



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

*To Mr. Fitzgerald  
from Mr. Brady*

January 12, 1978

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Honorable Joseph M. Hendrie  
Chairman  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555

Subject: REPORT ON PEBBLE SPRINGS NUCLEAR PLANT, UNITS 1 AND 2

Dear Dr. Hendrie:

During its 213th meeting, January 5-7, 1978, the Advisory Committee on Reactor Safeguards completed its review of the application of the Portland General Electric Company for a permit to construct the Pebble Springs Nuclear Plant, Units 1 and 2. This project was also considered during a Subcommittee meeting held in Portland, Oregon, on October 28, 1977. The Committee previously completed a partial review of this project at its 190th meeting, as discussed in its interim report to the Nuclear Regulatory Commission (NRC) dated February 11, 1976. During its review, the Committee had the benefit of discussions with representatives and consultants of the Portland General Electric Company, the Babcock and Wilcox Company, the Bechtel Power Corporation, and the NRC Staff. The Committee also had the benefit of presentations on the regional tectonics of the Pacific Northwest by representatives of the NRC Staff, the U. S. Geological Survey (USGS), Puget Sound Power and Light Company, Portland General Electric Company, Washington Public Power Supply System, their consultants, and members of the public at Subcommittee meetings held on September 1-2, 1977 in San Francisco, California, and on October 27-28, 1977 in Portland, Oregon. Matters related to the regional tectonics of the Pacific Northwest were considered at the 209th and 211th Committee meetings as reported in the Committee's letter dated November 15, 1977 to the NRC Executive Director for Operations. The Committee also had the benefit of the documents listed.

At the time of the Committee's interim report, February 11, 1976, the NRC Staff, the USGS, and the Applicant had not yet completed their reviews of the seismic design basis and of matters related to the possible deposition of volcanic ash arising from major volcanic eruptions of Mount Hood or Mount Saint Helens. These reviews have now been completed and the ACRS finds the Staff positions on these matters acceptable.

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The Committee believes that the Applicant and the NRC Staff should review the Pebble Springs Nuclear Plant for design features that could further reduce the possibility or consequences of sabotage. (Generic Item IIC-2 in ACRS Report, "Status of Generic Items Relating to Light-Water Reactors: Report No. 6," dated November 15, 1977).

Since the Committee's earlier partial review, the Staff has identified 13 additional issues, 11 of which require resolution prior to construction. These matters should be resolved in a manner satisfactory to the NRC Staff.

With regard to the generic problems cited in the Committee's report, "Status of Generic Items Relating to Light-Water Reactors: Report No. 6," dated November 15, 1977, items considered relevant to the Pebble Springs Nuclear Plant, Units 1 and 2 are: II-3, 4, 5B, 6, 7, 9, 10; IIA-2, 3, 4; IIB-1, 2; IIC-1, 3A, 3B, 4, 5, 6; IID-2; IIE-1. These problems should be dealt with by the NRC Staff and Applicant as solutions are found.

The ACRS believes that, if due regard is given to the items mentioned above and in its report of February 11, 1976, the Pebble Springs Nuclear Plant, Units 1 and 2 can be constructed with reasonable assurance that it can be operated without undue risk to the health and safety of the public.

Sincerely yours,

*Stephen Lawroski*

Stephen Lawroski  
Chairman

References:

1. Pebble Springs Preliminary Safety Analysis Report, Volumes 1-9 and Amendments 1 through 10.
2. Safety Evaluation Report, NUREG 0013, related to construction of Pebble Springs Nuclear Plant, Docket Nos. 50-514 and 50-515, January 1976, with Supplements 1 through 4.
3. USGS letter, dated January 3, 1978 from Henry W. Coulter, to Mr. Edson G. Case, ONRR, USNRC, re review of geologic and seismologic data relevant to Pebble Springs Nuclear Plant, Units 1 & 2.

