



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

March 21, 2013

Mr. Michael J. Pacilio  
Senior Vice President  
Exelon Generation Company, LLC  
President and Chief Nuclear Officer (CNO)  
Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

**SUBJECT: BRAIDWOOD STATION, UNITS 1 AND 2, AND BYRON STATION, UNIT NOS. 1 AND 2 - ISSUANCE OF AMENDMENTS RE: APPLICATION TO REVISE TECHNICAL SPECIFICATIONS TO ADOPT TSTF-510, "REVISION TO STEAM GENERATOR PROGRAM INSPECTION FREQUENCIES AND TUBE SAMPLE SELECTION" (TAC NOS. ME8243, ME8244, ME8245, AND ME8246)**

Dear Mr. Pacilio:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 172 to Facility Operating License No. NPF-72 and Amendment No. 172 to Facility Operating License No. NPF-77 for Braidwood Station, Units 1 and 2, respectively, and Amendment No. 179 to Facility Operating License No. NPF-37 and Amendment No. 179 to Facility Operating License No. NPF-66 for Byron Station, Unit Nos. 1 and 2, respectively. The amendments are in response to your application dated March 22, 2012, as supplemented by your letter dated December 3, 2012.

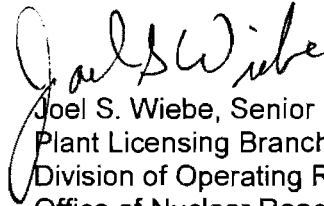
The proposed amendment would modify technical specification requirements regarding steam generator tube inspections and reporting as described in Technical Specifications Task Force (TSTF)-510, Revision 2, "Revision to Steam Generator Programmed Inspection Frequencies and Tube Sample Selection;" with proposed variations and deviations.

M. Pacilio

- 2 -

A copy of the Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

Handwritten signature of Joel S. Wiebe in black ink.

Joel S. Wiebe, Senior Project Manager  
Plant Licensing Branch III-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-456, STN 50-457,  
STN 50-454 and STN 50-455

Enclosures:

1. Amendment No. 172 to NPF-72
2. Amendment No. 172 to NPF-77
3. Amendment No. 179 to NPF-37
4. Amendment No. 179 to NPF-66
5. Safety Evaluation

cc w/encls: Listserv



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

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-456

BRAIDWOOD STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 172  
License No. NPF-72


1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated March 22, 2012, as supplemented by your letter dated December 3, 2012, 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;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-72 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 172 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Jeremy S. Bowen, Chief  
Plant Licensing Branch III-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical  
Specifications and Facility Operating License

Date of Issuance: March 21, 2013



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

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-457

BRAIDWOOD STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 172  
License No. NPF-77

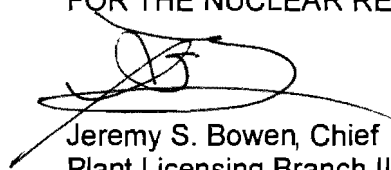
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  - A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated March 22, 2012, as supplemented by your letter dated December 3, 2012, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (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;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-77 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 172 and the Environmental Protection Plan contained in Appendix B, both of which were attached to License No. NPF-72, dated July 2, 1987, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Jeremy S. Bowen, Chief  
Plant Licensing Branch III-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical  
Specifications and Facility Operating License

Date of Issuance: March 21, 2013

ATTACHMENT TO LICENSE AMENDMENT NOS. 172 AND 172

FACILITY OPERATING LICENSE NOS. NPF-72 AND NPF-77

DOCKET NOS. STN 50-456 AND STN 50-457

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

Remove

License NPF-72  
Page 3

License NPF-77  
Page 3

TSs

3.4.19-1  
3.4.19-2  
5.5-7  
5.5-8  
5.5-9  
5.5-10  
5.5-11  
5.6-6  
5.6-7

Insert

License NPF-72  
Page 3

License NPF-77  
Page 3

TSs

3.4.19-1  
3.4.19-2  
5.5-7  
5.5-8  
5.5-9  
5.5-10  
5.5-11  
5.6-6  
5.6-7

- (3) Exelon Generation Company, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use at any time any byproduct, source and 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;
- (4) Exelon Generation Company, 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
- (5) Exelon Generation Company, 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. The 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

The licensee is authorized to operate the facility at reactor core power levels not in excess of 3586.6 megawatts thermal (100 percent rated power) in accordance with the conditions specified herein and other items identified in Attachment 1 to this license. The items identified in Attachment 1 to this license shall be completed as specified. Attachment 1 is hereby incorporated into this license.

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 172 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Emergency Planning

In the event that the NRC finds that the lack of progress in completion of the procedures in the Federal Emergency Management Agency's final rule, 44 CFR Part 350, is an indication that a major substantive problem exists in achieving or maintaining an adequate state of emergency preparedness, the provision of 10 CFR Section 50.54(s)(2) will apply.



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;

- (4) Exelon Generation Company, 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
- (5) Exelon Generation Company, 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. The 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

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(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 172 and the Environmental Protection Plan contained in Appendix B, both of which are attached to License No. NPF-72, dated July 2, 1987, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Emergency Planning

In the event that the NRC finds that the lack of progress in completion of the procedures in the Federal Emergency Management Agency's final rule, 44 CFR Part 350, is an indication that a major substantive problem exists in achieving or maintaining an adequate state of emergency preparedness, the provision of 10 CFR Section 50.54(s)(2) will apply.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.19 Steam Generator (SG) Tube Integrity

LCO 3.4.19 SG tube integrity shall be maintained.

AND

All SG tubes satisfying the tube plugging criteria shall be plugged in accordance with the Steam Generator Program.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

-----NOTE-----

Separate Condition entry is allowed for each SG tube.  
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CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more SG tubes satisfying the tube plugging criteria and not plugged in accordance with the Steam Generator Program.	A.1 Verify tube integrity of the affected tube(s) is maintained until the next refueling outage or SG tube inspection.	7 days
	<u>AND</u> A.2 Plug the affected tube(s) in accordance with the Steam Generator Program.	Prior to entering MODE 4 following the next refueling outage or SG tube inspection
B. Required Action and associated Completion Time of Condition A not met.  <u>OR</u> SG tube integrity not maintained.	B.1 Be in MODE 3.	6 hours
	<u>AND</u> B.2 Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.19.1 Verify SG tube integrity in accordance with the Steam Generator Program.	In accordance with the Steam Generator Program
SR 3.4.19.2 Verify that each inspected SG tube that satisfies the tube plugging criteria is plugged in accordance with the Steam Generator Program.	Prior to entering MODE 4 following a SG tube inspection

## 5.5 Programs and Manuals

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### 5.5.9 Steam Generator (SG) Program

A Steam Generator Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the Steam Generator Program shall include the following:

- a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the "as found" condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected or plugged to confirm that the performance criteria are being met.
- b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.
  1. Structural integrity performance criterion: All inservice steam generator tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down), all anticipated transients included in the design specification, and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

5.5 Programs and Manuals

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5.5.9 Steam Generator (SG) Program (continued)

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. Leakage is not to exceed a total of 1 gpm for all SGs.
  3. The operational LEAKAGE performance criteria is specified in LCO 3.4.13, "RCS Operational LEAKAGE."
- c. Provisions for SG tube plugging criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding 40% of the nominal wall thickness shall be plugged. The following alternate tube plugging criteria shall be applied as an alternative to the 40% depth based criteria:

For Unit 2, tubes with service-induced flaws located greater than 14.01 inches below the top of the tubesheet do not require plugging. Tubes with service-induced flaws located in the portion of the tube from the top of the tubesheet to 14.01 inches below the top of the tubesheet shall be plugged upon detection.

