



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

March 7, 2016

Mr. Robert Braun  
President and Chief Nuclear Officer  
PSEG Nuclear LLC - N09  
P.O. Box 236  
Hancocks Bridge, NJ 08038

SUBJECT: SALEM NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2 - ISSUANCE OF AMENDMENTS REGARDING NEW TECHNICAL SPECIFICATIONS TO ISOLATE UNBORATED WATER SOURCES IN MODE 6 (CAC NOS. MF5831 AND MF5832)

Dear Mr. Braun:

The Commission has issued the enclosed Amendment Nos. 311 and 292 to Renewed Facility Operating License Nos. DPR-70 and DPR-75 for the Salem Nuclear Generating Station, Unit Nos. 1 and 2. These amendments consist of changes to the Technical Specifications (TSs) in response to your application dated March 9, 2015, as supplemented by letters dated April 10, 2015; November 25, 2015; and February 3, 2016.

The amendments create new TSs to isolate unborated water sources in Mode 6 (Refueling Mode) to preclude a boron dilution event and support removing the existing requirement for one source range neutron flux monitor with audible indication in the containment and in the control room during Mode 6. In addition, by isolating the unborated water sources, a safety analysis for an uncontrolled boron dilution event is not required for Mode 6.

A copy of our safety evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

A handwritten signature in black ink, appearing to read "Thomas Wengert".

Thomas Wengert, Senior Project Manager  
Plant Licensing Branch I-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-272 and 50-311

Enclosures:

1. Amendment No. 311 to Renewed DPR-70
2. Amendment No. 292 to Renewed DPR-75
3. Safety Evaluation

cc w/enclosures: Distribution via Listserv



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

PSEG NUCLEAR LLC

EXELON GENERATION COMPANY, LLC

DOCKET NO. 50-272

SALEM NUCLEAR GENERATING STATION, UNIT NO. 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 311  
Renewed License No. DPR-70

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment filed by PSEG Nuclear LLC, acting on behalf of itself and Exelon Generation Company, LLC (the licensees) dated March 9, 2015, as supplemented by letters dated April 10, 2015; November 25, 2015; and February 3, 2016, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in Title 10 of the *Code of Federal Regulation* (10 CFR), Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-70 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 311, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. PSEG Nuclear LLC shall operate the facility in accordance with the Technical Specifications, and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 120 days.

FOR THE NUCLEAR REGULATORY COMMISSION

A handwritten signature in black ink, appearing to read "Douglas A. Broaddus". The signature is fluid and cursive, with a large initial "D" and "B".

Douglas A. Broaddus, Chief  
Plant Licensing Branch I-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to Renewed Facility Operating  
License and Technical Specifications

Date of Issuance: ~~March~~ 7, 2016

ATTACHMENT TO LICENSE AMENDMENT NO. 311

RENEWED FACILITY OPERATING LICENSE NO. DPR-70

DOCKET NO. 50-272

Replace the following page of Renewed Facility Operating License No. DPR-70 with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

Remove  
Page 3

Insert  
Page 3

Replace the following pages of the Appendix A, Technical Specifications, with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove  
IX  
XV  
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3/4 9-2

Insert  
IX  
XV  
3/4 9-2a  
3/4 9-2b

instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

- (5) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and
- (6) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Parts 30 and 70, to possess but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

PSEG Nuclear LLC is authorized to operate the facility at a steady state reactor core power level not in excess of 3459 megawatts (one hundred percent of rated core power).

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 311, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. PSEG Nuclear LLC shall operate the facility in accordance with the Technical Specifications, and the Environmental Protection Plan.

(3) Deleted Per Amendment 22, 11-20-79

(4) Less than Four Loop Operation

PSEG Nuclear LLC shall not operate the reactor at power levels above P-7 (as defined in Table 3.3-1 of Specification 3.3.1.1 of Appendix A to this renewed license) with less than four (4) reactor coolant loops in operation until safety analyses for less than four loop operation have been submitted by the licensees and approval for less than four loop operation at power levels above P-7 has been granted by the Commission by Amendment of this renewed license.

(5) PSEG Nuclear LLC shall implement and maintain in effect all provisions of the approved fire protection program as described in the Updated Final Safety

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REFUELING OPERATIONS

UNBORATED WATER SOURCE ISOLATION VALVES

LIMITING CONDITION FOR OPERATION

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3.9.2.1 Each valve used to isolate unborated water sources shall be secured in the closed position.