References (con't)

4. Shannon & Wilson report to Portland General Electric Company entitled "Volcanic Hazard Study - Potential for Volcanic Ash Fall, Pebble Springs Nuclear Plant Site, Gilliam County, Oregon," dated January 1976.
5. Pebble Springs Nuclear Plant Fire Protection Review, PGE 2013, March 1977 with Amendment 1 dated November 1977.
6. Portland General Electric Company letter dated September 7, 1977, from J.W. Lindblad to Director of Nuclear Reactor Regulation, USNRC, re identification of significant items not formally documented with NRC.
7. Portland General Electric Company letter dated November 17, 1977, from W.J. Lindblad to Director of Nuclear Reactor Regulation, USNRC, re forwarding detailed description of Solid State Interposing Logic System.
8. Portland General Electric Company letter dated November 29, 1977, from W.J. Lindblad to Director of Nuclear Reactor Regulation, USNRC, re evaluation of geological and seismological aspects and outstanding issues.
9. Portland General Electric Company letter dated November 30, 1977, from Joseph L. Williams, Executive Vice President to Director of Nuclear Reactor Regulation, USNRC, re response to questions raised by ACRS.

EXCERPT FROM  
MINUTES OF THE 213TH ACRS MEETING  
JANUARY 5-7, 1978

IV. Meeting on Pebble Springs Nuclear Plant (CP), Units 1 and 2  
(Open to Public)

[Note: Ragnwald Muller was the Designated Federal Employee for this portion of the meeting.]

[Note: D. J. Brcehl, Portland General Electric Co. (PGE) coordinated the presentations for the Applicant; C. Stahle, for the NRC Staff.]

A. Subcommittee Report

Mr. Plesset, Subcommittee Chairman, discussed the status of the Committee's review of the application for the Pebble Springs Nuclear Plant, Units 1 and 2 (see Appendix XIV). He noted that the Committee has written an interim report on this application, and that the current portion of the review addresses those items which were not completed when the interim report was issued in February, 1976. These items included

- Seismic Design Requirements - USGS has recommended a design basis acceleration of 0.25g for the SSE,
- Improved ECCS Performance - this plant will use the B&W Mark C fuel, which has a lower linear heat rate than previous B&W fuels,
- Asymmetric Loads During Blowdown - this matter is being pursued effectively, and a favorable resolution is expected in the near future,
- Anticipated Transients Without Scram - a report on this matter is expected soon,
- Protection Against Turbine Missiles,
- Fire Protection,
- Industrial Security, and
- Analysis for the Effect of Volcanic Ash.

Mr. Plesset noted that twenty-six technical questions had been raised by Mr. Ebersole regarding the Pebble Springs application, and that written responses to these questions have been provided by PGE (see Appendix XV).

*Pebble Springs*

The Chairman noted that no requests have been received from members of the public to make oral or written presentations regarding the Pebble Springs application.

B. Status of NRC Staff Review

C. Stahle said that the most significant event that has occurred, since the review of the regional tectonics of the Pacific Northwest, is the resolution of the seismic design question. He said that the Applicant, the NRC Staff, and USGS are in agreement that a ground acceleration of 0.25g is adequately conservative for the SSE. (For the USGS report on the geology and seismology of the Pebble Springs site, see Appendix XVI).

With regard to the previously identified open issues, C. Stahle noted the following:

- the seismic design basis has been resolved: 0.25g horizontal ground acceleration for the SSE,
- turbine missiles: the Applicant has committed to a missile shield if it is shown to be necessary. A current EPRI study regarding turbine missiles may lead to a reduction of the conservatism of turbine missile calculations.

(G. R. Mazetis, NRC Staff, discussed the following three open items.),

- Credit for feedwater isolation to mitigate consequences of Chapter 15 events: the NRC Staff will pursue with the Applicant a request to address the different closure times between the feedwater isolation valves to assure that a single component failure would not compromise feedwater isolation when needed.
- The NRC Staff will require an additional commitment from the Applicant to use NRC Staff criteria for designing against limited passive failures during the long term after a LOCA.
- The NRC Staff has requested additional information on the operator reactions during Chapter 15 events. The Applicant has indicated that this material will be submitted in the near future, and the NRC Staff will review it when it is received.

