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U. S. Nuclear Regulatory Commission
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**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
NRC BULLETIN 2003-01, POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON
EMERGENCY SUMP RECIRCULATION AT PRESSURIZED WATER REACTORS
SALEM GENERATING STATION UNIT 1 AND 2
FACILITY OPERATING LICENSE NO. DPR-70 AND DPR-75
DOCKET NO. 50-272 AND 50-311**

On August 18, 2005, the Nuclear Regulatory Commission (NRC) and PSEG Nuclear (PSEG) held a conference call to discuss the licensee's actions related to NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized Water Reactors." Based on information gathered in the conference call, the NRC requested additional information regarding the response related to WCAP-16204, "Evaluation of Potential ERG and EPG Changes to address NRC Bulletin 2003-01 Recommendations (PA-SEE-0085)," Appendix A, action COA A1a, "Operator Action to Secure One Spray Pump" (prior to initiating containment sump recirculation). The attached information provides PSEG's response to the NRC Staff's questions.

Should you have any questions regarding this submittal, please contact Mr. Howard Berrick at 856-339-1862.

Sincerely,

A handwritten signature in black ink that reads "Thomas P. Joyce". The signature is written in a cursive style with a long horizontal line extending to the right.

Thomas P. Joyce
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Salem Generating Stations

Attachment

A103

C Mr. S. Collins, Administrator - Region I
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**SALEM GENERATING STATIONS UNITS NO. 1 AND 2
FACILITY OPERATING LICENSE NO. DPR-70 AND DPR-75
DOCKET NO. 50-272 AND 50-311
REQUEST FOR ADDITIONAL INFORMATION**

On August 18, 2005, the NRC and PSEG held a conference call to discuss the licensee's actions related to NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized Water Reactors." The focus was on interim compensatory measure (ICM) #2, which relates to stopping one containment spray pump early in a LOCA to prolong the time available for operators to establish cold leg recirculation prior to depleting the refueling water storage tank (RWST). More specifically, the discussion related to WCAP-16204, "Evaluation of Potential ERG and EPG Changes to address NRC Bulletin 2003-01 Recommendations (PA-SEE-0085)," Appendix A, action Candidate Operator Action (COA) A1a-W, "Operator Action to Secure One Spray Pump" (prior to initiating containment sump recirculation). By letter dated October 29, 2004, PSEG committed to evaluate the actions to stop one of two operating containment spray (CS) pumps earlier in a LOCA recovery (e.g., to implement COA A1a) and, if acceptable, to implement appropriate EOP changes. The commitment was to complete the evaluation by February 11, 2005, and implement any procedure changes by July 31, 2005.

Based on information provided in the conference call, that PSEG has made "continuing action" changes to emergency procedure EOP-LOCA-3, "Transfer to Cold Leg Recirculation," and developed a new guidance document, EOP-APPX-7, "Containment Sump Blockage Guideline," that collectively direct operators to reduce spray flow under certain conditions (such as indication of loss of net positive suction head). However, these changes do not implement COA A1a, which is to secure one spray pump before switchover to containment sump recirculation (i.e., in EOP-LOCA-1). Therefore, the NRC requested the following information from PSEG.

NRC Question 1:

Discuss the emergency operating procedure changes referenced above.

PSEG Response to Question 1:

PSEG completed the evaluation of proposed LOCA-1 changes on February 7, 2005. The evaluation concluded that the proposed actions were not justified [See response to Question 2 for further discussion]; however other changes to EOPs were identified.

PSEG has made "continuous action" changes to emergency procedure EOP-LOCA-3, "Transfer to Cold Leg Recirculation", LOCA-5, "Loss Of Emergency Recirculation" and developed a new guidance document, EOP-APPX-7, "Containment Sump Blockage Guideline". This new procedure was developed to provide an operating strategy in the event recirculation capability becomes unavailable due to containment sump blockage, and incorporated interim compensatory actions as evaluated by the Westinghouse Owners Group (WOG) in WCAP-16204, to address concerns identified in NRC Bulletin 2003-01. The major action categories of procedure EOP-APPX-7 are to:

- Protect Emergency Core Cooling System (ECCS) and CS Pumps
- Establish and Maintain Optimum Emergency Coolant Flow
- Increase/Conserve Refueling Water Storage Tank (RWST) level
- Initiate Cooldown to Cold Shutdown
- Depressurize the Reactor Coolant System (RCS) to Minimize RCS Subcooling
- Depressurize Steam Generators to Cool Down and Depressurize RCS
- Maintain RCS Heat Removal.