APPLICABILITY: MODE 6.

ACTION:

-----NOTE-----  
Separate entry is allowed for each unborated water source isolation valve.  
-----

With one or more valves not secured in closed position:

- a. Immediately suspend CORE ALTERATIONS, and initiate actions to secure valve in closed position.

and

- b. Within 4 hours perform Surveillance Requirement 4.9.1

SURVEILLANCE REQUIREMENTS

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4.9.2.1 Verify each valve that isolates unborated water sources is secured in the closed position in accordance with the Surveillance Frequency Control Program.



REFUELING OPERATIONS

INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

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3.9.2.2 Two source range neutron flux monitors shall be OPERABLE.

APPLICABILITY: MODE 6.

ACTION:

- a. With one of the above required monitors inoperable, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity additions.
- b. With both of the required monitors inoperable; immediately suspend all operations involving CORE ALTERATIONS, positive reactivity additions, and initiate action to restore one source range monitor to OPERABLE status; and perform Surveillance Requirement 4.9.1 once per 12 hours.
- c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

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4.9.2.2 Each source range neutron flux monitor shall be demonstrated OPERABLE by performance of:

- a. A CHANNEL CHECK in accordance with the Surveillance Frequency Control Program during CORE ALTERATIONS, and

-----NOTE-----  
Neutron detectors are excluded from CHANNEL CALIBRATION  
-----

- b. A CHANNEL CALIBRATION in accordance with the Surveillance Frequency Control Program.



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

PSEG NUCLEAR LLC

EXELON GENERATION COMPANY, LLC

DOCKET NO. 50-311

SALEM NUCLEAR GENERATING STATION, UNIT NO. 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 292  
Renewed License No. DPR-75

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment filed by PSEG Nuclear LLC, acting on behalf of itself and Exelon Generation Company, LLC (the licensees) dated March 9, 2015, as supplemented by letters dated April 10, 2015; November 25, 2015; and February 3, 2016, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in Title 10 of the *Code of Federal Regulation* (10 CFR) Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-75 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 292, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. PSEG Nuclear LLC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 120 days.

FOR THE NUCLEAR REGULATORY COMMISSION



Douglas A. Broaddus, Chief  
Plant Licensing Branch I-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to Renewed Facility Operating  
License and Technical Specifications

Date of Issuance: March 7, 2016

ATTACHMENT TO LICENSE AMENDMENT NO. 292

RENEWED FACILITY OPERATING LICENSE NO. DPR-75

DOCKET NO. 50-311

Replace the following page of Renewed Facility Operating License No. DPR-75 with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

Remove  
Page 3

Insert  
Page 3

Replace the following pages of the Appendix A, Technical Specifications, with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

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IX  
XV  
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3/4 9-2

Insert  
IX  
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3/4 9-2a  
3/4 9-2b

- (4) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess and use at any time any byproduct, source or special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration and as fission detectors in amounts as required;
  - (5) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and
  - (6) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.
- C. This renewed license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:
- (1) Maximum Power Level  
PSEG Nuclear LLC is authorized to operate the facility at steady state reactor core power levels not in excess of 3459 megawatts (thermal).
  - (2) Technical Specifications and Environmental Protection Plan  
The Technical Specifications contained in Appendix A, as revised through Amendment No. 292, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. PSEG Nuclear LLC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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REFUELING OPERATIONS

UNBORATED WATER SOURCE ISOLATION VALVES

LIMITING CONDITION FOR OPERATION

---

3.9.2.1 Each valve used to isolate unborated water sources shall be secured in the closed position.

APPLICABILITY: MODE 6.

ACTION:

-----NOTE-----  
Separate entry is allowed for each unborated water source isolation valve.  
-----

With one or more valves not secured in closed position:

- a. Immediately suspend CORE ALTERATIONS, and initiate actions to secure valve in closed position.

and

- b. Within 4 hours perform Surveillance Requirement 4.9.1

SURVEILLANCE REQUIREMENTS

---

4.9.2.1 Verify each valve that isolates unborated water sources is secured in the closed position in accordance with the Surveillance Frequency Control Program.



