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

April 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: REPLACEMENT OF SOURCE RANGE AND INTERMEDIATE RANGE NEUTRON MONITORING SYSTEMS (CAC NOS. MF6065 AND MF6066)

Dear Mr. Braun:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment Nos. 313 and 294 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 April 3, 2015, as supplemented by letters dated June 2, 2015; November 27, 2015; February 3, 2016; February 10, 2016; and March 4, 2016.

The amendments revise TS 3/4.3.1, "Reactor Trip System Instrumentation," to support planned plant modifications to replace the existing source range and intermediate range nuclear instrumentation with equivalent neutron monitoring systems to increase system reliability.

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

Sincerely,

Thomas J. Wengert

Thomas J. 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. 313 to Renewed DPR-70
2. Amendment No. 294 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. 313
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 April 3, 2015, as supplemented by letters dated June 2, 2015; November 27, 2015; February 3, 2016; February 10, 2016; and March 4, 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 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) <u>Technical Specifications and Environmental Protection Plan</u>

    The Technical Specifications contained in Appendix A, as revised through Amendment No. 313, 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 during the fall 2017 refueling outage (1R25).

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 the Renewed Facility Operating License and Technical Specifications

Date of Issuance: April 28, 2016

ATTACHMENT TO LICENSE AMENDMENT NO. 313

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
3	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
Bases Index Page XII	Bases Index Page XII
2-5	2-5
3/4 3-2	3/4 3-2
3/4 3-5	3/4 3-5
3/4 3-7	3/4 3-7
3/4 3-11	3/4 3-11

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. 313, 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

BASES

TABLE 2.2-1

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUES
1. Manual Reactor Trip	Not Applicable	Not Applicable
2. Power Range, Neutron Flux	Low Setpoint - ≤ 25% of RATED THERMAL POWER	Low Setpoint - ≤ 26% of RATED THERMAL POWER
	High Setpoint - ≤ 109% of RATED THERMAL POWER	High Setpoint - ≤ 110% of RATED THERMAL POWER
3. Power Range, Neutron Flux, High Positive Rate	≤ 5% of RATED THERMAL POWER with a time constant ≥ 2 seconds	≤ 5.5% of RATED THERMAL POWER with a time constant ≥ 2 seconds
4. Deleted		
5. Intermediate Range, Neutron Flux	≤ 25% of RATED THERMAL POWER	≤ 38.5% of RATED THERMAL POWER
6. Source Range, Neutron Flux	≤ 10^5 counts per second	≤ 1.44 x 10^5 counts per second
7. Overtemperature ΔT	See Note 1	See Note 3
8. Overpower ΔT	See Note 2	See Note 4
9. Pressurizer Pressure--Low	≥ 1865 psig	≥ 1855 psig
10. Pressurizer Pressure--High	≤ 2385 psig	≤ 2395 psig
11. Pressurizer Water Level--High	≤ 92% of instrument span	≤ 93% of instrument span
12. Loss of Flow	≥ 90% of design flow per loop*	≥ 89% of design flow per loop*

* Design flow is 82,500 gpm per loop.

TABLE 3.3-1

REACTOR TRIP SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NUMBER OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
1. Manual Reactor Trip	2	1	2	1, 2 and *	12
2. Power Range, Neutron Flux	4	2	3	1, 2 and 3*	2
3. Power Range, Neutron Flux High Positive Rate	4	2	3	1, 2	2
4. Deleted					
5. Intermediate Range, Neutron Flux	2	1	2	1, 2 and *	3
6. Source Range, Neutron Flux					
A. Startup	2	1	2	2 and *	4
B. Shutdown	2	0	1	3, 4 and 5	5
7. Overtemperature ΔT	4	2	3	1, 2	6
8. Overpower ΔT	4	2	3	1, 2	6
9. Pressurizer Pressure-Low	4	2	3	1, 2	6
10. Pressurizer Pressure--High	4	2	3	1, 2	6

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.

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 3.3-1 (Continued)

ACTION 10 - With the number of OPERABLE Channels one less than the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 6 hours or be in at least HOT STANDBY in the next 6 hours; however, one channel may be bypassed for up to 4 hours for surveillance testing per Specification 4.3.1.1.1, provided the other channel is OPERABLE.

ACTION 11 - With less than the Minimum Number of Channels OPERABLE, operation may continue provided the inoperable channel is placed in the tripped condition within 6 hours.

ACTION 12 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or be in HOT STANDBY within the next 6 hours and/or open the reactor trip breakers.

ACTION 13 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or open the reactor trip breakers within the next hour.

ACTION 14 - With one of the diverse trip features (Undervoltage or shunt trip attachment) inoperable, restore it to OPERABLE status within 48 hours or declare the breaker inoperable and be in at least HOT STANDBY within 6 hours. The breaker shall not be bypassed while one of the diverse trip features is inoperable except for the time required for performing maintenance to restore the breaker to OPERABLE status.