NRC Question 2:

Discuss whether the recommendation COA A1a, was incorporated by July 31, 2005 or if not, the reason why PSEG ultimately chose not to implement COA A1a at Salem.

PSEG Response to Question 2:

As identified in PSEG letter LR-N04-0468, an analysis was performed to determine if the actions to stop one of two operating Containment Spray pumps earlier in the LOCA recovery (Procedure 1(2)-EOP-LOCA-1) as recommended in WCAP-16204, "Evaluation of Potential ERG and EPG Changes to address NRC Bulletin 2003-01 Recommendations (PA-SEE-0085)," Appendix A, action COA A1a, could be applied to Salem. Westinghouse performed this analysis for Salem.

A success criterion in the analysis for assessing the possibility of applying COA A1a-W was to maintain calculated containment pressures below the design pressure (47 psig). The analysis considered a complete interruption of spray flow due to the failure of the active spray pump (along with subsequent operator action to restart a spray pump) and determination if stopping one of two Containment Spray Pumps earlier in the recovery is bounding with regard to containment pressure and temperature. (Plant specific dose analysis assumptions were not considered in Westinghouse analysis).

The analysis results showed that the application of COA A1a-W to Salem was practical as long as the entry conditions are satisfied (i.e., two trains of containment safeguards and two trains of ECCS were in operation post-LOCA).

PSEG evaluated the analysis results from Westinghouse, along with the procedural changes that would have to be made to support the COA A1a-W recommendation and the additional evaluations that would be required (i.e., EQ and radiological dose), and WCAP-16204, Revision 1.

In the case of securing one CS pump, a single failure of the operating pump at any point after the pump is stopped leaves no CS pumps in service. The probability is high that the secured pump will restart, since it was running when shut down, but there will be a time when neither pump is operating. Current licensing basis assumes that at least one CS pump is running continuously, until RWST low-low level is reached, in LOCA-3. Iodine removal capability credited for CS would be lost with no CS pumps available.

PSEG reviewed the procedural sequence from initiating event, to the TRIP-1 procedures and then transitioning to LOCA-1. For Large Break (LB) LOCA, securing a CS pump prior to LOCA-1 was not considered a viable option. Once in LOCA-1, there would be a relatively short period of time (less than 5 minutes) before LOCA-3 would be entered based on RWST draindown calculations. One of the initial steps in LOCA-3 is securing a CS pump if two are running. PSEG concluded that there would be little benefit gained by stopping a containment spray pump earlier than LOCA-3 for LB LOCA.

Additionally, the potential effect of increased operator action time with regard to starting a Containment Spray Pump following single failure of the active spray pump was considered unacceptable. With respect to the small break LOCA (SBLOCA) event, while securing one spray pump will likely have minimal impact on the accident outcome or recovery, it may only provide marginal benefits in terms of mitigating sump blockage. This is based on the following:

1. A SBLOCA may result in reactor coolant system (RCS) pressures remaining above the shutoff pressure of the RHR pumps.
2. A SBLOCA may not result in containment pressure reaching the CS actuation setpoint of 15 psig.
3. With RCS pressure above the shutoff pressure of the RHR pumps and CS not actuated, the high head centrifugal charging/safety injection (C/SI) and intermediate head safety injection (SI) pumps would be the only pumps taking suction from the RWST. This operating configuration will increase the time to switchover to the ECCS recirculation sump.

4. With RCS pressures maintained sufficiently high for a SBLOCA, the resulting C/SI and SI pumps flow rates to the RCS may be sufficiently low that the RHR entry conditions for shutdown cooling may be reached before the ECCS switchover to the ECCS recirculation sump is initiated.
5. Again, with RCS pressure above the shutoff pressure of the RHR pumps and CS not actuated, if the ECCS sump recirculation phase is reached, the flow for the C/SI and SI pumps will be the only required flow from the ECCS recirculation sump. This operating configuration reduces flow to the ECCS recirculation sump, minimizing the potential for sump blockage.

Therefore, revisions to emergency procedures that would negatively affect the overall timing of the accident response sequence could potentially decrease plant nuclear safety. Considering the potential benefits and risks, PSEG determined that stopping a Containment Spray Pump earlier in the LOCA recovery (identified in COA-A1a-W) was not an acceptable pre-emptive action measure.