REFUELING OPERATIONS

3/4.9.2 INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

---

3.9.2.2 Two source range neutron flux monitors shall be OPERABLE.

APPLICABILITY: MODE 6.

ACTION:

- a. With one of the above required monitors inoperable, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity additions.
- b. With both of the required monitors inoperable; immediately suspend all operations involving CORE ALTERATIONS, positive reactivity additions, and initiate action to restore one source range monitor to OPERABLE status; and perform Surveillance Requirement 4.9.1 once per 12 hours.
- c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

---

4.9.2.2 Each source range neutron flux monitor shall be demonstrated OPERABLE by performance of:

- a. A CHANNEL CHECK in accordance with the Surveillance Frequency Control Program, and

-----NOTE-----  
Neutron detectors are excluded from CHANNEL CALIBRATION  
-----

- b. A CHANNEL CALIBRATION in accordance with the Surveillance Frequency Control Program.



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NOS. 311 AND 292 TO  
RENEWED FACILITY OPERATING LICENSE NOS. DPR-70 AND DPR-75  
PSEG NUCLEAR LLC  
EXELON GENERATION COMPANY, LLC  
SALEM NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2  
DOCKET NOS. 50-272 AND 50-311

1.0 INTRODUCTION

By letter dated March 9, 2015,<sup>1</sup> as supplemented by letters dated April 10, 2015; November 25, 2015; and February 3, 2016,<sup>2</sup> PSEG Nuclear LLC (PSEG or the licensee) submitted a request for changes to the Salem Nuclear Generating Station (Salem), Unit Nos. 1 and 2, Technical Specifications (TSs). The requested changes would isolate unborated water sources in Mode 6 (Refueling Mode) to preclude a boron dilution event and support removing the existing requirement for one source range neutron flux monitor with audible indication in the containment and in the control room during Mode 6. In addition, by isolating the unborated water sources, a safety analysis for an uncontrolled boron dilution event is not required for Mode 6.

Specifically, the license amendment request (LAR) proposes to create new TS Limiting Condition for Operation (LCO) 3.9.2.1 to isolate unborated water sources in Mode 6. In addition, the request proposes to permit the use of nuclear instrumentation system (NIS) source range neutron flux monitors and/or Gamma-Metrics post-accident neutron monitors (PANMs) to provide neutron flux indication during Mode 6. Currently, the licensee is only taking credit for the NIS source range neutron flux monitors. This request also proposes to revise the existing TS LCO 3.9.2, "Refueling Operations/Instrumentation," by renumbering it as TS LCO 3.9.2.2 to accommodate the new TS LCO 3.9.2.1; remove the requirement for one audible indication of neutron flux in the containment and the control room; reword the TS LCO and Action Statement for consistency of language between Salem, Unit Nos. 1 and 2, as well as NUREG-1431, Revision 4, "Standard Technical Specifications, Westinghouse Plants";<sup>3</sup> and replace the existing channel Functional Test with a Channel Calibration. The two NIS source range flux monitors and the two Gamma-Metrics PANMs are functionally equivalent and both are safety-related

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<sup>1</sup> Agencywide Documents Access and Management System (ADAMS) Accession No. ML15068A359.

<sup>2</sup> ADAMS Accession Nos. ML15100A406, ML15329A037, and ML16034A265 respectively.

<sup>3</sup> ADAMS Accession No. ML12100A222.

(Class 1E) systems. Thus, there are two sets of redundant channels for monitoring neutron flux during Mode 6.

By letter dated April 3, 2015,<sup>4</sup> PSEG submitted a separate, but related, LAR to replace the existing source range and intermediate range neutron monitoring instruments at Salem, Unit Nos. 1 and 2. This LAR proposes to replace the existing startup range and intermediate range neutron monitors with the Thermo-Scientific neutron flux monitors. The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the potential interdependence of these two LARs and addresses it in this safety evaluation.

The supplements dated November 25, 2015, and February 3, 2016, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on May 26, 2015 (80 FR 30101).

## 2.0 REGULATORY EVALUATION

The Commission's regulatory requirements related to the content of the TSs are set forth in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.36, "Technical specifications." This regulation requires that the TSs include items in the following five specific categories: (1) safety limits, limiting safety system settings, and limiting control settings; (2) limiting conditions for operation; (3) surveillance requirements (SRs); (4) design features; and (5) administrative controls. The regulation does not specify the particular requirements to be included in plant TSs.

