Public Service
Electric and Gas
Company

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RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
EXIGENT REQUEST FOR CHANGE TO TECHNICAL SPECIFICATIONS
EMERGENCY CORE COOLING SUBSYSTEMS
SALEM GENERATING STATION NOS. 1 AND 2
FACILITY OPERATING LICENSES DPR-70 AND DPR-75
DOCKET NOS. 50-272 AND 50-311

Gentlemen:

Public Service Electric and Gas (PSE&G) is providing the attached information in response to the Nuclear Regulatory Commission's Request for Additional Information transmitted to PSE&G on May 9, 1997. This information should complete the Staff's review of PSE&G's "Exigent Request for Change to Technical Specifications," submitted on April 25, 1997.

In the April 25, 1997 submittal, PSE&G requested that the amendment be made effective on the date of issuance, but provide for implementation prior to entry into Mode 3 from the current outages for Salem Units 1 and 2. Based on discussions held with the NRC, PSE&G understands that this change is no longer required to be implemented before Mode 3 and requests an implementation period of sixty days to provide sufficient time for associated administrative activities.

If you have any concerns regarding this submittal, please contact us.

Sincerely,

E. C. Simpson

A001

Attachment
Affidavit

C Mr. H. J. Miller, Region I Administrator
U. S. Nuclear Regulatory Commission
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Mr. L. Olshan, Licensing Project Manager - Salem
U. S. Nuclear Regulatory Commission
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STATE OF NEW JERSEY)
) SS.
COUNTY OF SALEM)

E. C. Simpson, being duly sworn according to law deposes and says:

I am Senior Vice President - Nuclear Engineering of Public Service Electric and Gas Company, and as such, I find the matters set forth in the above referenced letter, concerning Salem Generating Station, Units 1 and 2, are true to the best of my knowledge, information and belief.

E C Simpson

Subscribed and Sworn to before me
this 6 day of June, 1997

Elizabeth J. Kidd
Notary Public of New Jersey

ELIZABETH J. KIDD
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 25, 2000

My Commission expires on

The following is the Public Service Electric and Gas (PSE&G) response to the additional information requested by the NRC. The NRC's request for information is indicated in **bold** typeface followed by PSE&G's response.

1. **The staff does not fully understand your basis for concluding that there would be excessive flow through the residual heat removal (RHR) system during the recirculation phase of loss of coolant accident (LOCA) mitigation if RH26 was not closed. Provide a more detailed explanation.**

PSE&G Response:

Prior to the Emergency Operating Procedure (EOP) changes performed in 1994, the Emergency Core Cooling System (ECCS) would be aligned for hot leg recirculation as follows with two Residual Heat Removal (RHR) pumps operating:

- One RHR train would be realigned to deliver flow to only the suction of the Intermediate Head Safety Injection (IHSI) and High Head Safety Injection (HHSI) pumps (low head flow to the cold leg was isolated).

- The other RHR train was realigned from supplying containment spray and cold leg injection to low-head hot leg injection through the RH26 valve while maintaining continuous flow to the IHSI and HHSI pumps.

- Both IHSI pumps would be realigned to deliver flow to the Reactor Coolant System (RCS) hot legs via separate discharge headers (each header supplies two different RCS hot legs).

After alignment of the ECCS as discussed above, failure of one RHR pump would cause the operating pump to supply the suction flow to the IHSI and HHSI pumps and also the flow to the low-head hot leg injection flow path through the RH26 valve (either directly or the result of the loop-around flow path).

The above configuration involved decreased system resistance and head losses compared to the cold leg recirculation alignment. The single failure of one RHR pump and the above hot leg recirculation configuration created the potential for excessive RHR flow due to:

- higher IHSI pump flow due to two separate hot leg flow path discharge headers compared to a common cold leg discharge header
- a higher flow capability in the RHR hot leg header compared to either cold leg header.

As stated in LER 272/97-009-00 dated May 19, 1997, the flows estimated for hot leg recirculation (prior to the 1994 EOP changes) may have resulted in the RHR pump operating beyond its actual run-out limit which could have challenged the operation of the RHR pump.

Elimination of the use of the RHR flow path to the hot legs via the RH26 valve reduces the flow in the RHR system to within acceptable limits (i.e., flow is sufficient to satisfy accident analysis flow requirements) and ensures continued RHR pump operation assuming the failure of one RHR pump.

