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

March 28, 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 RE: REVISION TO REACTOR TRIP SYSTEM INSTRUMENTATION TECHNICAL SPECIFICATIONS (CAC NOS. MF6067 AND MF6068)

Dear Mr. Braun:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment Nos. 312 and 293 to Renewed Facility Operating License Nos. DPR-70 and DPR-75 for the Salem Nuclear Generating Station, Unit Nos. 1 and 2, respectively. These amendments consist of changes to the Technical Specifications (TSs) in response to your application dated March 27, 2015, as supplemented by letter dated February 3, 2016.

The amendments revise certain TS 3/4.3.1, "Reactor Trip System Instrumentation," actions. Specifically, TS Table 3.3-1, Action 2, is revised to allow one power range (PR) channel to be bypassed for up to 4 hours for surveillance testing, and two new action notes are established for the PR nuclear instrumentation in TS Table 4.3-1. The changes support the installation and use of bypass test capability for the PR nuclear instrumentation.

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

Sincerely,

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. 312 to Renewed DPR-70
2. Amendment No. 293 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 FACILITY OPERATING LICENSE

Amendment No. 312
Renewed License No. DPR-70

1. The U.S. 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 27, 2015, as supplemented by letter dated 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 Regulations* (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 Renewed 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. 312, 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 prior to returning to the MODE of applicability following refueling outage 1R24.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/ 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 the Technical Specifications

Date of Issuance: March 28, 2016

ATTACHMENT TO LICENSE AMENDMENT NO. 312

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 as indicated. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

Remove	Insert
Page 3	Page 3

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

Remove	Insert
3/4 3-5	3/4 3-5
3/4 3-11	3/4 3-11
3/4 3-13	3/4 3-13

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. 312, 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

TABLE 3.3-1 (Continued)

TABLE NOTATION

* With the reactor trip system breakers in the closed position and the control rod drive system capable of rod withdrawal.

High voltage to detector may be de-energized above P-6.

If ACTION Statement 1 is entered as a result of Reactor Trip Breaker (RTB) or Reactor Trip Bypass Breakers (RTBB) maintenance testing results exceeding the following acceptance criteria, NRC reporting shall be made within 30 days in accordance with Specification 6.9.2:

1. A RTB or RTBB trip failure during any surveillance test with less than or equal to 300 grams of weight added to the breaker trip bar.

2. A RTB or RTBB time response failure that results in the overall reactor trip system time response exceeding the Technical Specification limit.

ACTION STATEMENTS

ACTION 1 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, be in HOT STANDBY within 6 hours; however, one channel may be bypassed for up to 2 hours for surveillance testing per Specification 4.3.1.1.1 provided the other channel is OPERABLE.

ACTION 2 - With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in the tripped condition within 6 hours.

b. The Minimum Channels OPERABLE requirement is met; however, one channel may be bypassed for up to 4 hours for surveillance testing per Specification 4.3.1.1.1.

c. Either, THERMAL POWER is restricted to ≤ 75% of RATED THERMAL POWER and the Power Range, Neutron Flux trip setpoint is reduced to ≤ 85% of RATED THERMAL POWER within 4 hours; or, the QUADRANT POWER TILT RATIO is monitored at least once per 12 hours.

TABLE 4.3-1

REACTOR TRIP SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

FUNCTIONAL UNIT	CHANNEL CHECK(15)	CHANNEL CALIBRATION(15)	CHANNEL FUNCTIONAL TEST(15)	MODES IN WHICH SURVEILLANCE REQUIRED
1. Manual Reactor Trip Switch	N.A.	N.A.	(9)	1, 2, and *
2. Power Range, Neutron Flux		(2), (3) (6) (17)	(18)	1, 2, and 3*
3. Power Range, Neutron Flux, High Positive Rate	N.A.	(6)	(18)	1, 2
4. Deleted				
5. Intermediate Range, Neutron Flux		(6)	S/U(1)	1, 2 and *
6. Source Range, Neutron Flux	(7)	(6)	(16) and S/U(1)	2, 3, 4, 5 and *
7. Overtemperature ΔT				1, 2
8. Overpower ΔT				1, 2
9. Pressurizer Pressure--Low				1, 2
10. Pressurizer Pressure--High				1, 2
11. Pressurizer Water Level--High				1, 2
12. Loss of Flow - Single Loop				1

TABLE 4.3-1 (Continued)

NOTATION

* With the reactor trip system breakers closed and the control rod drive system capable of rod withdrawal.

(1) - If not performed in previous 31 days.

(2) - Heat balance only, above 15% of RATED THERMAL POWER.

(3) - Compare incore to excore axial offset above 15% of RATED THERMAL POWER. Recalibrate if absolute difference ≥ 3 percent.

(4) - Manual SSPS functional input check in accordance with the Surveillance Frequency Control Program.

(5) - Each train or logic channel shall be tested in accordance with the Surveillance Frequency Control Program.

(6) - Neutron detectors may be excluded from CHANNEL CALIBRATION.

(7) - Below P-6 (Block of Source Range Reactor Trip) setpoint.

(8) - Deleted

(9) - The CHANNEL FUNCTIONAL TEST shall independently verify the OPERABILITY of the Undervoltage and Shunt Trip mechanism for the Manual Reactor Trip Function.

The Test shall also verify OPERABILITY of the Bypass Breaker Trip circuits.

(10) - DELETED

(11) - The CHANNEL FUNCTIONAL TEST shall independently verify the OPERABILITY of the Reactor Trip Breaker Undervoltage and Shunt Trip mechanisms.

(12) - DELETED

(13) - Verify operation of Bypass Breakers Shunt Trip function from local pushbutton while breaker is in the test position prior to placing breaker in service.

(14) - Perform a functional test of the Bypass Breakers U.V. Attachment via the SSPS.

(15) - Frequencies are specified in the Surveillance Frequency Control Program unless otherwise noted in the table.

(16) - At the frequency specified in the Surveillance Frequency Control Program.

(17) - In MODES 1, and 2, the SSPS input relays are excluded from this Surveillance when the installed bypass test capability is used to perform this Surveillance.