5.5 Programs and Manuals

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5.5.9 Steam Generator (SG) Program (continued)

- d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet, and that may satisfy the applicable tube plugging criteria. For Unit 2, portions of the tube below 14.01 inches from the top of the tubesheet are excluded from this requirement.

The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A degradation assessment shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

1. Inspect 100% of the tubes in each SG during the first refueling outage following SG installation.
2. For Unit 1, after the first refueling outage following SG installation, inspect each SG at least every 72 effective full power months or at least every third refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, c, and d below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.

- a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 144 effective full power months. This constitutes the first inspection period;
  - b) During the next 120 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period;
  - c) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the third inspection period; and
  - d) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the fourth and subsequent inspection periods.
3. For Unit 2, after the first refueling outage following SG installation, inspect each SG at least every 48 effective full power months or at least every other refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, and c below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be

5.5 Programs and Manuals

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5.5.9 Steam Generator (SG) Program (continued)

inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.

- a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 120 effective full power months. This constitutes the first inspection period;
  - b) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period; and
  - c) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the third and subsequent inspection periods.
4. For Unit 1, if crack indications are found in any SG tube, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall not exceed 24 effective full power months or one refueling outage (whichever results in more frequent inspections). For Unit 2, if crack indications are found in any SG tube from 14.01 inches below the top of the tubesheet on the hot leg side to 14.01 inches below the top of the tubesheet on the cold leg side, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall not exceed 24 effective full power months or one refueling outage (whichever results in more frequent inspections).

If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

- e. Provisions for monitoring operational primary to secondary LEAKAGE.



## 5.6 Reporting Requirements

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### 5.6.8 Tendon Surveillance Report

Any abnormal degradation of the containment structure detected during the tests required by the Pre-Stressed Concrete Containment Tendon Surveillance Program shall be reported in the Inservice Inspection Summary Report in accordance with 10 CFR 50.55a and ASME Section XI.

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### 5.6.9 Steam Generator (SG) Tube Inspection Report

A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of an inspection performed in accordance with Specification 5.5.9, Steam Generator (SG) Program. The report shall include:

- a. The scope of inspections performed on each SG,
- b. Degradation mechanisms found,
- c. Nondestructive examination techniques utilized for each degradation mechanism,
- d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,
- e. Number of tubes plugged during the inspection outage for each degradation mechanism,
- f. The number and percentage of tubes plugged to date, and the effective plugging percentage in each steam generator,
- g. The results of condition monitoring, including the results of tube pulls and in-situ testing,

## 5.6 Reporting Requirements

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### 5.6.9 Steam Generator (SG) Tube Inspection Report (continued)

- h. For Unit 2, the operational primary to secondary leakage rate observed (greater than three gallons per day) in each steam generator (if it is not practical to assign the leakage to an individual steam generator, the entire primary to secondary leakage should be conservatively assumed to be from one steam generator) during the cycle preceding the inspection which is the subject of the report,
- i. For Unit 2, the calculated accident induced leakage rate from the portion of the tubes below 14.01 inches from the top of the tubesheet for the most limiting accident in the most limiting SG. In addition, if the calculated accident induced leakage rate from the most limiting accident is less than 3.11 times the maximum operational primary to secondary leakage rate, the report should describe how it was determined, and
- j. For Unit 2, the results of monitoring for tube axial displacement (slippage). If slippage is discovered, the implications of the discovery and corrective action shall be provided.



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

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-454

BYRON STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 179  
License No. NPF-37

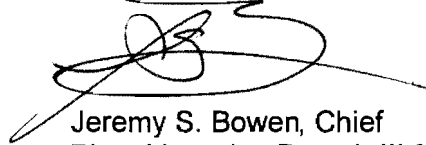
1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated March 22, 2012, as supplemented by your letter dated December 3, 2012, complies with the standards and requirements of the Atomic Energy Act 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;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-37 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 179 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

A handwritten signature in black ink, appearing to read 'J.S. Bowen', is written over a horizontal line.

Jeremy S. Bowen, Chief  
Plant Licensing Branch III-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical  
Specifications and Facility Operating License

Date of Issuance: March 21, 2013



UNITED STATES  
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WASHINGTON, D.C. 20555-0001

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-455

BYRON STATION, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 179  
License No. NPF-66

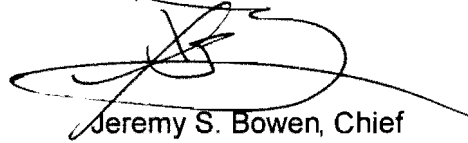
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  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-66 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A (NUREG-1113), as revised through Amendment No. 179 and the Environmental Protection Plan contained in Appendix B, both of which were attached to License No. NPF-37, dated February 14, 1985, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

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Jeremy S. Bowen, Chief  
Plant Licensing Branch III-2  
Division of Operating Reactor Licensing  
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Attachment: Changes to the Technical  
Specifications and Facility Operating License

Date of Issuance: March 21, 2013

ATTACHMENT TO LICENSE AMENDMENT NOS. 179 AND 179

FACILITY OPERATING LICENSE NOS. NPF-37 AND NPF-66

DOCKET NOS. STN 50-454 AND STN 50-455

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- (4) 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
  - (5) 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 license shall be deemed to contain and is subject to the conditions specified in the Commission's regulation 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  
The licensee is authorized to operate the facility at reactor core power levels not in excess of 3586.6 megawatts thermal (100 percent rated power) in accordance with the conditions specified herein.
  - (2) Technical Specifications  
The Technical Specifications contained in Appendix A as revised through Amendment No. 179 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.
  - (3) Deleted.
  - (4) Deleted.
  - (5) Deleted.
  - (6) The licensee shall implement and maintain in effect all provisions of the approved fire protection program as described in the licensee's Fire Protection Report, and as approved in the SER dated February 1987 through Supplement No. 8, subject to the following provision:  
  
The licensee may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.



- (3) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use at any time any byproduct, source and 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;
- (4) 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
- (5) 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 license shall be deemed to contain and is subject to the conditions specified in the Commission's regulation 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

The licensee is authorized to operate the facility at reactor core power levels not in excess of 3586.6 megawatts thermal (100 percent rated power) in accordance with the conditions specified herein.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A (NUREG-1113), as revised through Amendment No 179, and the Environmental Protection Plan contained in Appendix B, both of which were attached to License No. NPF-37, dated February 14, 1985, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

- (3) Deleted.
- (4) Deleted.
- (5) Deleted.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.19 Steam Generator (SG) Tube Integrity

LCO 3.4.19 SG tube integrity shall be maintained.

