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United States Nuclear Regulatory Commission  
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SALEM GENERATING STATION – UNIT 1 and UNIT 2  
FACILITY OPERATING LICENSE NOS. DPR 70 and DPR-75  
NRC DOCKET NOS. 50-272 and 50-311

Subject: **RESPONSE TO RAI #4 ON LCR S06-10 (TAC Nos. MD4843 & 4844)  
STEAM GENERATOR FEEDWATER PUMP TRIP, FEEDWATER ISOLATION  
VALVE RESPONSE TIME TESTING and CONTAINMENT COOLING  
SYSTEM**

- References:
- (1) Letter from PSEG to NRC: "License Change Request for S06-10, Steam Generator Feedwater Pump Trip, Feedwater Isolation Valve Response Time Testing and Containment Cooling System, Salem Nuclear Generating Station, Units 1 and 2, Facility Operating Licenses DPR-70 and DPR-75, Docket Nos. 50-272 and 50-311", dated March 16, 2007
  - (2) Letter from NRC to PSEG: "Salem Nuclear Generating Station, Units 1 and 2, Request for Additional Information, Amendment Request Re: Steam Generator Feedwater Pump Trip, Feedwater Isolation Valve Closure Response Times, and Containment Fan Coil Unit Cooling Water Flow Rate (TAC Nos. MD4843 & 4844)", dated August 28, 2007
  - (3) Letter from PSEG to NRC: "Response to RAI#1 and RAI#2 on License Change Request for S06-10, Steam Generator Feedwater Pump Trip, Feedwater Isolation Valve Response Time Testing and Containment Cooling System, Salem Nuclear Generating Station, Units 1 and 2, Facility Operating Licenses DPR-70 and DPR-75, Docket Nos. 50-272 and 50-311", dated August 30, 2007
  - (4) Letter from PSEG to NRC: "Response to RAI#3 on License Change Request for S06-10, Steam Generator Feedwater Pump Trip, Feedwater Isolation Valve Response Time Testing and Containment Cooling System, Salem Nuclear Generating Station, Units 1 and 2, Facility Operating Licenses DPR-70 and DPR-75, Docket Nos. 50-272 and 50-311", dated September 14, 2007

In Reference 1, PSEG Nuclear LLC (PSEG) submitted License Change Request (LCR) S06-07 to amend the Technical Specifications (TS) for the Salem Nuclear Generating Station, Units 1 and 2 (Reference 1). LCR S06-10 entails (1) new TS surveillance requirements for Steam

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Generator Feedwater Pump (SGFP) trip and Feedwater Isolation Valve (FIV) closure, and (2) revised TS surveillance requirements for Containment Fan Cooler Unit (CFCU) flow. The LCR relates to adoption of a new containment response analysis that credits Steam Generator Feedwater Pump (SGFP) Trip and Feedwater Isolation Valve closure (on a feedwater regulator valve failure) to reduce the mass/energy release to containment during a Main Steam Line Break (MSLB). The containment analysis also credits a reduced heat removal capability for the Containment Fan Cooler Units (CFCUs), allowing a reduction in the required Service Water (SW) flow to the CFCUs.

The NRC provided PSEG three Request for Additional Information (RAI) on LCR S06-10; these three RAIs were collectively provided via Reference 2. In References 3 and 4, PSEG submitted the response to RAIs 1 - 3 provided via Reference 2.

On October 26<sup>th</sup>, 2007, the NRC provided PSEG a fourth RAI on LCR S06-10. On November 6<sup>th</sup>, 2007, PSEG and the NRC discussed RAI#4 to provide additional clarification. The response to RAI#4 is provided as an attachment to this submittal.

In accordance with 10CFR50.91(b)(1), a copy of this letter has been sent to the State of New Jersey.

PSEG has evaluated the additional information provided in Attachment 1 in accordance with 10CFR50.91(a)(1), using the criteria in 10CFR50.92(c), and has determined there is no impact to the no significant hazards consideration provided in Reference 1. There is also no impact to the 10 CFR 51.22(c)(9) environmental assessment provided in Reference 1.

