



**NOV 27 2015**

10 CFR 50.90

LR-N15-0235  
LAR S15-02

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Salem Nuclear Generating Station Units 1 and 2  
Renewed Facility Operating License Nos. DPR-70 and 75  
NRC Docket Nos. 50-272 and 50-311

**Subject:** Response to Request For Additional Information Re: License Amendment Request Regarding Replacement Of Source Range and Intermediate Range Neutron Monitoring Systems (CAC Nos. MF6065 AND MF6066)

- References**
1. PSEG letter to NRC, "License Amendment Request Regarding Replacement of Source Range and Intermediate Range Neutron Monitoring Systems," dated April 3, 2015 (ADAMS Accession No. ML15093A291)
  2. PSEG letter to NRC, "Supplemental Information Needed for Acceptance of Requested Licensing Action Re: Amendment Request Regarding Replacement of Source Range and Intermediate Range Neutron Monitoring Systems (TAC Nos. MF6065 and MF6066)," dated June 2, 2015 (ADAMS Accession No. ML15153A193)
  3. NRC letter to PSEG, "Salem Nuclear Generating Station, Unit Nos. 1 and 2 - Request For Additional Information Re: License Amendment Request Regarding Replacement Of Source Range And Intermediate Range Neutron Monitoring Systems (CAC Nos. MF6065 and MF6066)," dated November 2, 2015 (ADAMS Accession No. ML15287A141)

In the Reference 1 letter, PSEG Nuclear LLC (PSEG) submitted a license amendment request for Salem Nuclear Generating Station (Salem), Unit Nos. 1 and 2. The proposed amendment would revise Technical Specifications (TS) 3/4.3.1, Reactor Trip System, to support the replacement of the existing source range (SR) and intermediate range (IR) nuclear instrumentation.

In Reference 3, the NRC provided PSEG a Request for Additional Information (RAI) related to the Reference 1 request, dated November 2, 2015. Attachment 1 to this submittal provides the response to the RAI.

Page 2  
LR-N15-0235

PSEG has determined that the information provided in this submittal does not alter the conclusions reached in the 10 CFR 50.92 no significant hazards determination previously submitted. In addition, the information provided in this submittal does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed amendment.

There are no regulatory commitments contained in this letter.

If you have any questions or require additional information, please contact Mr. Brian Thomas at 856-339-2022.

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

Executed on NOV 27 2015  
(date)

Respectfully,



John F. Perry  
Site Vice President  
Salem Nuclear Generating Station

Attachment 1 -Response to Request For Additional Information Re: License Amendment Request  
Regarding Replacement Of Source Range and Intermediate Range Neutron  
Monitoring Systems

cc: Mr. D. Dorman, Administrator, Region I, NRC  
Mr. T. Wengert, NRC Project Manager, Salem  
NRC Senior Resident Inspector, Salem  
Mr. P. Mulligan, Chief, NJBNE  
Mr. L. Marabella, Corporate Commitment Tracking Coordinator  
Mr. T. Cachaza, Salem Commitment Tracking Coordinator

LR-N15-0235

Attachment 1

Response to Request For Additional Information Re: License Amendment Request Regarding  
Replacement Of Source Range And Intermediate Range Neutron Monitoring Systems

By letter dated April 3, 2015, PSEG Nuclear LLC (the licensee) submitted a license amendment request to revise Technical Specification (TS) 3/4.3.1, "Reactor Trip System Instrumentation," to support planned plant modifications to replace the existing source range (SR) and intermediate range (IR) nuclear instrumentation with the Thermo Scientific Neutron Flux Monitoring Systems. The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the application and the June 2, 2015, supplemental information submitted by the licensee during the acceptance review. The supplemental information provided the basis for detailed review. The NRC staff identified additional information that is needed, as described below, to complete its review of the submittals. The requested information is applicable only to new or replacement items.

*NRC Question Instrumentation and Control Systems Branch (EICB) – Request for Additional Information (RAI)-1*

*In its response to the NRC's request for supplemental information dated June 2, 2015, the licensee explained that the Nuclear Instrumentation System source, intermediate range detectors, and associated cables inside the containment were evaluated for applicability of Title 10 of the Code of Federal Regulations Part 50.49 criteria and were exempted from the Salem Nuclear Generating Station equipment qualification program requirements. Since the equipment is located inside the containment, it should be qualified for normal and abnormal conditions inside the containment for its qualified life, so that the equipment can continue to meet its safety functions as required by General Design Criterion (GDC) 4.*

