Lunar House, Wellesley Road, CROYDON CR9 2EL. Telephone enquiries: 01-212 3434; ask for public inquiry unit.

Firm Index - Latest provisional index

BUILDING WORKS - SERIES DEC 1980 June 1978 = 100		Base	June
1	Demolition & alterations	220	222
2	Site Preparation, excavation & drainage	220	222
3	Foundations & general filling	216	220
4	Structural steelwork	220	222
5	Shed steel framing	180	185
6	Concrete	220	222
7	Non-structural precast concrete components	220	222
8	Structural precast concrete units	220	222
9	Non-structural precast concrete components	220	222
10	Roofing	220	222
11	Brickwork & masonry	220	222
12	Normal stone	220	222
13	Asphalt work	220	222
14	Seals & the roofing	220	222
15	Asbestos-removal sheet roofing & cladding	220	222
16	Plastic covering sheet roofing & cladding	220	222
17	Aluminium sheeting & cladding	220	222
18	Built-up felt roofing	220	222
19	Built-up felt roofing on metal decking	220	222
20	Canvas, tarpaulin & steeling	220	222
21	Hardwood flooring	220	222
22	Tile & sheet flooring (incl. tile)	220	222
23	Decorative flooring (incl. carpet)	220	222
24	Carpeted stairs	220	222
25	Hardwood joinery	220	222
26	Paintwork	220	222
27	Insulation	220	222
28	Steel windows & doors	220	222
29	Aluminium windows & doors	220	222
30	Miscellaneous metalwork	220	222
31	Cast iron pipes & fittings	220	222
32	Plastic pipes & fittings	220	222
33	Copper tubes, fittings & systems	220	222
34	Lead pipes, fittings & tanks	220	222
35	Boilers, furnaces & radiators	220	222
36	Sanitary fittings	220	222
37	Refrigeration	220	222
38	Pressing to work & roofing	220	222
39	Boats & boats to fit, fit & prep.	220	222
40	Dry partitions & walls	220	222
41	Filing & services work	220	222
42	Structural settings (dry construction)	220	222
43	Decorative masonry & paving	220	222
44	Decorations	220	222
45	Decorative masonry (other than cast stone)	220	222
46	Fencing, gates & screens	220	222
47	Groundwork surfacing to roads & paths	220	222
48	Soft landscaping	220	222
49	Land Work	220	222
APPX			
1	Building labour (subset)	220	220
2	Building labour (complete)	220	220
3	Working labour	220	220
4	Working labour	220	220
5	Working labour	220	220
6	Working labour	220	220
7	Plant	220	220

Road scheme plans: Approval given to use more consultants

TRANSPORT Minister David Howell has agreed that more firms of consultants should be allowed to work on the planning of new road schemes. The number has now been doubled.

His statement follows the "privatisation" of the RCU's and criticism by warring MPs that, at first, the work was restricted to only 15 companies.

Mr Howell has now told the

public accounts committee that his department "remains of the view that to have allocated existing RCU work to significantly more than the 15 chosen consultants would have created major problems in maintaining the continuity of the road programme."

However, the department accepted the recommendation that new work should be spread over a wider field. "Since the sub-unit's work was transferred, work on new road schemes has already been offered to a further 16 firms of consultants."

The government has also replied to reports over the cost of remedying defects in hospitals. There may be a black list in future of consultants guilty of poor performance.

The DHSS, said the Scottish and Welsh health departments are considering whether it would be possible "to set out clear definitions of the duties of the various parties who are involved in vetting consultants' designs of building schemes."

The health departments have introduced arrangements for the exchange of information with

health authorities about work undertaken by consultants and their performance. Arrangements have been made. MPs have been told, "to inform the inter-departmental committee on professional fees of gross performance by individual consultants who they would be irrelevant to other departments."

The government is also considering what can be done to ensure that consultants engaged in public works contracts carry adequate insurance against negligence. The government also promised that health departments would "continue to investigate fully the causes of any significant defects which come to light, where appropriate will take such steps as are necessary to minimise the risks of recurrence elsewhere; and wherever practicable will seek to recover costs of making good defects from these responsible."

Minister says: Don't lose out on materials sales abroad

BRITAIN'S building materials industry must do its utmost to secure maximum participation in overseas construction projects wherever a British contractor is involved, regardless of whether or not the consultants happened to be British.

The urgent need to expand sales abroad was expounded to the Building Materials Export Group at its annual meeting by John Stanley, Minister for Housing and Construction. He said that building material exports now running at £1,200 million a year presented an area of tremendous opportunity.

The information coming back to the government showed that

British manufacturers were often losing out. The Minister cited the example of King Khalid International Airport, where Bechtel, the managing contractor, had laid down specifications requiring the bulk of materials to be purchased in the United States.

Saudi-Tarmac, the only British contractor taking part in this huge project, had to set up a procurement office in New York because of the \$8 million worth of materials they needed, no less than \$7 million was coming out of the United States.

Instances of this kind according to Mr Stanley raise the important issue of establishing

internationally acceptable standards for British products. Not only that, it was questionable whether present British Standards were high enough for the European and American markets.

"If they aren't," said the Minister, "we will certainly fail to penetrate the high value markets of North America and Western Europe to the extent that we should."

