

September 25, 2007

Mr. Christopher M. Crane
President and Chief Nuclear Officer
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BYRON STATION, UNIT NOS. 1 AND 2 - EVALUATION OF PROPOSED
RISK-INFORMED REQUEST FOR AN INSERVICE INSPECTION PROGRAM
FOR THE THIRD 10-YEAR INSERVICE INSPECTION INTERVAL
(TAC NOS. MD3855 AND MD3856)

Dear Mr. Crane:

By letter dated February 14, 2006, as supplemented by letters dated April 3, 2007, and September 7, 2007, Exelon Generation Company, LLC, submitted (RR) I3R-02 which requested authorization to extend the risk-informed inservice inspection (RI-ISI) program plan for Byron Station, Unit Nos. 1 and 2 (Byron) to the third 10-year inservice inspection interval.

Based on the enclosed safety evaluation, the NRC staff concludes that the proposed alternative provides an acceptable level of quality and safety. Therefore, pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.55a(a)(3)(i), the NRC staff authorizes the proposed alternative in RR I3R-02 to extend the RI-ISI program plan for Byron to the third 10-year interval. The relief is authorized for the third 10-year ISI, which ends on January 15, 2016.

If you have any question, please contact Mr. Robert Kuntz (301) 415-3733.

Sincerely,

/RA/

Russell Gibbs, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. STN 50-454 and STN 50-455

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RISK-INFORMED INSERVICE INSPECTION PROGRAM

RELIEF REQUEST I3R-02, REVISION 0

EXELON GENERATION COMPANY, LLC

BYRON STATION, UNIT NOS. 1 AND 2

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

1.0 INTRODUCTION

By letter to the Nuclear Regulatory Commission (NRC) dated February 14, 2006 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML063530333), as supplemented by letter dated April 3, 2007 (ADAMS Accession No. ML070940193), and September 7, 2007 (ADAMS Accession No. ML072530024), Exelon Generation Company, LLC (Exelon, the licensee) submitted a request to extend the risk-informed inservice inspection (RI-ISI) program plan for the Byron Station, Unit Nos. 1 and 2 (Byron) to the third 10-year ISI interval.

The Byron RI-ISI program was initially submitted to the NRC staff in a letter dated November 17, 2000 (ADAMS Accession No. ML003770411). The Byron RI-ISI program was reviewed and approved by the NRC for use in the second 10-year ISI interval in a letter dated February 5, 2002 (ADAMS Accession No. ML020030027).

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a(g) specifies that the ISI of nuclear power plant components shall be performed in accordance with the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i) or alternatives are authorized pursuant to 10 CFR 50.55a(a)(3). Section 50.55a(a)(3) of 10 CFR states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC if: (i) the proposed alternatives would provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The licensee's second interval RI-ISI program was developed in accordance with the methodology contained in the Electric Power Research Institute's (EPRI's) report EPRI TR-112657, Rev. B-A which was reviewed and approved by the NRC staff. The Byron RI-ISI program is an alternative pursuant to 10 CFR 50.55a(a)(3)(i).

ENCLOSURE

In Relief Request (RR) I3R-02, Revision 0, the licensee requests NRC authorization to utilize the same RI-ISI program previously approved for use in the second 10-year ISI interval, for use in the third 10-year ISI interval at Byron. The scope of the RI-ISI program is limited to the inspection of ASME Code Class 1 and 2 piping (Categories B-F, B-J, C-F-A, and C-F-2 welds).

3.0 TECHNICAL EVALUATION

The licensee is requesting relief to use the proposed RI-ISI program plan in the third 10-year ISI interval instead of the ASME Code, Section XI program. An acceptable RI-ISI program plan is expected to meet the five key principles discussed in Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," (Revision 1, November 2002), RG 1.178 "An Approach for Plant-Specific Risk-Informed Decision Making: Inservice Inspection of Piping," (Revision 1, September 2003), NUREG 0800 "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" Section 3.9.8 "Standard Review Plan for Trial Use for the Review of Risk-Informed Inservice Inspection of Piping," (Revision 1, September 2003) and EPRI TR-112657 (December 1999), as stated below.

1. The proposed change meets the current regulations unless it is explicitly related to the request for alternatives under 10 CFR 50.55a(a)(3) or a requested exemption or rule change, i.e., a "specific exemption" under 10 CFR 50.12 or a "petition for rulemaking" under 10 CFR 2.802.
2. The proposed change is consistent with the defense-in-depth philosophy.
3. The proposed change maintains sufficient safety margins.
4. When proposed changes result in an increase in core damage frequency or risk, the increases should be small and consistent with the intent of the Commission's Safety Goal Policy Statement.
5. The impact of the proposed change should be monitored by using performance measurement strategies.