If you have any questions or require additional information, please do not hesitate to contact Mr. Jeff Kennan at (856) 339-5429.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 11/20/07  
(Date)

Sincerely,



Robert C. Braun  
Site Vice President  
Salem Generating Station

Attachments (1)

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REQUEST FOR ADDITIONAL INFORMATION #4  
REGARDING PROPOSED LICENSE AMENDMENT  
STEAM GENERATOR FEEDWATER PUMP TRIP,  
FEEDWATER ISOLATION VALVE CLOSURE RESPONSE TIMES,  
AND CONTAINMENT FAN COIL UNIT COOLING WATER FLOW RATE  
SALEM NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2  
DOCKET NOS. 50-272 AND 50-311

By letter dated March 16, 2007, as supplemented on August 30, and September 14, 2007, PSEG Nuclear LLC (PSEG or the licensee) submitted an amendment request for Salem Nuclear Generating Station (Salem), Unit Nos. 1 and 2. The proposed amendment would add new Technical Specification (TS) requirements for the response times associated with a steam generator feedwater pump (SGFP) trip and feedwater isolation valve (FIV) closure. The amendment would also revise the TS requirements for the containment fan cooler unit (CFCU) cooling water flow rate. These changes are associated with a revised containment response analysis that credits a SGFP trip and FIV closure (on a feedwater regulator valve failure) to reduce the mass/energy release to the containment during a main steam line break (MSLB). The containment analysis also credits a reduced heat removal capability for the CFCUs, allowing a reduction in the required service water (SW) flow to the CFCUs.

The Nuclear Regulatory Commission (NRC) staff has reviewed the information the licensee provided that supports the proposed amendment and would like to discuss the following issues to clarify the submittal.

- 1) Enclosure 2 (S-C-CBV-MEE-1982, Revision 0) (Page 15 of 54) of the application dated March 16, 2007, provides a discussion of the acceptance in crediting of non-safety related equipment as a backup to a single active failure of a safety grade component. It was indicated in the discussion that the FIV is a non-safety grade component, where as the referenced Standard Review Plan and NUREGs refer to the FIV as a safety grade component. The licensee's discussion in Enclosure 2 implies that the Feedwater Regulating Valve (FRV) and FRV bypass valve are safety grade components. The NRC staff review of Updated Final Safety Analysis Report (UFSAR) page 10.4-12 shows that "all feedwater piping downstream from, and including, the isolating motor operated stop check valve is designed to meet Class I seismic requirements." The FRVs are located upstream of the check valve (per UFSAR figure 10.4-5B, Sheet 3). Please confirm that the FRVs at Salem Units 1 and 2 are safety grade components and the FIVs are non-safety grade.

**Response**

The primary intent of the write-up on page 15 of S-C-CBV-MEE-1982, Revision 0 was to provide justification for crediting, as a backup to a single failure, the use of a non-safety

grade feedwater isolation valve or pump trip in steamline break mass/energy release safety analyses. The NRC's previous conclusion in the NUREGs was cited as precedent for this position. It was not PSEG's intent to match exactly the valve nomenclature in the NUREGs and in the PSEG configuration. However, on further review, we agree that the write-up could be confusing when trying to establish the safety grade of the involved components. The discussion below provides clarification.

UFSAR Section 15.4.8.2.2 states, in part:

*The feed water regulating valves (main and bypass) and main feed water isolation valves, which are relied upon to terminate main feed flow to the steam generators, are exempt from seismic requirements (thus classified as Seismic Category 3). However, each valve has safety-related performance requirements, and as such receives dual, independent, safety grade, trip close signals from the protection system following a steamline rupture event. The feed water regulating valves are air-operated, fail close design, whereas the feed water isolation valves are motor operated. Since the assumed pipe break occurs inside containment in a Seismic Category I pipe, the steamline rupture is not assumed to be initiated by a seismic event. There is no requirement to assume a coincident seismic event with the hypothetical pipe rupture. Thus a seismic classification for the main feed water regulating and isolation valves is not necessary to ensure closure following a steamline break inside containment. Also, since the feed water isolation valves are only credited in the event of a single failure of the regulating valves to close, additional failure of these valves does not need to be considered.*

The FRVs (main and bypass) and FIV have safety-related performance requirements, and receive dual, independent, safety grade trip close signals. The valves and power operators were originally procured as non-safety related consistent with the technical guidance provided by the NSSS vendor to the plant's Architect/Engineer (PSEG). The valves are included in the IST Program and are stroke time tested per TS 4.0.5. Also, the FIV motor operator is maintained and tested in accordance with the 89-10 Motor Operated Valve Program.

