Public Service
Electric and Gas
Company

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U. S. Nuclear Regulatory Commission
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Gentlemen:

RESPONSE TO NRC GENERIC LETTER 88-17
LOSS OF DECAY HEAT REMOVAL
SALEM GENERATING STATION
UNIT NOS. 1 AND 2
DOCKET NOS. 50-272 AND 50-311

Attached is the Public Service Electric and Gas Company (PSE&G) initial response to the subject NRC Generic Letter on the loss of decay heat removal capability. The concerns of losing decay heat removal capability in shutdown and refueling modes of operation, have been aggressively pursued at Salem. Since our response to Generic Letter 87-12 (in which Westinghouse thermal hydraulic analysis was provided), PSE&G has continued to closely follow the Westinghouse Owners Group (WOG) efforts in this area. PSE&G has also discussed decay heat removal concerns with NRR technical branches in detail to ensure the issues are understood and proper action has been taken. A review of Salem's procedures was recently conducted and the appropriate changes were made to provide further assurance that adequate decay heat removal will be maintained when in a shutdown condition. In preparation for the recent Salem Unit 2 Refueling Outage, PSE&G proactively implemented many of the recommendations identified in the subject Generic Letter, prior to formal issuance of the Generic Letter by the NRC. Furthermore, PSE&G is in the process of requesting amendment changes to the Technical Specifications to allow more operational flexibility of the Residual Heat Removal (RHR) System and to decrease the probability of losing the RHR System.

The eight recommended expeditious actions identified in the Generic Letter 88-17, have been reviewed and PSE&G's response to each action is provided in the attachment. PSE&G believes that Salem's program is in compliance with the NRC guidance provided in Generic Letter 88-17. It is PSE&G understanding that this response will provide Salem's Licensing Basis for loss of decay heat removal concerns, at reduced RCS inventory conditions, and that previous commitments in response to Generic Letter 87-12 will no longer be applicable.

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A WOG initiated program on Loss of Decay Heat Removal has been submitted to the NRC as WCAP-11916 per WOG Transmittal OG-88-41, dated November 21, 1988. This document forms the basis for Salem - specific normal and abnormal procedures for the loss of heat removal capability.

Please note that a one week extension on the due date for this response was granted by NRR (per telecon with W. R. Butler, Director, Directorate 1-2). PSE&G's response to the recommended long term program enhancements will be submitted at a later date consistent with the requirements of the Generic Letter.

Should you require any additional information with regard to this submittal, please do not hesitate to contact us.

Sincerely,

Attachment

C Mr. J. C. Stone
USNRC Licensing Project Manager

Ms. K. Halvey Gibson
USNRC Senior Resident Inspector

Mr. W. T. Russell, Administrator
USNRC Region 1

Ms. J. Moon, Interim Chief
New Jersey Department of Environmental Protection
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CN 415
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REF: GENERIC LETTER 88-17

STATE OF NEW JERSEY)
) SS.
COUNTY OF SALEM)

Stanley LaBruna, being duly sworn according to law deposes and says:

I am Vice President - Nuclear Operations of Public Service Electric and Gas Company, and as such, I find the matters set forth in our letter dated, , concerning the Salem Generating Station, Unit Nos. 1 and 2, are true to the best of my knowledge, information and belief.

S. LaBruna

Subscribed and Sworn to before me
this 6th day of January, 1989

Laraine Y. Beard
Notary Public of New Jersey

LARAINE Y. BEARD
Notary Public of New Jersey
My Commission Expires May 1, 1991

My Commission expires on _____

ATTACHMENT

RESPONSE TO GENERIC LETTER 88-17
SALEM GENERATING STATION
UNIT NOS. 1 AND 2
DOCKET NOS. 50-272 AND 50-311

The responses to each of the eight expeditious actions presented in NRC Generic Letter 88-17, Loss of Decay Heat Removal, regarding the Salem units during the approach to reduced inventory condition and during operation with a partially filled RCS are included in the following.

1. Discuss the Diablo Canyon event, related events, lessons learned, and implications with appropriate plant personnel. Provide training shortly before entering a reduced inventory condition.