2. **On page 2 of Attachment 1, under "Justification of Requested Changes," it states that "...the RCS pressure is at equilibrium with the containment pressure, which is conservatively assumed to be at 25.0 psig. At this pressure, the enthalpy of saturated steam is 1160.1 BTU/lbm, and 208.52 BTU/lbm for saturated liquid." According to our reading of the steam tables, your staff apparently used the enthalpy values at 25 psia and not 25 psig. Provide the correct containment pressure and corresponding enthalpy values. Also, provide your basis for concluding that the containment pressure (e.g., 25 psig or a corrected value) is a conservative value.**

PSE&G Response:

Based on the limiting containment pressure profile for the LOCA case in WCAP-13839, Figure 3-1, the containment pressure at 14 hours (50,400 seconds) is less than 18 psig (32.7 psia). At 100,000 seconds, the containment pressure is less than 10 psig (24.7 psia) and at 1,000,000 seconds it is less than 5 psig (19.7 psia). At this time in the LOCA transient, the RCS pressure is assumed to be in equilibrium with the containment pressure, therefore a back-pressure difference for the RHR pump performance would be nearly 0 psig. The pump performance at a higher pressure differential would be lower and therefore conservative with respect to the calculation of the LOCA mass and energy releases for containment integrity analysis because a lower ECCS flow results in a higher steam release and elevated containment temperature and pressure. The higher pressure differential was therefore used for the evaluation. A containment pressure of 25 psig (39.7 psia) would bound the containment pressure profile in

WCAP-13839 Figure 3-1 for use from a pump performance curve perspective. Use of minimum ECCS flows are conservative for the containment integrity calculations. Note that the 25 psig backpressure parameter, while conservative with respect to containment integrity, would minimize pump run-out. Consequently, 25 psig was not used in assessing pump run-out in the fluid system calculations.

The saturated enthalpies for 39.7 psia are:

h_f = 235.68 Btu/lbm

h_g = 1169.61 Btu/lbm

3. **Provide the basis for concluding that the hot leg recirculation swap over occurs approximately 14 hours after the LOCA.**

PSE&G Response:

On March 10, 1987, PSE&G submitted License Change Request (LCR) 87-01 for increasing the boron concentration limits in the Refueling Water Storage Tank (RWST) and Accumulators. As a result of the increase in boron concentration in the RWST and Accumulators, an analysis was performed by Westinghouse that concluded that the hot leg switchover time be revised from 22.5 hours to 14 hours. As stated in LCR 87-01, the results of this analysis were based upon the maximum allowable boric acid concentration established by the NRC. The NRC approved LCR 87-01 in Amendments 83 and 55 (for Unit 1 and Unit 2 respectively) on October 16, 1987. In the Safety Evaluation Report (SER) for Amendments 83 and 55, the NRC required PSE&G to revise the emergency operating procedures (EOPs) to reflect the 14 hour hot leg switchover time. The 14 hour hot leg switchover time was subsequently incorporated into the EOPs.

4. **Provide the basis for concluding that the heat generation rate (at the time of initiation of hot leg recirculation) is 24,540 BTU/sec.**

PSE&G Response:

From the Salem Unit 1 and 2 plant specific decay heat curve in Table 2-8 of WCAP-13839, for a power level of 102%, the decay heat level at 14 hours is 24628.4 Btu/sec. This curve is based on the ANS 1979 decay heat curve plus 2 sigma uncertainty. This energy level is higher than the value provided in Westinghouse SECL-93-291 and therefore more conservative for calculating the rate that inventory would be boiled off from around the core. A slightly more conservative value for decay heat may be determined depending on the method that is used to calculate the decay heat fraction. A conservative linear interpolation from the Salem Unit 1 and 2 plant specific decay heat curve in Table 2-8 of WCAP-13839 was used to determine the decay heat rate stated above.

Using the steam table data provided in response to Question 2, the boiloff rate would be:

Core Boiloff Rate = Decay Heat Rate/(heat of vaporization at 39.7 psia)

Core Boiloff Rate = 24,628.4 (Btu/sec)/(1169.61 - 235.68)(BTU/lbm)
= 26.37 lbm/sec

5. **Provide the basis for the statement, "The flow delivered by one Intermediate Head Safety Injection (IHSI) pump to two hot legs is 76.03 lbm/sec at a backpressure of 25.0 psig." The staff does not understand what affect "backpressure" has on the flow rate of the pump since it appears that the same pressure is also seen at the suction end of the pump (i.e., both the pump suction and pump discharge are inside reactor containment during the recirculation phase of LOCA mitigation). Provide the basis for the flow rate of the IHSI pump.**

PSE&G Response:

Based on the Salem Unit 1 and 2 specific pump performance curve, at a pressure of 25 psig that was determined as described in Question 2, the flow from one IHSI pump is 76.03 lbm/sec. Since the IHSI pump flow is 76.03 lbm/sec, the IHSI pump provides more than the core boiloff rate from the decay heat generated at 14 hours after a large break LOCA. See response to Question 4 for calculation of the core boiloff rate at 14 hours.