(18) - The SSPS input relays are excluded from this Surveillance when the installed bypass test capability is used to perform this Surveillance.

UNITED STATES
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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 FACILITY OPERATING LICENSE

Amendment No. 293
Renewed License No. DPR-75

1. The U.S. 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 27, 2015, as supplemented by letter dated 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 Regulations* (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 Renewed 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. 293, 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 prior to returning to the MODE of applicability following refueling outage 2R22.

FOR THE NUCLEAR REGULATORY COMMISSION

for 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 the Technical Specifications

Date of Issuance: March 28, 2016

ATTACHMENT TO LICENSE AMENDMENT NO. 293

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 as indicated. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

Remove	Insert
Page 3	Page 3

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

Remove	Insert
3/4 3-5	3/4 3-5
3/4 3-11	3/4 3-11
3/4 3-13	3/4 3-13

(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. 293, 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.

TABLE 3.3-1 (Continued)

TABLE NOTATION

* With the reactor trip system breakers in the closed position and the control rod drive system capable of rod withdrawal.

High voltage to detector may be de-energized above P-6.

If ACTION Statement 1 is entered as a result of Reactor Trip Breaker (RTB) or Reactor Trip Bypass Breaker (RTBB) maintenance testing results exceeding the following acceptance criteria, NRC reporting shall be made within 30 days in accordance with Specification 6.9.2:

1. A RTB or RTBB trip failure during any surveillance test with less than or equal to 300 grams of weight added to the breaker trip bar.

2. A RTB or RTBB time response failure that results in the overall reactor trip system time response exceeding the Technical Specification limit.

ACTION STATEMENTS

ACTION 1 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, be in HOT STANDBY within 6 hours; however, one channel may be bypassed for up to 2 hours for surveillance testing per Specification 4.3.1.1.1 provided the other channel is OPERABLE.

ACTION 2 - With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in the tripped condition within 6 hours.

b. The Minimum Channels OPERABLE requirement is met; however, one channel may be bypassed for up to 4 hours for surveillance testing per Specification 4.3.1.1.1.

c. Either, THERMAL POWER is restricted to ≤ 75% of RATED THERMAL POWER and the Power Range, Neutron Flux trip setpoint is reduced to ≤ 85% of RATED THERMAL POWER within 4 hours; or, the QUADRANT POWER TILT RATIO is monitored at least once per 12 hours.

d. The QUADRANT POWER TILT RATIO, as indicated by the remaining three detectors, is verified consistent with the normalized symmetric power distribution obtained by using either the movable in-core detectors in the four pairs of symmetric thimble locations or the power distribution monitoring system at least once per 12 hours when THERMAL POWER is greater than 75% of RATED THERMAL POWER.

TABLE 4.3-1

REACTOR TRIP SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

FUNCTIONAL UNIT	CHANNEL CHECK(15)	CHANNEL CALIBRATION(15)	CHANNEL FUNCTIONAL TEST(15)	MODES IN WHICH SURVEILLANCE REQUIRED
1. Manual Reactor Trip Switch	N.A.	N.A.	(9)	1, 2, and *
2. Power Range, Neutron Flux		(2), (3) (6) (17)	(18)	1, 2, and 3*
3. Power Range, Neutron Flux, High Positive Rate	N.A.	(6)	(18)	1, 2
4. Deleted				
5. Intermediate Range, Neutron Flux		(6)	S/U(1)	1, 2 and *
6. Source Range, Neutron Flux	(7)	(6)	(16) and S/U(1)	2, 3, 4, 5 and *
7. Overtemperature ΔT				1, 2
8. Overpower ΔT				1, 2
9. Pressurizer Pressure--Low				1, 2
10. Pressurizer Pressure--High				1, 2
11. Pressurizer Water Level--High				1, 2
12. Loss of Flow - Single Loop				1

TABLE 4.3-1 (Continued)

NOTATION

* With the reactor trip system breakers closed and the control rod drive system capable of rod withdrawal.

(1) - If not performed in previous 31 days.

(2) - Heat balance only, above 15% of RATED THERMAL POWER.

(3) - Compare incore to excore axial offset above 15% of RATED THERMAL POWER. Recalibrate if absolute difference ≥ 3 percent.

(4) - Manual SSPS functional input check in accordance with the Surveillance Frequency Control Program.

(5) - Each train or logic channel shall be tested in accordance with the Surveillance Frequency Control Program.

(6) - Neutron detectors may be excluded from CHANNEL CALIBRATION.

(7) - Below P-6 (Block of Source Range Reactor Trip) setpoint.

(8) - Deleted

(9) - The CHANNEL FUNCTIONAL TEST shall independently verify the OPERABILITY of the Undervoltage and Shunt Trip mechanism for the Manual Reactor Trip Function.

The Test shall also verify OPERABILITY of the Bypass Breaker Trip circuits.

(10) - DELETED

(11) - The CHANNEL FUNCTIONAL TEST shall independently verify the OPERABILITY of the Reactor Trip Breaker Undervoltage and Shunt Trip mechanisms.

(12) - DELETED

(13) - Verify operation of Bypass Breakers Shunt Trip function from local pushbutton while breaker is in the test position prior to placing breaker in service.

(14) - Perform a functional test of the Bypass Breakers U.V. Attachment via the SSPS.

(15) Frequencies are specified in the Surveillance Frequency Control Program unless otherwise noted in the table.

(16) At the frequency specified in the Surveillance Frequency Control Program.

(17) - In MODES 1 and 2, the SSPS input relays are excluded from this Surveillance when the installed bypass test capability is used to perform this Surveillance.

(18) - The SSPS input relays are excluded from this Surveillance when the installed bypass test capability is used to perform this Surveillance.

UNITED STATES
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WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 312 AND 293 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 27, 2015, as supplemented by letter dated February 3, 2016,[1] 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 revise certain TS 3/4.3.1, "Reactor Trip System Instrumentation," actions. Specifically, TS Table 3.3-1, Action 2, would be revised to allow one power range (PR) channel to be bypassed for up to 4 hours for surveillance testing, and two new action notes would be established for the PR nuclear instrumentation in TS Table 4.3-1. The proposed changes would support the installation and use of bypass test capability for the PR nuclear instrumentation.

