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June 19, 1968

MEMORANDUM

To : ACRS Members

From : J. C. McKinley, Staff Assistant J. C. McKinley  
ACRS

Original Signed by

Subject : SUMMARY OF 98th ACRS MEETING

*Thermal  
Shock  
P. 5*

Attached is a summary of the 98th ACRS meeting, June 5-8, 1968. Please forward any comments you may have so that corrections may be made, if needed.

Subsequent to the 98th meeting, Dr. Zabel polled the Committee to determine if the report on the Salem Nuclear Generating Station could be transmitted without further delay for discussion by the full Committee. All members that could be contacted (Dr. Bush and Dr. O'Kelly could not be contacted) agreed to release the Salem report.

A Special ACRS meeting will not be scheduled prior to the regular 99th meeting on July 11-13, 1968. The topic of control and safety separation will be discussed further at the July meeting.

Please note that Item 9, Naval Reactors, under Executive Sessions is classified restricted data and will, therefore, be transmitted under separate cover.

Attachment:

Summary, 98th ACRS Meeting, dtd June 19, 1968

9210120, 920520  
PDR DRG NRCHIST  
PDR

ACRS

McKINLEY: gpb

6-19-68

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ACRS Job ~~Box~~ Box 5 Shelf 11915  
Correspondence 6/68

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June 19, 1968

SUMMARY  
98th ACRS MEETING  
JUNE 5-8, 1968  
WASHINGTON, D. C.

SPECIFIC PROJECTS

1. Zion Station

The Committee completed its review and discussion with the applicant for authorization to construct nuclear generating units 1 and 2 at its Zion Station. The Committee deferred issuance of a report on this project pending resolution of the degree of separation of protection and control functions to be required and of the concerns expressed by Dr. Okrent regarding provisions to handle a pressure vessel failure at the Zion facility and other facilities located at sites of comparable or greater population densities.

The Committee indicated that the following areas require further consideration during the design and construction phase of the Zion Station:

- a. Matters that warrant careful consideration with regard to reactors of high power density and other matters of significance for all large water-cooled power reactors.
- b. Limitation of reactor vessel movement in the highly unlikely failure of the reactor vessel by longitudinal splitting.
- c. Control and protection instrumentation should be as nearly independent of common failure modes as possible.
- d. Continued emphasis on quality assurance in the manufacture, storage, and installation of the reactor and primary system components.
- e. Further consideration of the possibility of testing the Containment Spray System with full flow to the spray nozzles at least once at an appropriate time during construction. (During the meeting, the applicant agreed to a test program equivalent to that proposed for Salem with this exception.)

The Committee did not include reference to soil liquefaction, maintenance of fuel clad temperatures below the point at which disintegration may occur on subsequent cooling, or part length control rods since these problems are addressed in the application and resolution is expected prior to operation.

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In addition to the above, the Committee discussed:

- a. The population distribution around the Zion site and concluded that this site is comparable to the Indian Point site.
- b. Containment design.
- c. Research and Development program.
- d. Instrumentation for the prompt detection of gross fuel failure and for detection of primary coolant leakage.
- e. Ability to flood the reactor vessel cavity to a level above the top of the reactor core. It was agreed that provisions will be made for future installation of this system if R&D (HSST Program) now under way indicates that reactor vessel failure could occur as a result of thermal shock caused by ECCS operation.
- f. Emergency plans.
- g. Thermal shock to the reactor vessel.
- h. Core catcher.
- i. Instrumentation necessary to determine if accident is proceeding as predicted.
- j. Quality control and inservice inspection requirements.
- k. Separation of protection and control functions of the instrument and control system.
- l. Effects of tripping one unit off the line on power distribution system stability and on continued operation of the second unit.
- m. Ultrasonic mapping of reactor vessel following hydrostatic testing.
- n. Industrial sabotage.
- o. Stresses in containment liner under accident conditions.
- p. Pump seizures and consequential missiles.
- q. Plant generated missiles other than turbine-generator missiles that might present a hazard to the containment structure.
- r. Incore instrumentation.