- 2) The licensee has stated that FIV closure times are now being included in the TSs, because credit is taken for these valves to close in the revised containment analysis (WCAP-16503). However, UFSAR Section 15.4.8.2.2 (page 15.4-114) indicates that credit was already taken for these valves to close in the current analysis.

Please explain why the closure time for these valves is not in the existing TSs and what is the basis for its inclusion in the TS now.

**Response**

**Existing TS**

UFSAR Section 15.4.8.2.2 states, in part:

*There are two valves in each main feedline that serve to isolate main feed water flow following a steamline break. One is the main feed water regulator valve, which receives dual, separate train trip signals from the Plant Protection System on any safety injection signal and closes within 10 seconds (including instrument delays). The second is the feed water isolation valve that also receives dual, separate train trip signals from the reactor protection system following a safety injection signal. This valve closes within 32 seconds (including instrument delays). Additionally, the main feed water pumps receive dual, separate train trips from the protection system following a steamline break. Thus, the worst [single] failure in this system is a failure of the main feed water regulator valve to close.*

The above discussion is based on the current NRC approved Salem MSLB analysis methodology and assumption bases are described on S-C-CBV-MEE-1982 Page 4 as:

*The Westinghouse steam line break M&E release methodology was approved by the NRC (Reference 8 of WCAP-16503) and is documented in WCAP-8822 "M&E Releases Following a Steam Line Rupture" (Reference 9 of WCAP-16503). WCAP-8822 forms the basis for the assumptions and models used in the calculation of the M&E releases resulting from a steam line rupture.*

The current Technical Specification requirements for the Engineered Safety Feature Actuation System (ESFAS) response timing only document feedwater isolation for postulated events. The current MSLB analysis assumes closure of the FRV in 10 seconds, consequently the Salem TS contains the response time for the FRV (10 seconds). As mitigating action for the worst case single failure (failure of the FRV to close), credit is taken for the subsequent FIV closure 22 seconds later to terminate the event.

No other credit is taken for the assumed FIV closure timing. The currently licensed feedwater isolation event sequence for a MSLB with a FRV failure, as described in S-C-CBV-MEE-1982 page 4, states:

*While the approved MSLB accident methodology allows crediting closure of the BF13 FIV to terminate flow and trip of the SGFP to reduce flow until the BF13 FIV is fully shut, the current containment analyses do not credit the reduced M&E release that would occur with the SGFP trip and while the BF13 FIVs close. This is conservative because it results in high FW flow to the faulted Steam Generator (SG) for 32 seconds, until the BF13 MOV was fully shut.*

While the current MSLB analysis credits the FIV closure time assumption to terminate flow following the FRV single failure, the Salem specific FIV closure time (and SGFP trip/coast-down time) are not credited for any reduction in M&E release and containment response.

Consequently, the response time for this terminating action to address the worst case single failure is not included in the TS, consistent with the original Salem licensing basis.

The FRVs and FIVs are currently included in the IST Program and are stroke time tested per TS 4.0.5. The IST testing of the FRV and FIV valves will continue.

Proposed TS

The proposed changes identified in LCR S06-10 Technical Specification Table 3.3-5 Notes 9 and 10 identify specific deviations for the SGFP trip assumptions from previously approved Westinghouse MSLB containment analysis and include previously approved FIV timing setpoint assumptions, as discussed above.

The revised Salem containment analysis (WCAP-16503) does credit both the FIV closure timing and the SGFP trip timing for M&E considerations. Therefore the FIV closure timing and the SGFP trip timing are no longer simply analysis assumptions concerning terminating actions to account for single failure; they are now linked and required for satisfactory containment response to the MSLB with a FRV failure on the faulted steam generator. For this reason, the FIV closure timing and the SGFP trip timing are proposed to be added to the ESFAS Response Time TS.