BMEG chairman T.B. Addington-Smith, the Minister's managing director, said the industry was now looking to the East as the growth market for building material exports.

CIVIL ENGINEERING (NOV 1980) Base 1978 = 100 except for Index 11.0 where base is July 1976 = 100			
Labour	Aug	Oct	Nov
Price and equipment	1	480.0	480.0
Sand and gravel as per works	2	451.6	454.1
Engineering bricks delivered	3	588.5	588.3
Concrete delivered	4	499.4	499.3
Cast and spun iron pipes and fittings	5	545.0	549.3
Cement immediate deliveries	7	508.1	509.9
OSBY fuel	8	468.7	528.9
Gas oil fuel	9	1107.9	1262.8
Incrusted asphalt	10	458.7	457.8
Asphalt - hot mix, burnt and delivered	11	171.0	171.0
Lign. in rolled lags and sections	11a	427.7	427.7
Structural steel	12	447.0	447.0
Structural iron	13	529.5	529.5

SPECIALIST ENGINEERING - SERIES DEC 1980 PART 1: ELECTRICAL INSTALLATIONS Base 1978 = 100 except for Index 11.0 where base is July 1976 = 100			
Labour	Aug	November	December
PART 1: ELECTRICAL INSTALLATIONS			
Labour	5/1	504	501
Miscellaneous	5/2	480	480
PART 2: HEATING & VENTILATING AND SPRINKLER INSTALLATIONS			
Labour	5/1	480	480
M & V Materials	M/2	480	470
Specialist	S/2	480	480
PART 3: LIFTS			
Mechanical Engineering Labour	L/1	500	500
Mechanical Engineering Materials	L/2	480	480
Electrical Engineering Labour	L/3	480	480
Electrical Engineering Materials	L/4	480	480
PART 4: CIVIL ENGINEERING EQUIPMENT			
Labour	C/1	480	480
Mechanical Engineering Materials	C/2	480	480
Paintwork	C/3	480	480
Formwork	C/4	480	480
PART 5: STRUCTURAL STEELWORK			
Labour in fabrication and erection of	S/1	480	480
Materials	S/2	480	480

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No. 5798

THURSDAY, JANUARY 20, 1983

40p

US NUCLEAR ROW COULD REACH UK

BECHTEL, the multi-national giant which helped design Britain's first PWR power station — currently the subject of what could prove to be the biggest public inquiry this country has ever seen — is now the focus of a fierce anti-nuclear debate which could paralyse the US atomic power programme.

The controversy could spread to the UK, where the influence of a small Whetstone-based Bechtel team in the design of the Sizewell B reactor has incensed US nuclear power opponents, some of whom are planning a trip to Sizewell in protest.

Concern over the safety of two US plants in which Bechtel is directly involved has prompted opponents of the American nuclear power policy to question the ability of Bechtel, a company which has been responsible for more than a quarter of all the plants built or being built in the US.

Ironically, many of the present ailments affecting nuclear power stations throughout America came to light purely by chance. This is readily admitted by the Nuclear Regulatory Commission, the body charged with ensuring that nuclear plants are safe.

An extraordinary survey of nuclear plants in the mid-Western states by the NRC revealed shortcomings in nuclear plants being built in central US. It was prompted mainly by a personal campaign by a private investigator in Ohio. His tenacity led to a \$125,000 fine being imposed on a utility whose plant was found to have severe safety violations.

It was the efforts of Tom Applegate, a private investigator from Columbus, Ohio, and others who worked at the W H Zimmer plant near Cincinnati, that resulted in a lengthy investigation into safety doubts at the boiling water reactor station and ultimately, in a wide reaching

search for other plants that could be experiencing similar difficulties after the NRC admitted it does not have the resources to conduct full inspections.

The Zimmer station, where the utility — the Cincinnati Gas and Electric — has already spent some £1,000 million, was the subject of a construction suspension order last November despite being 97 per cent complete.

"Thousands" of welds in critical areas of construction are said to be defective and paperwork irregularities regarding quality checks are thought to be rife.

Now the NRC requires a thorough safety check of components and work at the site, a job which CG and E want Bechtel to carry out. Bechtel must first prove its independent status before securing the work, a claim which nuclear power opponents feel inappropriate because of Bechtel's communications with CG and E before construction was suspended.

Anti-nuclear campaigners are concerned over the competence of Bechtel in carrying out the safety assessment, in view of the company's current problems at the MIDLAND PWR plant in Michigan, where remedial work costing many millions of dollars is being carried out.

A recent inspection there revealed far reaching problems associated with quality deficiencies. The most significant problem at the plant involves the

use of fill materials and foundations, thought to be inferior to those detailed in the design. Excessive settlement of the reactor and buildings in safety-related areas has been noted. — **EXISTING programme of underpinning and reinforcement of the plant's foundations.**

As a result of the efforts of Mr Applegate and others, the NRC in the mid-Western states initiated a search for other possible troubled plants when shortcomings in the Clinton plant in Illinois also came to light. Bechtel is not thought to be involved here.

Construction in electrical areas was halted a year ago and in other areas last summer, mainly, says the NRC, because quality assurance procedures could not keep pace with the rate of construction.

But it is the nomination of Bechtel as trouble shooter at the troubled Zimmer plant which has most galvanised the anti-nuclear lobby to claim the company is ill-qualified to conduct a thorough safety appraisal at the site, given its own problems at Midland.