The Diablo Canyon event and other related events were discussed with all licensed operators prior to entering the Salem Unit 1, 7th Refueling Outage and the Salem Unit 2, 4th Refueling Outage. Training on RHR Events is incorporated into the Licensed Operator Requalification Training and is provided on a scheduled basis. RHR Events, including the Diablo Canyon event, are incorporated into the lesson plan 302/304-145.18-RHR872. This training includes methods for interpreting curves to determine time to boiling, minimum flow requirements, indication of vortexing, RHR system venting and pump restart, etc. PSE&G will continue pre outage briefings for the operating staff for the next two refueling outages. At this time, we will review the effectiveness of the requalification training on this issue to determine if continued briefings are necessary. Salem is following WOG developments on this subject and will incorporate guidance into plant documents as appropriate. A case study, utilizing INPO provided materials, will be conducted in the 1989-1990 requalification cycle. Other plant personnel are made aware of these concerns by the methods discussed in the response to Item 5.

2. Implement procedures and administration controls that reasonably assure that containment closure will be achieved prior to the time at which a core uncovery could result from a loss of DHR coupled with an inability to initiate alternate cooling or addition of water to the RCS inventory. Containment closure procedures should include consideration of potential steam and radioactive material release from the RCS should closure activities extend into the time boiling takes place within the RCS. These procedures and administrative controls should be active and in use:

   (a) prior to entering a reduced RCS inventory condition for NSSSs supplied by Combustion Engineering or Westinghouse,
   (b) (Not applicable to Westinghouse plants)

and should apply whenever operating in those conditions. If such procedures and administrative controls are not operational, then either do not enter the applicable condition or maintain a closed containment.

Salem has in place, administrative controls that require a minimum delay from the time of shutdown until operation in a reduced RCS inventory condition is allowed. Currently, this delay is 72 hours. This delay assures that the time to boiling is approximately 10 minutes and the time to core uncovery is approximately 2 hours if Decay Heat Removal capability is lost in the reduced inventory condition (worst case-beginning of an outage). The loss of Decay Heat Procedure requires that the hatch be replaced in an expeditious manner. Installation of the equipment hatch requires the use of the polar crane and other support items. It is estimated that the hatch can be installed in a maximum of 4 hours. Therefore, PSE&G shall procedurally require that the hatch remain closed during mid-loop operation, unless the core will remain covered for at least 4 hours if RHR is lost. Any deviation from this position will be justified by a safety evaluation. Procedures to address containment closure in potential steam and radioactive environments will be developed prior to entering midloop operation with hatch open.

3. Provide at least two independent, continuous temperature indications that are representative of the core exit conditions whenever the RCS is in a mid-loop condition and the reactor vessel head is located on top of the reactor vessel. Temperature indications should be periodically checked and recorded by an operator or automatically and continuously monitored and alarmed. Temperature monitoring should be performed either:

   (a) by an operator in the control room, or

   (b) from a location outside of the containment building with provision for providing immediate temperature values to an operator in the control room if significant changes occur. Observations should be recorded at an interval no greater than 15 minutes during normal conditions.

At Salem Units 1 and 2, bottom mounted instrumentation is used to monitor the core exit temperature. There are 58 bottom mounted thermocouples. These would usually be removed for mid-loop operation; however, PSE&G will administratively ensure that at least 2 of the thermocouples are maintained operable when in mid-loop operation. These thermocouples provide a continuous temperature indication to the plant process computer CRT, which is available for the operators direct use in the control room. Additionally, an alarm will be established to alert operators to

changing plant conditions indicative of RHR system degradation. This provides reliable indication of temperature such that rapid temperature changes would be easily and promptly observed. The control room log requires that the readings be logged hourly.

4. Provide at least two independent, continuous RCS water level indications whenever the RCS is in a reduced inventory condition. Water level indications should be periodically checked and recorded by an operator or automatically and continuously monitored and alarmed. Water level monitoring should be capable of being performed either:

   (a) by an operator in the control room
   (b) from a location other than the control room with provision for providing immediate water level values to an operator in the control room if significant changes occur. Observations should be recorded at an interval no greater than 15 minutes during normal conditions.

At Salem, at least 2 RCS loop flow transmitters, located on the intermediate leg, are recalibrated to provide RCS level indication in the control room prior to entering mid-loop operation. This indication is provided continuously on the control console in the control room. An alarm is provided at 6 inches above the centerline level to warn the operator of inventory loss. The indication is also input to the plant computer and recorder such that the level is trended on the recorder. This provides the operator with trend indication such that an inventory reduction would be readily observed. Hourly readings are taken and logged by the control room operators.

PSE&G also continues to employ the use of tygon tubing indication in the containment. The tygon tubing is connected to the #3 intermediate leg drain connection and is vented to the containment. The tubing is well supported throughout its length and the installation is checked for kinks, loops, or other interferences that could cause erroneous level indication. The tygon tubing level and the 2 control room level indcations are required to be within plus or minus 3 inches of each other. Any greater deviation requires prompt investigation before RCS level can be further reduced. The tygon tubing level is procedurally logged twice per shift and is isolated between readings.