REACTOR TRIP SYSTEM INTERLOCKS

DESIGNATION	CONDITION AND SETPOINT	FUNCTION
P-6	With 2 of 2 Intermediate Range Neutron Flux Channels $< 4.7 \times 10^{-6}$ % of RTP.	P-6 prevents or defeats the manual block of source range reactor trip.
P-7	With 2 of 4 Power Range Neutron Flux Channels $\geq$ 11% of RATED THERMAL POWER or 1 of 2 Turbine steam line input pressure channels $\geq$ a pressure equivalent to 11% of RATED THERMAL POWER.	P-7 prevents or defeats the automatic block of reactor trip on: Low flow in more than one primary coolant loop, reactor coolant pump undervoltage and under-frequency, pressurizer low pressure, pressurizer high level, and the opening of more than one reactor coolant pump breaker.

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

If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the nominal Trip Setpoint at the completion of the surveillance; otherwise the channel shall be declared inoperable. Setpoints more conservative than the nominal Trip Setpoint are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the surveillance procedures to confirm channel performance. The methodologies used to determine the as-found and as-left tolerances are specified in the Technical Specification Bases.

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. 294
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 April 3, 2015, as supplemented by letters dated June 2, 2015; November 27, 2015; February 3, 2016; February 10, 2016; and March 4, 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 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. 294, 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 during the spring 2017 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 the Renewed Facility Operating License and Technical Specifications

Date of Issuance: April 28, 2016

ATTACHMENT TO LICENSE AMENDMENT NO. 294

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
3	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
Bases Index Page XII	Bases Index Page XII
2-5	2-5
3/4 3-2	3/4 3-2
3/4 3-5	3/4 3-5
3/4 3-7	3/4 3-7
3/4 3-11	3/4 3-11

(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. 294, 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.

BASES

SECTION PAGE

3/4.3 INSTRUMENTATION

3/4.4 REACTOR COOLANT SYSTEM

TABLE 2.2-1

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUES
1. Manual Reactor Trip	Not applicable	Not applicable
2. Power Range, Neutron Flux	Low setpoint - ≤ 25 % of RATED THERMAL POWER High Setpoint - ≤ 109% of RATED THERMAL POWER	Low Setpoint - ≤ 26% of RATED THERMAL POWER High Setpoint - ≤ 110% of RATED THERMAL POWER
3. Power Range, Neutron Flux, High Positive Rate	≤ 5% of RATED THERMAL POWER with a time constant ≥ 2 second	≤ 5.5% of RATED THERMAL POWER with a time constant ≥ 2 second
4. Deleted		
5. Intermediate Range, Neutron Flux	≤ 25% of RATED THERMAL POWER	≤ 38.5% of RATED THERMAL POWER
6. Source Range, Neutron Flux	≤ 10^5 counts per second	≤ 1.44 x 10^5 counts per second
7. Overtemperature ΔT	See Note 1	See Note 3
8. Overpower ΔT	See Note 2	See Note 4
9. Pressurizer Pressure--Low	≥ 1865 psig	≥ 1855 psig
10. Pressurizer Pressure--High	≤ 2385 psig	≤ 2395 psig
11. Pressurizer Water Level--High	≤ 92% of instrument span	≤ 93% instrument span
12. Loss of Flow	≥ 90% of design flow per loop*	≥ 89% of design flow per loop*

*Design flow is 82,500 gpm per loop.

TABLE 3.3-1

REACTOR TRIP SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NUMBER OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
1. Manual Reactor Trip	2	1	2	1, 2 and *	12
2. Power Range, Neutron Flux	4	2	3	1, 2 and 3*	2
3. Power Range, Neutron Flux High Positive Rate	4	2	3	1, 2	2
4. Deleted					
5. Intermediate Range, Neutron Flux	2	1	2	1, 2 and *	3
6. Source Range, Neutron Flux					
A. Startup	2	1	2	2 and *	4
B. Shutdown	2	0	1	3, 4 and 5	5
7. Overtemperature ΔT	4	2	3	1, 2	6
8. Overpower ΔT	4	2	3	1, 2	6
9. Pressurizer Pressure-Low	4	2	3	1, 2	6
10. Pressurizer Pressure--High	4	2	3	1, 2	6

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.

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 3.3-1 (Continued)

ACTION 10 - With the number of OPERABLE Channels one less than the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 6 hours or be in at least HOT STANDBY in the next 6 hours; however, one channel may be bypassed for up to 4 hours for surveillance testing per Specification 4.3.1.1.1 provided the other channel is OPERABLE.

ACTION 11 - With less than the Minimum Number of Channels OPERABLE, operation may continue provided the inoperable channel is placed in the tripped condition within 6 hours.

ACTION 12 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or be in HOT STANDBY within the next 6 hours and/or open the reactor trip breakers.

ACTION 13 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or open the reactor trip breakers within the next hour.

ACTION 14 - With one of the diverse trip features (Undervoltage or shunt trip attachment) inoperable, restore it to OPERABLE status within 48 hours or declare the breaker inoperable and be in at least HOT STANDBY within 6 hours. The breaker shall not be bypassed while one of the diverse trip features is inoperable except for the time required for performing maintenance to restore the breaker to OPERABLE status.