The licensee states that testing the PR nuclear instrumentation channels in bypass would reduce the likelihood of reactor trips due to human error, channel failure, or spurious transient in a redundant channel; thereby increasing plant availability while still ensuring that the PR nuclear instrumentation channels are capable of performing their intended plant protection function. As an attachment to the license amendment request (LAR), PSEG included Westinghouse Electric Company, LLC (Westinghouse) Report WCAP-17947-P, "Power Range Nuclear Instrumentation System Bypass Test Instrumentation for Salem Units 1 and 2," which provides the Salem, Unit Nos. 1 and 2, plant-specific basis for testing the PR nuclear instrumentation in bypass. A publicly available version of the proprietary Westinghouse report can be found at ADAMS Accession No. ML15086A201.

The supplement dated 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 U.S. Nuclear Regulatory Commission (NRC or the Commission) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on July 7, 2015 (80 FR 38776).

[1] Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML15086A201 and ML16034A266, respectively.

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 (LCOs); (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 levels 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.
>
> 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.

As discussed in 10 CFR 50.36(c)(3), SRs are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the LCOs will be met. The LAR proposes to change TS 3/4.3.1 to allow certain reactor trip system (RTS) instrumentation SRs to be performed without entering a TS Action statement.

The regulation at 10 CFR 50.36(a)(1) states that a summary statement of the bases or reasons for such specifications, other than those covering administrative controls, shall also be included in the application, but shall not become part of the TSs. Accordingly, along with the proposed

TS changes, the licensee also submitted TS Bases changes corresponding to the proposed TS changes.

The NRC staff's guidance for review of TSs is in Chapter 16, "Technical Specifications," of NUREG-0800, Revision 3, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition," March 2010.[2] As described therein, as part of the regulatory standardization effort, the NRC staff has prepared standard TSs (STSs) for each of the light-water reactor nuclear designs. NUREG-1431, "Standard Technical Specifications – Westinghouse Plants," contains the STSs for Westinghouse Plants such as Salem.

The regulation at 10 CFR 50.54(jj), requires that structures, systems, and components must be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety function to be performed.

The regulation at 10 CFR 50.55a(h)(2), provides that each licensee's protection systems must meet the requirements stated in either Institute of Electrical and Electronics Engineers (IEEE) Standard 279, "Criteria for Protection Systems for Nuclear Power Generating Stations," or IEEE Standard 603-1991, "Criteria for Safety Systems for Nuclear Power Generating Stations," and the correction sheet dated January 30, 1995. For Salem, the protection systems are designed in accordance with the requirements of IEEE Standard 603-1991. The proposed installed bypass test capability is designed to meet the same requirements of that standard.

Salem was designed using the Atomic Industry Forum General Design Criteria and the licensee's understanding of the intent of the Atomic Energy Commission's (AEC's) proposed General Design Criteria. A comparison of the Salem, Unit Nos. 1 and 2, plant design was done with 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," (GDC) 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 2, "Performance Standards," is similar to GDC 2, "Design bases for protection against natural phenomena." AEC-proposed GDC 11, "Control Room," is similar to GDC 19, "Control room." AEC-proposed GDC 15, "Engineered Safety Features Protection Systems," is similar to GDC 20, "Protection system functions." AEC-proposed GDC 19, "Protection Systems Reliability," is similar to GDC 21, "Protection system reliability and testability." AEC-proposed GDC 20, "Protection Systems Redundancy and Independence," is similar to GDC 22, "Protective system independence." AEC-proposed GDC 26, "Protection Systems Fail-Safe Design," is similar to GDC 23, "Protection system failure modes." AEC-proposed GDC 22, "Separation of Protection and Control Instrumentation Systems," is similar to GDC 24, "Separation of protection and control systems."

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[2] ADAMS Accession No. ML100351425.

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

- Regulatory Guide (RG) 1.47, "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems," Revision 1, dated February 2010.[3]
- RG 1.53, "Application of the Single Failure-Criterion to Safety Systems," Revision 2, dated November 2003.[4]
- RG 1.75, "Criteria for Independence of Electrical Safety Systems," Revision 3, dated February 2005.[5]
- RG 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," Revision 1, dated June 1984.[6]
- RG 1.100, "Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants," Revision 3, dated September 2009.[7]
- RG 1.118, "Periodic Testing of Electric Power and Protection Systems," Revision 3, dated April 1995.[8]
- RG 1.22, "Periodic Testing of Protection System Actuation Functions," Revision 0, dated February 1972.[9]
- RG 1.30, "Quality Assurance Requirements for the Installation, Inspection, and Testing of Instrumentation and Electric Equipment," Revision 0, dated August 11, 1972.[10]

3.0 TECHNICAL EVALUATION

3.1 Description of Proposed TS Changes

PSEG proposes the following changes to the Salem TSs to allow certain functions of the RTS instrumentation to be tested in bypass:

1. TS 3/4.3.1, Table 3.3-1, "Reactor Trip System Instrumentation"

   Table 3.3-1 specifies the total number of channels and the minimum channels operable for reactor trip system instrumentation. If the number of operable channels is one less than the total number of channels for Functional Unit 2, Power Range Neutron Flux, and Functional Unit 3, Power Range Neutron Flux – High Positive Rate, Action 2 is applicable.

   Part b of Action 2 states that [power operation may proceed if] the minimum channels OPERABLE requirement is met; however, the inoperable channel may be bypassed for up to 4 hours for surveillance testing of other channels per Specification 4.3.1.1.1.

   The LAR proposes to change the wording of part b of Action 2 to:

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[3] ADAMS Accession No. ML092330064.
[4] ADAMS Accession No. ML033220006.
[5] ADAMS Accession No. ML043630448.
[6] ADAMS Accession No. ML003740271.
[7] ADAMS Accession No. ML091320468.
[8] ADAMS Accession No. ML003739468.
[9] ADAMS Accession No. ML083300530.
[10] ADAMS Accession No. ML081270243.