AND

All SG tubes satisfying the tube plugging criteria shall be plugged in accordance with the Steam Generator Program.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

-----NOTE-----

Separate Condition entry is allowed for each SG tube.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more SG tubes satisfying the tube plugging criteria and not plugged in accordance with the Steam Generator Program.	A.1 Verify tube integrity of the affected tube(s) is maintained until the next refueling outage or SG tube inspection.	7 days
	<u>AND</u> A.2 Plug the affected tube(s) in accordance with the Steam Generator Program.	Prior to entering MODE 4 following the next refueling outage or SG tube inspection
B. Required Action and associated Completion Time of Condition A not met.  <u>OR</u> SG tube integrity not maintained.	B.1 Be in MODE 3.	6 hours
	<u>AND</u> B.2 Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.19.1	Verify SG tube integrity in accordance with the Steam Generator Program.	In accordance with the Steam Generator Program
SR 3.4.19.2	Verify that each inspected SG tube that satisfies the tube plugging criteria is plugged in accordance with the Steam Generator Program.	Prior to entering MODE 4 following a SG tube inspection

## 5.5 Programs and Manuals

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### 5.5.9 Steam Generator (SG) Program

A Steam Generator Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the Steam Generator Program shall include the following:

- a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the "as found" condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected or plugged to confirm that the performance criteria are being met.
- b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.
  1. Structural integrity performance criterion: All in-service steam generator tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down), all anticipated transients included in the design specification, and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

5.5 Programs and Manuals

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5.5.9 Steam Generator (SG) Program (continued)

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. Leakage is not to exceed a total of 1 gpm for all SGs.
  3. The operational LEAKAGE performance criteria is specified in LCO 3.4.13, "RCS Operational LEAKAGE."
- c. Provisions for SG tube plugging criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding 40% of the nominal wall thickness shall be plugged. The following alternate tube plugging criteria shall be applied as an alternative to the 40% depth based criteria:

For Unit 2, tubes with service-induced flaws located greater than 14.01 inches below the top of the tubesheet do not require plugging. Tubes with service-induced flaws located in the portion of the tube from the top of the tubesheet to 14.01 inches below the top of the tubesheet shall be plugged upon detection.

5.5 Programs and Manuals

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5.5.9 Steam Generator (SG) Program (continued)

- d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet, and that may satisfy the applicable tube plugging criteria. For Unit 2, portions of the tube below 14.01 inches from the top of the tubesheet are excluded from this requirement.

The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A degradation assessment shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

1. Inspect 100% of the tubes in each SG during the first refueling outage following SG installation.
2. For Unit 1, after the first refueling outage following SG installation, inspect each SG at least every 72 effective full power months or at least every third refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, c, and d below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could

5.5 Programs and Manuals

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5.5.9 Steam Generator (SG) Program (continued)

potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.

- a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 144 effective full power months. This constitutes the first inspection period;
  - b) During the next 120 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period;
  - c) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the third inspection period; and
  - d) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the fourth and subsequent inspection periods.
3. For Unit 2, after the first refueling outage following SG installation, inspect each SG at least every 48 effective full power months or at least every other refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, and c below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be

5.5 Programs and Manuals

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5.5.9 Steam Generator (SG) Program (continued)

inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.

- a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 120 effective full power months. This constitutes the first inspection period;
  - b) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period; and
  - c) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the third and subsequent inspection periods.
4. For Unit 1, if crack indications are found in any SG tube, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall not exceed 24 effective full power months or one refueling outage (whichever results in more frequent inspections). For Unit 2, if crack indications are found in any SG tube from 14.01 inches below the top of the tubesheet on the hot leg side to 14.01 inches below the top of the tubesheet on the cold leg side, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall not exceed 24 effective full power months or one refueling outage (whichever results in more frequent inspections).

If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

- e. Provisions for monitoring operational primary to secondary LEAKAGE.



## 5.6 Reporting Requirements

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### 5.6.8 Tendon Surveillance Report

Any abnormal degradation of the containment structure detected during the tests required by the Pre-Stressed Concrete Containment Tendon Surveillance Program shall be reported in the Inservice Inspection Summary Report in accordance with 10 CFR 50.55a and ASME Section XI.

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### 5.6.9 Steam Generator (SG) Tube Inspection Report

A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of an inspection performed in accordance with Specification 5.5.9, Steam Generator (SG) Program. The report shall include:

- a. The scope of inspections performed on each SG,
- b. Degradation mechanisms found,
- c. Nondestructive examination techniques utilized for each degradation mechanism,
- d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,
- e. Number of tubes plugged during the inspection outage for each degradation mechanism,
- f. The number and percentage of tubes plugged to date, and the effective plugging percentage in each steam generator,
- g. The results of condition monitoring, including the results of tube pulls and in-situ testing,

## 5.6 Reporting Requirements

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### 5.6.9 Steam Generator (SG) Tube Inspection Report (continued)

- h. For Unit 2, the operational primary to secondary leakage rate observed (greater than three gallons per day) in each steam generator (if it is not practical to assign the leakage to an individual steam generator, the entire primary to secondary leakage should be conservatively assumed to be from one steam generator) during the cycle preceding the inspection which is the subject of the report,
- i. For Unit 2, the calculated accident induced leakage rate from the portion of the tubes below 14.01 inches from the top of the tubesheet for the most limiting accident in the most limiting SG. In addition, if the calculated accident induced leakage rate from the most limiting accident is less than 3.11 times the maximum operational primary to secondary leakage rate, the report should describe how it was determined, and
- j. For Unit 2, the results of monitoring for tube axial displacement (slippage). If slippage is discovered, the implications of the discovery and corrective action shall be provided.



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 172 TO FACILITY OPERATING LICENSE NO. NPF-72,  
AMENDMENT NO. 172 TO FACILITY OPERATING LICENSE NO. NPF-77,  
AMENDMENT NO. 179 TO FACILITY OPERATING LICENSE NO. NPF-37,  
AND AMENDMENT NO. 179 TO FACILITY OPERATING LICENSE NO. NPF-66  
EXELON GENERATION COMPANY, LLC  
BRAIDWOOD STATION, UNITS 1 AND 2  
BYRON STATION, UNIT NOS. 1 AND 2  
DOCKET NOS. STN 50-456, STN 50-457,  
STN 50-454, AND STN 50-455.

1.0 INTRODUCTION

By letter to the U.S. Nuclear Regulatory Commission (NRC, the Commission) dated March 22, 2012, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12082A135), as supplemented by December 3, 2012, letter (ADAMS ML123380149), Exelon Generation Company, LLC (the licensee), requested changes to the technical specifications (TSs) for its Braidwood Station, Units 1 and 2, and Byron Station, Unit Nos. 1 and 2, facilities.

The proposed change revises TS 3.4.19, "Steam Generator (SG) Tube Integrity," TS 5.5.9, "Steam Generator (SG) Program," and TS 5.6.9, "Steam Generator (SG) Tube Inspection Report." The licensee states that the proposed amendment is consistent with the NRC-approved Revision 2 to Technical Specifications Task Force (TSTF) Standard Technical Specifications (STS) Change Traveler TSTF-510, "Revision to Steam Generator Program Inspection Frequencies and Tube Sample Selection," (ADAMS Accession No. ML110610350), except certain changes as discussed in the amendment.

The December 3, 2012, supplement did not expand the scope of the application as originally noticed, and did not change the NRC staff's initial proposed finding of no significant hazards consideration.