As discussed in 10 CFR 50.36(c)(2), LCOs are the lowest functional capability or performance level of equipment required for safe operation of the facility. When LCOs are not met, the licensee shall shut down the reactor or follow any remedial action permitted by the TSs until the LCOs can be met.

The requirements in 10 CFR 50.36(c)(2)(ii) require that a TS LCO be established for each item meeting one or more of the following criteria:

### Criterion 1

Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.

### Criterion 2

A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

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<sup>4</sup> ADAMS Accession No. ML15093A291.

Criterion 3

A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

Criterion 4

A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.

Salem was designed using the Atomic Industry Forum General Design Criteria (GDC) and the licensee's understanding of the intent of the Atomic Energy Commission's (AEC's) proposed GDC. A comparison of the Salem, Unit Nos. 1 and 2, plant design was done with 10 CFR Part 50, Appendix A, GDC for Nuclear Power Plants, dated July 7, 1971. The comparison was documented in the Salem Updated Final Safety Analysis Report (UFSAR), Section 3.1.3, which states, in part, that, "The Salem Plant design conforms with the intent of the 'General Design Criteria for Nuclear Power Plants,' dated July 7, 1971."

AEC-proposed GDC 12, "Instrumentation and Control Systems," requires that, "Instrumentation shall be provided to monitor variables and systems and controls shall be provided to maintain variables within prescribed operating ranges." Criterion 12 of the proposed AEC GDC is similar to 10 CFR, Part 50, Appendix A, GDC 13, "Instrumentation and control."

As required by 10 CFR 50.34, "Contents of applications; technical information," each applicant for an operating license shall include a final safety analysis report. The UFSAR incorporates changes made to the Final Safety Analysis Report (FSAR) in accordance with Section (e) of 10 CFR 50.71, "Maintenance of records, making reports." Section 50.71(e) of 10 CFR also requires a licensee to submit revisions to the NRC on a periodic basis not to exceed 24 months. Changes to the UFSAR are controlled by 10 CFR 50.59, "Changes, tests and experiments."

The NRC staff also considered the following guidance for its review:

- NUREG-1431, Revision 4, "Standard Technical Specifications, Westinghouse Plants," issued April 2012.
- Regulatory Guide (RG) 1.97, Revision 2, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," issued December 1980.<sup>5</sup>
- NUREG-0800, Revision 6, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," issued March 2007.
- Technical Specification Task Force Traveler (TSTF)-23, "Bracket NUREG-1431 LCO 3.9.2, Unborated Water Source Isolation Valves," NRC-approved April 17, 1998.

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<sup>5</sup> ADAMS Accession No. ML060750525.

- TSTF-425, Revision 3, "Relocate Surveillance Frequencies to Licensee Control – RITSTF Initiative 5b," NRC-approved July 6, 2009.<sup>6</sup>

### 3.0 TECHNICAL EVALUATION

#### 3.1 Background - Boron Dilution Event Response

NUREG-0800, Standard Review Plan (SRP) Section 15.4.6 provides the review guidance for inadvertent decrease in boron concentration in the reactor coolant system (RCS). The SRP states, in part, that, "Unborated water can be added to the RCS, via the chemical volume and control system (CVCS), to increase core reactivity. This may be inadvertent due to operator error or CVCS malfunction, and cause an unwanted increase in reactivity and a decrease in shutdown margin. A specific plant design may include other inadvertent additions of unborated water to the RCS, like instrument flushing systems. During refueling, the RCS is an open system. An inadvertent addition of unborated water to the RCS is possible due to operator error or malfunction of systems not normally connected to the RCS. The operator must stop this unplanned dilution before the shutdown margin is eliminated."

One method to preclude boron dilution events in PWRs is an analysis which assumes a maximum unborated water flow and determines there is adequate time for operator action to mitigate the event. Plants which use this method are not required to isolate all unborated water sources by closing the valves. For this method, the audible count rate instrumentation provides the operator with prompt and definite indication of a boron dilution event. A high count rate alarm is provided in the containment and control room. This is the current method used at Salem and operability of the audible count rate is currently required by TS LCO 3.9.2.