[Power operation may proceed if] the minimum channels OPERABLE requirement is met; however, one channel may be bypassed for up to 4 hours for surveillance testing per Specification 4.3.1.1.1.

2. TS 3/4.3.1, Table 4.3-1, "Reactor Trip System Instrumentation Surveillance Requirements"

   The LAR proposes to modify the requirements for the Channel Calibration and Channel Functional Test surveillances for Functional Unit 2, Power Range Neutron Flux, and Functional Unit 3, Power Range Neutron Flux – High Positive Rate, by the addition of two footnotes.

   The footnote added to the Power Range Neutron Flux Channel Calibration requirement would state:

   > In MODES 1 and 2, the SSPS [Solid State Protection System] input relays are excluded from this Surveillance when the installed bypass test capability is used to perform this Surveillance.

   The footnote added to the Power Range Neutron Flux and Power Range Neutron Flux – High Positive Rate Channel Functional Test would state:

   > The SSPS input relays are excluded from this Surveillance when the installed bypass test capability is used to perform this Surveillance.

3.2 Evaluation of WCAP-17947-P

The licensee plans to implement necessary hardware changes to the Nuclear Instrumentation System (NIS) and RTS to facilitate bypass testing under the change authority of 10 CFR 50.59, which is not in the scope of this safety evaluation (SE). In order to use the bypass test capability planned to be installed, the licensee is required to revise TS Table 3.3-1 and Table 4.3-1. Since this TS change is supported by WCAP-17947-P, Revision 0, the NRC staff has evaluated the regulatory compliance related to the usage of bypass test instrumentation (BTI) within this plant-specific report as discussed below.

3.2.1 General Design Criteria

The following sections summarize the NRC staff's review with respect to the GDCs applicable to the installation of the BTI at Salem. As discussed in the Regulatory Evaluation section of this SE, Salem is designed to conform with the intent of the GDCs.

3.2.1.1 GDC 2, "Design Bases for Protection Against Natural Phenomena"

GDC 2 states, in part, that, "Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions."

This criterion is applicable to the installation of the BTI at Salem because the BTI would be added to the Class 1E NIS cabinets. Therefore, GDC 2 prohibits the BTI from adversely affecting the existing seismic qualification of the cabinets or becoming a missile in a seismic event, and thus, adversely affecting any safety-related equipment.

The information provided by PSEG states that, "[t]he BTI equipment to be installed in the Class 1E instrumentation cabinets was subjected to multi-axis, multi-frequency inputs in accordance with RG 1.100. The equipment was subjected to Westinghouse generic operating basis earthquake (OBE) and safe shutdown earthquake (SSE) testing." In addition, the licensee states that, "[t]he BTI generic seismic qualification and environmental evaluation bounds the PSEG Nuclear current licensing basis."

Based on the seismic testing performed, the NRC staff finds that the BTI conforms to GDC 2.

3.2.1.2 GDC 19, "Control Room"

GDC 19 states, in part, that, "A control room shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions."

This criterion is applicable to the installation of the BTI at Salem because adequate indication and annunciation of the status of the protection system channels must be available to the operators in the control room.

The licensee stated that the BTI has been designed to meet this criterion by providing the operator, as well as the test technician, with accurate information concerning the status of the channels being tested. Main control room alarm/status light indicators are provided to ensure that the operator knows which BTI panel has a protection set channel instrumentation loop in the bypass condition. It can be determined from the position of the keylock switch on the NIS bypass panel that the technician has attempted to put the channel in test, and the lighting of the light emitting diode (LED) on the bypass panel will indicate that power is available to the bypass panel. The LEDs that are associated with the locking toggle switches will identify to the technician that an individual channel has been placed in the bypass condition.

The indications available are adequate to provide the control room (and the test technician) an accurate status of the protection system channels as either normal, bypassed, or tripped. Therefore, the NRC staff finds that the BTI conforms to GDC 19.

3.2.1.3 GDC 20, "Protection System Functions"

GDC 20 states, in part, that, "The protection system shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded..."

This criterion is applicable to the installation of the BTI at Salem because the protection system must still be able to perform its function after the installation of the BTI.

The BTI is located in the same cabinets as the protection channels. PSEG states that no protection system signals pass through the BTI when the BTI is not powered and that isolation devices are being used between Class 1E and non-Class 1E circuits.

Since no protection system signals pass through the BTI when the BTI is not powered, and the Class 1E and non-Class 1E circuits are isolated, the NRC staff finds that the BTI conforms to GDC 20.

3.2.1.4 GDC 21, "Protection System Reliability and Testability"

GDC 21 states, in part, that, "The protection system shall be designed for high functional reliability and in service testability commensurate with the safety functions to be performed. Redundancy and independence designed into the protection system shall be sufficient to assure that (1) no single failure results in loss of the protection function..."

This criterion is applicable to the installation of the BTI at Salem because the BTI design must show sufficient reliability to ensure that a single failure will not cause the protection system to be unable to perform its function.

Since any bypass system failures that would inadvertently cause the channel in bypass to trip are failures in a safe direction (i.e., tripped conditions), they will not be discussed here. The licensee analyzed failures in the bypass systems that could:

1. Cause a channel to go into the bypass condition inadvertently, or

2. Cause a channel to fail to come out of the bypass condition while indicating that it has.

Both of these types of failures could cause the same result. That is, the possibility could exist for more than one redundant protection set to be in bypass at the same time such that a reactor trip may not be generated, contrary to GDC 21. The licensee identified that it would require several contacts to spuriously close on the NIS bypass system to cause an inadvertent bypass. For a channel to fail to come out of bypass while indicating that it has returned to normal, one contact would have to stick closed in the associated relay. These failures would all be detected by observation of the local bypass status lights.

Since the failures discussed above would be detected by the indications in the control room, in addition to observation of the local bypass status lights, there is no credible single failure of the BTI that could result in the protection system being unable to perform its intended safety function. In addition, the licensee will apply administrative control over the distribution of the keys for the NIS panel and RTS cabinet doors as described in the next section.

Based on the discussion above, the NRC staff finds that the BTI conforms to GDC 21.