The US anti-nuclear movement gathered more momentum earlier this week with the disclosure that there had been a major loss of coolant accident at the Browns Ferry plant in Alabama, which is claimed to have released contaminated water into the Tennessee river.



Philip puts accent on safety

THE Duke of Edinburgh broke off a holiday at Sandringham this week to pay an informal visit to the Construction Industry Training Board's Birchen Newton centre near King's Lynn.

His visit came three days after a regional launch at the centre of Site Safe '83, a campaign aimed at cutting the industry's death and injury rate.

And safety was the main item on the Duke's agenda — he had requested a visit because of his "long standing interest in Birchen Newton training centre and safety matters".

Flanked by CITB chairman Leslie Kemp (right) and director of training Dennis Madden, Prince Philip is seen here taking a look at activities in the scaffolding hangar. It includes a scaffolding erection containing some deliberate mistakes and visitors are invited to spot errors typical of those which lead to accidents.

At the launch of Site Safe '83 the Duke had sent a message to the organisers indicating his support for the venture and wishing it success.

© See page 5.

Eaton narrows 'anti subbie' campaign

ONE of the two leaders of the London 'anti-subbie' campaign, I.C.A.T.T. regional secretary Len Eaton, has renounced the use of unconstitutional methods and narrowed the campaign to the industry's "cowboys".

Following a meeting with general secretary Len Wood the regional secretary says that in the forthcoming campaign he will

abide by the industry's working rule agreements and will not deliberately take on Norman Tebbit's Unemployment Bill and will, if possible, marry it.

Three months ago Mr Eaton, along with Peter Kavanagh, T&C's London building group secretary, made a joint declaration that they would mount a campaign against all subcontractors who they believe are not only threatening the union's existence but lowering standards both in safety and workmanship.

However, fear of being in breach of the new Employment Act and being exposed to fines of £240,000, prompted union leaders Mr Wood and George Henderson, TGWU national construction secretary, to take control.

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Clouds gathering over nuclear industry in US



Tom Applegate, the private investigator whose undercover operations at the Zimmer plant (background) first revealed serious violations of safety practices at the site and "thousands" of faulty welds. He also reported widespread abuse of drugs and alcohol by operatives working in critical areas of construction. Mr Applegate's efforts and those of other former workers at the site finally led to a construction stop order at the plant last November.

BRITAIN'S decision to adopt an American-type reactor at Sizewell in its next generation of nuclear power stations comes, ironically, with the US industry at its lowest ebb.

Showing no signs of recovery since the Three Mile Island scare shook the foundations of the nuclear power programme nearly four years ago, the industry has received not a single new order for nuclear plant anywhere in the US. Instead, a growing lack of confidence in nuclear power and declining energy demand due in part to the deepening recession, has led to many cancellations and a seemingly irreversible decline.

Many plants have been moth-balled. More are coming up to ten times as much as planned @ build, while even the traditionally rich power utilities struggle to comply with rigorous posi-

TMI vetting in an attempt to improve safety margins at the plants.

The discovery of a startling list of problems at the W H Zimmer plant near Cincinnati sparked renewed and intensified concern over the possible existence of similar disasters.

Alarmed

The US Nuclear Regulatory Commission, admitting at least some of the blame for allowing the Zimmer plant to reach such an advanced stage of construction before finally intervening to check control at the site, further alarmed the public by claiming it had not the resources to carry out extensive on-site inspections. The NRC then sought to regain some of its lost credibility by strengthening its presence at nuclear sites.

Three Mile Island has left in its wake a nuclear programme littered with plants in severe difficulties. Zimmer joins plants like the unfortunate Diablo Canyon Unit One in California, where an order prohibiting the loading of fuel was issued in November 1981 because of concerns over its seismic design. Others joining the rank of unfortunate are the Clinton Illinois station, where work on electrical systems stopped a year ago and on other areas last June due to poor quality assurance, and the Midland plant in Michigan.

Concern over the future of the US nuclear industry is now widespread.

In 1981, chairman of the NRC Nunnio Palladino warned that the nuclear industry was "threatened with "the consequences of its own failures to achieve the quality of construction and plant operations it must have for its own well-being and for the safety of the public it serves".

The nature of the problems referred to in Mr Palladino's statement are crystallised in a number of NRC reports prompted by technical problems at Zimmer, Diablo Canyon, Midland, San Onofre, Susquehanna, and Palisades.

The NRC issued a suspension order at the Diablo Canyon plant preventing the loading of fuel before a full design verification had been carried out to ensure adequate attention had been given to its seismic design.

Bechtel, which is responsible for engineering, procurement and construction at the Midland site in Michigan was said by Mr W H Dickhoner, president of the Cincinnati Gas and Electric company, the utility building the Zimmer plant, to have "some problems with Region Three (of the NRC) on the Midland project". The Government Accountability Project in Washington DC is an organisation which exists to protect "whistle blowers" on major projects suggested the utility appeared to disregard the significance and seriousness of the difficulties.

In March 1982 GAP's citizen's clinic had been actively involved with the Midland plant pursuing allegations from workers of major problems at the site. GAP conducted a full investigation and filed six affidavits with the NRC last June, indicating a quality assurance breakdown at the heating, ventilation and air conditioning system at the plant. GAP also claims there are serious problems with the welding procedures at the site.

