

Public Service
Electric and Gas
Company

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Vice President - Nuclear Operations

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U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Gentlemen:

90 DAY RESPONSE TO 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) 90 day response to NRC Generic Letter 88-17. The six programmed enhancement recommendations have been reviewed and PSE&G's response including planned modifications and procedure controls are provided in the attachment. PSE&G's goal is to have all enhancements completed by the Unit 1, 9th and the Unit 2, 5th refueling outages.

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

Sincerely,



Attachment

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C Mr. J. C. Stone
Licensing Project Manager

Ms. K. Halvey Gibson
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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.

Stanley LaBruna

Subscribed and Sworn to before me
this 27th day of January, 1989

Laraine Y. Beard
Notary Public of New Jersey

LARAIN E. BEARD
Notary Public of New Jersey
My Commission Expires May 1, 1991

My Commission expires on _____

ATTACHMENT

The following provides PSE&G's response to Generic Letter (GL) 88-17 in regards to programmed enhancements for loss of decay heat removal concerns. The implementation of these enhancements is planned for the Unit 1, 9th and Unit 2, 5th refueling outage presently scheduled for September, 1990 and March, 1990 respectively.

Instrumentation

Provide reliable indication of parameters that describe the state of the RCS and the performance of systems normally used to cool the RCS for both normal and accident conditions. At a minimum, provide the following in the CR:

- (a) two independent RCS level indications
- (b) at least two independent temperature measurements representative of the core exit whenever the RV head is located on top of the RV (We suggest that temperature indications be provided at all times.)
- (c) the capability of continuously monitoring DHR system performance whenever a DHR system is being used for cooling the RCS
- (d) visible and audible indications of abnormal conditions in temperature, level, and DHR system performance

RESPONSE

- (a) Salem recalibrates two independent RCS loop flow transmitters, prior to entering mid-loop operations, to provide continuous RCS level indication in the control room. An alarm is provided at 6 inches above centerline level to warn the operator of inventory loss. The indication is also input to the plant computer and recorder to allow the level to be trended on the recorder.

In addition local level indication (presently the tygon tubing) in the containment will be converted into a permanently installed, hard pipe design. The system will have permanent level markings and will be used to verify the accuracy of the control room level indicators. The local indication will be isolated except when the operator is taking his readings.

- (b) Salem utilizes bottom mounted instrumentation to monitor the core exit temperature. There are 58 bottom mounted thermocouples, which are normally removed prior to mid-loop operation. PSE&G has established administrative controls to ensure that at least two of the thermocouples are maintained operable when in a reduced inventory condition. 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.
- (c) DHR system performance monitoring consists of various parameters of the RHR system such as suction pressure, discharge pressure, pump flow, RCS level and motor amps. Presently, PSE&G is evaluating the feasibility of installing these indications on the SPDS system and developing a specific status tree function for DHR monitoring. This type of design would minimize the modifications in the control room area and make use of the existing computer systems; thus, minimizing disruptions in the control room and not causing alterations in the modifications being made for human factors considerations.
- (d) The planned DHR monitoring system will utilize the SPDS computer and the two associated CRTs in the control room. Although a change in the status tree is visual, the change is highly noticeable to the operator. One SPDS screen must be kept on the SPDS "home" screen. This screen monitors all the status trees and changes from a green color to either yellow, purple or red depending on degradation of the system being monitored. Consequently, visual indication of abnormal level, temperature or DHR system performance will be available from the SPDS. The need for an audible alarm will be evaluated in the development and testing of the design change to the SPDS.

Procedures

Develop and implement procedures that cover reduced inventory operation and that provide an adequate basis for entry into a reduced inventory condition. These include:

- (a) procedures that cover normal operation of the NSSS, the containment, and supporting systems under conditions for which cooling would normally be provided by DHR systems.

- (b) procedures that cover emergency, abnormal, off-normal, or the equivalent operation of the NSSS, the containment and supporting systems if an off-normal condition occurs while operating under conditions for which cooling would normally be provided by DHR systems.
- (c) administrative controls that support and supplement the procedures in items (a), (b), and all other actions identified in this communication, as appropriate.

RESPONSE

- (a) The RCS drain down procedure (OI II-1.3.5) provides guidance on operation of the NSSS, the containment and supporting systems under reduced RCS inventory. This procedure is generally reviewed prior to entering an outage for any revisions necessitated from prior experience or other regulatory requirements. This procedure provides initial conditions for containment closure conditions, availability of ECCS equipment and associated flow paths, and RHR support systems such as component cooling and nuclear service water systems.
- (b) The operation of the NSSS with reduced RCS inventory under loss of RHR conditions is covered by abnormal operating procedure AOP-RHR-2. This procedure provides guidance on containment closure, NSSS monitoring, gravity feed and ECCS makeup, containment evacuation, RHR restoration, decay heat load, establishment of secondary side heat removal and feed and bleed operation of the RCS. Appropriate training has been conducted on this procedure. Procedure changes and training on these changes are implemented on a continuing basis as Salem specific and industry experience is obtained and as new information is developed by the Westinghouse Owners Group (WOG).
- (c) Salem management is fully involved during outage conditions, especially reduced inventory conditions. The outage managers provide extensive coverage as the Shift Outage Managers and conduct outage meetings three times a day. These outage meetings are used to provide updates on work in progress and provide necessary direction to outage personnel on critical issues. During reduced inventory conditions these meetings are also used to emphasize and stress reduced inventory precautions and to communicate the possible emergency actions that could be required of them. Additionally the Shift Supervisors review with the outage Containment Coordinators all jobs with potential impact on RHR operation. The Shift Supervisors exercise control over all jobs in process during reduced inventory conditions and have been trained on the loss of DHR concerns including the the Diablo Canyon incident.