3.2.1.5 GDC 22, "Protection System Independence"

GDC 22 states, in part, that, "The protection system shall be designed to assure that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident

conditions on redundant channels do not result in loss of the protection function, or shall be demonstrated to be acceptable on some other defined basis."

This criterion is applicable to the installation of the BTI at Salem because the ability exists, without the proper administrative controls, for the simultaneous bypassing of more than one protection set at a time.

The NRC staff noted that the BTI design uses administrative controls to prevent placing more than one redundant protection set in bypass at the same time. The licensee identified the following administrative controls to prevent simultaneous bypassing of more than one protection set at a time:

1. Each bypass panel is enclosed in a NIS rack. To access the bypass panel, the rack door would have to be opened. These doors are locked with the keys under Operations control.

2. The NIS bypass panels have keylock switches that require a specific key to move the keylock switch to the bypass position. When the keylock switch is moved to the bypass position, a control room annunciator actuates. This alerts the operator to the specific bypass panel that has been placed in bypass. The keys are kept under Operations control and are unit specific, so the Unit 1 key cannot be used on Unit 2 and vice versa. This prevents using two keys to bypass two channels on one unit at the same time.

3. There is local indication (LED) on the bypass panel when an individual channel has been placed in the bypass condition (i.e., bypass toggle switch is placed in the bypass position). The technician is aware of channels in bypass without relying on remote (control room) indication.

4. Surveillance procedures specify that they may be performed on only one channel, and its associated protection set, at a time. Verifications are also conducted per surveillance procedures.

The NRC staff finds that the administrative controls PSEG has in place are adequate to prevent simultaneous bypassing of more than one protection set at a time. Therefore, the NRC staff finds that the BTI conforms to GDC 22.

3.2.1.6 GDC 23, "Protection System Failure Modes"

GDC 23 states, in part, that, "The protection system shall be designed to fail into a safe state... if conditions such as disconnection of the system, loss of energy (e.g., electric power, instrument air), or postulated adverse environments (e.g., extreme heat or cold, fire, pressure, steam, water, and radiation) are experienced."

This criterion is applicable to the installation of the BTI at Salem because a failure mode of the BTI is the loss of power to the bypass system.

The licensee's request states that either a circuit breaker opening or loss of power to the cabinet will cause the bypass system to terminate any bypassing that was being performed, and the bypassed systems will then return to their normal operating mode.

Based on the bypassed systems returning to their normal operating modes during a loss of power, the NRC staff finds that the BTI conforms to GDC 23.

3.2.1.7 GDC 24, "Separation of Protection and Control Systems"

GDC 24 states, in part, that, "The protection system shall be separated from control systems to the extent that failure of any single control system component or channel, or failure or removal from service of any single protection system component or channel which is common to the control and protection systems leaves intact a system satisfying all reliability, redundancy, and independence requirements of the protection system."

This criterion is applicable to the installation of the BTI at Salem because the indication and annunciation of the status of the channels in bypass are part of the control system.

The licensee stated that each BTI panel is located within its own protection set; therefore, a single fault would not cause a problem in redundant channels. The components of the NIS BTI panels that are non-Class 1E are isolated from the Class 1E circuits by qualified isolators. Therefore, there is no possibility that a control system fault could propagate to all the bypass panels and simultaneously adversely affect all protection sets. Separation requirements are maintained in the NIS bypass panels through physical separation on the bottom lid of the bypass panel with 6 inches between the safety-related and non-safety-related 118 volts alternating current (VAC). The circuit board maintains this required separation by placing a ground layer between the safety-related and non-safety-related 118 VAC circuits.

The NRC staff finds the level of separation adequate, and therefore, the NRC staff finds that the BTI conforms to GDC 24.

3.2.2 Regulatory Guides

The following sections summarize the NRC staff's review with respect to the RGs applicable to the installation of the BTI at Salem.

3.2.2.1 RG 1.47, "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems," Revision 1, dated February 2010

RG 1.47 describes an acceptable method of complying with the requirements of IEEE Standard 603-1991 and states that automatic indication should be provided in the control room for each bypass or deliberately induced inoperable status that meets all of the following conditions:

a. Renders inoperable any redundant portion of the protection system, systems actuated or controlled by the protection system, and auxiliary or supporting systems that must be operable for the protection system and the systems it actuates to perform their safety-related functions.

b. Expected to occur more frequently than once per year; and

c. Expected to occur when the affected system is normally required to be operable.

This RG is applicable to the installation of the BTI at Salem because placing a protection system in the bypass mode renders that channel of the protection system inoperable.

The licensee stated that the BTI has the capability to provide timely and accurate information to the control room operator as well as to the test technician performing the bypass testing.

The NRC staff notes that control room indication provides alarm/status light indicators to ensure that the operator knows which BTI panel has a protection set channel instrumentation loop in the bypass condition. In addition, the NRC staff notes that the BTI provides local indication of any channels in bypass. It can be determined from the position of the keylock switch on the NIS bypass panel that the technician has attempted to put the channel in test, and the lighting of the LED on the bypass panel will indicate that power is available to the bypass panel. The LEDs that are associated with the locking toggle switches will inform the technician that an individual channel has been placed in the bypass condition.

Based on the above, the NRC staff finds that the BTI conforms to RG 1.47.

3.2.2.2 RG 1.53, "Application of the Single-Failure Criterion to Safety Systems," Revision 2, dated November 2003

RG 1.53 endorses IEEE Standard 379-2000 with some clarification. IEEE Standard 379-2000 addresses the single failure criterion in nuclear power plant protection systems. A discussion of the BTI adherence to IEEE Standard 379-2000 and the single failure criterion, in general, is in Sections 3.2.3.2 and 3.2.1.4 (respectively) of this SE.

3.2.2.3 RG 1.75, "Criteria for Independence of Electrical Safety Systems," Revision 3, dated February 2005

RG 1.75 endorses and delineates acceptable methods for complying with the requirements of IEEE Standard 279-1971 with respect to physical independence of electric systems. RG 1.75 discusses requirements for physical separation between Class 1E and non-Class 1E circuits, electrical isolation between Class 1E and non-Class 1E circuits, and requirements for associated circuits. A discussion of the BTI adherence to separation requirements is in Section 3.2.1.7 of this SE.