REACTOR TRIP SYSTEM INTERLOCKS

DESIGNATION	CONDITION AND SETPOINT	FUNCTION
P-6	With 2 of 2 Intermediate Range Neutron Flux Channels $< 4.7\times10^{-6}$ % of RTP.	P-6 prevents or defeats the manual block of source range reactor trip.
P-7	With 2 of 4 Power Range Neutron Flux Channels $\geq$ 11% of RATED THERMAL POWER or 1 of 2 Turbine steam line inlet pressure channels $\geq$ a pressure equivalent to 11% of RATED THERMAL POWER.	P-7 prevents or defeats the automatic block of reactor trip on: Low flow in more than one primary coolant loop, reactor coolant pump undervoltage and under-frequency, pressurizer low pressure, pressurizer high level, and the opening of more than one reactor coolant pump breaker.

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

If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the nominal Trip Setpoint at the completion of the surveillance; otherwise the channel shall be declared inoperable. Setpoints more conservative than the nominal Trip Setpoint are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the surveillance procedures to confirm channel performance. The methodologies used to determine the as-found and as-left tolerances are specified in the Technical Specification Bases.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 313 AND 294 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 April 3, 2015, as supplemented by letters dated June 2, 2015; November 27, 2015; February 3, 2016; February 10, 2016; and March 4, 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). Specifically, the licensee requested approval of an amendment to replace the existing Source Range (SR) and Intermediate Range (IR) Neutron Monitoring Systems (NMS) with equivalent new systems to increase system reliability. The proposed change will also revise TS 3/4.3.1, "Reactor Trip Instrumentation," to support the planned modifications.

The licensee is planning this replacement due to reliability and parts obsolescence. The existing SR and IR NMS were supplied by Westinghouse and installed as part of the original plant equipment. The replacement NMS is being supplied by Thermo Scientific, is equivalent with respect to interface with the rest of the nuclear instrumentation system (NIS) and reactor trip system, and meets all the functional requirements of the Westinghouse equipment being replaced. In its letter dated March 4, 2016, PSEG informed the U.S. Nuclear Regulatory Commission (NRC) staff that the replacement of the SR and IR nuclear instrumentation is being performed in accordance with the licensee's design change process under Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.59. The licensee further stated that in this license amendment request (LAR), it is only requesting NRC review and approval of the TS changes associated with this change to the SR and IR instrumentation channels. Therefore, the staff did not review the acceptability of the replacement NMS equipment. The 10 CFR 50.59 evaluation by the licensee will address the review and acceptance of the monitoring equipment.

---

[1] Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML15093A291, ML15153A193, ML15334A107, ML16034A277, ML16042A600, and ML16064A350, respectively.

The licensee submitted a separate, but related, LAR on March 9, 2015,[2] to isolate all unborated water system sources using the original Westinghouse-supplied neutron monitors and the Gamma-Metrics post-accident neutron monitors during the refueling mode of operation (Mode 6). These Amendment Nos. 311 and 292 to Salem, Unit Nos. 1 and 2, respectively, were issued by the NRC staff on March 7, 2016.[3] These two LARs were originally planned to be implemented in a single refueling outage. However, the two license amendments can be implemented either independently or during the same refueling outage, as long as the applicable TSs in force at the time are followed.

The supplements dated June 2, 2015; November 27, 2015; February 3, 2016; February 10, 2016; and March 4, 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 August 4, 2015 (80 FR 46350).

2.0 REGULATORY EVALUATION

The NRC staff reviewed the proposed TS changes in the application against the regulatory requirements and guidance listed below to ensure that there is reasonable assurance that the systems and components affected by the proposed TS changes will perform their safety functions.

2.1 Regulatory Requirements

The NRC staff identified the following regulatory requirements as applicable to the proposed amendment:

2.1.1 General Design Criteria

Salem was designed in accordance with the Atomic Industrial Forum General Design Criteria and the licensee's understanding of the intent of the Atomic Energy Commission (AEC)-proposed General Design Criteria published in 1967. The licensee performed a comparison of the Salem, Unit Nos. 1 and 2, plant design and 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants" (GDC), dated July 7, 1971. This comparison was documented in the Salem Updated Final Safety Analysis Report (UFSAR) Section 3.1.3, which concludes, in part, that, "The Salem Plant design conforms with the intent of the 'General Design Criteria for Nuclear Power Plants,' dated July 7, 1971."

---

[2] ADAMS Accession No. ML15068A359.

[3] ADAMS Accession No. ML16035A087.

The licensee's understanding of Criteria 12 and 14 of the 1967 AEC-proposed GDC is stated below:

- Criterion 12 - Instrumentation and Control Systems. Instrumentation and controls shall be provided, as required, to monitor and maintain variables within prescribed operating ranges.

This criterion meets the intent of the current equivalent GDC (GDC 13, 1971) and, therefore, the NRC staff finds the licensing basis for Criterion 12 for Salem acceptable.

- Criterion 14 - Core Protection Systems. Core protection systems, together with associated equipment, shall be designed to act automatically to prevent or to suppress conditions that could result in exceeding acceptable fuel damage limits.

This change does not affect the UFSAR Chapter 15 accident analysis. In addition, following implementation of the amendments, the automatic trips will continue to function. Therefore, the NRC staff finds the licensee's explanation acceptable.

The NRC staff review identified other criteria based on the current GDC. In its June 2, 2015, response to a request for additional information (RAI), the licensee provided the following responses to indicate compliance with the applicable GDC dated July 7, 1971. This assessment is based on the Salem UFSAR Section 3.1.3.