In December last year, a NRC Inspection and Enforcement probe of hardware problems in the diesel generator building resulted in a massive work stoppage at Midland. The same month, some 1,000 workers at the Bechtel site were reported to

have been laid off from construction work and Consumers Power, the utility involved, halted the most safety-related work. NRC's spokesman, Ian Strasma, said "the problems are significant and serious and have implications for the rest of the plant."

Although the NRC report and any corresponding enforcement package was not made public until the end of last month, the NRC acknowledged a number of serious deficiencies at the plant, including documentation problems relating to general quality assurance breakdown. They included a lack of material traceability on structural steel, at least 15,000 backlogged quality control records and the employment of unqualified or uncertified welders working in critical areas of construction.

It is understood these serious problems are only a part of the findings to be disclosed in the IE being prepared by the Midland Special Investigation Section. The Office of Investigation is also conducting an investigation into the allegations made by GAP officials last June when called in by CG & E, the utility building the Zimmer plant to trouble-shoot at that site where problems occurred. GAP said "furthermore, our review of Midland raises serious questions as to the competence of Bechtel's Area Arbor Division to adequately identify and audit (at Zimmer) problems which it has been unable to solve at its Midland facility."

Midland, a two-unit B&W reactor in central Michigan, is being built by the Consumers Power Company. Bechtel has been both the designer-engineer and the main contractor at the site. Although Midland's original cost was estimated at about £1,000 million, the cost could double.

Serious risk

GAP claims the most significant problem at Midland is a construction flaw unprecedented within the nuclear industry. The Midland plant site is plagued by a foundation soil settlement problem that has left the diesel generator building cracked, the auxiliary building unstable and other critical structures at serious risk. GAP alleges the problems are due to Bechtel's failure to comply with the Final Safety Analysis Report written by Bechtel and reviewed by the utility. The result, claims GAP has resulted in a number of problems that will be difficult to resolve, and a problem that was characterised by the US CBS national news as "corporate mismanagement on a massive scale."

GAP continues: "Not only did Bechtel take a risk by using improper fill and inadequate compacting techniques, it also misled the NRC about the risk involved." The NRC later cited Consumers Power for a material false statement "in that the fill material used at the site was not the type stated in the FSAR as having been used."

The FSAR specifies "controlled, compacted cohesive soils" to be used as the supporting soils for the diesel generator building, portions of the auxiliary building, portions of the water storage tank foundation, diesel fuel oil tank foundation, radwaste building and other structures. However, the supporting soil, claims GAP, actually used for the structures was random fill material, defined as any material free of humus, organic or other deleterious material. The material included

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This model shows Britain's proposed PWR nuclear station at Site Well, Suffolk. The public inquiry could prove Britain's longest. Some US objectors are planning to visit Site Well to protest at Bechtel's involvement in the design of the British plant.

From facing page

land, silt, clay and lean concrete. The NRC responded to the discovery of the soils settlement problem with a stop-work order on December 6, 1979. That year and also in 1980, a systematic assessment of licensing procedure (SALP) report gave notice of further problems at Midland. The problems outlined included a lack of qualifications of quality control inspectors and a continuation of work prior to corrective actions being taken by regulating authorities.

Criticized

Bechtel was criticized by the GAP because it has been nominated by the owner of the Zimmer plan, CG&E, as independent auditor assigned to resolve the extensive problems at the Cincinnati, Ohio station.

GAP also pointed to Bechtel's involvement in the Trojan plant at Rainier, Oregon, where in 1979 two utilities sued the company for about £20 million for a design flaw which forced the plant to close for nine months during the preceding year.

GAP says Bechtel discovered after the plant started operating that a re wall in the control room did not meet NRC seismic standards. The resultant design problems according to the Atomic Safety and Licensing Board conducting the licensing hearings included:

• Both the horizontal and vertical reinforcing steel embedded in the inner concrete core of the control building's frame was generally discontinuous and not anchored to the steel beams and columns of the control building's steel frame.

• The construction drawing details used to place the steel in the walls during construction failed to show the proper anchorage wherever the steel frame intersected the steel reinforcement and;

• Bechtel misapplied a shear design formula in combination with the applicable limiting seismic loading, which resulted in less than the required amount of steel in the shear walls.

The case was settled in 1981 with the terms of the settlement agreement remaining confidential.

tiel GAP claims, however, that Bechtel lodged a counterclaim against the Oregon utilities involved that it should not be held liable because of a clause in its contract that exempted Bechtel from damage arising out of design deficiencies. At San Onofre, where Bechtel is construction manager, the NRC found significant breakdowns in the quality assurance programme. It is claimed the most significant problem was that a 430 tonne reactor vessel was installed backwards.

Other reported problems involved cavities created by well drilling and ranging in size from 30 cu m volume upwards found close to the foundation of the plant. These were of particular concern to NRC because of San Onofre's location on a site of high seismic activity. In August 1977, NRC issued a violation notice because of improper welding procedures. On-site welding of various components was found to be defective after errors were found in the weld inspection programme.

Last June SALP identified problems with pipe weaknesses in the construction and quality assurance programme at Bechtel's Susquehanna Unit One plant in Pennsylvania.