2. Indian Point Nuclear Generating Unit No. 2

The Committee completed its discussions and consideration of the Indian Point 2 ECCS, core internals, and pit crucible (core catcher). Consolidated Edison was informed that the Committee concurred with the applicant's conclusion "that the pit crucible need not be an essential engineered safety feature of the reactor". Earlier (95th ACRS meeting, March 1968), the Committee concluded that "The design of these (ECCS) systems and components and the analysis of their performance under postulated accident conditions for Indian Point 2 are not complete but the Committee believes that satisfactory progress is being made." After discussions with Consolidated Edison during this meeting, it was determined that a letter report on these items was not required. Consolidated Edison indicated that construction of the pit crucible would be terminated and that its deletion and the basis for deletion will be documented in the Final Safety Analysis Report. The Committee urged prompt submission of the FSAR so that this information will be available to the public as soon as possible.

At the 98th meeting, the Committee considered:

- a. Other engineered safeguards to replace the pit crucible.
- b. Status of pit crucible design and fabrication.
- c. Potential effects of an ACRS report on the applicant's licensing proceedings.
- d. Cost of the pit crucible (estimated by the applicant to cost about \$750,000).

The Committee heard a report on three proposed sites for Consolidated Edison's proposed nuclear Units 3 and 4.

### 3. Salem Nuclear Generating Station

The Committee completed its review of the application by Public Service Electric and Gas Company for authorization to construct Salem Nuclear Generating Station. The Committee deferred issuance of a report on this project pending resolution of the degree of separation of protection and control functions to be required.

The Committee identified the following areas that require further consideration during the design and construction phase of the Salem Station:

- a. Matters that warrant careful consideration for all large water-cooled reactors of high power density.
- b. Control and protection instrumentation should be as nearly independent of common failure modes as possible.

In addition to the above items, the Committee discussed:

- a. The population distribution around the Salem site. This is a sparsely populated area.
- b. Foundation design and measures taken to preclude "liquefaction".
- c. The applicant's quality assurance program.
- d. Containment design.
- e. Piping code used in design (B31.7).
- f. Keeping fuel clad temperature below the point at which the clad may disintegrate upon subsequent cooling.
- g. Part length control rods.
- h. Incore instrumentation.



## EXECUTIVE SESSIONS

### 1. ACRS Reports

The Committee authorized the Chairman to explore the possibility of a Special ACRS meeting to complete the reports on Salem and Zion if the delay of these reports would create a serious problem for the applicants.

### 2. Metropolitan Siting

Dr. Monson reported that the Metropolitan Siting Subcommittee was attempting to develop population related site criteria. Some of the aspects being considered are:

- a. Number of fatalities.
- b. Number of injuries (man rem exposure).
- c. Angular width of plume.
- d. Size and population density of affected sector.
- e. Temporary (daily or seasonal) populations.
- f. Geographical, topographical and meteorological features of the site.
- g. Engineered safeguards.
- h. Maximum fission product inventory available to the reactor being considered.

Dr. Monson presented a comparison of several sites using various assumptions regarding the size of the lethal zone and the population sector over which the plume would pass.

Dr. Monson requested that members provide the Subcommittee with any ideas they might have with regard to criteria for metropolitan siting.

### 3. Meeting with JCAE

Dr. Zabel noted that there have been two speeches recently by persons associated with the Joint Committee on Atomic Energy (JCAE) (Rep. Craig Hosmer and John Conway, Executive Director) that contained remarks critical of the ACRS and the regulatory process. Dr. Zabel reported that he has requested Mr. Fraley to arrange a meeting with representatives of the JCAE to develop information related to this matter. This meeting is scheduled for 10:00 AM on July 12, 1968.

### 4. Meeting with Commissioners Ramey and Johnson

Dr. Zabel reported on his meeting with Commissioners Ramey and Johnson. The ACRS has been asked to appoint representatives to a group that will establish the role and scope of the proposed Internal Review Group that will review the AEC's regulatory process. Dr. Zabel, after consulting the Procedures Subcommittee, appointed himself, Dr. Hensauer and Mr. Mangelsdorf to the group. He requested that members suggest items for

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consideration as to role and scope of the Task Force. (Dr. Iabn suggested that the Division of Compliance be represented on the review group. Dr. Okrent suggested that the role of the Commissioners in the regulatory process be defined.) Dr. Zabel also reported that Commissioners Ramey and Johnson will be working closely with the Atomic Safety and Licensing Board as well as with the ACRS.