<u>GDC 1, "Quality Standards and Records"</u>

In its June 2, 2015, supplement, the licensee stated, in part:

> GDC 1 requires structures, systems, and components important to safety to be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. The replacement SR and IR instrumentation is safety related. The design, procurement, installation, and operation of the replacement instrumentation is subject to the requirements of the PSEG quality assurance program.

Based on the licensee's response, the replacement instrumentation will be designed, installed, and tested commensurate with the importance of the safety functions of the instrumentation. Therefore, the NRC staff concludes that that the intent of current GDC 1 is met and is acceptable.

<u>GDC 4, "Environmental and Dynamic Effects Design Bases"</u>

In its June 2, 2015, supplement, the licensee stated, in part:

> GDC 4 requires structures, systems, and components important to safety to be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. The

> replacement instrumentation is designed to function in the environmental conditions associated with normal operation, maintenance, testing, and the postulated accidents for which it is credited.

The replacement equipment is designed to handle the required environmental conditions that are applicable to the replacement equipment. In its letter dated March 4, 2016, PSEG informed the NRC staff that equipment changes are being implemented under 10 CFR 50.59, and the evaluations for qualifications will also be covered in the 10 CFR 50.59 evaluations. Therefore, equipment qualification is not addressed as part of this LAR. A summary of the licensee's review of equipment qualification is stated for information purposes only.

GDC 13, "Instrumentation and Control"

In its June 2, 2015, supplement, the licensee stated, in part:

> GDC 13 requires instrumentation to be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges. Following implementation of the proposed changes, Salem will continue to meet the intent of GDC 13.

As explained above, the proposed changes meet AEC-proposed Criterion 12. Therefore, the NRC staff concludes that the implementation of the proposed changes, as explained by the licensee, meets the intent of GDC 13, 1971.

GDC 19, "Control Room"

In its June 2, 2015, supplement, the licensee stated, in part:

> GDC 19 requires 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, including loss-of-coolant accidents. Equipment at appropriate locations outside the control room shall be provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary instrumentation and controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures. Following implementation of the proposed changes, Salem will continue to meet GDC 19.

The NRC staff concludes that as explained by the licensee above, the implementation of the changes will meet the intent of GDC 19, 1971.

2.1.2 <u>Applicable TS Regulations</u>

The categories of items required to be in the TSs are provided in 10 CFR Section 50.36(c). As required by 10 CFR 50.36(c)(2)(i), the TSs will include limiting conditions for operation (LCOs), which are the lowest functional capability or performance levels of equipment required for safe operation of the facility. Per 10 CFR 50.36(c)(2)(i), 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 regulation at 10 CFR 50.36(c)(3) requires TSs to include items in the category of surveillance requirements, 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 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.

2.2 <u>Regulatory Guidance</u>

The NRC staff identified the following regulatory guidance as being applicable to the proposed amendment.

- Regulatory Guide (RG) 1.105, "Setpoints for Safety-Related Instrumentation," describes a method that the NRC staff considers acceptable for complying with the agency's regulations for ensuring that setpoints for safety-related instrumentation are initially within and remain within the TS limits. The NRC staff used this guide to determine the adequacy of the licensee's setpoint calculation methodologies and the related plant surveillance procedures.

  In its June 2, 2015, RAI response, the licensee stated, in part:

  > RG 1.105, Instrument Setpoints For Safety-Related Systems - Revision 2 of RG 1.105 endorsed ISA S67.04-1982 for use in establishing and maintaining setpoints in safety-related systems. The methodology used to calculate the Salem trip setpoints is consistent with ISA-S67.04-1982.

  The methodology satisfies the guidance of RG 1.105 and, therefore, the NRC staff finds it acceptable.

- Branch Technical Position (BTP) 7-19, "Guidance for Evaluation of Diversity and Defense-in-Depth in Digital Computer-Based Instrumentation and Control Systems," provides guidance for evaluating an applicant/licensee's defense-in-depth assessment and the design of manual controls and displays to ensure conformance with the NRC position on defense-in-depth for instrumentation and control systems incorporating digital computer-based reactor trip systems or engineered safety features actuation systems.

In its June 2, 2015, supplement, the licensee stated, in part:

> ... the only microprocessor based device associated with the replacement NIS is the Shutdown Margin Monitor (SDMM). There are no failure modes associated with SDMM that could affect the ability of the SR channels to perform their intended function.

Based on the fact that the SR and the IR monitors are not digital computer/microprocessor based devices, the response is acceptable to the NRC staff. The SDMM is a digital device with no safety function. The isolation between the SR and the IR monitors and the SDMM is discussed later in this safety evaluation (SE). Therefore, there is no need to address diversity, with respect to the applicable guidance in BTP 7-19 for the SR and the IR monitors. Therefore, the licensee's response to BTP 7-19 is acceptable.

- Technical Specifications Task Force (TSTF) Traveler TSTF-493, Revision 4, "Clarify Application of Setpoint Methodology for LSSS Functions," dated April 30, 2010, and an errata sheet, "Transmittal of TSTF-493, Revision 4, Errata," dated April 23, 2010,[4] clarify the application of setpoint methodology for Option A. The NRC staff verified the compliance of the proposed footnotes with the applicable functions identified in Appendix A to TSTF-493, Revision 4, for Westinghouse plants. NUREG-1431, Revision 4, "Standard Technical Specifications – Westinghouse Plants," has similar notes for Westinghouse plants for as-found and as-left tolerances. Based on the addition of the footnotes, the staff determined that the proposed changes are consistent with the guidance of TSTF-493, Option A.