Another method of precluding boron dilution events in PWRs during refueling is to isolate all sources of unborated water. When this method is used no analyses are required. In addition, when this method is used an audible count rate is not required. PSEG proposes to use this method to prevent RCS boron dilution during refueling (Mode 6) at Salem, and has proposed changes to the TSs to implement this change. The proposed changes include a new TS LCO 3.9.2.1 to isolate unborated water sources in Mode 6 and renumbering TS 3.9.2 as TS 3.9.2.2.

#### 3.2 Proposed TS Changes

##### Current TS LCO 3.9.2 and associated SR:

As a minimum, two source range neutron flux monitors shall be operating, each with continuous visual indication in the control room and one with audible indication in the containment and control room.

APPLICABILITY: Mode 6.

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<sup>6</sup> ADAMS Accession No. ML090850642.

**ACTION:** With the requirements of the above specification not satisfied, immediately suspend all operation involving CORE ALTERATIONS or positive reactivity changes. The provisions of 3.0.3 are not applicable.

Associated SR 4.9.2:

Each source range neutron flux monitor shall be demonstrated OPERABLE by performance of:

- a. A CHANNEL FUNCTIONAL TEST in accordance with the Surveillance Frequency Control Program, and
- b. A CHANNEL CHECK in accordance with the Surveillance Frequency Control Program during CORE ALTERATIONS.

Proposed TS LCO 3.9.2.2: The proposed LCO is renumbered from LCO 3.9.2 to 3.9.2.2 due to the insertion of new LCO 3.9.2.1 and it is rephrased as follows:

Two source range neutron flux monitors shall be OPERABLE in Mode 6.

The action statements for this proposed LCO state:

- a. With one of the above required monitors inoperable, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity additions.
- b. With both of the required monitors inoperable; immediately suspend all operations involving CORE ALTERATIONS, positive reactivity additions, and initiate action to restore one source range monitor to OPERABLE status; and perform Surveillance Requirement 4.9.1 once per 12 hours.
- c. The provisions of Specification 3.0.3 are not applicable.

Associated SR 4.9.2.2 is proposed as follows:

Each source range neutron flux monitor shall be demonstrated OPERABLE by performance of:

- a. A CHANNEL CHECK in accordance with the Surveillance Frequency Control Program, and

-----NOTE-----  
Neutron detectors are excluded from CHANNEL CALIBRATION  
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- b. A CHANNEL CALIBRATION in accordance with the Surveillance Frequency

Control Program.

SR 4.9.2.2 is proposing to change the CHANNEL FUNCTIONAL TEST to a CHANNEL CALIBRATION. Performing a CHANNEL CALIBRATION is consistent with TSTF-23, which specifies that a CHANNEL CALIBRATION shall be performed. In addition, Section 1 of Salem's TSs define CHANNEL CALIBRATION to include a CHANNEL FUNCTIONAL TEST. Therefore, the CHANNEL FUNCTIONAL TEST will continue to be done.

This LCO is consistent with TS and SR language in the approved TSTF-23. This LCO is also consistent with TS and SR language in NUREG-1431.

Based on the preceding observations, these LCO and SR changes are acceptable to the NRC staff.

Proposed New TS LCO 3.9.2.1: This LCO has been added to address the proposal to isolate each unborated water source isolation valve. The proposed LCO states that, "Each valve used to isolate unborated water sources shall be secured in the closed position." This LCO is applicable in Mode 6.

The action statements for this proposed LCO states:

NOTE

Separate entry is allowed for each unborated water source isolation valve.

With one or more valves not secured in the closed position:

- a. Immediately suspend CORE ALTERATIONS, and initiate actions to secure valve in the closed position.

and

- b. Within 4 hours perform Surveillance Requirement 4.9.1

Proposed New SR 4.9.2.1 states:

Verify each valve that isolates unborated water sources is secured in the closed position in accordance with the Surveillance Frequency Control Program.

This LCO is consistent with TS and SR language in the approved TSTF-23 and is an acceptable method to address boron dilution events. This LCO is also consistent with TS and SR language in NUREG-1431.

Based on the preceding observations, these LCO and SR changes are acceptable to the NRC staff.