3.2.2.4 RG 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," Revision 1, dated June 1984

RG 1.89 endorses IEEE Standard 323-1974, which describes the requirements for qualifying Class 1E equipment for nuclear power plants. Since the NIS PR bypass panels are installed in the Class 1E instrumentation racks, it must be shown that (1) the installation of the bypass system in these instrumentation racks will not adversely affect the seismic qualification of the Class 1E racks, and (2) the panels are able to withstand the required seismic levels associated

with Salem, Unit Nos. 1 and 2, and still continue to show structural integrity and electrical isolation. The BTI panels are located in the control room, which is considered to be a mild environment. All components used in the cards and bypass panels are acceptable for the environment expected in the cabinets. Further environmental qualification considerations for the BTI equipment are addressed in Section 3.2.1.1 of this SE.

3.2.2.5 RG 1.100, "Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants," Revision 3, dated September 2009

RG 1.100 endorses IEEE Standard 344-2004 and previous revisions of the standard. A discussion of the BTI adherence to this RG is in Section 3.2.1.1 of this SE.

3.2.2.6 RG 1.118, "Periodic Testing of Electric Power and Protection Systems," Revision 3, dated April 1995

RG 1.118 endorses IEEE Standard 338-1987 for periodic testing of protection systems subject to providing a method of preventing the expansion of any bypass condition to redundant channels. This is accomplished by administrative control of access to bypass capability as described in Section 3.2.1.5 of this SE.

3.2.2.7 RG 1.22, "Periodic Testing of Protection System Actuation Functions," Revision 0, dated February 1972

RG 1.22 describes acceptable methods of including the actuation devices in the periodic tests of the protection system during reactor operation. The licensee identified the following areas where the BTI panel complies with the applicable parts of RG 1.22.

1. The BTI panel provides a preferred means for periodic testing because it allows testing a channel in bypass versus trip, and reduces the potential for a spurious reactor trip during testing. When the entire protection channel is being tested, the trip signal simply passes through the BTI panel.

2. The BTI panel provides a means of verifying the 120 V [volt] signal on the terminal blocks, which are located in the same cabinet. If the 120V signal is not present in the terminal blocks, the SSPS would alarm depending on the BTI state. Within a protection channel, the BTI panel is located between the NIS drawers and SSPS; therefore, the BTI panels do not directly interface with the actuation device. The BTI panel does not interfere with the testing of the actuation devices, and the required testing of the actuation devices will not be affected by the BTI panel.

3. Each channel is isolated from each other; therefore placing one channel in bypass cannot result in placing any other channel in bypass. The BTI panels have individual and automatic annunciation.

Based on the above, the NRC staff finds that the BTI conforms to RG 1.22.

3.2.2.8 RG 1.30, "Quality Assurance Requirements for the Installation, Inspection, and Testing of Instrumentation and Electric Equipment," Revision 0, dated August 1972

RG 1.30 describes an acceptable method of complying with the NRC's regulations with regard to the quality assurance requirements for the installation, inspection, and testing of nuclear power plant instrumentation and electric equipment. The licensee stated that factory acceptance testing will be performed at a 10 CFR Part 21, Appendix B, facility before shipping the hardware to the site in order to comply with RG 1.30. Based on the above, the NRC staff finds that the BTI conforms to RG 1.30.

3.2.3 Institute of Electrical and Electronics Engineers Standards

The following sections summarize the NRC staff's review with respect to the IEEE standards applicable to the installation of the BTI at Salem.

3.2.3.1 IEEE Standard 603-1991

IEEE Standard 603-1991 establishes minimum functional design criteria for the power, instrumentation, and control portions of nuclear power generating station safety systems. The standard has several design criteria which are applicable to the BTI installation at Salem. The sections that are applicable are discussed below.

Section 5.1, Single Failure Criterion

This section requires that any single failure in the protection system shall not prevent proper protective action at the system level when required. The NRC's NUREG-0800, Chapter 7, "Instrumentation and Controls," Appendix 7.1-B, Section 4.2, "Single-Failure Criterion," provides acceptance criteria for the single-failure criterion. This section states that the applicant/licensee's analysis should confirm that the requirements of the single-failure criterion are satisfied. A discussion of the possible fault conditions and failure detection of the BTI is in Section 3.2.1.4 of this SE.

Section 5.3, Quality of Components

This section requires that components and modules be of high quality. The licensee stated that the components used in the BTI are of a quality consistent with minimum maintenance requirements and low failure rates; that the quality of components used in the BTI is consistent with components used in the protection system; and that all of the components are mechanical or electro-mechanical and are reliable through at least 50,000 operations under normal environmental conditions.

Section 5.4, Equipment Qualification

This section requires that type test data, or reasonable engineering extrapolation based on test data, be available to verify that protection system equipment shall meet the performance requirements on a continuing basis. The licensee has conducted generic tests to verify that the NIS bypass panels that are located in Class 1E instrument cabinets will not go into one of the identified failure modes during a seismic event. The tests were run to show structural integrity

and electrical isolation where applicable. A discussion of the equipment seismic qualification of the BTI is in Section 3.2.1.1 of this SE.

In its letter dated March 27, 2015, PSEG stated:

> The NIS PR bypass panels and associated wiring are completely contained inside a metal cabinet; therefore, the dominant entry of electromagnetic interference would be expected to be conducted through the field cabling. Additionally, the NIS bypass panels employ high level signals (118 VAC) that are not susceptible to radiated or conducted interference. The ability of the BTI panel to affect other equipment within the same cabinet is minimal due to the panel metal assembly and, more importantly, the very low duty cycle of the bypass relays. In the event that the BTI panel is required to be placed in bypass, the relays are manually actuated only twice. Additionally, the relays have been provided with arc suppression circuits in order to minimize any interference issues.