C. Stahle said that the Applicant has identified eight engineering changes which resolve geological-seismological aspects of the Pebble Springs Plant. The NRC Staff has resolved six of these items. One of the two remaining items, regarding the mini-purge system, is still under review. The NRC Staff foresees no problem with this system, and believes it will be able to report satisfactory resolution in the next supplement to the SER.

S. Varga, NRC Staff, said that the 54-inch diameter vent, to be used during the fueling operation is under consideration by the Applicant for use during operating times also. If the Applicant requests the use of this 54-inch valve during operation, the NRC Staff will require that the same requirements be met regarding valve operability, acceptable doses, and ECCS back pressure, as is required for the mini-purge system. The applicant will be required to show that this 54-inch butterfly valve can withstand the maximum design pressure of the containment, and also be capable of closing against this pressure.

Mr. Bender questioned the practicability of using a 54-inch valve in a vent line.

C. Applicant's Response to the NRC Staff Report

D. J. Broehl took issue with the 0.25g horizontal ground acceleration requirement. Although the Applicant believes that 0.2g is both conservative and conforms to 10 CFR 100, Appendix A, the plant has been designed to the 0.25g required by the NRC Staff. The Applicant disagrees with the NRC Staff's interpretation of the criteria. With regard to the turbine missile question, he said that the principal contributor to the high probability of a penetration event, is the steam line penetration. A certain amount of spall shielding would eliminate the problem. The Applicant has committed to installing the spall shielding if it proves to be required. He said that one factor which was not considered in the NRC Staff's analysis, was a change in design in which the number of moisture separator reheaters was increased from two to four, which the Applicant calculates will reduce the probability of serious penetration from a turbine missile to the order of  $2 \times 10^{-7}$ . He suggested that the bases for calculations of missile penetration probability have changed since Dr. Bush's report because of improved valve testing. Another element which may have an effect is improved turbine disk integrity. The spall shielding need not be ordered until two years prior to fuel loading, which is scheduled for 1986 or 87.

D. Resolution of Postulated Volcanic Ash Problem

S. Christensen, PGE, said that the solution to the current volcanic ash problem, with regards to the acidity of the ultimate heat sink following fallout of volcanic ash, would be resolved by buffering this water. Buffered Columbia River water has been calculated to have a pH of 6.4 under these conditions, unbuffered, the water would have a pH of 3.3.

In answer to a question, S. Christensen said that if there were a catastrophic volcanic eruption, if the wind were blowing toward the plant as postulated, and an ash fall in the postulated amount occurred, the plant would be shutdown.

D. J. Broehl suggested that a volcanic eruption of the size postulated would present problems additional to the ash fall, such as difficulties with the transmission system, transportation, personnel commuting, etc. Because of these complications, the Applicant has assumed that the plant would be shutdown. The capability of maintaining a safe shutdown under the most severe circumstances has been evaluated. With regard to highway problems from deposited ash, road graders and bulldozers will be available for clearing.

E. NRC Staff's Response to ACRS's Questions

(For questions and Applicant's response, see Appendix XV.)

S. Varga said the NRC Staff found nothing in the Applicant's answers to the twenty-six questions submitted by the Committee to alter the Staff's conclusions.

Mr. Ebersole suggested that clarification of several points was in order:

- Localized vulnerability - D. R. Swanson, PGE, said that gross damage to the control room would not prevent safe shutdown by means of the remote control center. The Applicant has the capability and can maintain the capability for safely shutting down the plant from outside the control room. The automatic control systems provided do not deny the prerogative of an operator to restore services he needs.
- Worst chilling effects of differential temperatures on the tubes and the shell of the steam generators - C. W. Bruny, Bechtel Corp., said that the number quoted in response to the question, 3% strain, is an average, uniform strain

along the length of the steam generator tube. He said that the tube to tube sheet weld has also been evaluated for startup as well as accident conditions, and it is considered acceptable.

