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

August 8, 2011

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

SUBJECT: THREE MILE ISLAND NUCLEAR STATION, UNIT 1 (TMI-1) - PROPOSED ALTERNATIVE REGARDING CONTROL ROD DRIVE HOUSING EXAMINATIONS ASSOCIATED WITH THE THIRD INSERVICE INSPECTION INTERVAL, REQUEST NO. RR-10-01 (TAC NO. ME4882)

Dear Mr. Pacilio:

By letter dated October 13, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML102870077), supplemented by letter dated April 5, 2011 (ADAMS Accession No. ML110960228), Exelon Generation Company, LLC (the licensee) submitted proposed alternative request RR-10-01 for the use of an alternative to certain requirements of the American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* (ASME Code), Section XI, 1995 Edition through the 1996 Addenda, at Three Mile Island, Unit 1 (TMI-1). Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 55a(a)(3)(i), RR-10-01 proposes to conduct alternative examinations of welds on three non-peripheral control rod drive (CRD) housings in lieu of the ASME Code-required examinations of certain peripheral CRD housings.

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of the proposed alternative as discussed in the enclosed safety evaluation. The NRC staff review concludes that the proposed alternative provides an acceptable level of quality and safety. Therefore, RR-10-01 is authorized pursuant to 10 CFR 50.55a(a)(3)(i), for the third 10-year inservice inspection interval at TMI-1. The third 10-year interval began on April 20, 2001, and will end on, or before, April 19, 2012, including the one year extension allowed by paragraph IWA-2430(d)(1) of ASME Section XI.

If you have any questions, please contact the TMI-1 Project Manager, Mr. Peter J. Bamford, at 301-415-2833.

Sincerely,

Harold K. Chernoff, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-289

Enclosure: As stated

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

PROPOSED ALTERNATIVE REGARDING CONTROL ROD DRIVE HOUSING

EXAMINATIONS ASOCIATED WITH THE THIRD INSERVICE INSPECTION INTERVAL

REQUEST NO. RR-10-01

EXELON GENERATION COMPANY, LLC

THREE MILE ISLAND NUCLEAR STATION, UNIT 1

DOCKET NO. 50-289

1.0 INTRODUCTION

By letter dated October 13, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML102870077), supplemented by letter dated April 5, 2011 (ADAMS Accession No. ML110960228), Exelon Generation Company, LLC (the licensee) submitted proposed alternative request RR-10-01 for the use of an alternative to certain requirements of the American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* (ASME Code), Section XI, 1995 Edition through the 1996 Addenda, at Three Mile Island, Unit 1 (TMI-1). Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 55a(a)(3)(i), RR-10-01 proposes to conduct alternative examinations of welds on three non-peripheral control rod drive (CRD) housings in lieu of the ASME Code-required examinations of certain peripheral CRD housings. The U.S. Nuclear Regulatory Commission (NRC, or Commission) staff reviewed and evaluated RR-10-01 pursuant to the provisions of 10 CFR 50.55a(a)(3)(i).

2.0 REGULATORY EVALUATION

The inservice inspection (ISI) of ASME Code Class 1, Class 2, and Class 3 components is to be performed in accordance with the applicable edition and addenda of ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," as required by 10 CFR Part 50 (specifically 10 CFR 50.55a(g)), except where specific relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Paragraph 10 CFR 50.55a(a)(3) states, in part, that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the applicant demonstrates that: (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.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) will meet the requirements set forth in the ASME Code, Section XI to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the

first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The inservice inspection (ISI) Code of Record for the third 10-year ISI interval at TMI-1 is the 1995 Edition, 1996 Addenda of ASME Code, Section XI.

3.0 TECHNICAL EVALUATION

3.1 ASME Components for Which Relief is Requested and Applicable Code Requirement

ASME Code, Class 1, Examination Category B-O, Item Number B14.10, "Welds in Control Rod Drive Housings," in Table IWB-2500-1 of Section XI of the ASME Code requires essentially 100 percent volumetric or surface examination of 10 percent of the peripheral CRD housing welds.

TMI-1 has 69 CRD locations which have four butt welds each. Twenty-four of these CRD locations are categorized as "peripheral" per Examination Category B-O. Ten percent of the peripheral CRD housings equates to an examination of three CRD locations. Peripheral housing welds with the 'D' designator are accessible for non-destructive examination (NDE) through access ports in the reactor vessel closure head service structure and are not applicable to this request. At TMI-1, CRD housing welds with an 'A,' 'B,' or 'C' designator are only accessible for examination when a CRD is removed from the reactor pressure vessel closure head.

3.2 Licensee's Proposed Alternative Examination

As a proposed alternative, TMI-1 will credit the examinations of the 'A,' 'B,' and 'C' designator welds on three non-peripheral CRD housings, performed in the first period of the third interval. According to the licensee, the examinations performed met the requirements of Table IWB-2500-1 Examination Category B-O for NDE methods, area examined, and acceptance.

3.3 Licensee's Basis for Requesting Relief

According to the licensee, CRD housing welds with an 'A,' 'B,' or 'C' designator are only accessible for examination when a CRD is removed from the reactor vessel closure head. The reactor vessel closure head service structure surrounding the CRDs causes interferences that result in the peripheral CRD housing welds being inaccessible for examination unless the CRD is removed to gain access. Literal compliance with Table IWB-2500-1, Examination Category B-O, requires that only welds on the peripheral CRD locations can be credited for meeting the ASME Code requirements. According to the licensee's application, the intent of this requirement was to provide greater flexibility in meeting the ASME Code by requiring examination of the peripheral locations as compared to the inner locations. Typically, examination of welds on non-peripheral CRD locations is limited due to access restrictions. However, the ASME Code did not account for the fact that some plants, such as TMI-1, have a reactor vessel closure head service structure that makes examination of the peripheral CRD locations more difficult.