### 3.3 NRC Staff Evaluation

As part of this amendment request, PSEG proposes to isolate all unborated water sources in Mode 6. This action will preclude a boron dilution event in Mode 6 and the need for operator action in response to audible count rate indication to address the potential boron dilution event when all the unborated water sources are not isolated. New LCO 3.9.2.1 requires that all sources of unborated water be closed during Mode 6. Per licensee letter dated November 25, 2015, new SR 4.9.2.1 will confirm that the unborated water source valves are closed at the specified surveillance. The initial surveillance frequency will be 31 days, consistent with NUREG-1431. In addition, the licensee's letter dated November 25, 2015, states that even though the requirement for the audible count rate is being deleted from the TS, the audible count rate will continue to be available to the plant operators.

As noted in the Introduction section, PSEG plans to change the existing source range and the intermediate range neutron monitors from the original plant equipment to the Thermo-Scientific neutron monitoring instruments. The rationale and justification of this change is addressed in a separate LAR submitted by PSEG for Salem.<sup>7</sup> Implementation of the isolation of all unborated water sources in Mode 6 is not dependent on the replacement of neutron monitors. In addition, the new neutron monitoring channels will have the same design functions and features as the current channels and are being designed to meet the existing TS 3.9.2 requirements.

#### 3.3.1 Instrumentation

Existing TS LCO 3.9.2 requires that two source range neutron flux monitors be operable in Mode 6, each with continuous visual indication, and one with audible indication, in the containment and control room. TS LCO 3.9.2 is currently met using the NIS source range neutron flux monitors (original plant installed equipment). These monitors are classified as safety-related (Class 1 E). These detectors monitor the neutron flux in counts per second (cps) over a range that covers 6 decades.

The licensee has proposed to use both the NIS source range neutron flux monitors and the Gamma-Metrics PANMs. The licensee stated that these PANMs were installed at Salem to satisfy post-accident monitoring requirements specified in RG 1.97, Revision 2. The PANMs are also required to support post-fire safe shutdown capability per 10 CFR 50, Appendix R. The PANMs are safety-related, Class 1E. There are no environmental qualifications or 10 CFR 50, Appendix R, fire protection program requirements for the PANMs in Mode 6.

The licensee provided information to compare the existing NIS source neutron flux range monitors with the Gamma-Metrics PANM monitors, which are being credited as part of this LAR. A summary of this comparison is provided below.

The current NIS source range neutron flux monitors provide audible count rate in the containment and control room. The Gamma-Metrics PANMs do not provide audible indication in either the containment or control room; however, the audible count rate function is not required

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<sup>7</sup> ADAMS Accession No. ML15093A291.



for the proposed change. Both the NIS and Gamma-Metrics monitors will provide continuous visual indication of neutron flux level in the control room.

The detectors for the NIS monitors and Gamma-Metrics PANMs are located in detector wells outside the reactor vessel. The NIS detectors are located at an orientation of 0 degrees and 180 degrees. The Gamma-Metrics PANMs are located at an orientation of 90 degrees and 270 degrees. The output signals from the NIS detectors are input to a preamplifier assembly. The signal from the preamplifier is sent to the source range drawer. The source range drawer conditions and processes the signal before it goes to indication meters, audio count rate drawer, comparator and rate drawer, and the plant computer. Similarly, the signals from the PANM detectors are sent to amplifier assemblies containing signal conditioning circuitry, direct current power supplies, and the detector high voltage power supplies. The amplifier assembly outputs are sent to a signal processing assembly. The detector signal is displayed in the control room as source range count rate and wide range logarithmic power level.

NIS source range neutron flux monitors have two channels; each is independently input to the reactor protection system (RPS). These channels are physically and electrically separated in accordance with the Salem criteria and licensing basis. In Mode 6, the source range neutron flux monitors do not have any RPS trip functions. The Gamma-Metrics PANMs also use two separate and independent safety-related channels, which are physically and electrically independent. The Gamma-Metrics PANMs do not perform protective or control functions. The NIS source range detectors have a range of  $10^0$  to  $10^6$  cps, whereas Gamma-Metrics PANM detectors have a range of  $10^{-1}$  to  $10^5$  cps for the source range. The fact that the Gamma-Metrics detectors do not cover the range from  $10^5$  to  $10^6$  cps is not considered to be significant for plant operation in Mode 6. The one higher decade in the NIS detectors is used for reactor trip function, which is not required during Mode 6 operation. The NIS detectors have an accuracy of 3 percent of full scale, and the Gamma-Metrics detectors have an accuracy of 2 percent of full scale. The NIS detectors are designed for detector temperature operation up to 300 °F. The Gamma-Metrics detectors are designed for 32-302 °F for 10 to 90 percent relative humidity for non-accident conditions and for up to 428 °F at 90 percent relative humidity for a design-basis event.