- The NRC staff's guidance for review of TSs is in Chapter 16, "Technical Specifications," of NUREG-0800, Revision 3, "Standard Review Plan," March 2010.[5] As described therein, as part of the regulatory standardization effort, the NRC staff has prepared Standard Technical Specifications for each of the light-water reactor nuclear designs. NUREG-1431, Revision 4, contains the current Standard Technical Specifications for Westinghouse plants such as Salem.

3.0 TECHNICAL EVALUATION

3.1 Description of Proposed TS Changes

The licensee proposed the following changes to the Salem TSs:

---

[4] ADAMS Accession Nos. ML100710442 and ML101160026, respectively.

[5] ADAMS Accession No. ML100351425.

1. TS 3/4.3.1, Table 2.2-1, "Reactor Trip System Instrumentation Trip Setpoints"

   The Allowable Value for Table 2.2-1, Functional Unit 5, Intermediate Range, Neutron Flux is currently specified as ≤ 30% Rated Thermal Power.

   The LAR proposes to change the Allowable Value to ≤ 38.5% Rated Thermal Power.

2. TS 3/4.3.1, Table 2.2-1, "Reactor Trip System Instrumentation Trip Setpoints"

   The Allowable Value for Table 2.2-1, Functional Unit 6, Source Range, Neutron Flux is currently specified as ≤ 1.3×10^5 counts per second.

   The LAR proposes to change the Allowable Value to ≤ 1.44×10^5 counts per second.

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

   The Applicable Modes for Functional Unit 6.A, Source Range, Neutron Flux, Startup currently contain a footnote that states, "High voltage to detector may be de-energized above P-6 [Permissive P-6]."

   The LAR proposes to delete this footnote.

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

   The Condition and Setpoint of Permissive P-6 in the tabulation of Reactor Trip System Interlocks currently states, "With 2 of 2 Intermediate Range Neutron Flux Channels $< 6 \times 10^{-11}$ amps."

   The LAR proposes to change this value to "$< 4.7 \times 10^{-6}$ % of RTP [Rated Thermal Power]."

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

   The LAR proposes the addition of two new footnotes (# and # #) that apply to the Channel Functional Test and Channel Calibration for Functional Unit 5, Intermediate Range, Neutron Flux, and Functional Unit 6, Source Range, Neutron Flux.

   The footnotes read as follows:

   # If the as-found channel setpoint is outside its predetermined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

   # # The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the nominal Trip Setpoint at the completion of the surveillance; otherwise the channel shall be declared inoperable.

Setpoints more conservative than the nominal Trip Setpoint are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the surveillance procedures to confirm channel performance. The methodologies used to determine the as-found and as-left tolerances are specified in the Technical Specification Bases.

3.2 Evaluation of Proposed Changes

Due to reliability and parts obsolescence issues, the existing Westinghouse SR and the IR NMS are being replaced with the Thermo Scientific 300i Neutron Flux Monitoring System. The existing SR and IR detectors use boron triflouride (BF3) and compensated ion chambers, respectively. Thermo Scientific detectors use a fission chamber that performs both the SR and IR monitoring functions. The Thermo Scientific detectors have a 40-year design life, eliminating the need to periodically replace the limited life SR BF3 detector assemblies and the IR compensated ion chamber detector assemblies. Section 3.2.1 below describes and evaluates the functional differences between the existing and the new detectors.

3.2.1 Detector Functionality Differences

To determine the acceptability of the Thermo Scientific neutron monitors, the licensee evaluated the functions of the new detectors, as well as the changes in setpoints. Both the existing and the replacement detectors are safety-related (Class 1E), and both have safety functions, including the functions related to the reactor protection system. However, due to the way the different types of detectors are used, there are some differences between the existing and the replacement neutron monitors, which are explained below:

- Detector Orientation - The existing SR BF3 detector is positioned below the centerline of the core height. The Thermo Scientific detector assembly utilizes two fission chambers to provide both the SR and IR signals. The fission chamber detector will be positioned such that the centerline of the sensitive volume aligns with the centerline of core height. This difference is due to the use of different detectors and does not impact the functionality of the detectors and, therefore, the NRC staff finds this acceptable.

- Source Range Scale - The SR indication scale changes from 10° - 10^6 counts per second (cps) (6 decades) for the existing detectors to 10^{-1} - 10^6 cps (7 decades) for the new detectors. The new range more than encompasses the range of the current detectors and, therefore, the NRC staff finds this acceptable.

- Source Range High Flux at Shutdown Alarm - The existing SR instrumentation has a setpoint of 0.5 to 1.0 decade above background SR level. The Thermo Scientific alarm setpoint is electronically established based on a selectable fixed ratio between 1.25 to 4.0 times steady-state, and is automatically reduced as steady-state count rate decreases. The selection of a setpoint value between the range of 1.25 to 4.0 times that automatically reduces as the background steady-state value declines is acceptable to the NRC staff when compared with setpoint of 0.5 to 1 decade steady-state above the background SR value. This is acceptable because the range of the new SR high flux shutdown alarm values is lower than the range of the current values.