TSTF-510 Background:

The SG tubes in pressurized-water reactors (PWRs) have a number of important safety functions. These tubes are an integral part of the reactor coolant pressure boundary

Enclosure

(RCPB) and, as such, are relied upon to maintain primary system pressure and inventory. As part of the RCPB, the SG tubes are unique in that they are also relied upon as a heat transfer surface between the primary and secondary systems, such that residual heat can be removed from the primary system, and are relied upon to isolate the radioactive fission products in the primary coolant from the secondary system. In addition, the SG tubes are relied upon to maintain their integrity to be consistent with the containment objectives of preventing uncontrolled fission product release under conditions resulting from core damage during severe accidents.

The current STS requirements in the above specifications were established in May 2005, with the NRC staff's approval of TSTF-449, Revision 4, "Steam Generator Tube Integrity" (*Federal Register* (FR) Notice 70 FR 24126; dated May 6, 2005). The TSTF-449 changes to the STS incorporated a new, largely performance-based, approach for ensuring the integrity of the SG tubes is maintained. The performance-based requirements were supplemented by prescriptive requirements relating to tube inspections and tube repair limits to ensure that conditions adverse to quality are detected and corrected on a timely basis. As of September 2007, the TSTF-449, Revision 4, changes were adopted in the plant TSs for all PWRs.

The changes proposed by TSTF-510 do not affect the design of the SGs, the method of operation, the operational leakage limit, the accident analyses or primary coolant chemistry controls. The primary coolant activity limit and its assumptions are not affected by the proposed changes to the STS. The proposed changes are an improvement to the existing SG inspection requirements and continue to provide assurance that the plant licensing basis will be maintained between SG inspections.

The proposed changes contain a number of editorial corrections, changes, and clarifications intended to improve internal consistency, consistency with the implementing industry documents, and usability without changing the intent of the requirements.

The proposed changes to TS 5.5.9.d.2 are more effective in managing the frequency of verification of tube integrity and sample selection than those required by current technical specifications. As a result, the proposed changes will not reduce the assurance of the function and integrity of SG tubes.

## 2.0 REGULATORY EVALUATION

The NRC staff finds that the licensee in Section 2.1 of its submittal, identified the applicable regulatory requirements by referencing an approved change to the STS (TSTF-510). The regulatory requirements for which the staff based its acceptance are identified below.

Title 10 of the *Code of Federal Regulations* (10 CFR) establishes the requirements with respect to the integrity of the SG tubing. Specifically, the general design criteria (GDC) in Appendix A to 10 CFR Part 50 states that the RCPB shall have "an extremely low probability of abnormal leakage...and of gross rupture" (GDC 14), "shall be designed with sufficient margin," (GDCs 15 and 31), shall be of "the highest quality standards practical," (GDC 30), and shall be designed to permit "periodic inspection and testing...to assess structural and leaktight integrity," (GDC 32).

A review of Braidwood and Byron stations combined updated final safety analysis report (UFSAR), Revision 13, Sections 3.1.2.2.5, "Evaluation Against Criterion 14 - Reactor Coolant Pressure Boundary," 3.1.2.2.6, Evaluation Against Criterion 15 – "Reactor Coolant System Design," 3.1.2.4.1, Evaluation Against Criterion 30 – "Quality of Reactor Coolant Pressure Boundary," 3.1.2.4.2, Evaluation Against Criterion 31 – "Fracture Prevention of Reactor Coolant Pressure Boundary," and 3.1.2.4.3, Evaluation Against Criterion 32 – "Inspection of Reactor Coolant Pressure Boundary," shows that these stations are in compliance with the NRC GDC.

Section 50.55a of 10 CFR specifies that components, which are part of the RCPB, must meet the requirements for Class 1 components in Section III of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code). Section 50.55a further requires, in part, that throughout the service life of a PWR facility, ASME Code Class 1 components meet the requirements, except design and access provisions and pre-service examination requirements, in Section XI, "Rules for Inservice Inspection [ISI] of Nuclear Power Plant Components," to the extent practical. This requirement includes the inspection and repair criteria of Section XI of the ASME Code.

Section 50.36 of 10 CFR, "Technical specifications," establishes the requirements related to the content of the TS. Pursuant to 10 CFR 50.36, TSs are required to include items in the following five categories related to station operation: (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. LCOs and accompanying action statements and SRs in the STS relevant to SG tube integrity are in Specification 3.4.13 "Reactor Coolant System Operational Leakage," and Specification 3.4.17 (SR 3.4.17.2), and "Steam Generator (SG) Tube Integrity." The SRs in the "Steam Generator (SG) Tube Integrity" specification reference the SG program which is defined in the STS administrative controls.

The licensee's TSs 3.4.19, 5.5.9, and 5.6.9, address requirements similar to those specified in STS sections above.

Section 50.36(c)(5) of 10 CFR defines administrative controls as "the provisions relating to organization and management, procedures, recordkeeping, review and audit, and reporting necessary to assure the operation of the facility in a safe manner." Braidwood and Byron's TS 5.5.9 requires that a SG program be established and implemented to ensure that SG tube integrity is maintained. TS 5.5.9.a requires that a condition monitoring assessment be performed during each outage in which the SG tubes are inspected, to confirm that the performance criteria are being met. SG tube integrity is maintained by meeting the performance criteria specified in TS 5.5.9.b for structural and leakage integrity, consistent with the plant design and licensing basis. The applicable tube repair criteria, specified in TS 5.5.9.c, are that tubes found during ISI to contain flaws with a depth equal to or exceeding 40 percent of the nominal wall thickness shall be plugged, unless the tubes are permitted to remain in service through application of the alternate repair criteria provided in TS 5.5.9.c.1. For Braidwood Unit 2 and Byron Unit No. 2, TS 5.5.9.c.1 states that tubes with service induced flaws located greater than 14.01 inches below the top of the tubesheet do not require plugging. Tubes with service-induced flaws located in the portion of the tube from the top of the tubesheet to 14.01 inches below the top of the tubesheet shall be plugged upon detection.

The licensee's TS 5.5.9.d includes provisions regarding the scope, frequency, and methods of SG tube inspections. These provisions require that the inspections be performed with the objective of detecting flaws of any type that (1) may be present along the length of a tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet, and (2) may satisfy the applicable tube repair criteria.

### 3.0 TECHNICAL EVALUATION

Each proposed change to the TS is described individually below, followed by the NRC staff's assessment of the change. This evaluation applies to all four units, except where noted. When changes are specific to the tube types, similar ones will be grouped together as follows:

- Braidwood Unit 1 and Byron Unit No. 1
- Braidwood Unit 2 and Byron Unit No. 2

#### 3.1 TS 5.5.9, "Steam Generator (SG) Program"

The last sentence in the introductory paragraph currently states, "In addition, the Steam Generator Program shall include the following provisions."

Proposed Change: The sentence is revised to say "In addition, the Steam Generator Program shall include the following:". The subsequent paragraph starts with "Provisions for" and stating "provisions" in the introductory paragraph is duplicative.

Assessment: The NRC staff has reviewed the licensee's proposed change to TS 6.19 and agrees that the word, "provisions," in the introductory paragraph is duplicative. The NRC staff agrees that the change is administrative in nature, and therefore is acceptable.

