

August 9, 2001

Mr. Oliver D. Kingsley, President
Exelon Nuclear
Exelon Generation Company, LLC
Executive Towers West III
1400 Opus Place, Suite 500
Downers Grove, IL 60515

SUBJECT: ISSUANCE OF AMENDMENTS - TECHNICAL SPECIFICATIONS CHANGES
TO REVISE STEAM GENERATOR INSPECTION FREQUENCY, BRAIDWOOD
STATION, UNITS 1 AND 2 (TAC NOS. MB1226 AND MB1227)

Dear Mr. Kingsley:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No. 117 to Facility Operating License No. NPF-72 and Amendment No. 117 to Facility Operating License No. NPF-77 for the Braidwood Station, Unit Nos. 1 and 2, respectively. The amendments are in response to your application dated February 9, 2001, as supplemented by your letters dated May 18, 2001, and June 26, 2001.

The amendment revises Braidwood Unit 1 Technical Specifications (TS), Section 5.5.9.d.2, "Steam Generator Tube Surveillance Program, Inspection Frequencies," for the Braidwood Station, Unit 1, fall 2001 refueling outage to allow a one-time 40 month inspection interval after its first (post replacement) inservice inspection resulting in a C-1 classification, rather than after two conservative inspections.

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/

Mahesh Chawla, Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-456 and STN 50-457

Enclosures: 1. Amendment No. 117 to NPF-72
2. Amendment No. 117 to NPF-77
3. Safety Evaluation

cc w/encls: See next page

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EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-456

BRAIDWOOD STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No.117
License No. NPF-72

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated February 9, 2001 as supplemented by letters dated May 18, 2001 and June 26, 2001, 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. 117 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.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: August 9, 2001

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-457

BRAIDWOOD STATION, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No.117
License No. NPF-77

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated February 9, 2001 as supplemented by letters dated May 18, 2001 and June 26, 2001, 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. 117 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.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: August 9, 2001

ATTACHMENT TO LICENSE AMENDMENT NOS. 117 AND 117

FACILITY OPERATING LICENSE NOS NPF-72 AND NPF-77

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

Replace the following page of the Appendix "A" Technical Specifications with the attached page. The revised page is identified by amendment number and contains vertical lines indicating the area of change. Page marked with an asterisk is provided for convenience.

Remove Pages

5.5-10

Insert Pages

5.5-10

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 117 TO FACILITY OPERATING LICENSE NO. NPF-72
AND AMENDMENT NO. 117 TO FACILITY OPERATING LICENSE NO. NPF-77
EXELON GENERATION COMPANY, LLC
BRAIDWOOD STATION, UNIT NOS. 1 AND 2
DOCKET NOS. STN 50-456 AND STN 50-457

1.0 INTRODUCTION

In a letter dated February 9, 2001, Exelon Corporation (the licensee), submitted a request for changes to the Braidwood, Unit No. 1, Technical Specifications (TS). The requested changes would revise TS 5.5.9.d.2, "Steam Generator Tube Surveillance Program." Specifically, the proposed changes would revise the TS for Braidwood Unit 1, fall 2001 refueling outage to allow a one-time 40 month inspection interval after its first (post replacement) inservice inspection resulting in a C-1 classification, rather than after two consecutive inspections.

During the review of the initial submittal, the staff had some questions and needed further clarifications. These were discussed with the licensee during a phone call held on April 24, 2001. The questions which needed a written response were sent as a request for additional information (RAI) on May 5, 2001. The licensee provided their response in a letter dated May 18, 2001. The staff had some more questions based on this response, and these were sent to the licensee via e-mail (ADAMS Accession No. ML011800124) on June 1, 2001. These additional questions were discussed with the licensee during a phone call on June 19, 2001. The licensee provided their written response to this RAI in their letter dated June 26, 2001. An additional phone call was held with the licensee on July 16, 2001, to get further clarification on the issue of stress corrosion cracking (SCC) at Braidwood. The May 18, 2001, and June 26, 2001, supplemental letters provided clarifying information that did not change the scope of the original Federal Register notice or the initial no significant hazards consideration determination.

The staff of the Materials and Chemical Engineering Branch has completed review of the information submitted by the licensee requesting approval of the TS amendments. The staff's evaluation is provided below.

2.0 BACKGROUND

Braidwood Station, Unit No. 1, replaced its steam generators (SGs) in November 1998 and currently uses four steam generators, manufactured by Babcock and Wilcox, International. These SGs have thermally treated (TT) Alloy 690 tubing that is hydraulically expanded along the full depth of the tube sheet. Since the replacement of the steam generators, the licensee

has performed an inservice inspection in the spring of 2000. Braidwood 1 is scheduled to have a refueling outage in the fall of 2001.

The current TS requires Unit 1 to have two consecutive inspections resulting in C-1 category before extending its inspection interval to the maximum interval allowed by TS of once per 40 months. The TS currently states: "Extension Criteria: If two consecutive inspections, not including the preservice inspection, result in all inspection results falling into the C-1 category or if two consecutive inspections demonstrate that previously observed degradation has not continued and no additional degradation has occurred, the inspection interval may be extended to a maximum of once per 40 months."

The licensee proposed to change its TS and to go to the extended inspection interval after the first post-replacement inspection which was performed in spring 2000. The licensee proposed to add the following to its TS: "An exception to this Extension Criteria is that for Braidwood Unit 1 a one-time inspection interval extension of a maximum of once per 40 months is allowed for the inspection performed immediately following the A1R08 inspection. This is an exception to the Extension Criteria in that the inspection interval extension is based on the result of only one inspection result falling into the C-1 category."