Section 5.6, Independence

Section 5.6.3 requires that the control signals from protection system equipment shall be through isolation devices that meet all the protection system requirements. It also requires that under single random failure condition, the remaining redundant protection channels shall be capable of providing the protective action. This criterion has been discussed previously as follows:

- Section 3.2.1.4 of this SE describes the safety function performance with single failure of BTI.
- Section 3.2.1.6 of this SE describes how the BTI are designed to fail into a safe state under postulated adverse environments.
- Section 3.2.1.7 of this SE describes the interaction between the control and protection systems.

Section 5.7, Capability for Test and Calibration

This section requires the system to provide the capability for testing and calibration of safety system equipment, while retaining the capability of the safety systems to accomplish their safety functions.

The licensee stated that the BTI panel complies with this section by providing the capability to functionally test its operation and that it does not require any calibration.

Section 5.8.3, Indication of Bypasses

This section requires continued indication of a bypass in the control room for each affected safety group if protective actions of some part of a safety system have been bypassed or deliberately rendered inoperative for any purpose other than an operating bypass.

The licensee states that the design of the BTI at Salem provides local alarm/status light and annunciators in the control room when a channel is bypassed.

Section 5.9, Control of Access

This section requires that the BTI design permit administrative control of the means of bypassing channels or protective functions.

The licensee stated that the design of the BTI for Salem requires the use of the NIS keylock switches for placing a channel in bypass. Administrative control is implemented by proper control of the distribution of the keys for the NIS panels.

Section 6.6, Operating Bypasses

This section requires the system to be designed to initiate the appropriate safety functions, even with a channel in a bypass condition.

The licensee stated that the BTI panel for Salem will not affect the compliance of the protection system to this section. When one channel is bypassed for testing, there will be sufficient channels available to trip the reactor since two-out-of-three coincidence logic is still in place.

Based on the review of the BTI design included in the LAR submittal, as discussed above, the NRC staff finds that the applicable requirements of IEEE Standard 603-1991 have been met.

3.2.3.2 IEEE Standard 379-2000

IEEE Standard 379-2000 describes the application of the single failure criterion to the protection system. A discussion of the safety function performance with single failure of BTI is in Section 3.2.1.4 of this SE.

Based on the review of the BTI design included in the LAR submittal, as discussed above, the NRC staff finds that the applicable requirements of IEEE Standard 379-2000 have been met.

3.2.3.3 IEEE Standard 384-1974

IEEE Standard 384-1974 discusses the separation requirements for Class 1E circuits and equipment. These separation requirements are required when Class 1E and non-Class 1E equipment is located within close proximity to one another. A discussion of the separation requirements relating to the BTI panel is in Section 3.2.1.7 of this SE.

Based on the review of the BTI design included in the LAR submittal, as discussed above, the NRC staff finds that the applicable requirements of IEEE Standard 384-1974 have been met.

3.2.3.4 IEEE Standard 344-2004

IEEE Standard 344-2004 discusses the recommended practices for performing seismic qualification of Class 1E equipment. The BTI, since it is being installed in Class 1E instrument

racks, must be shown to be seismically qualified. A discussion of the seismic qualification of the BTI panel is in Section 3.2.1.1 of this SE.

Based on the review of the BTI design included in the LAR submittal, as discussed above, the NRC staff finds that the applicable requirements of IEEE Standard 344-2004 have been met.

3.2.3.5 IEEE Standard 338-1987

IEEE Standard 338-1987 discusses the criteria for performing periodic testing of safety systems. The licensee stated that the installation of the BTI does not impact the capability for performing periodic tests that were originally designed into the equipment. The BTI panel provides an alternative means of testing in bypass rather than in a tripped condition.

This IEEE standard applies to the nuclear instrumentation detectors and drawers. This standard provides guidance for the periodic testing of safety-related systems. The BTI panel does not perform a safety function and does not have any impact on the capability to perform the required testing as discussed in the IEEE standard. PSEG states that the BTI panel only allows the drawers to be tested in bypass. It does not change or influence the method of surveillance testing of the drawers. Thus, the installation of the BTI panels has no effect on the NIS compliance with this IEEE standard.

Based on the review of the BTI design included in the LAR submittal, as discussed above, the NRC staff finds that the applicable requirements of IEEE Standard 338-1987 have been met.

3.2.3.6 IEEE Standard 323-1974

IEEE Standard 323-1974 discusses the requirements for qualifying Class 1E equipment for nuclear power plants. A discussion of the qualification requirements is in Section 3.2.3.1 of this SE.

Based on the review of the BTI design included in the LAR submittal, as discussed above, the NRC staff finds that the applicable requirements of IEEE Standard 323-1974 have been met.

3.3 Evaluation of the Proposed TS Changes

3.3.1 Evaluation of Bypass Capability

Technical Specification Task Force Traveler (TSTF)-418, "RPS and ESFAS Test Times and Completion Times (WCAP-14333)," Revision 2, dated March 2003,[11] established that bypass testing is an acceptable method of testing. In addition, NUREG-1431, Revision 4, has incorporated TSTF-418 for plants with installed bypass test capability. Therefore, by changing TS 3/4.3.1, Table 3.3-1 and Table 4.3-1 to reflect STSs wording, the proposed change aligns Salem TSs with NUREG-1431.

The RTS PR NIS utilizes a two-out-of-four coincidence logic from redundant channels to initiate protective actions. In the current design, the RTS NIS PR analog channel comparators are

[11] ADAMS Accession No. ML030650848.

placed in the "tripped" condition during channel testing or if a channel is inoperable. In the current design of testing a channel in the tripped condition, a redundant channel cannot be tested without bypassing an inoperable channel that is in the tripped condition. Additionally, routine testing of a channel in the tripped position can result in the potential for an unnecessary reactor trip if a second comparator trips in a redundant channel, which can be caused by a human error, spurious transient, or channel failure.

With the implementation of this TS change, the licensee can avoid a spurious reactor trip because the partial trip conditions that would have been present are eliminated. The coincidence logic, with a channel in bypass, becomes two-out-of-three for the remaining channels. This logic requires signals from two additional channels to actuate the protective function. This provides the benefits of reducing challenges to the plant safety systems that may result from spurious actuations, human error, or channel failure.

