

October 1, 2004

Mr. Christopher M. Crane, President
and Chief Executive Officer
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SUBJECT: SAFETY EVALUATION ON RELIEF REQUEST TO USE CODE CASE N-661 AT BRAIDWOOD STATION, UNITS 1 AND 2 (TAC NOS. MC3000, MC3001); BYRON STATION, UNITS 1 AND 2 (TAC NOS. MC3002, MC3003); CLINTON POWER STATION (TAC NO. MC3004); DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3 (TAC NOS. MC3005, MC3006); LASALLE COUNTY STATION, UNITS 1 AND 2 (TAC NOS. MC3007, MC3008); LIMERICK GENERATING STATION, UNITS 1 AND 2 (TAC NOS. MC3009, MC3010); OYSTER CREEK GENERATING STATION (TAC NO. MC3011); PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3 (TAC NOS. MC3012, MC3013); QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2 (TAC NOS. MC3014, MC3015) AND THREE MILE ISLAND, UNIT 1(TAC NO. MC3016)

Dear Mr. Crane:

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the information provided by Exelon Generation Company, LLC (Exelon, the licensee), and AmerGen Energy Company, LLC (AmerGen, the licensee), in its letter (ML041210175) dated April 26, 2004 (RS-04-065). The licensees requested that the NRC approve ASME Code Case N-661, "Alternative Requirements for Wall Thickness Restoration of Class 2 and 3 Carbon Steel Piping for Raw Water Service" for use at Braidwood Station, Units 1 and 2; Byron Station, Units 1 and 2; Clinton Power Station; Dresden Nuclear Power Station, Units 2 and 3; LaSalle County Station, Units 1 and 2; Limerick Generating Station, Units 1 and 2; Oyster Creek Generating Station; Peach Bottom Atomic Power Station, Units 2 and 3; Quad Cities Nuclear Power Station, Units 1 and 2; and Three Mile Island, Unit 1. The request was made pursuant to Section 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR).

For the reasons set forth in the enclosed Safety Evaluation, the staff concludes that the licensee has provided an acceptable alternative to the requirements of IWA-4120(a) of the 1989 Edition (or IWA-4410(a) and (b) of the 1995 Edition through 1996 Addenda) of the American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code (Code), Section XI, and IWA-4310 of 1989 Edition (or IWA-4611.1 of the 1995 Edition through 1996 Addenda) of ASME Code Section XI, subject to the following three conditions, which were proposed in the licensee's application and must be met when using Code Case N-661. These conditions are: (a) if the root cause of the degradation has not been determined, the repair is only acceptable for one cycle, (b) weld overlay repair of an area can only be performed once in the same location and (c) when through-wall repairs are made by welding on surfaces that are wet or exposed to water, the weld overlay repair is only acceptable until the next refueling outage.

The staff concludes that the proposed alternative, as supplemented by the three conditions listed above, provides reasonable assurance of structural integrity and an acceptable level of quality and safety. Therefore, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for Braidwood Station, Units 1 and 2; Byron Station, Units 1 and 2; Clinton Power Station; Dresden Nuclear Power Station, Units 2 and 3; LaSalle County Station, Units 1 and 2; Limerick Generating Station, Units 1 and 2; Oyster Creek Generating Station; Peach Bottom Atomic Power Station, Units 2 and 3; Quad Cities Nuclear Power Station, Units 1 and 2; and Three Mile Island, Unit 1, for each plant specific current 10-year inservice inspection interval, or until Code Case N-661 is approved for general use by reference in 10 CFR 50.55a. After that time, the licensee must follow the conditions, if any, specified in the rule. All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Sincerely,

/RA/

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

Docket Nos.: STN 50-456, STN 50-457, STN 50-454, STN 50-455, 50-461, 50-237, 50-249, 50-373, 50-374, 50-352, 50-353, 50-219, 50-277, 50-278, 50-254, 50-265 and 50-289.

