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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 RAIs ON LCR S06-03
REQUEST FOR CHANGE TO TECHNICAL SPECIFICATIONS
ACCIDENT MONITORING INSTRUMENTATION AND SOURCE
CHECK DEFINITION**

**References: (1) Letter from PSEG to NRC: "LCR S06-03, Request for Change to
Technical Specifications, Accident Monitoring Instrumentation and
Source Check Definition, Salem Nuclear Generating Station, Units 1 and
2, Facility Operating Licenses DPR-70 and DPR-75, Docket Nos. 50-272
and 50-311", dated May 1, 2006**

In accordance with the requirements of 10 CFR 50.90, PSEG Nuclear LLC (PSEG) previously submitted License Change Request (LCR) S06-03, dated May 1, 2006, to amend the Technical Specifications (TS) for Salem Generating Station Unit 1 and Unit 2 (Reference 1). LCR S06-03 contained two proposed changes: (1) Relocation of the Main Steamline Discharge (Safety Valves and Atmospheric Dumps) Radiation Monitors (R46) from the radiation monitoring instrumentation technical specification (3.3.3.1) to the accident monitoring technical specification (3.3.3.7), and (2) Modification of TS Definition 1.31, SOURCE CHECKS, to allow for different methods to comply with the SOURCE CHECK requirement.

PSEG received a Request for Additional Information (RAI) from the NRC on LCR S06-03. The response to the RAI is provided in Attachment 1.

If you have any questions or require additional information, please do not hesitate to contact Mr. Jamie Mallon at (610) 765-5507.

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If you have any questions or require additional information, please do not hesitate to contact Mr. Jamie Mallon at (610) 765-5507.

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

Executed on 10/9/06
(Date)

Sincerely,



Thomas P. Joyce
Site Vice President
Salem Generating Station

Attachments 1

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RESPONSE TO LCR S06-03 RAIs

By letter dated May 1, 2006, PSEG requested a license amendment for the Salem Nuclear Generating Station, Units 1 and 2, to make two changes to the plant technical specifications (TSSs). The first change is to administratively move the requirements for the main steam radiation monitors (R-46) from TS 3.3.3.1, "Radiation Monitoring," to TS 3.3.3.7, "Accident Monitoring." The second change is to change the definition of "Source Check" in TS 1.31.

The NRC staff requires additional information to complete its review of the proposed changes. Please provide the following information:

Administrative Move of Main Steam Radiation Monitors from TS 3.3.3.1 to TS 3.3.3.7

1. One of the changes that results from administratively moving the R-46 monitors from TS 3.3.3.1 to TS 3.3.3.7 is a change in the modes in which the detectors are required to be operable: TS 3.3.3.1 requires operability in Modes 1-4 while TS 3.3.3.7 requires operability in Modes 1-3. The LAR discusses two uses of the R-46 monitors: 1) the R-46 monitors are used to measure high-level, post-accident releases of radioactive noble gases; and 2) the R-46 alarms are used as an entry point in the EOPs for a steam generator tube rupture event. However, the LAR does not provide a discussion of why these functions are not required in Mode 4. Provide additional justification for not requiring the R-46 monitors to be operable in Mode 4.

RESPONSE:

As stated in LCR S06-03 Attachment 1, Section 4, the R46 monitors provide continuous monitoring of high-level, post-accident releases of radioactive noble gases via the safety-relief valves, atmospheric dump valves, and auxiliary feedpump turbine and are capable of functioning both during and following an accident. The monitors are designed to meet the requirements of NUREG-0737 II.F.1 and the intent of RG 1.97. The monitor's alarm function is used in the EOPs to identify a SGTR event EOP entry point. The Salem EOPs, which use the R46s, are applicable in Modes 1-3.

The R46 monitors are required for post-accident only. There are no normal (10CFR20) effluent monitoring or primary-to-secondary leak detection functions required. The R46 monitors have no requirement or capability to detect minor steam generator tube leaks on the order of tens of gallons per day. There is no Mode 4 function requirement.

Salem TS Table 1.1 defines Mode 4, "Hot Shutdown," as having the reactor shut down and reactor coolant system average temperature between 200 and 350 degrees

Fahrenheit. The STS Bases (B3.3.3, Post Accident Monitoring, Applicability) state that the postulated accidents are assumed to occur in Modes 1-3. In lower modes (e.g., Mode 4), operating conditions are such that the probability of an event that would require accident monitoring instrumentation is low. As stated above, the Salem EOPs utilizing the R46s are only applicable in Modes 1-3. Therefore, the proposed change provides a consistent set of requirements between the accident monitoring instruments and the applicable safety analyses.

In the SER for Salem Amendments 272 and 253 (TAC Nos. MC8311 and MC 8312), the NRC made a similar Mode requirement conclusion for the Containment High Range Accident Monitors (R44) instruments. Both the R44 and R46 instruments have only post accident monitoring functions; therefore they are not required in Mode 4.