The first principle is met in this RR because an alternative ISI program may be authorized pursuant to 10 CFR 50.55a(a)(3)(i). The second and third principles require assurance that the alternative program is consistent with the defense-in-depth philosophy and that sufficient safety margins are maintained, respectively. Assurance that the second and third principles are met is based on the application of the approved methodology and not on the particular inspection locations selected. The licensee's February 14, 2006, submittal states that the methodology used to develop the third 10-year RI-ISI interval program is unchanged from the methodology approved for use in the second 10-year RI-ISI interval program and, therefore, the second and third principles are met.

The fourth principle requires an estimate of the change in risk between the proposed risk-informed program and the program the licensee would otherwise be required to implement. In the April 3, 2007, letter, the licensee stated that the change in risk calculation was based on the difference between the ASME Code, Section XI program for the second interval and the

risk-informed program proposed for the third interval. The licensee's Code of Record for the second interval when relief was requested was the 1989 Edition of the ASME Code. The licensee stated in the February 14, 2006, that Byron's current Code of Record is the ASME Code, Section XI 2001 Edition, up through and including 2003 Addenda.

An acceptable level of quality and safety in RI-ISI programs is achieved primarily by directing inspections to the most risk significant locations. The estimates of the change in core damage frequency (CDF) and large early release frequency (LERF) are calculated in the final phase of the RI-ISI methodology, and are intended only to provide additional assurance that aggregate changes in risk will be acceptable. Because of this limited reliance on the change in risk calculations for determining the acceptability of RI-ISI programs, the needed accuracy of the change in risk calculations does not warrant developing a new ASME program for the new code of record to be used solely as a new baseline and then discarded. Therefore, the staff finds that the change of risk estimate between the RI-ISI program proposed for the third interval and the ASME program based on the code of record from the second interval is appropriate and acceptable.

As discussed in RG 1.178, an acceptable change in risk evaluation (and risk-ranking evaluation used to identify the most risk significant locations) requires the use of a probabilistic risk assessment (PRA) of appropriate technical quality that models the as-built and as-operated and maintained plant. In the April 3, 2007, letter, the licensee stated that Byron PRA version 5B from April 2004 was used as a basis for the risk-informed evaluations for the proposed program. This PRA estimates the CDF as $6.1E-5/\text{year}$ and the LERF as $5.5E-6/\text{year}$. RG 1.174 identifies a peer review of the PRA as one approach a licensee can use to assess technical acceptability of a PRA. In the April 3, 2007, letter, the licensee reported that the Byron PRA underwent a Westinghouse Owners Group peer review certification in July of 2000. This peer review identified 15 B level facts and observations (i.e., observations that are necessary to eventually address but that may be deferred until necessary to support a specific risk informed application). The April 3, 2007, letter, briefly discusses each of the seven level B observations that have not yet been resolved and explained why their resolution would not likely impact the evaluations done to support RI-ISI. The April 3, 2007, letter, also reports that the PRA maintenance at Byron Station is done in accordance with the Exelon procedure "FPIE PRA Model Update," ER-AA-600-1015. This procedure specifically provides a process to evaluate design changes, plant procedure changes, and calculation revisions that may impact PRA modeling assumptions or results and directs that such changes are tracked and, as needed, incorporated into the PRA.

In the April 3, 2007, letter, the licensee reported the estimated total change in risk associated with implementing the proposed RI-ISI program in the third interval instead of the ASME Code, Section XI program is developed for use in the second interval. These estimates are provided in the table below and are well below the acceptance guidelines in EPRI TR-112657 of $1E-6/\text{year}$ and $1E-7/\text{year}$ for increases in CDF and LERF respectively. The licensee further stated that system level changes in risk were estimated and were all below the acceptance guidelines in EPRI-TR-112657. Therefore, the NRC staff finds that the fourth principle of risk informed decisionmaking is met because Byron has, and uses, an acceptable process to evaluate the technical adequacy of the PRA and assure that the PRA adequately reflects changes to the plant, and because the resulting estimate risk increases are all below the acceptance guidelines.