#### 3.2 TS 5.5.9 b.1, "Structural integrity performance criterion"

The first sentence currently states:

All in-service steam generator tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down and all anticipated transients included in the design specification) and design basis accidents.

Proposed Change: Revise the sentence to read as follows:

All in-service steam generator tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down), all anticipated transients included in the design specification, and design basis accidents.

The basis for the change is that the sentence inappropriately includes anticipated transients in the description of normal operating conditions.

**Assessment:** The NRC staff agrees the current wording is incorrect and that anticipated transients should be differentiated from normal operating conditions. Therefore, the NRC staff finds the change acceptable.

3.3. TS 5.5.9.c, "Provisions for SG tube repair criteria," TS 5.5.9.d, "Provisions for SG tube inspections," LCO 3.4.19, "Steam Generator (SG) Tube Integrity," and SR 4.19.2 for LCO 4.19, "Steam Generator Tube Integrity"

**Proposed Change:** Change all references to "tube repair criteria" to "tube plugging criteria." This change is intended to be consistent with the treatment of SG tube repair throughout TS 5.5.9.

**Assessment:** The NRC staff finds that the proposed change provides a more accurate label of the criteria and, therefore, adds clarity to the specification. As a result, there are no longer any repair options in TS 5.5.9.c. The only available action is to remove the tube from service by plugging the tube at both tube ends. The NRC staff finds the change acceptable.

3.4 TS 5.5.9.d, "Provisions for SG tube inspection"

**Proposed Change:** Change the term "assessment of degradation" to "degradation assessment" to be consistent with the terminology used in industry program documents.

**Assessment:** The NRC staff agrees that the terminology should be consistent and finds the change acceptable.

3.5 TS 5.5.9.d.1

The paragraph currently states: "Inspect 100% of the tubes in each SG during the first refueling outage following SG replacement."

**Proposed change:** The change would replace "SG replacement" with "SG installation." The basis for the change is that it will allow the SG Program to apply to both existing plants and new plants.

**Assessment:** The NRC staff agrees the SG Program can apply to both existing and new plants. Therefore, the NRC staff finds the change acceptable.

3.6 TS 5.5.9.d.2 for plants with SGs with alloy 600 and alloy 690 thermally treated (TT) tubes

**Note:** Per the licensee's combined UFSAR, Revision 13, SGs in Braidwood Unit 1 and Byron Unit No. 1 employ alloy 690 TT tubing design, and SGs in Braidwood Unit 2 and Byron Unit No. 2 employ alloy 600 TT tubing design.

TS 5.5.9.d.2 currently states:

Inspect 100% of the Unit 1 tubes at sequential periods of 144, 108, 72, and, thereafter, 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the SGs. In addition, inspect 50% of the tubes by the refueling outage nearest the midpoint of the period and the remaining 50% by the

refueling outage nearest the end of the period. No SG shall operate for more than 72 effective full power months or three refueling outages (whichever is less) without being inspected.

Inspect 100% of the Unit 2 tubes at sequential periods of 120, 90, and, thereafter, 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the SGs. In addition, inspect 50% of the tubes by the refueling outage nearest the midpoint of the period and the remaining 50% by the refueling outage nearest the end of the period. No SG shall operate for more than 48 effective full power months or two refueling outages (whichever is less) without being inspected.

Proposed Change: The first paragraph of TS 5.5.9.d.2 would be replaced with:

For Unit 1, after the first refueling outage following SG installation, inspect each SG at least every 72 effective full-power months or at least every third refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, c, and d, below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location, and that may satisfy the applicable tube plugging criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.

- a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 144 effective full power months. This constitutes the first inspection period;
- b) During the next 120 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period;
- c) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the third inspection period; and
- d) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the fourth and subsequent inspection periods.



For Unit 2, after the first refueling outage following SG installation, inspect each SG at least every 48 effective full power months or at least every other refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, and c below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period.

Each inspection period defined below may be extended up to three effective full-power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.

- a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 120 effective full power months. This constitutes the first inspection period;
- b) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period; and
- c) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full-power months. This constitutes the third and subsequent inspection period.

### 3.6.1 Assessment:

TS 5.5.9.d.2, in its current form and with the proposed changes (including renumbering), is similar for each of the tube alloy types used in domestic steam generators, but with differences that reflect the improved resistance of alloy 690 TT to stress corrosion cracking relative to both alloy 600 mill annealed (MA) and alloy 600 TT and the improved resistance of alloy 600 TT to stress corrosion cracking relative to 600 MA. These differences include progressively larger maximum inspection interval requirements and sequential inspection periods (during which 100 percent of the tubes must be inspected) for alloy 600 MA, 600 TT, and 690 TT tubes, respectively. In addition, because of the longer maximum inspection intervals allowed for alloy 600 TT and 690 TT tubes, TS 5.5.9.d.2 includes a restriction on the distribution of sampling over each sequential inspection period for alloy 600 TT and 690 TT tubes that is not included for alloy 600 MA tubes. The assessment of the TS 5.5.9.d.2 changes for the alloy 690 TT SGs and the alloy 600 TT SGs are discussed separately below.

3.6.2 Assessment for Braidwood Unit 1 and Byron Unit No. 1 alloy 690 TT SGs:

The first paragraph of the current TS 5.5.9.d.2 applies to Braidwood Unit 1 and Byron Unit No. 1 which have alloy 690 TT SGs. The first two sentences of this paragraph currently read:

Inspect 100% of the Unit 1 tubes at sequential periods of 144, 108, 72, and, thereafter, 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the SGs.

The licensee proposes to move these sentences to the inspection periods, as specified in a, b, c and d of the revised paragraph, and make editorial changes to improve clarity. The NRC staff finds these changes to be of a clarifying nature, not changing the current intent of these two sentences. However, the amendment also includes three changes to when inspections are performed as follows:

- The second inspection period would be revised from 108 to 120 effective full-power months (EFPM).
- The third inspection period would be revised from 72 to 96 EFPM.
- The fourth and subsequent inspection periods would be revised from 60 to 72 EFPM.

The licensee characterizes these changes as marginal increases for consistency with typical fuel cycle lengths that better accommodate the scheduling of inspections. The NRC staff observes that this is clearly the case for plants operating with 18- or 36-month inspection intervals (one or two fuel cycles, respectively). With these intervals, the last scheduled inspection during the first inspection period would coincide with the end of the first, third, and subsequent inspection periods. The NRC staff finds that for plants operating with 54-month inspection intervals (three fuel cycles), the end of each inspection period will not generally coincide with a scheduled inspection outage. The actual inspection interval (18, 36, or 54 months) is determined by the licensee in accordance with the SG program.

For plants operating with 18- or 36-month inspection intervals, the proposed changes would generally increase the number of inspections in each of the third and subsequent inspection periods by up to one additional inspection. This could reduce the required average minimum sample size during these periods. For plants operating with 54-month inspection intervals, the proposed changes will usually have no effect on the required average minimum sample size during these periods. However, inspection sample sizes will continue to be subject to TS 5.5.9.d.2 which states that in addition to meeting the requirements of TS 5.5.9.d.2, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure SG tube integrity is maintained until the next scheduled inspection. Therefore, the NRC staff concludes that with the proposed changes to the length of the second and subsequent inspection periods, compliance with the SG program requirements in TS 5.5.9.d.2 will continue to ensure both adequate inspection scopes and tube integrity.