J. Rajan, Bechtel Corp., pointed out that the strain at rupture would be between 20 to 25%, and that the current case postulates a strain of only 0.3%.

- Loss of feedwater flow control, subject to turbine trip, where no more than normal maximum level of pressure is developed - R. Schomaker, Babcock and Wilcox, said that the analysis was performed assuming all valves were working and safety valves were operating.

T. Novak, NRC Staff, said that in reviewing a plant for overpressurization, the assumption is made that all spring-loaded safety valves would function. The conservatism of the analysis comes from the delayed signals that are derived to cause reactor trip. Failure of a safety valve to operate is not required for the analysis.

- Inconsistency of single failure criterion - Mr. Ebersole offered his interpretation of the single failure criterion applying to an occurrence that results in the loss of capability of a component to perform its intended safety function when called upon. Implicit in that statement is that the affected component is on standby duty. This definition is not consistent with the class of systems, such as battery systems, on-site a-c power systems, service water systems, and component cooling systems, because these systems are called upon 100% of the time, whether the plant is operating or shut down.
- Requirement for cable spreading room - S. Krishnamurthy, Bechtel Corp., said that the auxiliary shutdown panel can accomplish a plant shutdown without dependence on either cable-spreading room. The architect-engineer intends to separate the two redundant auxiliary shutdown panels into two different rooms.
- Freon compressor Locations - D. R. Swanson, PGE, said that the freon compressors for the chilled water system are both redundant and separated into different rooms.



- Control room dose calculations - S. Varga, NRC Staff, said that while the methods of calculations for control room dose differ between the Applicant and the NRC Staff, the calculated doses are in approximately the same range.
- Electrical penetration protection - Members noted that the NRC Staff's requirement for combining seismic and LOCA loads may not be consistent. Mr. Ebersole requested that the NRC Staff report on its requirements for analysis of combined seismic and LOCA loads on safety systems and requirements.

P. Industrial Security (Closed to Public)

D. Broehl said that the Applicant has reached no details in security plans for Pebble Springs. The Applicant's security experts are currently working on upgrading the security at the Trojan Plant. No work has been done beyond the current applications and the meeting of the various Regulatory Guides relating to separation of equipment and electrical systems. He said that he believes that the plant has a basic sabotage-resistant design. He noted that the Applicant is currently caught in a series of changes and development of new regulations.

C. Goodwin, PGE, said that he has read the Michaelson Report, and that he plans to review the events identified by Michaelson to prevent such scenarios from occurring at Pebble Springs. He suggested that in order to evaluate a plant against sabotage by inside personnel, one has to evaluate motives, capabilities for carrying out specific actions, and opportunities. He believes that the best method to prevent sabotage by personnel considered trustworthy is to keep the personnel happy. This can be accomplished with good management practices.

Members suggested that the Applicant should analyze his proposed plant to determine areas which may be problems, and not wait to meet NRC Staff requirements.

W. J. Ross, NRC Staff, said that the Applicant had developed good plans for Trojan in the Spring of 1975. These plans met the existing guidelines. He noted that as far as the NRC Staff is concerned, industrial security is a developing area. The NRC Staff has been cognizant of the problems of this Applicant as well as others. The NRC Staff is handling this situation with PG&E as it is handling the situation with other applicants by educating

them of the currently perceived threat levels. It is desired that the Applicants work with their architect-engineers to identify critical systems, components, and trains. The NRC Staff is attempting to improve communications between themselves and the Applicants.

G. Caucus (Open to Public)

The Members provided their opinions concerning the matters discussed above and identified those matters which they believed should be addressed in a report concerning this review.

The Committee concluded that they could write a report at this meeting.