Another Michigan plant, in Palisades, near South Haven, began producing power in March 1972. Costing £100 million, the plant has troubled its owner, Consumers Power Company, ever since.

Reported early problems included rusting inside the steam generating system, vibration damage leaks in the steam generators tubes and leakage of radioactive water into Lake Michigan. After a year, CP shut down the plant for major repairs, including the replacement of the majority of the 14,000 metal tubes in the plant's condenser.

In August 1974, Consumers Power Company sued the architects, designers and builders of the Palisades plant for more than £150 million.

Zimmer, the plant owned by Cincinnati Gas and Electric, 40 km east of Cincinnati, is possibly the new owner to the growing list of nuclear sites in the US on which there are fundamental problems.

Victor Griffin, a former quality control engineer at the site alleges, there are many defects in the quality control programme for components

supplied by outside manufacturers.

As a result, he says, the ultimate safety of the plant is impossible to determine without a complete dismantling and inspection, even though the plant is now some 97 per cent complete. The utility is now struggling to comply with a construction stop order so that it can get the plant operating.

The core of Mr Griffin's concern relates to the quality control system for "essential" and "critical" components, piping and materials supplied by vendors to the plant. Critical components are generally those whose failure could interfere with the safe shut-down of the plant, while the failure of essential components, though not able to prevent a shut-down, would nevertheless be dangerous. Mr Griffin says that he first became aware of problems at Zimmer some two or three weeks after starting work there in 1972, when CG&E announced it would assume responsibility for quality control, effectively relieving Kaiser, the builder, of any control over the quality of materials used in the plant.

John Jackson, then Kaiser's corporate manager of quality control at Zimmer, was concerned that the quality control effort, by an independent QC inspection service would be minimal. In hindsight, says Mr Griffin, his fears were well justified, as quality control at the site turned out to be practically non-existent.

Mr Griffin says he would have expected the QC inspectors to subject the components to a thorough inspection, both by dismantling them and checking their internal organs, and by reassembling them and testing under operating conditions. But, he alleges that CG&E's independent inspectors bypassed all of these steps and merely relied on the vendor's paperwork to buy parts off the shelf. Earl Bergmann, Vice-President of CG&E later defended these actions by saying "we have to put our trust in the manufacturers". CG&E is reported to have been satisfied to call up other utilities and obtain telephone references on the component suppliers.

Mr Griffin says CG&E's shortcuts began at the start of purchasing critical and essential components for the Zimmer plant and as a result he claims that virtually all of the parts and

materials from outside suppliers are suspect.

Another improper quality control practice alleged at Zimmer involved upgrading materials. Kaiser was accused of ordering material as non-essential and then upgrading it to essential status after it arrived. Consequently, lower-grade material than that required has been used in a number of critical areas of work at the plant, according to the affidavit sworn by Mr Griffin.

Mr Griffin claims there was also extensive manipulation of quality control records at Zimmer, a policy which he says cost him the top of CG&E management.

As early as 1976, says Mr Griffin, he discussed all of his concerns with NRC investigator Gerald Phillips and two of his aides for three hours. But Griffin says he was concerned that the NRC would not pursue his charges seriously, a fear that was soon confirmed when NRC failed to conduct an independent investigation, but merely reviewed a small quantity of paperwork.

Neglect

On balance, says Griffin, the significance of his claims is that the quality control programme at Zimmer has failed for ten years, not just a few. It is his hope to just inspect parts purchased over the last few years. "They all have to be covered. It says further that a surface inspection will miss all of the flaws hidden underneath. This creates a difficult problem because now CG&E cannot dismantle the components, parts and materials to do the inspection. Although CG&E has now started a quality confirmation programme, Griffin believes it to be just a gimmick. To solve a decade of neglect at the site, Griffin says the QC programme must conduct a 100 per cent inspection of all the components, parts and materials purchased from outside.

The plant is known to suffer from a high proportion of defective welds both on structures and pipework. If a quality confirmation programme were carried out on the scale suggested by Mr Griffin, it would doubtless reveal some very costly necessary remedial works, a result that could dwarf the £1,000 million already spent at the site.

CONSTRUCTION INDICES

INDICES FOR USE WITH PRICE ADJUSTMENT FORMULAE - JANUARY 1982

Work Category 2:2 Glass, Mirrors and Patent Glazing. The Department of Industry has reviewed two of the Wholesale Price Indices which are constituent indices of Work Category 2:43 and has decided to restate these two indices into one new reconstructed index to reflect the current uses within the industry.

Table with columns: RESOURCE, WEIGHTING %, RECONSTITUTED RESOURCE INDEX. Rows include Clear glass, Double glazing units, Float glass.

The Working Group has decided to substitute the reconstructed index for the two indices above as follows:

Table with columns: RESOURCE, WEIGHTING %, RECONSTITUTED RESOURCE INDEX. Rows include Clear glass, Double glazing units, Float glass.

The reconstructed index has been back-calculated by the Department of Industry to January 1982 and the Working Group has decided therefore to use it two weeks commencing 2:43 on February 1982.

The firm index value for September 1982 is 185.

Building Index - Appendix 8. The provisional January index number includes the increased wage rates for Grade 2:1 operators of £2.19 per hour and the increased lodging allowance of £10 per night promulgated by the National Joint Council for the Flat Glass Industry on December 22 1982 and effective from January 3 1983.

