

RS-10-203  
December 6, 2010

10 CFR 50.55a

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Braidwood Station, Units 1 and 2  
Facility Operating License Nos. NPF-72 and NPF-77  
NRC Docket Nos. STN-50-456 and STN 50-457

Byron Station, Units 1 and 2  
Facility Operating License Nos. NPF-37 and NPF-66  
NRC Docket Nos. STN 50-454 and STN 50-455

**Subject:** Response to Request for Additional Information Regarding Request for Relief from ASME Code Case N-729-1 Requirements for Examination of Reactor Vessel Head Penetration Welds

- References:**
1. Letter from P. R. Simpson (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "Request for Relief from ASME Code Case N-729-1 Requirements for Examination of Reactor Vessel Head Penetration Welds," dated March 12, 2010
  2. Letter from M. J. David (U. S. Nuclear Regulatory Commission) to M. J. Pacilio (Exelon Generation Company, LLC), "Braidwood Station, Units 1 and 2, and Byron Station, Unit Nos. 1 and 2 – Request For Additional Information Related to Request for Relief from ASME Code Case N-729-1 Requirements for Examination of Reactor Vessel Head Penetration Welds (TAC Nos. ME3510, ME3511, ME3512, and ME3513)," dated October 8, 2010
  3. Letter from S. J. Campbell (U. S. Nuclear Regulatory Commission) to C. G. Pardee (Exelon Generation Company, LLC), "Byron Station, Unit No. 2 – Relief Request I3R-16 for Reactor Pressure Vessel Head Penetration Examination Frequency (TAC NO. ME1066)," dated January 28, 2010

In Reference 1, Exelon Generation Company, LLC (EGC), requested relief for the third 10-year inservice inspection (ISI) interval at Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2. The relief request proposed an alternative to the requirements in 10 CFR 50.55a(g)(6)(ii)(D) for the ISI of the reactor pressure vessel upper head penetrations in accordance with American Society of Mechanical Engineers Boiler and Pressure Vessel Code Case N-729-1, "Alternative Examination Requirements for PWR Reactor Vessel Upper Heads With Nozzles Having Pressure-Retaining Partial-Penetration Welds," due to the physical configuration and limitations of the examination equipment associated with certain reactor head penetration nozzles.

In Reference 2, the NRC requested that EGC provide additional information in support of its review of Reference 1. In response to this request, the Attachment of this submittal provides the requested information.

EGC is correcting information provided in Tables 4 and 5 of Reference 1. Specifically, for Byron Station, Unit 2, the inspection coverage obtained for reactor vessel head control rod drive mechanism (CRDM) Penetration 68 (P68) was 0.84" based on the NRC Order EA-03-009 examinations. However, no alternative coverage is proposed for P68. EGC is no longer requesting relief for P68 as this penetration is subject to the relief authorized for Byron Station, Unit 2, on January 28, 2010 (Reference 3). This issue has been entered into EGC's corrective action program.

There are no regulatory commitments contained in this submittal. Should you have any questions concerning this letter, please contact Ms. Lisa A. Schofield at (630) 657-2815.

Respectfully,



Darin Benyak  
Director – Licensing  
Exelon Generation Company, LLC

Attachment: Response to Request for Additional Information

cc: NRC Regional Administrator, Region III  
NRC Senior Resident Inspector, Braidwood Station  
NRC Senior Resident Inspector, Byron Station  
NRC Project Manager, NRR – Braidwood and Byron Stations  
Illinois Emergency Management Agency - Division of Nuclear Safety

**ATTACHMENT 1**  
**Response to Request for Additional Information**

By letter to the Nuclear Regulatory Commission (NRC) dated March 12, 2010, Exelon Generation Company, LLC, (EGC) submitted a relief request for the third 10-year inservice inspection (ISI) interval at Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2. The relief request proposed an alternative to the requirements in 10 CFR 50.55a(g)(6)(ii)(D) for the ISI of the reactor pressure vessel upper head penetrations in accordance with American Society of Mechanical Engineers Boiler and Pressure Vessel Code Case N-729-1, "Alternative Examination Requirements for PWR Reactor Vessel Upper Heads With Nozzles Having Pressure-Retaining Partial-Penetration Welds," due to the physical configuration and limitations of the examination equipment associated with certain reactor head penetration nozzles.

In a letter dated October 8, 2010, the NRC requested that EGC provide additional information in support of its review of the March 12, 2010, relief request.

**NRC Request**

1. The NRC staff requests the licensee's basis for not performing a surface examination of the lower portion of each penetration nozzle necessary to meet the inspection requirements of 10 CFR 50.55a(g)(6)(ii)(D). As currently written, the NRC staff finds insufficient basis to grant relief under 10 CFR 50.55a(a)(3)(i), as surface examinations could be performed on each penetration nozzle to meet the current inspection requirements.

**Response**

Surface examinations were not proposed as part of the relief due to the configuration of the lower end of the Control Rod Drive Mechanism Nozzle (CRDM Nozzle) having a notch and threaded surfaces that do not lend themselves to efficient penetrant examination (PT) application and the resultant accumulated radiation dose to perform the examinations. Eddy current examination would similarly not be effective due to the notched and threaded configuration. As such, performance of surface exams will not result in an increase in safety or quality.

