

Public Service  
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Company

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United States Nuclear Regulatory Commission  
Document Control Desk  
Washington, DC 20555

Gentlemen:

RESPONSE TO NORTH ANNA STEAM GENERATOR  
TUBE RUPTURE EVENT  
SALEM GENERATING STATION  
UNIT NO. 1  
FACILITY OPERATING LICENSE DPR-70  
DOCKET NOS. 50-272

At the request of Mr. D. Fischer of your staff, PSE&G presented an assessment of the susceptibility of Salem Unit 1 to an event similar to the July 15, 1987 steam generator tube rupture at North Anna Unit 1 to members of the NRR Materials Engineering Branch and others on November 24, 1987 in Bethesda, MD. The presentation included the performance history of the Salem Unit 1 steam generators, primary to secondary steam generator leakage detection capabilities, and a description of the Salem Unit 1 Emergency Operating Procedures relating to steam generator tube rupture and associated training.

The Salem Unit 1 steam generators have an excellent performance record and have historically exhibited minimal tube degradation at the areas in question (Rows 9-12 tubes at the 7th Tube Support Plate). PSE&G attributes this performance record to a very effective AVT chemistry program as well as other steam generator operation and maintenance program enhancements. For this reason, PSE&G has approached the evaluation of the susceptibility of the Salem Unit 1 steam generator tubes to the North Anna scenario in a graded fashion. The initial effort involves the physical identification, through review of eddy current inspection tapes, of the prerequisite conditions for a North Anna type tube failure (i.e., tube denting at the top tube support plate of Rows 9 through 12 and an absence of Anti-Vibration Bar (AVB) support). If a tube is not dented or has AVB support, it is not susceptible to the North Anna scenario. If tubes are identified which are dented and have no AVB support at the top tube support plate in Rows 9 through 12, the next step would be to consider further engineering evaluation and/or analysis.

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During the current Salem Unit 1 outage, a "North Anna" eddy current inspection was performed on the 13 Steam Generator in addition to the eddy current inspection performed in accordance with the Technical Specifications. The inspection results indicated the lack of AVB support for only one tube in Rows 9 through 12. Although the eddy current indications revealed minimal (1 mil) denting, the tube was plugged as a conservative measure. Subsequently, the most recent full (all tubes inspected) eddy current inspection tapes of the 12 and 14 Steam Generators (performed in 1984) were sent to Westinghouse to be evaluated for degree of denting and AVB location for the tube rows in question. The preliminary results of this evaluation have indicated some tubes above Row 8 with no AVB support. However, the tubes with no AVB support had no indication of denting. The final results of the Westinghouse evaluation of these eddy current tapes are to be provided in the near future.

The review of the eddy current inspection tapes of the 11 Steam Generator for denting and AVB support of the tubes in question is currently being discussed with Westinghouse. The results will depend on the ability of the available eddy current inspection tapes to discern the desired information. We anticipate the ultimate results to be similar to those of the other three steam generators as the 11 Steam Generator has historically been the best performer of the four in terms of eddy current inspection results.

PSE&G feels that the evaluation of the 13 steam generator is complete and that no further action is required with regard to the North Anna event. If the final results of the 11, 12 and 14 Steam Generator eddy current inspection tape reviews reveal any tubes which may be susceptible to the North Anna problem, the need for more detailed analysis will be considered at that time.

Because the individual steam generator evaluations had not been completed, the NRR technical reviewers attending the November 24, 1987 meeting in Bethesda expressed particular interest in PSE&G's ability to detect and trend accelerated primary to secondary leakage, such as that which occurred at North Anna. PSE&G Chemistry and Health Physics personnel discussed the sensitivity, reliability, and performance of those radiation monitors which are used to detect primary to secondary leakage. In particular, the Air Ejector Monitor was demonstrated to be quite sensitive, very reliable, and capable of detecting very low leakage levels. Empirical data presented during the meeting demonstrated the early detection of primary to secondary steam generator leakage. The other radiation monitors used and contingency actions taken if the monitors are lost were also discussed.