(A meeting of this "Steering Committee" was held on June 13, 1968.)

Dr. Zabel reported that Commissioner Ramey is concerned with the statements made recently regarding the continued need for the ACRS. The consensus of the Committee seemed to be that the ACRS should insure that the JCAE is aware of the facts regarding ACRS activities but that it should make no effort to justify its existence; since it exists at the pleasure of the JCAE as an independent review body.

#### 5. Thermal Shock

Dr. Bush reported to the Committee on the progress being made in the analytical techniques used to evaluate the effects of thermal shock on reactor vessels. He identified a major difficulty as the lack of accurate values for  $K_{Ic}$ . The HSST program is one that is trying to obtain this data. Results are expected in 4-5 years.

Dr. Bush evaluated the various reactor vendors' analysis techniques as:

Babcock and Wilcox - A very simple model assuming a cosine stress distribution and a very conservative (30) value for  $K_{Ic}$ .

Combustion Engineering - A much more complicated model with varying values of  $K_{Ic}$ . He considers it to be less conservative than B&W's approach.

General Electric - No problem because of thinner walls and less neutron damage.

Westinghouse - Most sophisticated approach using a finite element technique with variable mesh sizes. Dr. Bush estimated that Westinghouse has spent between \$100,000 and \$200,000 on this program. He has not seen the final report so cannot pass judgment on its relative conservatism.

In view of the conservatism and margin in evaluating crack propagation, Dr. Bush indicated that he would be satisfied that a vessel would not fail completely when analysis indicates that a crack would not propagate through more than 35-40% of the vessel wall thickness.

Separation of Protection and Control Functions  
of Instrument and Control Systems

A report on this subject comparing various systems was presented by the Regulatory Staff. During the discussion, Mr. Levine stated that DRL would be satisfied with any protection and control system that could meet the IEEE criteria plus criteria yet to be developed, regarding protective overrides and devices intended to protect equipment but not related to safety.

The position that DRL has taken as a result of the ACRS comment on Diablo Canyon has been that as an absolute minimum, each variable monitored for protection should be instrumented by sufficient channels independent of control to meet the single failure criterion. The applicant may elect to provide additional channels of protection which are not independent of control; if this is done, the applicant should provide a rigorous failure mode analysis to show that there can be no interaction between the control system and the independent protection channels through the shared channel(s).

Both of the above positions are less demanding than requested by the ACRS in its letters on Diablo Canyon, Prairie Island, Surry, Kewaunee, and Point Beach which state that the control and protection instrumentation should be separated to the fullest extent practicable/practical.

Benauer prepared a paragraph on protection and control instrumentation for the Zion and Salem letters. A statement of guidance was provided to the Regulatory Staff. The Committee accepted Zion and Salem paragraphs until the Staff representative (F. Schroeder) raised a question of applicability to Salem. Time did not permit resolution of this question and the matter was deferred until the ninety-ninth ACRS meeting or a Special meeting to be called by the Chairman, if appropriate.

Copies of the Salem/Zion paragraph and statement to the Staff are attached to this Summary. DRL was requested to be prepared to discuss these at the ninety-ninth ACRS meeting.

7. Guide to Content of Technical Specifications for Nuclear Reactors

Mr. Etherington reported the results of a Subcommittee meeting with DRL on the amendments to 10 CFR Part 50 and the Draft Guide to Content of Technical Specifications for Nuclear Reactors proposed by DRL. A number of improvements were made to these documents as a result of this Subcommittee review.

Mr. Etherington recommended that the Committee approve the publication of the proposed amendments and Guide without detailed ACRS review.

It was noted that the proposed amendments and Guide would become effective thirty days after publication.

The Committee approved the amendments and Guide for publication. The Director of Regulation was advised of this approval.