Partials and Daily Rates. BRITISH Rail 2nd class ordinary return fares were increased by an average of 9 per cent with effect from January 9, 1983, and there are consequent increases in the periodic fare constituent of the Labour Index (and also the daily fares constituent in the case of Plumbing, Heating, Gas Fitting and Gas Installing Labour Indices). These increases are included in the indices from and including January 1983.

Electrical Installations Labour Index E1. THE Joint Industry Board for the Electrical Contracting Industry in their Industrial Determination dated November 1 1982, promulgated increased wage rates for apprentices with effect from January 1 1983. The rate for 18-year-old apprentices is £1.50 per hour and is included in the index from and including January 1983.

BUILDING INDEX - SERIES 2 (JAN 1980 = 100)

Large table with multiple columns (Jan, Jun, Dec) and rows for various building materials and components like 1 Bricks, 2 Tiles, 3 Cement, etc.

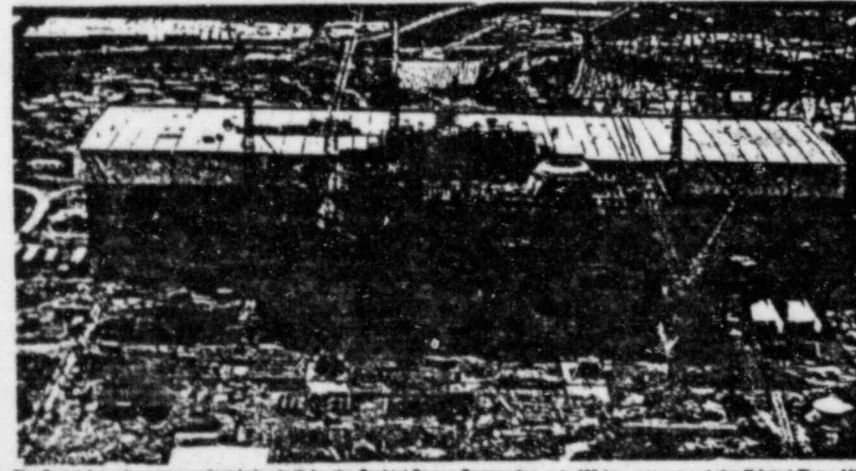
Table with columns: APPS, 1 Building labour, 2 Building materials, 3 Plumbing, etc.

CIVIL ENGINEERING (DEC 1982)

Table with columns: Super, Base, and rows for various civil engineering materials like 1 Sand and gravel, 2 Cement, etc.

SPECIALIST ENGINEERING - SERIES 2 (JAN 1980 = 100)

Table with columns: PART 1 ELECTRICAL INSTALLATIONS, PART 2 HEATING & VENTILATING AND SPRINKLER INSTALLATIONS, etc.



The Susquehanna nuclear power plant being built by the Bechtel Power Corporation only 136 km upstream of the 3-rated Three Mile Island station in Pennsylvania. The Susquehanna plant has, itself, suffered some criticism for shortcomings in its quality control programme.

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A question of balance

THOUGH the Treasury counsels caution in interpreting the figures, the latest White Paper on the government's spending plans confirms the impression that the Chancellor of the Exchequer will ease taxation on employment in his Budget statement, now due on March 15. This will not please the contracting industry which advised him against that course; at least it will not please those who seek more capital investment rather than additional purchasing power.

It is being widely forecast, presumably with prompting from the Treasury, that cuts in income tax through sharp increases in personal allowances are likely to absorb the lion's share of the £2,000 million or so that the Chancellor fears able to put back into the economy.

There can be little doubt that such moves will be welcome to most hard-pressed taxpayers. It will also indirectly ease the cost pressures on corporate entities, even more so with further relief in NI surcharge. One would not expect anything much different from Sir Geoffrey Howe in election year, for this is the way to help the largest number at least cost.

However the construction industry's needs are recognised also, because capital expenditure is now planned to be £11,250 million or 12 per cent higher next financial year. Spending on construction is expected to rise by about 10 per cent to £10,250 million. Changes are also being made in capital allocation procedures for local authorities to ensure correction of capital underspending.

Principal contention of the government is that public expenditure is under firm control. Leon Brittan, chief secretary at the Treasury, claims that the current year's estimated outturn will be some £7,000 million less than the cash equivalent of the previous government's plans for that year. Next year total cash plans will be about £1,000 million less than 1982 Budget plans, and £500 million less than the programmes shown in the Autumn statement.

So the government may well feel justified in easing the tax pressure on employment, especially since there is growing evidence that some of Britain's loss of competitiveness over the last four years is due to the relentless pressure of taxation. Not only do these pressures place a burden on overseas trade, they also depress employment at home.

Why US decisions may influence the Sizewell inquiry

by John D Allan, Editor-in-Chief

AMERICA'S Nuclear Regulatory Commission will shortly be issuing its decision on the contentious proposal of the Cincinnati Gas & Electric Company to appoint Bechtel Power Corporation for the management review at Zimmer nuclear power station.

As readers of Construction News will already know, this PWR project sited at Moscow, Ohio, is the subject of a stop order imposed by NRC on November 12 last year, at a stage when the £1 billion project was virtually complete.