If this proposal is accepted, the licensee would reduce its radiation dose by approximately 18 man-rem, save one day of critical path, and save the cost of the SG inspection.

3.0 EVALUATION

3.1 Steam Generator Design Improvements - BWC Replacement SGs

The replacement steam generators (SGs) incorporate a number of design and material changes when compared to the original steam generators.

The previous steam generator tubes are made of mill annealed Alloy 600. Use of this material contributed, in part, to significant steam generator tube degradation. These steam generators were replaced by the licensee with new steam generators that use thermally-treated Alloy 690 tubing material. Alloy 690 is more resistant to intergranular attack (IGA) and stress-corrosion cracking (SCC) than Alloy 600. Containing 13 percent more chromium, Alloy 690 reduces the degree of sensitization, thus increasing resistance to corrosion attack. Extensive testing has been performed which demonstrated that thermally treated Alloy 690 tubing is superior to mill annealed Alloy 600 tubing in its resistance to both primary and secondary system SCC, pitting, and general corrosion.

Many design improvements were incorporated in the replacement SGs as discussed below.

- Full depth hydraulic expansion of the tubes in tubesheet. This design minimizes sludge deposits and maintains contaminants in suspension.
- Redesign of feed water inlet. The new "goose neck" design will eliminate water hammer and minimize thermal stratification of the feed nozzle.

- Floating Fan Bar (FFB). This design will replace the old antivibration bar (AVB) design. Operating experience at units with FFB configuration shows that it significantly minimized wear and wear related degradation.
- Alloy 690 TT tubes with over 15:1 signal to noise (S/N) ratio. The increase in S/N ratio allows for more reliable non-destructive examination (NDE) Eddy Current inspection.
- The overall design incorporated erosion/corrosion resistant materials in many components.
- Lattice grid assembly instead of support plate. This type of assembly is more open to water flow, more flexible, less prone to cruding, and it reduces pressure drop.
- All-welded separator assembly to eliminate loose parts risk.

Additional stress relief was performed on all U-bends up to a 12-inch center line radius for Braidwood Unit 1 replacement SGs. The smallest centerline radius is 3.6 inches as compared to 2.25 inches in the original SGs. The larger radius and additional stress relief reduce residual stress and minimize the potential for degradation in the low row U-bend region.

Specific design efforts have been taken to minimize corrosion potential of small thickness metal parts and to incorporate mechanisms for capturing or eliminating fasteners. Thus, the potential for any loose parts is significantly minimized.

3.2 Industry Experience Regarding Replacement BWC SGs and Performance of Alloy 690 TT

The licensee performed a review of plants with SGs containing Alloy 690 TT tubing. These plants have more operating time (i.e., effective full power years) than Braidwood Unit 1 and have not experienced any degradation other than mechanical wear. Review of the wear data from the same BWI replacement SG design showed minor wear (i.e., < 20 percent through-wall) has been detected from a small number of tubes in some units. For wear indications obtained from multiple outage inspections, the growth rate has been about 6 percent per cycle. This information provides reasonable assurance that wear indications will not become structurally significant over the proposed cycle of operation.

Byron Unit 1, also operated by Exelon, replaced its SGs with essentially identical BWI SGs in 1997 and thus has more years of operating experience. No defective or degraded tubes were identified during the first or second ISI inspection after the SG replacement.

The licensee also reviewed operating experience of its Braidwood Unit 2 SGs, of Westinghouse Model D-5 containing Alloy 600 TT tubing, operating under essentially the same conditions as the Unit 1 SGs. This review revealed that no IGA or SCC had been detected within the first 60 effective full-power months (EFPMs) of operation. With the design improvements aforementioned, Unit 1 SGs are expected to perform better than Unit 2 SGs, and thus is unlikely to develop IGA or SCC over the time frame of the first 60 EFPMs.

3.3 Results from the First Inservice Inspection after the Steam Generator Replacement Outage (A1R08)

The licensee stated that during the spring 2000 refueling outage (A1R08), following the first cycle of operation since the steam generator replacement, 100 percent of the tubing was inspected full-length with eddy current testing and showed no defective or degraded tubes and no evidence of loose parts.

The staff reviewed the licensee's A1R08 inspection summary report. The report showed that there were only seven indication calls in the full scope of the eddy current inspection. All calls were re-inspected by plus-point probe testing. Further analysis confirmed only one indication of wear, which was less than 10 percent through-wall, and the rest of the indications were not confirmed. The tube with minor wear indication was subsequently plugged on a conservative basis.

A condition monitoring assessment was performed after the completion of the A1R08 inspection to evaluate SG tubes based on inspection results. It showed that all performance criteria had been met based on full length bobbin inspection of all of the tubes in all four SGs. The staff agrees with this assessment.

4.0 SUMMARY

The above evaluation shows that the safety performance has been significantly improved in the replacement SGs after the incorporation of material changes and design changes. Industry operating experience revealed that no significant material degradation has occurred in this type of replacement SG except minor wear. With the addition of Braidwood Unit 1's operating experience based on the first inservice inspection (ISI), its condition monitoring assessment, and operating experience with similar steam generators, Braidwood Unit 1 SG operation is justified for another cycle without another consecutive inspection. Based on the staff's review and evaluation of Braidwood Unit 1's proposed TS changes, the staff has determined that the proposed TS changes are acceptable and approves the proposed amendments of the Braidwood Unit 1 TS.

5.0 STATE CONSULTATION

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

6.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. 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 (66 FR 22030). 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.

7.0 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 Contributor: Z. Bart Fu

Date: August 9, 2001