In order to allow for testing in bypass, the licensee proposed to revise TS 3/4.3.1, Table 3.3-1 and Table 4.3-1 for Salem, Unit Nos. 1 and 2, as described in Section 3.1 of this SE. This TS revision would allow the surveillance testing to be done in bypass with installed bypass capability.

The existing design has been modified such that in order to bypass a channel, the channel function output to the SSPS trains would be connected to the bypass switch. When the bypass switch is placed in bypass, an energized signal is applied to the input of the SSPS trains, thereby continuously providing power to the channel function and maintaining the channel in a non-tripped condition. The locking bypass switch is connected to a status light that provides indication both locally and in the control room when a channel bypass switch is armed. The NIS bypass test card is designed so that the relay failure will not lead to a channel inadvertently being bypassed.

The NRC staff noted that in order to test the bypass of a NIS channel, the technician needs to make two independent manual switch actuations to place a channel in bypass. In addition, the licensee uses administrative controls to strictly prevent the simultaneous bypassing of more than one redundant protection set at any one time.

The NRC staff has reviewed WCAP-17947-P, which was included as an attachment to the LAR to support this TS change, as described in Section 3.2 of this SE.

The licensee has confirmed that bypass switches for each channel are completely independent from the other channels and that the redundancy and diversity of safety functions remain unchanged. Based on the above discussion, the NRC staff finds that the licensee has adequately assured that the BTI design modification meets the plant licensing basis, and that the surveillance testing of the function identified previously can be safely conducted.

Therefore, the NRC staff finds that the proposed TS changes are acceptable.

3.3.2 Evaluation of TS Changes

The NRC staff reviewed the technical discussion of the proposed changes provided in the LAR to ensure that the reasoning was logical, complete, and clearly written, as described in Chapter

16 of NUREG-0800. The staff reviewed the proposed changes for continued compliance with the regulations in 10 CFR 50.36 and for consistency with conventional terminology and with the format and usage rules embodied in the TSs.

- 10 CFR 50.36(c)(2)(i) requires that the TSs include LCOs, which are the lowest functional capability or performance levels of equipment required for safe operation of the facility. No changes are being proposed to the lowest functional capability or performance levels. Therefore, TS 3/4.3.1 continues to comply with this regulation.

- 10 CFR 50.36(c)(2)(i) additionally requires that when an LCO of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the TSs until the condition can be met. The remedial actions are being changed to allow a channel to be placed in bypass for up to 4 hours for surveillance testing. The length of time that a channel may be placed in bypass has previously been reviewed and approved by the NRC staff and is reflected in NUREG-1431. Section 3.3.1 of this SE evaluates the use of the bypass capability at Salem. The NRC staff finds that the revised remedial actions are appropriate and do not create a conflict with 10 CFR 50.36(c)(2)(i).

- 10 CFR 50.36(c)(3) requires TSs to include items in the category of SRs, which are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the LCOs will be met. The staff reviewed the proposed changes to the surveillance testing requirements to determine if the SRs continue to comply with 10 CFR 50.36(c) requirements. The exclusion of the SSPS input relays during surveillance testing in Modes 1 and 2 reduces the potential for an inadvertent reactor trip during surveillance testing. The NRC staff finds this to be an acceptable change to the SRs, and the SRs, as modified, continue to be appropriate to assure that the necessary quality of systems and components is maintained, and thus, meets the requirements of 10 CFR 50.36.

The NRC staff finds that the proposed changes to the Action Statement of TS 3/4.3.1 and the modifications to SRs do not create a conflict with the requirements of 10 CFR 50.36(c)(2) and (c)(3).

3.3.3 Technical Conclusion

Based on the above review, the NRC staff concludes that the Salem, Unit Nos. 1 and 2, bypass testing design meets the applicable NRC requirements in 10 CFR 50.55a(h)(2), 10 CFR 50.54(jj), and 10 CFR 50, Appendix A, GDC 2, 19, 20, 21, 22, 23, and 24. The licensee has ensured adequate controls to preclude improper bypass of a channel. In addition, the configuration of bypass testing is consistent with the previously NRC-accepted topical reports and NUREG-1431, Revision 4. The NRC staff, therefore, finds that the proposed TS changes to the RTS to permit bypass testing are acceptable.

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 the installation or use of a facility component located within the restricted area as defined in 10 CFR, Part 20, and change 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 published in the *Federal Register* on July 7, 2015 (80 FR 38776). 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: Daniel Warner
Samir Darbali
Margaret Chernoff

Date: March 28, 2016

March 28, 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 RE: REVISION TO REACTOR TRIP SYSTEM INSTRUMENTATION TECHNICAL SPECIFICATIONS (CAC NOS. MF6067 AND MF6068)

Dear Mr. Braun:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment Nos. 312 and 293 to Renewed Facility Operating License Nos. DPR-70 and DPR-75 for the Salem Nuclear Generating Station, Unit Nos. 1 and 2, respectively. These amendments consist of changes to the Technical Specifications (TSs) in response to your application dated March 27, 2015, as supplemented by letter dated February 3, 2016.

The amendments revise certain TS 3/4.3.1, "Reactor Trip System Instrumentation," actions. Specifically, TS Table 3.3-1, Action 2, is revised to allow one power range (PR) channel to be bypassed for up to 4 hours for surveillance testing, and two new action notes are established for the PR nuclear instrumentation in TS Table 4.3-1. The changes support the installation and use of bypass test capability for the PR nuclear instrumentation.

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. 312 to Renewed DPR-70
2. Amendment No. 293 to Renewed DPR-75
3. Safety Evaluation

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ADAMS Accession No.: ML16054A068 *by memo

OFFICE	DORL/LPL1-2/PM	DORL/LPL1-2/LA	DE/EICB/BC*	DSS/STSB/BC*
NAME	CParker	LRonewicz	MWaters	RElliott
DATE	2/23/2016	2/25/2016	1/7/2016	2/25/2016
OFFICE	OGC	LPL1-2/BC	LPL1-2/PM	
NAME	JWachutka NLO w/ comments	DBroaddus (TLamb for)	TWengert	
DATE	3/7/2016	3/25/2016	3/28/2016	

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