8. Regulatory Workload

The Committee discussed the future workload for both itself and the Division of Regulation. It noted that the applications for Provisional Operating Licenses will be more difficult to approve than are the applications for Construction Permits. It was agreed to request the Regulatory Staff to start an early, comprehensive review of one PWR and one BWR in order to set precedents and establish criteria by which other POL applications may be reviewed.

Some members expressed concern for the independence of each of the DRL and ACRS reviews if the ACRS Subcommittees worked closely with DRL on two selected projects.

The Committee also discussed the problem of obtaining technical support for the Regulatory Staff from DRD&T contractors. Some members viewed a memorandum from Shaw to Morris dated June 3, 1968 as very discouraging with regard to DRD&T's willingness to provide technical assistance.

Dr. Hendrie described the time-consuming procedure required to perform a calculation at BNL for the Regulatory Staff through DRD&T.

It was agreed that the topic of additional professional support for the Regulatory Staff may be appropriate for discussion with the Commissioners at the next meeting with them.

The Subcommittee also recommended that ACRS Subcommittees or working groups of the Reactor Safety Research Subcommittee be established to follow the work of major reactor vendors in connection with topical subjects (e.g., R&D related to asterisked items, consideration of topical reports, etc.). The Committee concurred with this recommendation.

An appropriate revision of ACRS Subcommittee assignments will be promulgated.

9. Naval Reactors (See classified supplement - Confidential Restricted Data.)

10. ACRS Participation in National Academy of Engineering Forum

Mr. Palladino had been asked to serve on a committee to organize a discussion on nuclear reactor safety by and for the National Academy of Engineering. Performing this task will involve direct discussions with some of the Commissioners.

The Committee had no objection to Mr. Palladino's participation.

Mr. Palladino requested suggestions for topics to be discussed.

11. ACRS Participation in AIF Panel Discussion on November 13, 1968

Dr. Okrent has been invited to participate in a panel discussion on Reactor Licensing, Codes and Standards at the AIF's annual meeting on November 13, 1968.

The Committee favored Dr. Okrent's participation.

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12. New Members

Dr. Zabel advised the Committee that Dr. Clifford's term on the ACRS expires in the fall of 1968 and that Dr. Gifford will not accept reappointment. The Committee desired that Dr. Gifford be retained as a consultant.

The Committee agreed to recommend Dr. Lombard Squires, Manager, Atomic Energy Division, E. I. du Pont de Nemours & Co. to fill the next vacancy on the ACRS. Dr. Zabel has transmitted this recommendation to Chairman Seaborg.

13. Consultant

Mr. John Landis was recommended as a consultant to the ACRS.

14. General Letter on Reactor Vessel Failures

The Committee agreed to attempt to prepare a general letter relating to protection against certain types of reactor vessel failures at sites having population densities comparable to or worse than Indian Point 2 and Zion. Dr. Bush, Mr. Etherington, and Dr. Okrent have agreed to prepare independent drafts of such a letter for consideration at the ninety-ninth ACRS meeting.

MEETINGS WITH THE DIRECTOR OF REGULATION  
AND THE REGULATORY STAFF

1. Subpoena of ACRS Members for Atomic Safety  
and Licensing Board Hearings

The Director of Regulation was advised that the Committee would like a written reply to its January 5, 1968 letter requesting immunity from subpoena for members and records of the Advisory Committee on Reactor Safeguards.

Mr. Price agreed to recommend a reply by the Commission and suggested that the Committee draft a reply for him so that he would know what the Committee desires.

Mr. Plaine agreed to prepare a draft reply. (A copy of this draft was distributed to members on June 8, 1968.)

2. Seismic Design Criteria

Mr. Price reported that he is still awaiting DRD&T comments on the draft seismic criteria dated May 6, 1968. Mr. Price said that he was trying to arrange a meeting with Mr. Shaw to attempt to resolve the DRD&T comments. Mr. Price further stated that he was prepared to submit the draft criteria to the Commission with or without DRD&T's input.

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It was noted that DRD&T may have a conflict of interest between the seismic design criteria and the Bolsa Island project.