*Please provide the qualification documentation that shows how the equipment meets the environmental conditions for its qualified life. If this information is not available, please specify when the information will be available for staff review. If a summary report is provided, it should explain the test requirements based on plant specifications and provide the test results. If the equipment inside the containment has been previously qualified and is not being changed or replaced in the subject amendment request, state that in the response.*

*PSEG Response*

The nuclear instrumentation system (NIS) replacement items that are located inside containment include the source range and intermediate range detector, in-containment cable, amplifier cables, and junction box. All of these replacement items are provided by Thermo Fisher Scientific. The containment is considered a harsh environment. The PSEG Specification (S-C-DE-NIS-0210) provided to Thermo Fisher Scientific included the parameters for normal and abnormal (Design Basis Event) environmental conditions to which the detectors, interconnecting cables, and junction box shall be qualified. The parameters included temperature, humidity, pressure, and radiation. The PSEG Specification also included requirements for testing to be performed per Institute of Electrical and Electronic Engineers (IEEE)-323-1974, "IEEE Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations."

Thermo Fisher Scientific has provided PSEG with a qualification summary report that outlines the basis for environmental qualification of each replacement item provided to PSEG. The qualification method is qualification by similarity analysis. All assemblies are qualified by similarity analysis and extrapolation from previously tested and analyzed equipment in accordance with IEEE-323. In each case, including the replacement items installed inside the containment, the qualification summary report provided by Thermo Fisher Scientific demonstrates by analysis that the replacement items are similar to previously qualified items.

The similarity analysis included evaluation of material, size, shape, and function. The parameters used as the basis for the qualification exceed those provided by PSEG including those for the containment. With the exception of the O-ring associated with the junction box, all replacement equipment meets the environmental conditions for their qualified life. Thermo Fisher Scientific recommends a total life of 20 years and a maximum installed life of 10 years for the junction box O-ring. Preventative maintenance tasks will be developed as part of the design change package to address the maximum installed life of the junction box O-ring.

The above is based on review of the qualification summary report provided by Thermo Fisher Scientific. The qualification summary report will be formally reviewed and approved as part of the Design Change Package (DCP) issuance. The current estimated completion date for issuance of the DCP is December 30, 2015.

#### NRC Question EICB-RAI-2

*Please provide the documentation to confirm that all new and replacement equipment will perform their safety functions during and after an earthquake, as required by GDC 4. The equipment must be qualified to the seismic response spectra based on the location of the equipment and any amplification caused by the test equipment elevation. State the basis (e.g., Institute of Electrical and Electronics Engineers standard) and a summary of the test results.*

#### PSEG Response

The seismic qualification requirements for the NIS replacement items are identified in the PSEG Specification (S-C-DE-NIS-0210). PSEG provided Thermo Fisher Scientific with the required response spectra (RRS) for the Auxiliary Building and the Containment where the replacement items will be installed. The PSEG Specification states that the floor response spectra provided are applicable to the mounting location of the equipment. The PSEG Specification states that test response spectra shall envelope the RRS with at least 10% margin. PSEG also requested Thermo Fisher Scientific to perform the qualification in accordance with IEEE-344, "IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations."

Thermo Fisher Scientific has provided PSEG a qualification summary report that demonstrates seismic qualification for each replacement item by similarity analysis to previously qualified equipment. In all cases the test response spectra (TRS) envelope the RRS by greater than the 10% margin identified in the PSEG Specification.

The above is based on review of the qualification summary report provided by Thermo Fisher Scientific. The qualification summary report will be formally reviewed and approved as part of the DCP issuance. The current estimated completion date for issuance of the DCP is December 30, 2015.

#### NRC Question EICB-RAI-3

*With regard to the electromagnetic interference/radio frequency interference (EMI/RFI) susceptibility for the equipment in mild environment (the source range (SR) and intermediate range (IR) monitors), the licensee stated in its June 2, 2015, letter that the qualification and*

*analysis were conducted in accordance with Electric Power Research Institute Topical Report-102323, Revision 2, "Guidelines for Electromagnetic Interference Testing in Power Plants."*

*Please provide a summary of the qualification requirements and the tests performed to confirm that the equipment is not susceptible to EMI/RFI. The summary should include sufficient description for the NRC staff to determine the adequacy of the test program and its results. As an alternative, the licensee may provide the test requirements specifications and the test reports.*

PSEG Response:

PSEG Specification (S-C-DE-NIS-0210) requires that the replacement equipment be certified to meet or exceed the requirements of EPRI TR-102323 or RG 1.180, Revision 1 for both transmission and susceptibility. Thermo Fisher Scientific has provided PSEG with their qualification plan for electromagnetic compatibility which includes both EMI susceptibility and EMI emissions. For both susceptibility and emissions, Thermo Fisher Scientific has provided PSEG a qualification summary report that demonstrates qualification for each replacement item by similarity analysis to previously qualified equipment.