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While acknowledging PSE&G's capability to detect low levels of steam generator primary to secondary leakage, the NRR technical reviewers expressed the need for PSE&G to consider a commitment to trend the rate-of-change of primary to secondary steam generator leakage above a certain leakage value. This rate-of-change would then be reported to plant management in a timely manner to enable consideration of power reduction and/or shutdown (i.e., to preclude a North Anna type tube rupture). In particular, the NRR reviewers asked that PSE&G consider its ability to monitor a curve extracted from a plot of steam generator tube leakage vs. time in an October 1987 Westinghouse Proprietary Report discussing the North Anna event. The NRR reviewers portrayed this curve as being representative of a tube failure condition similar to that experienced at North Anna. PSE&G meeting attendees stated that action would be considered pending a formal NRC request for response.

On December 7, 1987, Mr. D. Fischer requested via telecon that PSE&G provide a formal response of its ability to perform the trending of accelerated leakage such as that of the curve referred to above and to provide timely reporting of the leakage trend to plant management so that mitigating actions may be taken in a timely manner. While PSE&G recognizes NRC's desire to have interim leakage trending measures implemented at the plants which are potentially "susceptible" to the North Anna scenario until formal NRC technical positions can be generated, we would like to express our reluctance to refer to the curve noted above as a technical basis for our actions. At this time, PSE&G has not been presented with enough information to assure the valid applicability of this curve to Salem Unit 1. Similarly, we have no indication as to formal NRC acceptance or rejection of the curve and its technical basis.

PSE&G would like to address this NRC request by stating that the primary to secondary leakage monitoring capabilities at Salem Unit 1 are excellent and that leakage rate-of-change trending, if necessary, may be accommodated into the existing program as an interim measure. Early detection capability contributes to the effectiveness of Salem Unit 1's existing leakage monitoring program.

Salem Unit 1 will continue its existing normal primary to secondary leakage monitoring program as outlined in the November 24, 1987 presentation. This program involves close scrutiny of both on-line radiation monitors and radiochemistry results and has proven its capability to detect and trend low levels of primary to secondary leakage.

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If the primary to secondary steam generator leakage rate reaches 42 gpd (0.03 gpm), the leakage rate will be calculated and graphically recorded with a 24-hour projection. This will be done once every 8 hours. The Air Ejector and Steam Generator Blowdown Radiation Monitors will be checked every two hours. If either of these instruments indicate a rapidly increasing leak, a leak rate calculation together with a 24-hour projection will be performed at that time. Upon reaching the 42 gpd (0.03 gpm) level, the Senior Shift Supervisor and the Operations Manager will be notified.


If the 24-hour projections indicate that a 288 gpd (0.2 gpm) leakage rate will be reached, the personnel indicated above and the Station General Manager will be notified. Two additional primary and secondary leakage rate calculations will be performed along with Air Ejector Monitor and Steam Generator Blowdown Monitor readings. If the three 24-hour projections indicate that 288 gpd would be reached, station management will review the need for a power reduction or shutdown. The implementation of this augmented leakage monitoring program and appropriate management controls will be accomplished prior to startup of Salem Unit 1. Salem Unit 1 is tentatively scheduled to startup from its current refueling outage on December 24, 1987.

PSE&G has recently been informed that an NRC Bulletin is to be issued shortly delineating the NRC's formal position in this area and requested licensee actions. As such, we consider the response provided herein to be an interim measure pending our response to the forthcoming Bulletin. These actions will be superceded by and formalized in our Bulletin response.

To this date, the NRR requests for information regarding the evaluation of the North Anna event with respect to Salem Unit 1 have been verbal. It is requested that any future requests for information be made in writing so that we may keep a formal record of the NRC concerns in this area.

Should you have any further questions, please do not hesitate to contact us.

Sincerely,

A handwritten signature in black ink, appearing to be 'C. Allen', followed by a long, sweeping horizontal line that extends to the right.

C Mr. D. C. Fischer  
USNRC Licensing Project Manager

Mr. T. J. Kenny  
USNRC Senior Resident Inspector

Mr. W. T. Russell, Administrator  
USNRC Region I

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