NRC's decision in the Zimmer case will be of crucial importance to the future of the United States nuclear power industry. Not only that, it may well introduce a new factor into the inquiry currently proceeding on the Central Electricity Generating Board's proposal for Sizewell B.

Documentation issued by NRC and others over recent months has revealed just how badly adrift the US nuclear power programme has gone.

Informed sources in Washington said this week that the Zimmer decision was being finalised and the appointment of Bechtel would be confirmed. If this forecast proves correct, and the engineering company is given more than a limited brief for quality verification, it will arouse strong protest and call into question the role of NRC itself as guardian of the public interest.

Many public bodies and groups of individuals in the USA have urged that the review must be carried out by people manifestly clear of involvement with the troubled history of the Zimmer site.

with the troubled history of the Zimmer site. In doing so, the objection appeal to criteria set up when NRC issued an order suspending the Pacific Gas and Electric Company's licence for the Diablo Canyon plant. This occurred in November 1981 when independent verification was required of the seismic design.

Apart from obvious requirements of competence and integrity, NRC chairman Nuncio J Palladino told the House of Representatives' energy and commerce committee that independent audit was essential to obtain objective, dispassionate technical judgement.

The commission went in the end to Teledyne Engineering Services, later said to be victims of undue pressure to complete the work.

One might think that none of this would deter Bechtel. This indeed was the view of Mr Dickhoner, Cincinnati Gas & Electric president, in his reply to the order suspending construction. Bechtel's nuclear experience is well established, though Mr Dickhoner did accept that the company "has had some problems with (NRC) Region III on the Midland project".

Two days before the stop order, CG&E announced it had advised Bechtel to take over project management at Zimmer and complete its construction. The first step would be an assessment of the project's problems which the president was confident would take only three weeks.

What he evidently meant was that this programme would take only three weeks to complete, for apparently Bechtel personnel had already been on the site for some time prior to the stop order. So it

was alleged to NRC. On the basis of this initial assessment, a formal contract was to be worked out. The plan was that Bechtel would become joint manager with the licensee until the power station's successful completion. Bechtel would direct the project with personnel matching the utility's in key positions.

Appealing against the impending shutdowns, Mr Dickhoner claimed it would result in the loss of 1,500 jobs without any countervailing advantage to the public. On the contrary it would prevent the new organisation getting a grip on the problems that had beset the project.

This last-minute bid to stop the inevitable failed, but the objectioners fear that the basic proposal of CG&E that together we will finish the job will be accepted. The problems for NRC seem to be that any other course would be difficult to enforce, quite apart from involving the power utility in massive charges on its investment for an indefinite period, carelessly by sale of output.

However NRC has another problem and that is the growing weight of public opinion, aroused by sensational disclosures of the circumstances surrounding the Zimmer project in Ohio and the Midland project in Michigan where Bechtel Power Corporation is the main contractor. If Zimmer has raised questions about Bechtel's independence as an auditor, it is Midland that has raised questions about its competence as a project manager.

In presenting its objections the City of Cincinnati took the sensible line of being reluctant to engage in disputing the competence of Bechtel.

There will be a switch in marketing strategy by builders from simple and significant cash discounts — in return for early completion. If sales, builders' profitability and cash flow are to be maintained, the legal profession has a major part to play. Small wonder, then, is a source of the NBF's attention.

The Building Societies Association, too, has noted this point. Last week, following a report from a working party headed by John Spalding, general manager of the world's largest society, the Halifax, the association made clear that in future it wishes to carry out functions which cross the boundaries defined by all the professions between the builder and his source of income — the purchaser.

In a move that could smooth the path between builder and purchaser, building societies have said they wish to set up bank, estate agent, conveyancer, structural surveyor and insurer as well as their traditional role of provider of funds.

What it was more concerned about was independence of the review agency, in the light of the utility's decision to engage Bechtel all at once at management, quality assurance and construction consultant. Could Bechtel really pass the vital test of disinterest?

The city authorities were also worried about the prospect that the power utility and its newly appointed contractor would steam ahead with the work without taking the trouble to determine some of the underlying causes for the breakdown in quality assurance. There was no sign that the new set-up would acknowledge evidence which contributed to revelation of the deficiencies.

This is all the more important because, according to D David Altman, chairman of Cincinnati's environmental advisory council, Congressional sub-committees have raised the question of deliberate falsification of records at Zimmer and harassment of quality assurance in-spectors.

Moreover, a federal grand jury was studying possible violations of federal criminal law at the site. There was also evidence uncovered by NRC investigators of management wrongdoing by high-level corporate officials, all issues involving the fundamental integrity of the project's management.

Allying that NRC had chosen to shut the public out of the decision-making process, Mr Altman said the regulatory commission had acknowledged the problems at Zimmer to be unprecedented.

All the same, in its plan of action, NRC ruled that since selection of an independent organisation was only a preliminary phase, a public meeting was not planned at this stage. But it did promise that the criteria governing the relationship between the licensee and the consultant would parallel those used for the Diablo Canyon review.

The Government Accountability Project of the Institute for Policy Studies has some more to say on its own allegations. It asserts that the only basis on which Bechtel's participation in quality verification at Zimmer can be accepted is prohibiting any part in completing the project.