5. Implement procedures and administrative controls that generally avoid operations that deliberately or knowingly lead to perturbations to the RCS and/or to systems that are necessary to maintain the RCS in a stable and controlled condition while the RCS is in a reduced inventory condition.

If operations that could perturb the RCS or systems supporting the RCS must be conducted while in a reduced inventory condition, then additional measures should be taken to ensure that the RCS will remain in a stable and controlled condition. Such additional measures include both prevention of a loss of DHR and enhanced monitoring requirements to ensure timely response to a loss of DHR should such a loss occur.

PSE&G has specific Salem procedures which govern the operation of the plant with reduced RCS inventory. The Cautions section of the "Draining the Reactor Coolant System" Operating Instruction Procedure (OI II-1.3.6) alerts the operators of the conditions to expect in a loss of RHR event, especially during reduced RCS inventory conditions. As mentioned elsewhere in this letter, pertinent RHR parameters are logged as specified in operating procedures. The initial conditions section of the procedure assures that the required equipment and proper valve lineup is maintained to mitigate the loss of RHR event. Upon the loss of RHR, the operator is directed by Abnormal Operating Procedure AOP-RHR-2. All planned work and manipulations are reviewed by the station outage management and shift supervision for their effect on plant safety and for potential effect on reduced inventory operation.

During Salem's last Refueling Outage (Unit 2, 4th), the concerns related to mid-loop operation were stressed to all the supervisors involved in the outage. Posters were placed at all major workplace entrances describing "Mid-loop Operation" and the associated DOs and DO NOTs. Prior to the outage, a Supervisory Letter was issued to all supervisors discussing the Diablo Canyon event, related events, lessons learned, and the implications for Salems' supervisory oversight during mid-loop operations. The Supervisory Letter required them to discuss with their workers the importance of preventing a loss of RHR event and the emergency actions which might be required of them to mitigate the consequences of a long duration loss of RHR event. These actions have resulted in a substantially improved understanding of RHR concerns at Salem. These above actions will continue in future outages.

6. Provide at least two available or operable means of adding inventory to the RCS that are in addition to pumps that are a part of the normal DHR system. The water addition rate capable of being provided by each of the means should be at least sufficient to keep the core covered. Procedures for use of these systems during loss of DHR events should be provided. The path of water addition must be specified to assure the flow does not bypass the reactor vessel before exiting any opening in the RCS.

Salem's procedures for operating with reduced RCS inventory require that one High Head Charging/Safety Injection pump be OPERABLE (per Technical Specification 3.1.2.3) and one Intermediate Head Safety Injection pump be available (administratively tagged for the shift supervisor). The availability of the Safety Injection pump provides the capability for hot leg injection such that injection will not be impeded by an opening on the cold leg. The availability of the Charging and Safety Injection pumps ensures that the makeup capacity is greater than the boiloff rate for a loss of RHR event. This excess capacity is utilized to recover the RCS level and to restart the RHR pumps, after venting the system. The flow paths associated with these pumps is maintained and verified to be available. As a additional alternative, gravity feed is available as a makeup source.

7. Implement procedures and administrative controls that reasonably assure that all hot legs are not blocked simultaneously by nozzle dams unless a vent path is provided that is large enough to prevent pressurization of the upper plenum of the RV. See references 1 and 2.

If all 4 Steam Generators need to have their hot leg and cold leg closed by nozzle dams, a minimum 0.5 square foot opening is required to provide an adequate vent path. These requirements are based on the high decay heat loads anticipated early on in the outage. These requirements may be relaxed, based on a safety evaluation, as the time after shutdown increases based on the vent path size required to ensure adequate venting for the decay heat load of the core. In the worst case scenario the 3 safety valves are required to be removed to ensure an adequate vent path; however, based on the decay heat load (time after shutdown) the vent path may be significantly reduced to where the PORVs and the 2 Steam Generators (normally maintained available) are more than adequate. When the PORVs are utilized, the rupture disk is required to be removed from the Pressurizer Relief Tank to prevent the occurrence of an excessive back pressure condition. Additionally, plant procedures have been modified to require that hot leg nozzle dames are installed last and removed first to prevent sudden ejection of RCS inventory.

8. SALEM DOES NOT HAVE LOOP STOP VALVES; THEREFORE, THIS ACTION IS NOT APPLICABLE TO SALEM GENERATING STATION