For each inspection period, TS 5.5.9.d.2 currently requires that at least 50 percent of the tubes be inspected by the refueling outage nearest to the mid-point of the inspection period, and the remaining 50 percent by the refueling outage nearest the end of the inspection period. The NRC staff notes that if there are not an equal number of inspections in the first half and second half of

the inspection period, the average minimum sampling requirement may be markedly different for inspections in the first half of the inspection period compared to those in the second half, even when there are uniform intervals between each inspection. For example, a plant in the second (120 EFPM) inspection period with a scheduled 36-month interval (two fuel cycles) between each inspection would currently be required to inspect 50 percent of the tubes by the refueling outage nearest the midpoint of the inspection which would be the third refueling outage in the period, six months before the mid-point (assuming an inspection was performed at the very end of the 144-EFPM inspection period). However, since no inspection is scheduled for that outage, then the full 50-percent sample must be performed during the inspection scheduled for the second refueling outage in the period. Two inspections would be scheduled to occur in the second half of the inspection period, at 72 and 108 months into the inspection period. Thus, the current sampling requirement could be satisfied by performing a 25-percent sample during each of these inspections or other combinations of sampling (e.g., 10 percent during one and 40 percent in the other) totaling 50 percent.

The NRC staff finds there is no basis to require the minimum initial sample size to vary so much from inspection to inspection. The licensee proposes to revise this requirement such that the minimum sample size for a given inspection in a given inspection period is 100 percent divided by the number of scheduled inspections during that inspection period. For the above example, the proposed change would result in a uniform initial minimum sample size of 33.3 percent for each of the three scheduled inspections during the inspection period. The NRC staff concludes this proposed revision to be an improvement to the existing requirement since it provides a more consistent minimum initial sampling requirement.

In TS 5.5.9.d.2, the proposed third and fourth sentences state: "If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube repair criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location, at the end of the inspection period, shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period."

These sentences address the possibility that a degradation assessment in accordance with TS 5.5.9.d.2 indicates the tubing may be susceptible to a type of degradation at a location not previously inspected with a technique capable of detecting that type of degradation at that location. For example, suppose new information from another similar plant becomes available indicating the potential for circumferential cracking at a specific location on the tube. Previous degradation assessments had not identified the potential for this type of degradation at this location. Thus, previous inspections of this location had not been performed with a technique capable of detecting circumferential cracks. However, now that the potential for circumferential cracking has been identified at this location, TS 5.5.9.d.2 requires a method of inspection to be performed with the objective of detecting circumferential cracks which may be present at this location and that may satisfy the applicable tube repair criteria.

Furthermore, suppose this inspection is performed for the first time during the third of four SG inspections scheduled for the 144-EFPM inspection period. TS 5.5.9.d.2 currently does not

specifically state whether this location needs to be 100 percent inspected by the end of the 144-EFPM inspection period, or whether a prorated approach may be taken. The NRC staff addressed this question in Issue 1 of NRC Regulatory Information Summary (RIS) 2009-04, "Steam Generator Tube Inspection Requirements," dated April 3, 2009, (ADAMS Accession No. ML083470557), as follows:

Issue 1: A licensee may identify a new potential degradation mechanism after the first inspection in a sequential period. If this occurs, what are the expectations concerning the scope of examinations for this new potential degradation mechanism for the remainder of the period (e.g., do 100 percent of the tubes have to be inspected by the end of the period or can the sample be prorated for the remaining part of the period)?

[NRC Staff Position:] The TS contain requirements that are a mixture of prescriptive and performance-based elements. Paragraph "d" of these requirements indicates that the inspection scope, inspection methods, and inspection intervals shall be sufficient to ensure that SG tube integrity is maintained until the next SG inspection. Paragraph "d" is a performance-based element because it describes the goal of the inspections but does not specify how to achieve the goal. However, paragraph "d.2" is a prescriptive element because it specifies that the licensee must inspect 100 percent of the tubes at specified periods.

If an assessment of degradation performed after the first inspection in a sequential period results in a licensee concluding that a new degradation mechanism (not anticipated during the prior inspections in that period) may potentially occur, the scope of inspections in the remaining portion of the period should be sufficient to ensure SG tube integrity for the period between inspections.

In addition, to satisfy the prescriptive requirements of paragraph "d.2" that the licensee must inspect 100 percent of the tubes within a specified period, a prorated sample for the remaining portion of the period is appropriate for this potentially new degradation mechanism. This prorated sample should be such that if the licensee had implemented it at the beginning of the period, the TS requirement for the 100 percent inspection in the entire period (for this degradation mechanism) would have been met. A prorated sample is appropriate because (1) the licensee would have performed the prior inspections in this sequential period consistently with the requirements, and (2) the scope of inspections must be sufficient to ensure that the licensee maintains SG tube integrity for the period between inspections.

The NRC staff finds that relocation of information in sentences three and four as described above, clarifies the existing requirement consistent with the NRC staff's position from RIS 2009-04 quoted above and is, therefore, acceptable.

In TS 5.5.9.d.2, the proposed fifth sentence states: "Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an

inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.”

This allows extension of the inspection periods by up to an additional 3 EFPM and potentially impacts the average tube inspection sample size to be implemented during a given inspection in that period. For example, if four SG inspections are scheduled to occur within the nominal 144-EFPM period, the minimum sample size for each of the four inspections could average as little as 25 percent of the tube population. If a fifth inspection can be included within the period by extending the period by three EFPM, then the minimum sample size for each of the five inspections could average as little as 20 percent of the tube population. Therefore, the proposed change does not impact the required frequency of SG inspection.

Required tube inspection sample sizes are also subject to the performance-based requirement in TS 5.5.9.d.2, which states, in part, that in addition to meeting the requirements of TS 5.5.9.d.2, “the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next scheduled SG inspection.” This requirement remains unchanged under the proposal. The NRC staff concludes the proposed fifth sentence involves only a relatively minor relaxation to the existing sampling requirements in TS 5.5.9.d.2. However, the performance-based requirements in TS 5.5.9.d.2 ensure that adequate inspection sampling will be performed to ensure tube integrity is maintained. The NRC staff concludes that the proposed change is acceptable.

Finally, the first sentence of the proposed revision to TS 5.5.9.d.2, which states, “after the first refueling outage following SG installation, inspect each SG at least every 72 effective full power months or at least every third refueling outage (whichever results in more frequent inspections),” replaces the last sentence of the current TS 5.5.9.d.2, which states, “No SG shall operate for more than 72 effective full power months or three refueling outages (whichever is less) without being inspected.” The change establishes the minimum allowable SG inspection frequency to at least every 72 EFPM or at least every third refueling outage (whichever results in more frequent inspections). This minimum inspection frequency is unchanged from the current TS requirement. The NRC staff finds that the wording changes in the sentence are of an editorial and clarifying nature and are not material, such that the current intent of the requirement is unchanged. Thus, the NRC staff concludes the proposed change is acceptable.