Based on the information above, the NRC staff finds that the NIS source range neutron flux monitors and the Gamma-Metrics PANMs are both capable of detecting and indicating neutron flux levels over the shutdown range required during Mode 6 operation. The Gamma-Metrics PANMs do not provide the audible count rate; however, the audible count rate is not needed for the proposed change. Continuous visual indication will be provided for both the NIS and the Gamma-Metrics monitors in the control room. Therefore, the NRC staff finds the licensee's plan to use both the NIS source range neutron flux monitors and the Gamma-Metric PANMs to fulfill the requirements of TS LCO 3.9.2 (being renumbered to 3.9.2.2) acceptable.

### 3.3.2 Boron Dilution Analysis

The proposed change would isolate all unborated water sources by closing the unborated water valves that could cause boron dilution. NUREG-1431, LCO 3.9.2, states, in part, that, "For units which have not analyzed boron dilution event in Mode 6, the isolation of all unborated water sources is required to preclude [a boron dilution] event from occurring." NRC-approved

TSTF-23, states, in part:

One method relies on precluding a boron dilution event by requiring all unborated water source isolation valves be closed. This is typically done at the source (makeup water storage tank outlet valve(s) and other potential sources). Plants using this method have clear statements in the FSARs that boron dilution is precluded by the Tech Spec requirement to isolate all potential sources of unborated water. No analyses are required or performed for the boron dilution event in this case.

The licensee stated that Section 15.2.4 of the UFSAR will be revised to indicate that Salem is isolating unborated water sources during Mode 6 and not taking credit for operator action in response to an audible count rate indication to address the boron dilution event.

The NRC staff questioned the licensee to determine if there is an existing procedure that is used to secure all applicable valves in the closed position or if a new procedure will be developed. The staff also asked if there is a list of applicable valves. In its letter dated November 25, 2015, the licensee responded that a new surveillance procedure will be issued during the implementation of the approved TS amendment and will contain the methods for securing the valves in the closed position. The list of valves that are associated with isolating the unborated flow paths will be contained and controlled in the new surveillance procedure.

The NRC staff finds the licensee's plans to isolate unborated water sources as an acceptable method to preclude a boron dilution event, consistent with TSTF-23. In addition, the staff finds that because all unborated water sources will be isolated in MODE 6, a boron dilution analysis is not necessary, consistent with TSTF-23.

### 3.3.3 Audible Indication

The requirement of audible alarm and audible count rate is not applicable for the proposed change. Deletion of this requirement was addressed in TSTF-23, which was reviewed and approved by NRC letter dated September 27, 1996. TSTF-23 requires an audible count rate when the unborated water sources are not isolated in order to alert operators to stop the dilution and protect the shutdown margin. NUREG-1431, Bases Section B 3.9.3, states in part, "For plants that isolate all boron dilution paths (per LCO 3.9.2), the source range OPERABILITY includes only a visual monitoring function." The current NIS monitors provide continuous visual indication and audible indication in the control room. The Gamma-Metrics PANMs are not included in the current TSs but will be credited as part of this change. The Gamma-Metrics PANMs also provide continuous visual indication in the control room. In addition, even though the requirement for the audible count rate is being deleted from the TS, the audible count rate will continue to be available to the plant operators via the NIS monitors.

The NRC staff finds that based on isolation of all unborated water sources and continuous visual indication in the control room, an audible indication is not necessary, consistent with TSTF-23.

### 3.3.4 Isolation Valve

The proposed change creates new TS LCO 3.9. 2.1 for unborated water source isolation valves in Mode 6. The application states that the surveillance frequency for new SR 4.9.2.1, which verifies that each valve that isolates unborated water sources is secured in the closed position, would be included in its Surveillance Frequency Control Program (SFCP) per the NRC-approved TSTF-425. Salem has implemented TSTF-425 as approved by the NRC with Amendment Nos. 299 and 282 for Unit Nos. 1 and 2, respectively.<sup>8</sup> In order for a surveillance frequency to be included in the SFCP, it must meet the following TSTF-425 requirements: The surveillance frequency must be a periodic surveillance that: (1) does not reference other approved programs for the specified interval, (2) is not event driven, (3) does not have a time component based on event occurrence, and (4) is not related to a specific condition for performance.