In NRC letter from S. J. Campbell to C. G. Pardee dated January 28, 2010, the NRC authorized the alternative EGC proposed in relief request I3R-16, submitted April 2, 2009, at Byron Unit 2 until the end of the third 10-year ISI interval or until additional indications of primary water stress corrosion cracking (PWSCC) are found in the Byron 2 reactor pressure vessel (RPV) head penetration nozzles or associated J-groove welds. Specifically, the January 28, 2010, relief authorized the proposed alternative to perform volumetric and/or surface examinations of all Byron Unit 2 penetrations as identified by Table 1 of ASME Code Case N-729-1 at a frequency of once every second refueling outage or four calendar years, whichever is less, except for Penetration 68 (P68), which will be volumetrically, surface, and visually examined each refueling outage.

In the spring 2010 Byron Unit 2 refueling outage (B2R15), the last performance of the surface examination for P68, radiological surveys showed dose rates beneath the head at P68 from a minimum of 2.3 Rem/hr at 3 feet to a maximum of 4.1 Rem/hr on contact. Additional survey information showed a maximum of 4.8 Rem/hr at the center of the head with smearable contamination levels of 200-240 mRad/hr/100 cm<sup>2</sup>. Based on the similar design and configuration of the Braidwood and Byron RPV heads, the dose rates are expected to be

**ATTACHMENT 1**  
**Response to Request for Additional Information**

comparable for all four units. These dose rates and contamination levels present a burden to performance of surface examinations.

Surface examination methods would be limited with the configuration of the nozzles. The dye penetrant method requires the examination surface to be clean and the excess penetrant to be adequately removed to perform an acceptable examination. The configuration has a threaded outside portion. Nozzles that contain thermal sleeves would have limited access to the inner examination surface as there is approximately 0.125" clearance between the thermal sleeve and the inner surface of the nozzle. Pre-examination cleaning and removal of the excess dye penetrant would be difficult on both of these surfaces. The length of time required to perform the cleaning and excess dye penetrant removal would result in a significant impact on accumulated personnel dose.

The surface examination on the repaired P68 is performed on a smooth surface without a threaded portion and the examination surface does not extend into the inside of the nozzle. This examination, with these advantages, has an average dose of 619 mRem per examination.

There are a total of 106 nozzles at Byron and Braidwood that require the supplemental surface examination to complete the coverage requirements. The two ISI intervals covered by Braidwood and Byron would require a total of 190 examinations.

Using the dose rate values from the P68 surface examination in spring 2010 as representative values and an average duration at the component of 15 minutes per examination, the accumulated dose beneath the head would range from 109.3 Rem at 3 feet to 194.8 Rem on contact with a maximum of 228.0 Rem using general area survey dose rates of 4.8 Rem/hr taken at the center of the head for these surface examinations to be completed.

Unit	No. of Nozzles Affected (1)	No. of Exams in Interval	Number of Nozzle Examinations	Low Value Dose Rate: 2.3 Rem/Hr	High Value Dose Rate: 4.1 Rem/Hr	Max Value General Area: 4.8 Rem/Hr
				Dose per Nozzle Examination (2): 0.575 Rem	Dose per Nozzle Examination (2): 1.025 Rem	Dose per Nozzle Examination (2): 1.2 Rem
Braidwood U1	31	2	62	35.65	63.55	74.40
Braidwood U2	19	2	38	21.85	38.95	45.60
Byron U1	22	1	22	12.65	22.55	26.40
Byron U2	34	2	68	39.10	69.70	81.60
<b>Total</b>	<b>106</b>	<b>-</b>	<b>190</b>	<b>109.25</b>	<b>194.75</b>	<b>228.00</b>

(1) Numbers requiring coverage relief.  
(2) Estimated time for each examination is 15 minutes.

The surface examination requirements would result in hardship (excessive personnel dose) and unusual difficulty due to the requirements of surface examinations in these high dose rate fields without a compensating increase in the level of quality and safety; therefore, relief is requested in accordance with 10 CFR 50.55a(a)(3)(ii).

**ATTACHMENT 1**  
**Response to Request for Additional Information**

**NRC Request**

2. The NRC staff notes that the time period of the licensee's basis, in Figure 12 and Section 5.1 of the relief request, 6 effective full power years (EFPY), may not bound the possible period of time between inspections, 8 calendar years or 2.25 reinspection years, whichever is less. In Figure 12, the licensee's flaw analysis for penetration nozzle number 68 on Byron Station, Unit No.1, shows that a flaw would take 6 EFPY to grow from the uninspected region of the nozzle to the toe of the J-groove weld. As well, in Section 5.1 of the relief request, the licensee states, in part, "Figures 7 through 12 below demonstrate that obtaining at least 0.55" below the J-groove weld is sufficient to allow for a minimum of six effective full power years (EFPY) or four 18-month cycles between examinations." The NRC staff notes that under Item No. B4.20 of Table 1 of ASME Code Case N-729-1, the Extent and Frequency of Examinations reads, in part, "All nozzles, every 8 calendar years or before RIY=2.25, whichever is less." Therefore, the NRC staff requests additional information or clarification to support this difference in time between required inspection frequency and the licensee's basis for continued operation with a reduced inspection area.

**Response**

The word **minimum** as written in Section 5.1 should have been a **maximum**. There is no intention of exceeding the four 18-month cycles which would have been acceptable per Figure 12.

With this change, the statement in Section 5.1 of the relief request dated March 12, 2010, is revised to state, in part, as follows:

Figures 7 through 12 below demonstrate that obtaining at least 0.55" below the J-groove weld is sufficient to allow for a maximum of six effective full power years (EFPY) or four 18-month cycles between examinations.