Salem administratively assures that the time from shutdown prior to reduced RCS inventory is at least 72 hours. RCS makeup equipment is aligned and available as required by the procedures. Administrative controls also are used to control various other jobs on primary systems to minimize the potential for loss of RHR.

Salem normal procedures, abnormal procedures and administrative controls have been reviewed and revised to ensure that reduced inventory concerns and controls are addressed. PSE&G is participating in Westinghouse Owners Group activities and will implement appropriate improvements that are identified in the industry effort.

Equipment

- (a) Assure that adequate operating, operable, and/or available equipment of high reliability is provided for cooling the RCS and for avoiding a loss of RCS cooling. (Reliable equipment is equipment that can be reasonably expected to perform the intended function. See Enclosure 2 for additional information).
- (b) Maintain sufficient existing equipment in an operable or available status so as to mitigate loss of DHR or loss of RCS inventory should they occur. This should include at least one high pressure injection pump and one other system. The water addition rate capable of being provided by each equipment item should be at least sufficient to keep the core covered.
- (c) Provide adequate equipment for personnel communications that involve activities related to the RCS or systems necessary to maintain the RCS in a stable and controlled condition.

RESPONSE

- (a) The required makeup equipment at Salem are the high head charging/safety injection pump (C/SI), intermediate head safety injection pump, interconnecting piping, and gravity feed makeup from Refueling Water Storage Tank. All services such as motor and control power, control air, ventilation, and pump bearing cooling water are assured for the equipment required during the loss of RHR event. At Salem, one C/SI pump is operable and one SI pump is available, but tagged, for shift supervisor. Adequate RWST level is maintained to ensure gravity makeup capability.

- (b) Service Water (ultimate heat sink) and component cooling water equipment maintenance is scheduled such that required equipment is available. If no makeup to the RCS is assumed during the initial loss of RHR event, the RCS would start boiling. If no vent is provided on the RCS hot leg side, two SGs with their secondary side filled will be available. The steam would be condensed in the SGs and RCS inventory would be lost only through the small size vents on the reactor head and the PORVs. The condensation in the SGs will continue until the secondary side of the SGs starts boiling. It is expected that the operators would establish a secondary side flow path by initiating SG blowdown or opening the PORVs (steam side), and thus, significantly delay core uncovering.

During loss of RHR or loss of RCS inventory, Salem procedures assure the operability or availability of one C/SI pump and one SI pump. The C/SI pump provides 550 gpm and SI pump provides 650 gpm with RCS vented or at relatively low pressure. The maximum expected boil-off rate at 72 hours from shutdown is approximately 90 gpm. Consequently, the RCS level will be recovered quickly even if a portion of the makeup is lost through RCS opening.

- (c) Salem provides several telephones inside containment during outages in addition to a page system. Containment coordinators and shift managers assure adequate coverage of supervision in the containment during outages with radio communications. Radios are also stored in the control room area and are available to the operators.

Analyses

Conduct analyses to supplement existing information and develop a basis for procedures, instrumentation installation and response, and equipment/NSSS interactions and response. The analyses should encompass thermodynamic and physical (configuration) states to which the hardware can be subjected and should provide sufficient depth that the basis is developed. Emphasis should be placed upon obtaining a complete understanding of the NSSS behavior during loss of RHR event.

RESPONSE

WOG has developed an analysis of NSSS behavior under Mode 5 and 6 operations. This analysis, WCAP-11916, which has been sent to the NRC, forms the basis for Salem's procedures in these modes. Currently Salem's analysis and basis are covered by a safety evaluation for mid-loop operations. This safety evaluation includes the WOG

information, industry experience and Salem's specific experience and design. An Engineering Standard will be developed per the Generic Letter schedule. This Engineering Standard will incorporate the additional WOG information and analysis as it is developed along with the current safety evaluation information. When completed the Engineering Standard will become the analytical basis for Salem's procedures, instrumentation requirements, equipment requirements, and NSSS behavior and interactions.

Technical Specifications

Technical Specifications (TSS) that restrict or limit the safety benefit of the actions identified in this letter should be identified and appropriate changes should be submitted.

RESPONSE

Salem is processing a Technical Specification change to the RHR flow rate which will change the RHR flow rate from 3000 gpm to a variable flow rate that is based on the decay heat rate which is determined as a function of time from shutdown. This Technical Specification change will be submitted to the NRC by March 31, 1989.

Another Technical Specification change will delete the auto-closure feature on the RHR pump suction valves. This should preclude loss of the RHR pumps due to momentary bus power loss or pressure instrument failures. This Technical Specification change has been submitted to the NRC and is under review.

RCS perturbations

Item (5) of the expeditious actions should be reexamined and operations refined as necessary to reasonably minimize the likelihood of loss of DHR.

RESPONSE

To reduce the perturbations to RCS during RHR operation with reduced RCS inventory, the jobs are screened for the potential impact and likelihood of loss of RHR either from intentional or unintentional actions of various personnel. A supervisory letter to emphasize the critical importance of decay heat removal is issued every outage to all personnel who may have potential to cause the loss of RHR. All supervisors are reminded of the need to assure continued safe operation of RHR and avoid perturbations which could cause the loss of RHR during the outage meetings, which take place everyday, while the plant is in a reduced inventory condition.

ADDITIONAL ENHANCEMENTS

Although not included in the required enhancements, Salem is considering a modification to the containment equipment hatch door. This modification would provide the capability to quickly close containment in the event of loss of RHR.

Salem is also considering installing a permanent, hard piped, vent on the RHR system to allow quick venting of any entrapped air in the system. This would significantly reduce the possibility of losing the RHR pumps for significant periods of time.