2. The other change that results from administratively moving the R-46 monitors to TS 3.3.3.7 is that the source check surveillance will no longer apply to the R-46 monitors, since TS 3.3.3.7 does not include source checks. The LAR requests approval in September of 2006 to support replacing the Unit 2 monitors during the fall refueling outage (because the new monitors are not compatible with the definition of source check in the current TSs); however, the amendment will also apply to the monitors on Unit 1. Clarify whether the source check will continue to be performed on the Unit 1 monitors until their replacement, or whether other surveillance testing will be performed in lieu of the source check. If the source check will not continue to be performed until the Unit 1 instruments are replaced, discuss the operating history of the current R-46 monitors.

RESPONSE:

The Unit 2 monitors are scheduled to be replaced during the Unit 2 Fall 2006 outage, including the complete abandonment of the current monitors, which requires shutdown conditions. The new Unit 1 monitors are also scheduled to be installed in the 3rd quarter 2006 (following the Unit 2 work), with the current Unit 1 monitor abandonment work scheduled for the Spring 2007 Unit 1 outage. The new Unit 1 monitors can be declared operable prior to completing the abandonment work on the old monitors. Consequently, both Units will have the new monitors prior to receipt of the proposed amendment.

3. The LAR states that the R-46 monitors are being replaced; however, the LAR provides little information on the new instruments. Please discuss the following:

Provide a description of the new instrumentation, including the important design features, expected life of the internal radiation source, detector response time, detector response function (output vs. energy and output vs. radiation level), expected readings from the internal

source compared to alarm setpoints, expected readings at ambient full power conditions, and range of detection. Also discuss the environmental qualification of the new instruments and, if available, the operating experience of these detectors at other power plants.

RESPONSE:

The ion chamber detectors will be installed in shield assemblies and located in the North and South Penetrations Areas below, in parallel to, and in close proximity of the Main Steam lines, upstream of the Safety Relief Valves and Atmospheric Dump Valves. The detectors will monitor the steam lines directly for radiation levels. The current from the ion chamber detectors will provide signals to frequency converters, which will in turn provide signals to local digital ratemeters. The local ratemeter communicates to the remote ratemeters in the Control Equipment Room that will provide Control Room alarms, indication via the Plant Computer, and signals to the Safety Parameters Display System.

The new system uses a high temperature ion chamber directly viewing the process. The detector shield allows the ion chamber a 60° angle unshielded view of the main steam line. The simplicity of the ion chamber design as well as the deletion of the complexity of an off-line sampling system results in a more reliable and robust instrument channel.

The ion chambers dynamic range is 1.0 mR/hr to 1E+6 mR/hr. This corresponds to an activity of 1E-1 to 1E+5 $\mu\text{Ci/cc}$ (Cs-137 equivalent energy) in the main steam line pipe. The detector location has a maximum normal exposure rate of 1 mR/hr which will not be seen by the shielded detector. An internal keep-alive source of Am-241 (half life: 432.2 years) will keep the detector reading within 0.2 to 0.5 mR/hr equivalent at ambient full power conditions, compared to the alarm setpoint of 10 mR/hr.

This is an indication only loop and does not have specific required response time. The equipment is designed to provide timely response while allowing filtration of inherent random variations of the signal. The detector shield assembly, including the cables, is qualified to the harsh post-accident conditions specified for the area. Ion chambers are used extensively throughout the industry in critical safety-related applications and, because of simplicity of design, are very reliable.

- 4a. The LAR states that the setpoint is being maintained at 10 mR/hr, but this information is being removed from the TSS because TS 3.3.3.7 does not specify setpoints. Provide the following information related to the alarm setpoint:

Provide the basis for the alarm setpoint.

Discuss how the alarm setpoint will be controlled when it is removed from the TSS.

RESPONSE:

The basis for the R46 setpoint is an administrative limit only. The Technical Specification setpoint of 10 mR/hr does not have a documented engineering basis. The alarm is set sufficiently low enough to alert the operator that a significant post-accident release is occurring. Consequently, the actual alarm setpoint does not need to be maintained in TS; this is consistent with the other monitors in TS 3.3.3.7.

The alarm setpoint is appropriate since it is at the top of the first useful decade of the instrument range and would thereby prevent unnecessary alarms while still alerting operators that a significant release is in progress. As discussed in the response to Item 3 above, the ion chambers dynamic range is 1.0 mR/hr to 1E+6 mR/hr. This corresponds to an activity of 1E-1 to 1E+5 $\mu\text{Ci/cc}$ (Cs-137 equivalent energy) in the Main Steam line pipe. The detector location has a maximum normal exposure rate of 1 mR/hr which will not be seen by the shielded detector. An internal keep-alive source of Am-241 (Half life: 432.2 years) will keep the detector reading within 0.2 to 0.5 mR/hr equivalent at ambient full power conditions, compared to the alarm setpoint of 10 mR/hr.