### 3.6.3 Assessment for Braidwood Unit 2 and Byron Unit No. 2 alloy 600 TT SGs

The second paragraph of the current TS 5.5.9.d.2 applies to Braidwood Unit 2 and Byron Unit No. 2 which have alloy 600 TT SGs. The first two sentences of this paragraph currently read:

Inspect 100% of the Unit 2 tubes at sequential periods of 120, 90, and, thereafter, 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the SGs.

The licensee proposes to move these sentences to the inspection periods, as specified in a, b, and c of the revised paragraph, and make editorial changes to improve clarity. The NRC staff finds these changes to be of a clarifying nature, not changing the current intent of these two sentences. However, the license amendment request also includes two changes to when inspections are performed as follows:

- The second inspection period would be revised from 90 to 96 EFPM.
- The third and subsequent inspection periods would be revised from 60 to 72 EFPM.

The licensee characterizes these changes as marginal increases for consistency with typical fuel cycle lengths that better accommodate the scheduling of inspections. The NRC staff notes that plants with alloy 600 TT SG tubes typically inspect at 18- or 36-month intervals (one or two fuel cycles, respectively) depending on whether stress corrosion crack activity was observed during the most recent inspection. With these intervals, the last scheduled inspection during the first inspection period would occur at 108 months after the first refueling outage following SG installation. This is 12 months before the end of the first 120-EFPM inspection period. However, with the proposed changes to the length of the second and subsequent inspection periods, the NRC staff finds that the last scheduled inspections in the second and subsequent inspection periods will coincide exactly with the end of these periods.

The proposed changes would generally increase the number of inspections in each of the second and subsequent inspection periods by up to one additional inspection. This could reduce the required average minimum sample size during these periods. However, inspection sample sizes will continue to be subject to TS 5.5.9.d which states that in addition to meeting the requirements of TSs 5.5.9.d.1, d.2, and d.3, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure SG tube integrity is maintained until the next scheduled inspection. Therefore, the NRC staff concludes that with the proposed changes to the length of the second and subsequent inspection periods, compliance with the SG program requirements in TS 5.5.9 will continue to ensure both adequate inspection scopes and tube integrity.

For each inspection period, TS 5.5.9.d.2 currently requires that at least 50 percent of the tubes be inspected by the refueling outage nearest to the mid-point of the inspection period and the remaining 50 percent by the refueling outage nearest the end of the inspection period. The NRC staff notes that if there are not an equal number of inspections in the first half and second half of the inspection period, the average minimum sampling requirement may be markedly different for inspections in the first half of the inspection period compared to those in the second half, even when there are uniform intervals between each inspection. For example, a plant in the first (120-EFPM) inspection period with a scheduled 36-month interval (two fuel cycles) between each inspection would currently be required to inspect 50 percent of the tubes by the refueling outage nearest the midpoint of the inspection which would be the third refueling outage in the period, six months before the mid-point. However, since no inspection is scheduled for that outage, then the full 50-percent sample must be performed during the inspection scheduled for the second refueling outage in the period. Two inspections would be scheduled to occur in the second half of the inspection period, at 72 and 108 months into the inspection period. Thus, the current sampling requirement could be satisfied by performing a 25-percent sample during each of these inspections or other combinations of sampling (e.g., 10 percent during one and 40 percent in the other) totaling 50 percent.

The NRC staff finds there is no basis to require the minimum initial sample size to vary so much from inspection to inspection. The licensee proposes to revise this requirement such that the minimum sample size for a given inspection in a given inspection period is 100 percent divided by the number of scheduled inspections during that inspection period. For the above example, the proposed change would result in a uniform initial minimum sample size of 33.3 percent for

each of the three scheduled inspections during the inspection period. The NRC staff concludes this proposed revision to be an improvement to the existing requirement since it provides a more consistent minimum initial sampling requirement.

The proposed changes to TS 5.5.9.d.2 include two new sentences addressing the prorating of required tube sample sizes if a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube repair criteria. These new sentences are identical to those proposed for alloy 690 TT tubing (see Section 3.6.2 above). The NRC staff concludes these new sentences to be acceptable for the same reasons given in Section 3.6.2 for alloy 690 TT tubes.

Finally, the first sentence of the proposed revision to TS 5.5.9.d.2, which states, "after the first refueling outage following SG installation, inspect each SG at least every 48 effective full power months or at least every third refueling outage (whichever results in more frequent inspections)," replaces the last sentence of the current TS 5.5.9.d.2, which states, "No SG shall operate for more than 48 effective full power months or two refueling outages (whichever is less) without being inspected." This sentence establishes the minimum allowable SG inspection frequency as at least every 48 EFPM or at least every other refueling outage (whichever results in more frequent inspections). This minimum inspection frequency is unchanged from the current sentence. The NRC staff finds that the wording changes in the sentence are of an editorial and clarifying nature and are not material, such that the current intent of the requirement is unchanged. Thus, the NRC staff concludes the first sentence of proposed TS 5.5.9.d.2 is acceptable.

### 3.7 TS 5.5.9.d.3 changes

The first paragraph of TS 5.5.9.d.3 currently states:

For Unit 1, if crack indications are found in any SG tube, then the next inspection for each SG for the degradation mechanism that caused the crack indication shall not exceed 24 effective full power months or one refueling outage (whichever is less). For Unit 2, if crack indications are found in any SG tube from 14.01 inches below the top of the tubesheet on the hot leg side to 14.01 inches below the top of the tubesheet on the cold leg side, then the next inspection for each SG for the degradation mechanism that caused the crack indication shall not exceed 24 effective full power months or one refueling outage (whichever is less).

Proposed Changes: TS 5.5.9.d.3 will be renumbered as TS 5.5.9.d.4 and the first paragraph will be revised as follows (changes are underlined):

For Unit 1, if crack indications are found in any SG tube, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall not exceed 24 effective full-power months or one refueling outage (whichever results in more frequent inspections). For Unit 2, if crack indications are found in any SG tube from 14.01 inches below the top of the tubesheet on the hot leg side to 14.01 inches below the top of the tubesheet on the cold leg side, then the next inspection for each affected and potentially affected SG for the degradation mechanism

that caused the crack indication shall not exceed 24 effective full power months or one refueling outage (whichever results in more frequent inspections).

The proposed change is replacing the words "for each SG" with words "for each affected and potentially affected SG." The licensee states that the existing wording can be misinterpreted. The licensee further states that the intent is that those SGs that are affected and those SGs that are potentially affected must be inspected for the degradation mechanism that caused the crack indication. However, some licensees have questioned whether the current reference to "each SG" requires only the SGs that are affected to be inspected for the degradation mechanism. The proposed revision is intended to clarify the intent of the requirement.