- Source Range De-energization - With the existing Westinghouse system, the SR indication is disabled by de-energizing high voltage to the detectors when the SR reactor trip is manually blocked upon receipt of the permissive P-6. Permissive P-6 prevents or defeats the manual block of the SR reactor trip. This prevents damage to the BF3 detectors from operation beyond their design limits. Removing high voltage to the Thermo Scientific fission chamber detectors is not required; they remain energized through all levels of operation. The new detectors have a 40-year qualified life without the need to switch off the power supply, as was required for the replacement of the old detectors. Detector replacement is no longer required. Therefore, the NRC staff concludes that this is acceptable.

- Intermediate Range Scale Units - The IR indication scale units change from amps to percent power. The change in units does not adversely affect the functionality. Therefore, the NRC staff finds this acceptable.

- Intermediate Range Scale - The IR indication scale changes from 10^{-11} -10^{-3} amps (8 decades) to 10^{-8} – 200 percent RTP (10 decades). These differences do not affect the NIS reactor trip protective function. The new detectors have a wider range, and they cover power up to 200 percent of reactor power, whereas the existing detectors cover only up to 120 percent of reactor power. Based on the wider range, the NRC staff finds the new detectors acceptable.

Interlock P-6 prevents or defeats the manual block of SR reactor trip. Due to the changes in the IR detector output and units, an assessment was completed to verify adequate coordination between the P-6 setpoint and the SR neutron flux reactor trip setpoint for the Thermo Scientific instrumentation. The SR neutron flux reactor trip setpoint and the P-6 setpoint should have overlap between the SR and IR scales. The P-6 setpoint is selected such that its bistable trips after the IR indication comes on scale (allowing verification of IR operation) and before the SR indication goes off scale (within the overlap region of the instruments). The SR neutron flux reactor trip setpoint is established between the P-6 setpoint and the upper range of the SR scale, sufficiently above the P-6 value, to allow the operator time to block the SR neutron flux reactor trip.

The Westinghouse IR P-6 setpoint (1×10^{-10} amps) provides 1 decade overlap. The Thermo Scientific instrumentation extends the IR bottom end range 2 additional decades. The equivalent P-6 setpoint of 10^{-5} percent RTP provides 3 decades of overlap. The assessment determined that there is margin between the SR neutron flux trip descending setpoint ((-) as-found tolerance) and the IR P-6 ascending setpoint ((+) as-found tolerance). This allows the operator sufficient time to actuate the SR neutron flux reactor trip block signal, and at the same time, ensures a conservative signal overlap with the IR indication. The assessment also calculated a P-6 reset value of $< 4.7 \times 10^{-6}$ percent RTP.

3.2.2 Evaluation of TS Changes

1. TS 3/4.3.1, Table 2.2-1

Change the Functional Unit 5 (Intermediate Range, Neutron Flux) Allowable Value from ≤ 30 percent of rated thermal power to ≤ 38.5 percent of rated thermal power. The trip setpoint is ≤ 25 percent of rated thermal power.

Change the Functional Unit 6 (Source Range, Neutron Flux) Allowable Value from ≤ $1.3x10^5$ to ≤ $1.44x10^5$ counts per second. The trip setpoint is ≤ 10^5 counts per second.

This change is needed due to a larger range for the new detectors. There is adequate margin between the trip setpoint and the allowable value to justify this change. Therefore, the NRC staff finds the changes acceptable.

2. TS 3/4.3.1, Table 3.3-1

Delete - ## for Functional Unit 6.A (Source Range, Neutron Flux - Startup).

The new SR detectors do not need to be de-energized above P-6, due to the design of the new type of detectors. Therefore, the NRC staff finds that this change is acceptable.

3. TS 3/4.3.1, Table 3. 3-1 (Continued), Table Notation

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

This change is acceptable as explained under item 2 above.

4. TS 3/4.3.1, Table 3.3-1 (Continued), Reactor Trip System Interlocks

Change the permissive P-6 reset from < 6×10^{-11} amps to < 4.7×10^{-6} percent of rated thermal power.

Permissive P-6 enables the SR reactor trip setpoint to be blocked on increasing power and disables this block on decreasing power. It should be noted that there is no defined analytical limit for the P-6 permissive reset setpoint. The allowable value is based on the calculated error, which is dependent on the range. Based on the wider range of the IR detectors and the calculated value of the as-found tolerances (AFTs), the NRC staff concludes that the revised P-6 allowable value of < 4.7×10^{-6} percent of rated thermal power is acceptable.

5. TS 3/4.3.1, Table 4.3-1

Add two new footnotes (# and ##) that apply to the Channel Functional Test and Channel Calibration for Functional Units 5 and 6. The Allowable Value changes indicated above affect these functional units. The proposed footnotes read as follows:

#	If the as-found channel setpoint is outside its predetermined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.
##	The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the nominal Trip Setpoint at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the nominal Trip Setpoint are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the surveillance procedures to confirm channel performance. The methodologies used to determine the as-found and the as-left tolerances are specified in the Technical Specification Bases.

The above notes are consistent with the notes in TSTF-493 for the Westinghouse plants. Therefore, the NRC staff finds this acceptable.