- 4b. The staff notes that the current instrument uses off-line sampling which passes steam by a Geiger-Muller tube, while the new instrument uses an ion chamber mounted adjacent to the main steam lines. Discuss whether this change in instrument design and placement causes a change in the detector's response to radionuclides in the main steam line (i.e., on a Ci/cc basis), which would, in effect, be a change to the alarm setpoint.

Discuss whether any safety analyses assumptions were changed to support the new instrumentation (i.e., for different response times, setpoints, etc.).

RESPONSE:

The characteristics of this instrument are not used as assumptions in any safety analyses. The change in instrument design and placement causes a change in detector response. Because of the thickness of the Main Steam pipe, the new detection system will have little to no sensitivity to gammas with energy below 500 keV. As such, the new detection system will have no significant response to isotopes emitting these lower energies, such as Xe-133. This is acknowledged in Reg. Guide 1.97, Table 3, note 13, for this type of monitor. In this application, the isotopes that emit lower energies are found in the presence of other higher energy emitting isotopes. Because the isotopic mix is consistent, the quantities can be determined by the detector response and the isotopic mix. Both the current and new system have similar Cs-137 equivalent responses. Therefore, the alarm occurs at the same Cs-137 equivalent activity level as that in the old system. The alarm is used only to alert the operator that a significant post-accident release is occurring. The instrument will still monitor and record the

release independent of the alarm operation. The alarm setpoint is appropriate since it is at the top of the first useful decade of the instrument range and would thereby prevent unnecessary alarms while still alerting operators that a significant release is in progress.

Change in Definition of Source Check

1. The LAR proposes to delete a portion of the definition of source check as indicated by the following strikeout:
~~"SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a source of increased radioactivity."~~ The definition of source check applies to all of the instrumentation addressed by TS 3.3.3.1; therefore, changing the definition effects all of these instruments. The LAR states that the proposed revised definition will allow equivalent qualitative methods and recognizes the technology of improved designs; however, the staff is concerned that the proposed new definition of source check is vague and may be subject to different interpretations. The purpose of a source check is to verify that the channel would respond if its detector (or sensor) was exposed to an increase in radiation levels. Describe how the revised definition ensures the proper functioning of the detectors (or sensors), or modify the definition accordingly.

RESPONSE:

The revised definition will ensure proper functioning of the detectors. The SOURCE CHECK requirement is only applicable to the monitors in TS Table 4.3-3 (see response to Item 2 below). Unlike the R46 monitors, none of the remaining monitors in TS Table 4.3-3 are appropriate to relocate to the accident monitoring TS, therefore, the qualitative SOURCE CHECK assessment remains applicable. Currently all of the remaining monitors in Table 4.3-3 are designed to have the qualitative source check assessment implemented via an exposure to an actual source attached to a mechanical device. However, it is likely that in the future some, or all, of these monitors may be replaced with improved technology, making the exposure to an actual source for the SOURCE CHECK assessment obsolete. Examples of the replacement technology would be an internal keep-alive source (similar to the R46s) or an LED source check for a scintillator monitor.

The purpose of the Salem Source Check (per the TS definition) is to "qualitatively" "assess" that the channel would respond if its detector (or sensor) was exposed to an increase in radiation levels. The inclusion of the phrase "exposed to an increase in radiation levels" in the current definition was simply one method of accomplishing this qualitative assessment, based on the technology (or lack of) at the time when the Salem plants were licensed. Some current detector technology does not rely on the methodology of utilizing an actual high-rad source. For these types of detectors, implementing the SOURCE CHECK via use of an actual source would be burdensome and expose personnel to unnecessary dose, as an actual source would have to be carried out to the detector.

The revised definition is an updated clarification, and meets the intent of the original definition and ensures the proper functioning of the detectors (or sensors), based on the detector design. If a detector is designed with source check capability via exposure to an increase in radiation levels (i.e., by an actual source attached to a mechanical device as part of the detector design), then this 'old' method would continue to be employed. Improved technology detectors will be "qualitatively assessed" in a manner that is a significant improvement over the old methodology, and that is appropriate to their design. The proposed revised definition will allow for equivalent qualitative assessment methods, recognizing the technology of improved designs. This revised (clarified, updated) definition will also eliminate unnecessary dose or radiation exposure.

2. Please confirm that the source check is only used in TS 3.3.3.1. If the source check is reference by other TSS, please provide a discussion of the impact of the proposed change on the other TSS.

RESPONSE:

Source Check is only used in TS 3/4 3.3.1 (Table 4.3-3). Note that TS 4.4.6.1 also refers to Table 4.3-3 for the Containment Monitors. Also note that Source Check is listed in Table 4.3-12, but there is no assigned instrument requirement.