Since SR 4.9.2.1 is a new surveillance, which is proposed by the licensee to be added in its TSs, the NRC staff needed additional information from the licensee to determine whether it meets the requirements for the SFCP. In response to the staff's request, PSEG stated that, "The initial surveillance frequency will be 31-days consistent with NUREG-1431, Standard Technical Specifications for Westinghouse Plants," in its November 25, 2015, letter.

The criteria for relocation of a surveillance frequency to a licensee-controlled program in accordance with TSTF-425 were reviewed. This surveillance frequency is a periodic surveillance that: (1) does not reference other approved programs for the specified interval, (2) is not event driven, (3) does not have a time component based on event occurrence, and (4) is not related to a specific condition for performance. Therefore, the periodic surveillance frequency is within the scope of TSTF-425 for location in the licensee-controlled SFCP.

The NRC staff has determined that the licensee's proposed placement of the subject surveillance frequency in the SFCP is acceptable since the new surveillance is a periodic surveillance that meets all of the four SFCP exclusion criteria described above. Therefore, the staff concludes that placement of the surveillance frequency in the program is consistent with the licensee's SFCP requirements and is acceptable.

### 3.4 NRC Staff Conclusion

Based on the above review, the NRC staff has determined that the proposed changes will preclude a boron dilution event during refueling (Mode 6) by isolating unborated water sources. As such, an audible alarm and boron dilution analysis are no longer required. In addition, the NRC staff finds that the proposed changes to the Salem TSs are consistent with the guidance in TSTF-23 and NUREG-1431. As such, the NRC staff concludes that the proposed changes to the TSs and SRs are acceptable.

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<sup>8</sup> ADAMS Accession No. ML110410691.

#### 4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New Jersey State official was notified of the proposed issuance of the amendments. The State official had no comments.

#### 5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes SRs. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (80 FR 30101). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

#### 6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: G. Singh  
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R. Grover

Date: March 7, 2016

March 7, 2016

Mr. Robert Braun  
President and Chief Nuclear Officer  
PSEG Nuclear LLC - N09  
P.O. Box 236  
Hancocks Bridge, NJ 08038

SUBJECT: SALEM NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2 - ISSUANCE OF AMENDMENTS REGARDING NEW TECHNICAL SPECIFICATIONS TO ISOLATE UNBORATED WATER SOURCES IN MODE 6 (CAC NOS. MF5831 AND MF5832)

Dear Mr. Braun:

The Commission has issued the enclosed Amendment Nos. 311 and 292 to Renewed Facility Operating License Nos. DPR-70 and DPR-75 for the Salem Nuclear Generating Station, Unit Nos. 1 and 2. These amendments consist of changes to the Technical Specifications (TSs) in response to your application dated March 9, 2015, as supplemented by letters dated April 10, 2015; November 25, 2015; and February 3, 2016.

The amendments create new TSs to isolate unborated water sources in Mode 6 (Refueling Mode) to preclude a boron dilution event and support removing the existing requirement for one source range neutron flux monitor with audible indication in the containment and in the control room during Mode 6. In addition, by isolating the unborated water sources, a safety analysis for an uncontrolled boron dilution event is not required for Mode 6.

A copy of our safety evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

Thomas Wengert, Senior Project Manager  
Plant Licensing Branch I-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-272 and 50-311

Enclosures:

1. Amendment No. 311 to Renewed DPR-70
2. Amendment No. 292 to Renewed DPR-75
3. Safety Evaluation

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ADAMS Accession No.: ML16035A087

\*by memo \*\*by email

OFFICE	DORL/LPL1-2/PM	DORL/LPL1-2/LA	DSS/SRXB/BC(A)*	DE/EICB/BC*	DSS/STSB/BC**
NAME	CParker	LRonewicz	EOesterle	MWaters	RElliott
DATE	2/4/2016	2/8/2016	1/14/2016	12/22/2015	12/18/2016
OFFICE	DRA/ARCB/BC	OGC-NLO w/comments	DORL/LPL1-2/BC	DORL/LPL1-2/PM	
NAME	UShoop	MRing	DBroaddus	TWengert	
DATE	2/10/2016	2/23/2016	3/7/2016	3/7/2016	

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