Watershed year for housebuilders

If early indications are anything to go by, 1983 is likely to be a watershed year for the housebuilding industry. The House-Builders Federation has turned its attention to the thorny question of land shortage and the slow processes of conveyancing, while the Building Societies Association has declared its intention to seek a more positive role in the industry as a whole.

With an estimated 160,000 new starts this year — at an average selling price of just under £30,000 — there is an annual turnover of something like £5 billion at stake. As profit margins throughout the industry become more and more slender, it is small wonder that a concerted effort to protect the market is at last being made.

On behalf of its members, the HBF is lobbying for an end to "restraint policies" which prevent private housebuilders from responding to demand. On behalf of the potential house purchaser — the builder's source of income — the BSA is looking for an extension of its selling powers, hardly changed since the beginning of this century.

And when he has inspected these sites personally, something he insists on doing, he will no doubt be able to confirm this.

In the meantime, he has indicated that another source of his attention is to be the legal system. Builders' profitability depends on sales, sales depend on exchange of contracts between purchaser and builder, exchange of contracts relies generally on lawyers.

This section of the community is partly held back by our laws; nevertheless, there is room for improvement in its performance, and what is a tedious grid for the house purchaser's cash flow to the builder.

It will be a switch in marketing strategy by builders from simple and significant cash discounts — in return for early completion. If sales, builders' profitability and cash flow are to be maintained, the legal profession has a major part to play. Small wonder, then, is a source of the NBF's attention.

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

March 2, 1983

APPENDIX XXVI
ADDITIONAL INFORMATION CONCERNING THE
SKAGIT/HANFORD CONSTRUCTION SCHEDULE

MEMORANDUM FOR: ACRS Members

FROM: *A. J. Cappucci*
A. J. Cappucci, Staff Engineer

SUBJECT: ADDITIONAL INFORMATION CONCERNING THE SKAGIT/HANFORD
CONSTRUCTION SCHEDULE

Enclosed please find a letter to Jerry Ray completing Puget Sound Power and Light's response to Committee questions during the 274th ACRS meeting on February 10, 1983 concerning the construction schedule of the Skagit/Handford Nuclear Project. The PSP&L anticipated schedule is described below:

- receive construction permit - later half of 1984
- begin construction (earliest) - 1986
- begin construction (latest) - 1990
- PSP&L "need for power" projection - 1990 to 1999

I suggest that this letter be made part of the 274th ACRS meeting minutes.

Enclosure: As stated

cc: R. Fraley
M. Libarkin
G. Quittschreiber
N. Schwartz
I. Catton
G. Thompson
Z. Zudans

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PUGET
POWER

February 14, 1983

Honorable Jeremiah J. Ray
Chairman
U.S. Nuclear Regulatory Commission
Advisory Committee on Reactor
Safeguards
Washington, D.C. 20555

Dear Mr. Ray:

Time did not permit us to complete the response to one of the questions asked during our appearance before the ACRS on February 10, 1983, regarding the Skagit/Hanford Nuclear Project (S/HNP). That question concerned the schedule for beginning construction of the project.

As you will recall from the presentation, we believe that S/HNP should be licensed so that it will be available as part of the resource portfolio for the Pacific Northwest Region and for the systems of the 4 participants in the project. Our analysis of the need for power indicates that S/HNP could be needed as early as 1991 and as late as 1999.

Under the current hearing schedule promulgated by the Atomic Safety and Licensing Board, we would anticipate receiving construction permits during the first half of 1984. Should the ASLB grant our recent motion to suspend the schedule until the end of April 1983, we would anticipate the construction permits in the second half of 1984.

Following receipt of the construction permits, we plan to reassemble the needed design and construction teams, restart design, complete applicable TMI commitments, and bring the project forward to the point where construction could begin. These activities would carry through until about the end of 1986.

To meet the latest date that S/HNP would be needed, construction could begin as late as 1990. Should the project be needed sooner, construction could start as early as 1986. If it appears major construction would commence later than 1990, it would be appropriate to consult with the NRC staff to review the status of plant design prior to commencing construction.

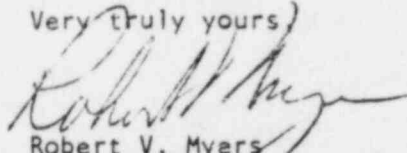
We believe that this type of schedule provides the flexibility necessary to keep the project available as a resource and assures that the design remains valid for construction.

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Honorable Jeremiah J. Ray
February 14, 1983
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We urge that the ACRS submit its report on S/HNP promptly, in accordance with its usual procedures. We will be glad to supply any additional information you may need.

Very truly yours,



Robert V. Myers
Vice President
Generation Resources

cc: NRC Service List

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SKAGIT/HANFORD NUCLEAR PROJECT
NRC Service List
Docket Nos. STN 50-522 and STN 50-523

DATE February 14, 1983

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ADDITIONAL DOCUMENTS PROVIDED FOR ACRS' USE

1. Memorandum. E. F. Goodwin to R. F. Fraley, Proposed NRR Agenda Items for the March, April and May 1983 ACRS Meetings, February 9, 1983
2. Letter, Cordell Reed, Chairman of IDCOR Steering Group to N. Palladino, regarding IDCOR recommendations for SECY-81-28, Policy Statement on Severe Accidents, February 1, 1983

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