Summary of NRC Staff Evaluation of TS Changes

The NRC staff reviewed the technical discussion of the proposed changes provided in the LAR to ensure 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. The staff finds that the proposed changes to the TS Allowable Values in TS 3/4.3.1, deletion of the footnotes, and the change to the setpoint for Permissive P-6 do not create a conflict with the requirements of 10 CFR 50.36. The staff finds that the revised TS 3/4.3.1 continues to specify the lowest functional capability or performance levels of equipment required for safe operation of the facility and, thus, continues to satisfy 10 CFR 50.36(c)(2)(i).

In reviewing the proposed addition of the footnotes to the Surveillance Requirements Table 4.3-1, the staff considered the guidance contained in TSTF-493. The staff finds that the proposed addition of the footnotes is consistent with this guidance and that the revised surveillance requirements, as modified by the footnotes, continue to satisfy the requirements of 10 CFR 50.36(c)(3).

3.2.3 Setpoint Calculation Evaluation

A plant-specific methodology was prepared for Salem by Westinghouse for protection systems in 1989 using the methodology in existence at that time. The Salem plant-specific setpoint methodology bases document, issued in 1994, provides a compilation of the calculations, terms, references, and assumptions made by Westinghouse in the performance of the uncertainty calculations for the Salem plant setpoint study. The technical criteria for selecting the setpoints is based on Salem Technical Standard SC.DE-TS.ZZ-1904 (Q). In response to an RAI from the NRC staff, the licensee submitted a copy of the setpoint document for the Salem SR and IR monitor setpoints.

The basic methodology uses the Square Root Sum of the Squares (SRSS) method for all random uncertainties. Any bias or non-random terms are added algebraically. The total error or uncertainty is obtained by combining the random and bias components. This method is consistent with the guidance of RG 1.105. The setpoint selection is based on a safety limit value, which is based on protecting the physical barriers that guard the reactor against the uncontrolled release of radioactivity. The analytical limit of a calculated variable is established by a safety analysis to ensure that the safety limit is not exceeded. Limiting Safety System Settings (LSSSs) are the setpoints established for the plant's automatic safety systems. The LSSSs take into account the required allowances such that the analytical limits are not exceeded. The trip setpoints are the settings at which the required trip is initiated. These are more conservative than the LSSSs. The allowable values are the values used in TSs that should not be exceeded during operation, and include allowances for drift over time and accuracy of setting and measurement instruments. Due to these additional allowances, allowable values are usually less conservative than the trip setpoints.

The as-left tolerances and the AFTs have been defined to assure that instruments are working within their anticipated deviations from the trip setpoints. The as-left tolerance is the allowed deviation from the setpoint within which the instrument should be left at the end of calibration. Its calculation is based on the SRSS of the reference accuracy, measurement and test equipment (M&TE) accuracy, and M&TE readability. The AFT is the allowed deviation from the setpoint within which the instrument should be found just prior to the next calibration of the instrument. Its calculation is based on the SRSS of the rack accuracy, drift, M&TE accuracy, and M&TE readability.

A setpoint calculation assessment was performed in support of the planned plant modifications to replace the existing SR and IR instrumentation. The results required changes to the associated values listed in TS 3/4.3.1, Tables 2.2-1 and 3.3-1, as described in Section 3.1 above.

Following is a summary of the SR and IR ranges, calculated values, and settings:

SR trip logic unit = ± 10.25 percent of span
IR trip logic unit = + 2.01 percent of span and - 3.69 percent of span

The rationale for accepting the changes to the TSs is explained in Section 3.2.1 of this SE regarding differences between the existing detectors and the new detectors. Based on the evaluation of the setpoint methodology and the proposed TS changes, the NRC staff concludes that the proposed revisions to the TSs are acceptable.

3.2.4 Equipment Qualification Evaluation

Thermo Fisher Scientific has provided PSEG with a qualification summary report that demonstrates qualification for each replacement item by similarity analysis to previously qualified equipment. The qualification summary report has been formally reviewed and approved by PSEG to support the equipment replacement using the 10 CFR 50.59 criteria. PSEG submitted a copy of this report for information. In its letter dated March 4, 2016, the licensee informed the NRC staff that the evaluation of the equipment replacement is being performed in accordance with PSEG's design change process under 10 CFR 50.59. The 10 CFR 50.59 evaluation covers equipment qualification reviews. Therefore, the NRC staff's acceptance of equipment qualification is not addressed as part of the SE for this LAR.

3.2.5 BTP 7-19 Evaluation

In order to evaluate compliance with BTP 7-19, the NRC staff requested the licensee to identify components with software, or embedded devices using software, and how such components comply with the guidance of BTP 7-19 with regard to software common cause failure. In its June 2, 2015, supplement, the licensee stated that the only microprocessor-based device associated with the replacement NIS is the Shutdown Margin Monitor (SDDM) and that the remaining parts of the NIS are analog. The SDDM does not provide a function that is required for system operability in accordance with the TSs. The SDDM continuously measures and displays the count rate from neutron flux monitors. The indication and alarm function provided by SDDM is located in the control equipment room. It is separate and independent from the audible count rate indication in the main control room.