At TMI-1, over the course of a 10-year ISI interval, a small population of CRDs (though often not peripheral in location) are removed for various purposes which allows an opportunity to perform examinations. During the third interval in the first period (2001), six CRDs not in the periphery were examined and no indications were identified. There were no examination limitations reported for these welds. A review by the licensee of ISI data for examinations of welds 'A,' 'B,' and 'C' completed since 1986 identified no degradation. Visual examination of the flange region of all CRDs is completed using remote video each outage to assure there is no leakage from the

mechanical joint. Small leakage from the welds above the flange that might not be evident during the normal ASME Code, Section XI, visual (VT-2) examination pressure tests would likely be observed during the flange video examinations.

A review of the operating conditions between the interior and peripheral CRD locations shows that the difference in operating temperatures is not significant. The motor tube (reactor coolant system pressure boundary) weldments (welds 'A,' 'B,' and 'C') are located above an internal thermal barrier which results in the welds being at a lower operating temperature. The thermal barrier restricts the thermal circulation of hot, primary coolant and acts as an insulator between the reactor vessel and the drive. The maximum steady state operating temperature for the internal components above the thermal barrier is 470 degrees Fahrenheit. Welds 'A' and 'B' are located slightly above the internal rotor assembly (further away from the top of the reactor vessel head) so their operating temperature is slightly lower. Additionally, an external water cooled stator-water jacket assembly is installed over the motor tube region of welds 'A' and 'B' for all 69 drives which leads to a relatively consistent temperature. Weld 'C' is located approximately 165 inches above weld 'B' and is the coolest of the three welds based on the lack of flow and distance from the reactor vessel closure head.

Accordingly, an examination sample of welds from interior drive locations is essentially equivalent to a sample of welds from the peripheral drive locations and will adequately represent the condition of the Examination Category B-O welds. Therefore, the licensee proposes that an examination of the CRD housing welds on any of the 69 CRD locations provides an equivalent level of quality and safety.

3.4 NRC Staff Evaluation

The ASME Code requires 100 percent volumetric or surface examination of 10 percent of the peripheral CRD housing welds. The drawings and descriptions provided by the licensee support the fact that the area above the reactor vessel is congested. Thus, the NRC staff agrees that the subject CRD housing welds are only accessible for examination when a CRD is removed from the reactor pressure vessel closure head and that the reactor vessel closure head service structure surrounding the CRDs causes interferences that result in the peripheral CRD housing welds being inaccessible for examination unless the CRD is removed to gain access.

During the first period of the third interval (2001), six CRDs not in the periphery were examined by liquid penetrant examination and no indications or evidence of degradation mechanisms were identified. The welds were examined over 100 percent of their surface. The NRC staff reviewed the ISI data provided by the licensee by letter dated April 15, 2011, for examinations of welds 'A,' 'B,' and 'C' completed since 1986. These inspections identified no degradation, providing a strong historical record of acceptable service. The proposed alternative also provides a visual examination of the flange region of all CRDs using remote video each outage to assure there is no leakage from the mechanical joint. Small leakage from the welds above the flange that might not be evident during the normal ASME Code Section XI, VT-2 examination pressure tests would likely be observed during the flange video examinations. This provides an added degree of assurance that the proposed alternative will adequately monitor the subject joints. The licensee has performed a review of the operating conditions between the interior and peripheral CRD locations. It shows that the difference in operating temperatures between the interior and peripheral CRD locations is not significant and that an examination sample of welds from interior drive locations is essentially equivalent to a sample of welds from the peripheral drive locations. The NRC staff agrees that with the similar operating temperatures between the peripheral and

non-peripheral CRDs, that the examinations of the interior CRDs would provide comparable data to examinations of the peripheral CRDs, thus meeting the intent of the ASME Code requirement.

Based on the licensee's alternative to perform examinations which met the requirements of Table IWB-2500-1 Examination Category B-O for NDE methods, area examined, and acceptance on three non-peripheral CRD housings, the visual examination of the flange region of all CRDs using remote video each outage, and the VT-2 examinations performed on these components during system pressure tests each refueling outage, the NRC staff has concluded that if significant service-induced degradation occurs, there is reasonable assurance that evidence of it will be detected. Therefore, the NRC staff has determined that the proposed alternative provides an acceptable level of quality and safety.

4.0 CONCLUSION

The NRC staff has determined, as described above, that it is reasonable to conclude that if significant service-induced degradation occurs on the subject welds, evidence of it would be detected by the examinations in the proposed alternative. Therefore, the NRC staff concludes that the proposed alternative provides an acceptable level of quality and safety, and that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(i). The NRC staff therefore authorizes proposed alternative request RR-10-01 at TMI-1 for the third 10-year ISI interval.

All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested and approved, remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributors: E. Andruszkiewicz
P. Bamford

Date: August 8, 2011

If you have any questions, please contact the TMI-1 Project Manager, Mr. Peter J. Bamford, at 301-415-2833.

Sincerely,
/RA/

Harold K. Chernoff, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-289

Enclosure: As stated

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