



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

September 17, 2010

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

SUBJECT: BRAIDWOOD STATION, UNIT 2 - REVIEW OF THE 2009 STEAM  
GENERATOR TUBE INSERVICE INSPECTION REPORT (TAC NO. ME3372)

Dear Mr. Pacilio:

By letter to the Nuclear Regulatory Commission (NRC) dated January 27, 2010 (Agencywide Documents Access and Management System Accession No. ML100350212), Exelon Generation Company, LLC (the licensee), submitted information pertaining to the 2009 steam generator tube inspections at Braidwood Station, Unit 2, in accordance with the station's technical specifications (TSs). In addition, the licensee provided some clarifying information concerning the 2009 inspections on June 25, 2010. This was the 14th refueling outage for Braidwood Station, Unit 2.

The NRC staff has completed its review of the report and concludes that the licensee has provided the information required by the station's TSs, and that no additional follow-up is required at this time. A copy of the NRC staff's evaluation is enclosed.

Sincerely,

A handwritten signature in black ink, appearing to read "Marshall J. David", written in a cursive style.

Marshall J. David, Senior Project Manager  
Plant Licensing Branch III-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. STN 50-457

Enclosure:  
Review of the 2009 Steam Generator Tube Inservice Inspections

cc w/encl: Distribution via ListServ

OFFICE OF NUCLEAR REACTOR REGULATION  
REVIEW OF THE 2009 STEAM GENERATOR TUBE  
INSERVICE INSPECTIONS  
BRAIDWOOD STATION, UNIT 2  
DOCKET NO. 50-457

By letter dated January 27, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML100350212), Exelon Generation Company, LLC (the licensee) submitted information summarizing the results of the 2009 steam generator (SG) tube inspections at Braidwood Station, Unit 2. These inspections were performed during the fourteenth refueling outage (A2R14). In addition, the licensee provided some clarifying information concerning the 2009 inspections on June 25, 2010.

Braidwood Station Unit 2 has four Westinghouse Model D5 SGs. There are 4570 thermally-treated Alloy 600 tubes in each SG, with an outside diameter of 0.750 inches and a nominal wall thickness of 0.043 inches. The tubes are hydraulically-expanded for the full depth of the tubesheet at each end and are welded to the tubesheet at the bottom of each expansion. The tubes are supported by a number of Type 405 stainless steel supports with quatrefoil shaped holes.

The licensee provided the scope, extent, methods, and results of their SG tube inspections in the documents referenced above. In addition, the licensee described corrective actions, such as tube plugging, taken in response to the inspection findings. The tubes in all four SGs were inspected during this refueling outage.

After reviewing the information provided by the licensee, the NRC staff has the following comments/observations:

1. The modes of tube degradation found during A2R14 were anti-vibration bar wear, pre-heater tube support plate wear, and secondary side foreign object wear. No indications of cracking were identified during these inspections.
2. The licensee performed visual inspections of the secondary side moisture separator region in SGs 2B and 2C during A2R14. This was a follow-up inspection of SGs 2B and 2C based on erosion of the moisture separator tangential nozzles, downcomer barrels, and swirl vanes being identified during A2R13 (2008). Ultrasonic thickness (UT) measurements were taken of the eroded areas, with an emphasis on re-inspection of the eroded areas identified in SGs 2B and 2C during the A2R13 inspection. While continued erosion of components in SGs 2B and 2C was identified, no indications of through-wall erosion were identified. The bounding wear measurement in the 2B SG showed a maximum wall loss of 47 percent, and the bounding wear measurement in the 2C SG showed a maximum wall loss of 38 percent, as compared to the original manufacturing nominal value. An analysis was performed by the licensee that determined that significant margin remained in the eroded areas before the erosion would penetrate

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through-wall and affect SG performance or possibly generate loose parts. The erosion was not projected to penetrate through-wall, create loose parts, or impact SG performance over the next operating cycle. Monitoring of the condition is planned over subsequent operating cycles in order to develop a degradation growth rate and take corrective actions if they become necessary.

3. On June 25, 2010, the licensee provided clarifying information concerning their 2009 SG inspections. The licensee stated that each time the Braidwood, Unit 2, SG steam drum regions are inspected, it is visually notable that the magnetite layer that covers all the internal surfaces is not uniform and significantly changes cycle to cycle. The locations where UT measurements are being taken typically have some level of magnetite layer on both the inboard and outboard surfaces of the component. While some small amount of magnetite is removed to properly couple the UT transducer, the inaccessible surface of the component is unable to be cleaned prior to inspection. The UT thickness reading has been shown to vary depending on the thickness and density of the magnetite layer. Additionally, since the surfaces being inspected are internal to the SG, it is not possible to physically mark the exact location of each UT reading with the marking remaining visible the next cycle. Knowing that there is variance in the thickness readings outage-to-outage, average thickness readings over similar components are used to trend degradation rates. The thickness readings referenced in the current January 27, 2010, submittal and in the November 11, 2008, "Braidwood Station, Unit 2 Thirteenth Refueling Outage Steam Generator Tube Inspection Report" (ADAMS Accession No. ML083220444) submittal are the minimum UT thickness readings observed each outage. As a result, there are variations in the maximum wall loss readings from outage-to-outage (because the exact locations may not be monitored from outage-to-outage and the magnetite layer thickness varies from outage-to-outage.)
4. On June 25, 2010, the licensee clarified that the 2D SG waterbox cap plate was visually inspected during the A2R14 refueling outage. The 2D SG waterbox cap plate showed no missing components, and no appreciable changes in the amount of erosion of the cap plate flow hole openings were observed between the previous inspection (A2R11 in April 2005) and the A2R14 inspection of the waterbox cap plate.

Based on a review of the information provided by the licensee, the staff concludes that the licensee provided the information required by their technical specifications. The SG tube inspections at Braidwood Station, Unit 2, appear to be consistent with the objective of detecting potential tube degradation and the inspection results appear to be consistent with industry operating experience at similarly designed and operated units.

Principal Contributor: T. Morgan