Byron	Estimated change in CDF	Estimated change in LERF
Unit No. 1	9.21E-8/year	1.45E-9/year
Unit No. 2	5.78E-8/year	-3.53E-10/year

The fifth key principle is that the impact of the proposed change should be monitored by using performance measurement strategies. An ISI program is, itself, a monitoring program and the fifth key principle is accomplished in RI-ISI through the implementation of a living RI-ISI program. In addition to the PRA update process discussed above, the licensee notes in the February 14, 2006, letter, that consequence evaluation, degradation mechanism assessment, risk ranking, and element selection steps encompass the complete living program process applied under the Byron RI-ISI program. In the April 3, 2007, letter, the licensee noted that the number of inspection locations increased for each unit and the total including both Unit Nos. 1 and Unit 2 locations increased from 529 in 2002 to 650 in the proposed program. The licensee identified the following reasons for changes between the two RI-ISI programs:

- 1) Changes in selection due to limited access to the examination surface,
- 2) Changes in weld selection due to reclassification into different RI-ISI categories,
- 3) Changes due to reassessment of degradation mechanism, and
- 4) Changes caused by expansion in the scope of the piping that should be subject to inservice inspection under the ASME Code, Section XI 2001 Edition, up through and including 2003 Addenda (Changes to ASME Code exemption criteria).

The changes in the RI-ISI program reported by the licensee are consistent with the type of changes that the approved living program would be expected to identify and therefore the NRC staff concludes that the licensee has demonstrated that it has implemented a living RI-ISI program and that the fifth key principle is met.

Due to recent ongoing issues related to degradation due to primary water stress corrosion cracking in components that contain alloy 600/82/182, the staff requested additional information related to welds containing alloy 82/182. In the September 7, 2007, letter, the licensee responded that it will perform the visual and volumetric examinations in accordance with the industry Electric Power Research Institute Materials Reliability Program (MRP) guidance contained in "Primary System Piping Butt Weld Inspection and Evaluation Guideline (MRP-139)" (Reference 10), throughout the inspection interval as an augmented examination program for dissimilar metal welds.

Based on the above discussion, the NRC staff finds that the five key principles of RI decision making are ensured by the licensee's proposed third 10-year RI-ISI interval program plan and, therefore, the proposed program for the third 10-year ISI inspection interval is acceptable.

3.0 CONCLUSION

Based on the information provided in the licensee's submittals, the NRC staff has determined that the proposed alternative provides an acceptable level of quality and safety. Therefore, it is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI interval, which ends on January 15, 2016 at Byron.

4.0 REFERENCES

1. Letter from David Hoots (Exelon Generation Company) to U.S. Nuclear Regulatory Commission, "Byron Station, Units 1 and 2, Transmittal of Inservice Inspection Program Plan for the Third Ten year Inspection Interval," February 14, 2006.
2. Letter from Darin Benyak (Exelon Generation Company), to U.S. Nuclear Regulatory Commission, "Additional Information Supporting Risk-Informed Inservice Inspection Relief Request," April 3, 2007.
3. Letter from Patrick Simpson (Exelon Generation Company) to U.S. Nuclear Regulatory Commission, "Additional Information Supporting Risk-Informed Inservice Inspection Relief Request," September 7, 2007.
4. Letter from William Levis (Byron Generating Station), to U.S. Nuclear Regulatory Commission, "Byron Station, Units 1 and 2, Facility Operating License Nos. NPF-37 and NPF-66, NRC Docket Nos. STN 50-454 and STN 50-255, Byron Station Interval 2 Inservice Inspection Program Relief Request I2R-40, Alternative to the ASME Boiler and Pressure Vessel Code Section XI Requirements for Class 1 and 2 Piping Welds," dated November 17, 2000.
5. Letter from Anthony Mendiola, (U.S. Nuclear Regulatory Commission) to Exelon Generation Company, "Approval of Relief Request I2R-40 for Application of Risk-Informed Inservice Inspection Program as an Alternative to the ASME Boiler and Pressure Vessel Code Section XI Requirements for Class 1 and Class 2 Piping Welds for Byron Station, Units 1 and 2," February 5, 2002.
6. EPRI TR-112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure, Final Report," December 1999.
7. NRC RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 1, November 2002.
8. NRC RG 1.178, "An Approach for Plant-Specific Risk-Informed Decision Making: Inservice Inspection of Piping," Revision 1, September 2003.
9. NRC NUREG-0800, Chapter 3.9.8, "Standard Review Plan for the Review of Risk-Informed Inservice Inspection of Piping," Revision 1, September 2003.
10. MRP-139, "Materials Reliability Program: Primary System Butt Weld Inspection and Evaluation Guideline," July 14, 2005, © Electric Power Research Institute, Palo Alto, California.

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Date: September 25, 2007