Assessment: Proposed changes in TS 5.5.9.d.3 (renumbered as TS 5.5.9.d.4) permits SG inspection intervals to extend over multiple fuel cycles for SGs with alloy 600 TT and 690 TT tubing, assuming that such intervals can be implemented while ensuring tube integrity is maintained in accordance with TS 5.5.9.d. However, stress corrosion cracks may not become detectable by inspection until the crack depth approaches the tube repair limit. In addition, stress corrosion cracks may exhibit high growth rates. For these reasons, once cracks have been found in any SG tube, TS 5.5.9.d.4 restricts the allowable interval to the next scheduled inspection to 24 EFPM or one refueling outage (whichever is less). The intent of this requirement is that it applies to the affected SG and to any other SG which may be potentially affected by the degradation mechanism that caused the known cracks. For example, a root cause analysis in response to the initial finding of one or more cracks might reveal that the cracks are associated with a manufacturing anomaly which causes locally high residual stress which in turn caused the early initiation of cracks at the affected locations. If it can be established that the extent of condition of the manufacturing anomaly applies only to one SG and not the others, then the NRC staff agrees that only the affected SG needs to be inspected within 24 EFPM or one refueling cycle in accordance with TS 5.5.9.d.4. The next scheduled inspections of the other SGs will continue to be subject to all other provisions of TS 5.5.9.d. The NRC staff finds the proposed change to TS 5.5.9.d.4 acceptable because it clarifies the intent.

(Note: The licensee's amendment contains certain marked up changes for TS 5.5.9.d, which according to the licensee, reflect licensee's proposed changes specified in a separate amendment concerning the H\* Permanent Alternate Repair Criteria. These specific changes are not reviewed or approved in this amendment.)

### 3.8 TS 5.6.9, "Steam Generator Tube Inspection Report"

TS 5.6.9 currently lists items a. through l. to be included in a report which shall be submitted within 180 days after the average reactor coolant temperature exceeds 200 °F following completion of an inspection performed in accordance with the TS 5.5.9, "Steam Generator (SG) Program."

Proposed Change: Item b. currently reads: "Active degradation mechanisms found," to be revised to read: "Degradation mechanisms found,"

Item e. currently reads: "Number of tubes plugged during the inspection outage for each active degradation mechanism," to be revised to read: "Number of tubes plugged during the inspection outage for each degradation mechanism."



Item f. currently reads, "Total number and percentage of tubes plugged to date," to be revised to read: "The number and percentage of tubes plugged to date, and the effective plugging percentage in each steam generator."

Item h. for Braidwood currently reads: "The effective plugging percentage for all plugging and tube repairs in each SG," which will be deleted.

Item h. for Byron currently reads: "The effective plugging percentage for all plugging and tube repairs in each SG, and," which will be deleted.

Assessment: This proposal would delete the word "active" in items b. and e. above. Thus, all degradation mechanisms found, whether deemed to be active or not, would now be reportable. The NRC staff finds the proposed change acceptable. The proposal to combine items f. and h. are editorial changes that do not materially change the reporting requirements. The NRC staff finds this change acceptable.

### 3.9 Optional Changes and Variations from TSTF-510

The licensee has proposed a number of changes and variations that are not part of TSTF-510, but are plant-specific and administrative in nature, and do not affect the conclusions of the TSTF-510 safety evaluation previously performed by the NRC staff. These changes are discussed below.

#### 3.9.1 ABB Combustion Engineering, Inc. (Westinghouse) Tungsten Inert Gas (TIG) Welded Sleeves

- a. TSs 5.5.9.c.2, 5.5.9.c.3, and 5.5.9.f provide provisions for implementing Westinghouse TIG welded sleeves, which are currently approved as an alternate repair for SG tubes at Byron Unit No. 2 and Braidwood Unit 2 only.

Proposed change: The licensee proposed in its application to revise the existing requirements of TS 5.5.9.c by deleting TSs 5.5.9.c.2, 5.5.9.c.3, and 5.5.9.f. Currently, there are no Westinghouse TIG welded sleeves installed in either Braidwood Unit 2 or Byron Unit No. 2 SGs. Additionally, the licensee has been informed by the sleeve vendor (Westinghouse) that TIG welded sleeves are no longer commercially available. As a result of the commercial non-availability of the TIG welded sleeves, and the absence of any installed TIG welded sleeves in the SGs at Braidwood Unit 2, or Byron Unit No. 2, the licensee proposes to delete TSs 5.5.9.c.2, 5.5.9.c.3, and 5.5.9.f.

Assessment: Per the licensee's supplement letter, dated, December 3, 2012 (ADAMS Accession No. ML123380149), this variation from TSTF-510 has already been addressed (documented as Reference 2 in the letter), therefore, the variation is no longer applicable to the TSTF-510 license amendment. The NRC staff concurs.

- b. TS 5.6.9.i requires the licensee to include in the SG tube inspection report, the repair method utilized and the number of tubes repaired by each repair method

Proposed change: The licensee is proposing to revise the existing requirements of TS 5.6.9 by deleting the reporting requirement in TS 5.6.9.i.

Assessment: Based on removing the TIG welded sleeves as an approved alternate repair criteria in TS 5.5.9.c.2, 5.5.9.c.3, and 5.5.9.f, and the absence of any installed TIG welded sleeves in the Braidwood Unit 2 or Byron Unit No. 2 SGs, the NRC staff finds the proposed change acceptable.

### 3.9.2 Implementation of TSTF-510

As a result of implementing TSTF-510, the licensee has proposed to implement a change to the length of the third inspection period for Braidwood Unit 2 and Byron Unit No. 2 during the current period, thereby increasing the current period duration from 60 EFPM to 72 EFPM. As a result of this change, SG inspections performed under the current sampling requirements do not meet the minimum sampling requirements of the proposed TS 5.5.9.d.2. The proposed minimum inspection sample for the third inspection period is 33 percent for Byron Unit No. 2 and Braidwood Unit 2 as a result of three planned inspections within the four refueling outages period to meet the 100 percent inspection requirement for areas potentially susceptible to degradation that were inspected by the plus-point probe. The inspections that did not meet the proposed 33 percent minimum sample were sampled at 25 percent. The licensee has stated that they will sample the remaining population in future outages to complete 100 percent of the affected areas prior to the end of the third inspection period.

Both Byron Unit No.1 and Braidwood Unit 1 completed 100 percent inspection of tubes identified with existing and potential damage mechanisms during the first inspection period. The second and subsequent inspection periods will implement the proposed TSTF-510, Revision 2, inspection periods.

The licensee stated that they will implement the minimum sampling requirements and inspection periods in the subsequent inspection periods in accordance with the proposed TS 5.5.9.d.2.

Assessment: The NRC staff notes that the licensee is proposing to implement an increase in the current inspection period from 60 EFPM to 72 EFPM in accordance with the proposed guidelines given in TSTF-510 and the NRC finds this acceptable.

## 4.0 STATE CONSULTATION

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

## 5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. 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 (77 FR 31660; May 29, 2012). 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) 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: R. Grover  
A. Johnson

Date of Issuance: March 21, 2013

M. Pacilio

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A copy of the Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

**/ RA /**

Joel S. Wiebe, Senior Project Manager  
Plant Licensing Branch III-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-456, STN 50-457,  
STN 50-454 and STN 50-455

Enclosures:

1. Amendment No. 172 to NPF-72
2. Amendment No. 172 to NPF-77
3. Amendment No. 179 to NPF-37
4. Amendment No. 179 to NPF-66
5. Safety Evaluation

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RecordsAdmin Resource			

**Accession Nos: Amendment:ML13009A182, Package:ML13009A172**

**\*via memo dates 12/20/12**

OFFICE	LPL3-2/PM	LPL3-2/LA	DIRS/ITSB*	OGC NLO	LPL3-2/BC
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