Power to the SDDM assembly is provided via a fuse in the SDDM that isolates the SDDM from the power source for the SR monitor. The power input to the SDDM drawer is also equipped with a circuit breaker. The combination of the fuse and the circuit breaker isolates the SR from the SDDM. The signals between the SDDM and the SR are isolated by using two relays. The test and alarm outputs of the SDDM to the SR drawer are relay contacts that are isolated by the relay coil. The input from the SR signal processor to the SDDM uses a pulse signal through an isolation device located in the SR channels. The relays and the isolators provide electrical isolation between the SR drawer and the SDDM, thereby satisfying the isolation requirements. Since there are no other computer-based components, the design is consistent with the guidance of BTP 7-19, and is, therefore, acceptable.

3.2.6 Evaluation of the Effects of SR and IR Trip Setpoints on the UFSAR Chapter 15 Analysis

The SR and IR nuclear flux trips provide reactor core protection during reactor startup. These trips provide redundant protection to the low setpoint trip of the power range monitors. The licensee proposed to change the Allowable Values of the SR and IR nuclear flux trips in TS 3/4.3.1, Table 2.2-1. Setpoints in accordance with their Allowable Values ensure that the applicable safety analyses that demonstrate that safety limits are met remain valid. In support of the proposed TS changes, the licensee performed an impact analysis addressing the effects of the proposed Allowable Values for the SR and IR nuclear flux trips on the Salem UFSAR Chapter 15 analysis, and presented the results on pages 6 through 8 of Attachment 1 to its letter dated June 2, 2015. In the impact analysis, the licensee listed, for each event, the limiting reactor trip setpoints credited for the UFSAR Chapter 15 analysis and showed that no credit was taken for operation of the reactor trips associated with either SR or IR channels in the safety analysis.

In addition, the licensee indicated that for the analysis of the uncontrolled boron dilution event, operator action was credited to terminate the boron dilution event. UFSAR Section 15.2.4 states that the associated operator action has prompt and definite indication of any boron dilution from the audible count rate instrumentation. High count rate is alarmed in the reactor containment and the control room. The proposed changes to the Allowable Values for the SR and IR nuclear flux trips do not affect the audible count rate instrumentation. Since no SR or IR trip functions were credited in the UFSAR Chapter 15 analysis, and the proposed changes to the Allowable Values for the SR and IR nuclear flux trips do not affect the audible count rate instrumentation, which was credited in the anlysis of the boron dilution event documented in the UFSAR Section 15.2.4, the NRC staff determined that the current UFSAR Chapter 15 analysis remains acceptable for the proposed TS changes.

3.3 Technical Evaluation Summary

Based on the foregoing evaluation of the licensee's application and supplements, the NRC staff concludes that the proposed changes to the Salem, Unit Nos. 1 and 2, TSs provide reasonable assurance of adequate protection of public health, safety, and security. This SE, however, does not include an evaluation of the acceptability of the replacement NMS equipment, which will be performed by the licensee under 10 CFR 50.59. Based on the staff's evaluation in Section 3.0 of this SE, which applies current and applicable regulatory evaluation criteria identified in Section 2.0 of this SE, the staff concludes that the proposed TS changes for these items 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 surveillance requirements. 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 August 4, 2015 (80 FR 46350). 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
M. Chernoff
S. Sun

Date: April 28, 2016

April 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: REPLACEMENT OF SOURCE RANGE AND INTERMEDIATE RANGE NEUTRON MONITORING SYSTEMS (CAC NOS. MF6065 AND MF6066)

Dear Mr. Braun:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment Nos. 313 and 294 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 April 3, 2015, as supplemented by letters dated June 2, 2015; November 27, 2015; February 3, 2016; February 10, 2016; and March 4, 2016.

The amendments revise TS 3/4.3.1, "Reactor Trip System Instrumentation," to support planned plant modifications to replace the existing source range and intermediate range nuclear instrumentation with equivalent neutron monitoring systems to increase system reliability.

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

Sincerely,

/RA/
Thomas J. 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. 313 to Renewed DPR-70
2. Amendment No. 294 to Renewed DPR-75
3. Safety Evaluation

cc w/enclosures: Distribution via Listserv

DISTRIBUTION:
PUBLIC
RidsNrrDorlDpr Resource
RidsNrrDssStsb Resource
Records Amend
GSingh, NRR
LPLI-2 R/F
RidsNrrDorlLpl1-2 Resource
RidsNrrPMSalem Resource
RidsNrrDeEicb Resource
SSun, NRR
RidsACRS_MailCTR Resource
RidsRgn1MailCenter Resource
RidsNrrLALRonewicz Resource
RidsNrrDssSrxb Resource
MChernoff, NRR

ADAMS Accession No.: ML16096A419 *by memo **by e-mail

OFFICE	DORL/LPL1-2/PM	DORL/LPL1-2/LA	DE/EICB/BC*	DSS/STSB/BC**
NAME	TWengert	LRonewicz	MWaters	AKlein
DATE	4/7/2016	4/20/2016	3/17/2016	4/11/2016
OFFICE	DSS/SRXB/BC(A)**	OGC – NLO w/comments	DORL/LPL1-2/BC	DORL/LPL1-2/PM
NAME	EOesterle	MRing	DBroaddus (TLamb for)	TWengert
DATE	4/5/2016	4/18/2016	4/27/2016	4/28/16

OFFICIAL RECORD COPY