The above is based on review of the qualification summary report provided by Thermo Fisher Scientific. The qualification summary report will be formally reviewed and approved as part of the DCP issuance. The current estimated completion date for issuance of the DCP is December 30, 2015.

NRC Question EICB-RAI-4

*With respect to the embedded software or embedded electronic components with software, the licensee's June 2, 2015, letter stated, in part:*

*The power to the SDMM [shutdown margin monitor] assembly is via a fuse in the SDMM that provides the isolation between the SDMM and the power source associated with the Source Range (SR) Monitor. The circuit isolation between SDMM and SR is provided by two relays. The SDMM provides  $\pm 12v$  to LEDs [light emitting diodes] for local indication of the status of the instrument power and does not interface with any other components. The SR signal processor provides a pulse signal to the SDMM through an isolation device in the SR channels. ...*

*Please confirm that the fuse supplying power to the SDMM is properly coordinated with the upstream power supply breaker or fuse. Also, describe the type of signals processed through the isolation device. Is the circuit isolation achieved by coil to contact or fiber optic isolation or some form of isolation? Further, describe the type of isolation device used for sending the SR pulse signal to the SDMM.*

PSEG Response

The input from the SR signal processor to SDMM is via a pulse buffer isolator assembly which provides the electrical isolation between the SR drawer and the SDMM. The test and alarm outputs of the SDMM to the SR drawer are relay contacts and are isolated from the relay coil. The SR drawer and the SDMM do not share DC power or circuit common. The SDMM is

equipped with a DC power supply which provides +5, +12, and -12 VDC to the module. The AC input to the SR drawer is equipped with a circuit breaker. This same AC input is also provided to SDMM DC power supply via a fuse. The DC power supply is also equipped with short circuit protection on all outputs provided to the SDMM. The combination of the fuse and short circuit protection provided by the DC power supply will ensure proper isolation of the SDMM from the AC input to the SR drawer.

NRC Question EICB-RAI-5

*In response to the accident analysis impact, the licensee referenced Section 15.2 of the Updated Final Safety Analysis Report (UFSAR) in its letter dated June 2, 2015, and provided the accident analysis table to go with this section. Item 15.2.4 in this table addresses uncontrolled boron dilution accident and reactor trip initiators. The reactor trip for this event is credited by an operator action based upon audible count rate. A note at the end of table states:*

*\*For the uncontrolled boron dilution event, UFSAR Section 15.2.4 notes that the operator has prompt and definite indication of any boron dilution from the audible count rate instrumentation. The Source Range and Intermediate Range upgrades do not affect the audible count rate instrumentation. The UFSAR also states that high count rate is alarmed in the reactor containment and the Control Room. The UFSAR does not provide for a High Count Rate alarm setpoint.*

*Please clarify the source of audible count rate, since it is stated that the audible count rate is not affected by the SR and IR changes. What is the current setpoint for high count rate alarm? Also, provide the rationale for selecting the current setpoint (no calculation is required to be provided). Please confirm that the audible count rate and the high count rate alarm will continue to be provided after the implementation of the license amendment.*

PSEG Response

When the existing Westinghouse Source Range channels, 1N31 and 1N32, are replaced with the Thermo Fisher Scientific Source Range Rack Mounted Signal Processors (RMSP), isolated pulse outputs are provided to an external Dual Timer/Scaler and Audible Count Rate (ACR) drawer. The ACR drawer in return provides an audible count rate signal to a local and remote speaker. The Thermo Fisher Scientific ACR drawer has four selectable signal inputs. Two of the inputs are for the N31 and N32 source range channels similar to the configuration of the existing Westinghouse ACR. The remaining two inputs will be utilized for the existing Gamma Metrics Post Accident Neutron Monitoring (PANM) channels C and D.

The Source Range High Flux at Shutdown Alarm which receives an input from the Source Range instrumentation has a setpoint of 0.5 to 1.0 decade above background SR level (3 to 10 times background SR level). This setpoint is based on input from the original NSSS supplier (Westinghouse). The Thermo Fisher Scientific alarm setpoint is electronically established based on a selectable fixed ratio between 1.25 to 4.0 times steady-state, and is automatically reduced as steady-state count rate decreases. No design basis operator actions are taken in response to the High Flux at Shutdown alarm. This alarm is additional indication provided to the operator to alert them of changes in the core neutron population during refueling.

The audible count rate and high flux at shutdown alarm are not being eliminated with the replacement of the Westinghouse SR channels with the Thermo Fisher Scientific SR channels.