A copy of the May 6, 1968 draft of the criteria and tentative DRD&T comments were forwarded to ACRS members on June 10, 1968.

3. Oyster Creek Nuclear Power Plant

Mr. Price advised the Committee that the applicant has requested authorization to proceed with the repairs to the two stub tubes that had been reserved by the ACRS for further analysis if such analysis was deemed necessary.

Members of the Regulatory Staff reported on the progress of the repairs to the Oyster Creek vessel and the measures proposed to minimize the effects of a failure of the sensitized lower shroud support ring.

The Committee concluded that it should not be involved in such "day-to-day" decisions and agreed to leave this decision to the Regulatory Staff. Comments of individual members (Mr. Etherington and Dr. Bush) were provided to the Staff (copy attached).

4. Fort St. Vrain Nuclear Generating Station

Mr. Price advised the Committee that he had received a letter from the Public Service Company of Colorado requesting an exemption to permit them to start construction of the Fort St. Vrain Nuclear Generating Station before a construction permit is issued. Mr. Price stated that his office was preparing a denial for this request.

5. DRD&T Reactor Safety Projects

The Committee inquired into the effects of recent AEC budget cuts on DRD&T reactor safety projects.

Mr. Price had not seen the DRD&T budget that reflected the recent cuts and did not know their effect on reactor safety projects. He suggested, however, that the safety research program would be subjected to its "share" of the cut.

6. Division of Compliance Report

The Division of Compliance reported on a number of problems encountered in the construction and operation of various nuclear plants.

- a. LaCrosse - A test of the emergency condenser was initiated by closure of the steam line isolation valve with the reactor operating at 25% power. Three of the four air operated valves in the lines leading to and from the emergency condenser failed to open. One failure was attributed to

foreign material wedged in the valve seat, the other failures may be from a design or maintenance deficiency. These valves were tested successfully two weeks prior to this failure. The plant is presently shut down and the investigation is continuing.

- b. Elk River - Fuel is being removed from this reactor preparatory to further leak testing. The next test will be performed at 600 psi and 330° F. Later plans call for a 1000 psi test to be held for a week and for the use of Sr<sup>85</sup> and Rb<sup>86</sup> tracers.
- c. Fermi - Two radioactive waste pipes were found to have failed. One, a gas line, was to have been encased in 10 inches of concrete and buried. It was found to have been buried without the concrete. The other was to have been a stainless steel line but it was found to have been carbon steel and corroded through from the inside.

#### 7. DRL Reports

- a. Dr. Morris reported that representatives from Gulf General Atomics had visited him concerning future commercial applications of the 1000 MWe HTGR. Gulf General Atomics would like to make a presentation to the ACRS sometime after August 1968.

Some ACRS members questioned ACRS participation in meetings of this type but no decision was reached.

This item has been scheduled tentatively for discussion at the 99th meeting.

- b. Mr. Skovholt reported that Big Rock Point is requesting authorization to install and use a new pelletized fuel element. Under accident conditions, it is estimated that the clad temperature of this fuel could reach 2660° F. This proposal is contained in an amendment to Change 14 of the operating license and is currently being reviewed by DRL. It had not yet been determined if this change required a mandatory ACRS review.
- c. In response to a question from Dr. Hanauer, Mr. Skovholt reported that the EONUS reactor has been permanently shut down.
- d. Dr. Morris stated that DRL will be prepared to discuss the problem of synchronizing diesel-driven emergency generators at the next ACRS meeting.
- e. Mr. Skovholt reported that it had been determined that ACRS review of the fuel reshuffle for the W. S. SAVANNAH was not required. It was agreed that DRL would handle this review without ACRS participation.



MISCELLANEOUS

July Meeting Agenda

- a. Zion Station - C.P. letter
- b. Maine Yankee Atomic Power Station - C.P. review
- c. Rancho Seco Nuclear Generating Station, Unit No. 1 - C.P. review
- d. W-Reactor - Effluent control program
- e. Consolidated Edison Nuclear Units Nos. 4 & 5 - Preliminary  
site review

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