Enclosure: Safety Evaluation

cc w/encls: See next page

The staff concludes that the proposed alternative, as supplemented by the three conditions listed above, provides reasonable assurance of structural integrity and an acceptable level of quality and safety. Therefore, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for Braidwood Station, Units 1 and 2; Byron Station, Units 1 and 2; Clinton Power Station; Dresden Nuclear Power Station, Units 2 and 3; LaSalle County Station, Units 1 and 2; Limerick Generating Station, Units 1 and 2; Oyster Creek Generating Station; Peach Bottom Atomic Power Station, Units 2 and 3; Quad Cities Nuclear Power Station, Units 1 and 2; and Three Mile Island, Unit 1, for each plant specific current 10-year inservice inspection interval, or until Code Case N-661 is approved for general use by reference in 10 CFR 50.55a. After that time, the licensee must follow the conditions, if any, specified in the rule. All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Sincerely,

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Enclosure: Safety Evaluation

cc w/encls: See next page

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*See TChan to AMendiola memorandum dated July 26, 2004

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
REQUEST TO USE ASME CODE CASE N-661 AT BRAIDWOOD UNITS 1 AND 2; BYRON
UNITS 1 AND 2; CLINTON; DRESDEN UNITS 2 AND 3; LASALLE UNITS 1 AND 2; LIMERICK
UNITS 1 AND 2; OYSTER CREEK; PEACH BOTTOM UNITS 2 AND 3; QUAD CITIES
UNITS 1 AND 2; AND THREE MILE ISLAND UNIT 1 NUCLEAR POWER PLANTS
EXELON GENERATION COMPANY, LLC AND AMERGEN ENERGY COMPANY, LLC
DOCKET NUMBERS STN 50-456, STN 50-457, STN 50-454, STN 50-455, 50-461, 50-237,
50-249, 50-373, 50-374, 50-352, 50-353, 50-219, 50-277, 50-278, 50-254, 50-265 AND 50-289

1.0 INTRODUCTION

By letter (ML041210175) dated April 26, 2004, Exelon Generation Company, LLC (Exelon, the licensee), and AmerGen Energy Company, LLC (AmerGen, the licensee), requested that the NRC approve an alternative to the requirements of IWA-4120(a) and IWA-4310 of the 1989 Edition of the American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code (Code), Section XI. Similarly, the licensees also requested that the NRC approve an alternative to the requirements of IWA-4410(a) and (b) and IWA-4611.1 of the 1995 Edition through the 1996 Addenda of the ASME Code, Section XI. Specifically, the licensees requested that the NRC approve the use of ASME Code Case N-661, "Alternative Requirements for Wall Thickness Restoration of Class 2 and 3 Carbon Steel Piping for Raw Water Service." Byron Station, Units 1 and 2; Braidwood Station, Units 1 and 2; LaSalle County Station, Units 1 and 2; Clinton Power Station; Peach Bottom Atomic Power Station, Units 2 and 3; and Limerick Generating Station, Units 1 and 2 are committed to the 1989 Edition of Section XI of the ASME Code. Quad Cities Nuclear Power Station, Units 1 and 2, Dresden Nuclear Power Station Units 2 and 3, Three Mile Island, Unit 1, and Oyster Creek Generating Station are committed to the 1995 Edition through the 1996 Addenda of Section XI of the ASME Code. The request was made pursuant to Section 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR) to address replacement or internal weld repair of wall thinning conditions resulting from various wall thinning degradation mechanisms such as erosion, corrosion, cavitation and pitting in Class 2 and 3 carbon steel raw water piping systems. The licensees' stated the primary reason for the request was to provide adequate time for additional examination of adjacent piping so that pipe replacement can be planned to reduce impact on system availability including Maintenance Rule applicability and availability of replacement materials.

ENCLOSURE

The regulation at 10 CFR 50.55a(g) specifies that inservice inspection (ISI) of nuclear power plant components shall be performed in accordance with the requirements of the ASME Code, Section XI. As stated in 10 CFR 50.55a(a)(3), 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.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," 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 ten-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) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable edition of Section XI of the ASME Code for the applicable nuclear power plants is listed below:

PLANT	INTERVAL	EDITION
Byron Station, Unit 1	Second	1989 Edition, no addenda
Byron Station, Unit 2	Second	1989 Edition, no addenda
Braidwood Station, Unit 1	Second	1989 Edition, no addenda
Braidwood Station, Unit 2	Second	1989 Edition, no addenda
Quad Cities Nuclear Power Station, Units 1 and 2	Fourth	1995 Edition through 1996 Addenda
LaSalle County Station, Unit 1	Second	1989 Edition, no addenda
LaSalle County Station, Unit 2	Second	1989 Edition, no addenda
Clinton Power Station	Second	1989 Edition, no addenda
Dresden Nuclear Power Station, Units 2 and 3	Fourth	1995 Edition through 1996 Addenda
Three Mile Island, Unit 1	Third	1995 Edition through 1996 Addenda
Peach Bottom Atomic Power Station, Unit 2	Third	1989 Edition, no Addenda
Peach Bottom Atomic Power Station, Unit 3	Third	1989 Edition, no Addenda
Oyster Creek Generating Station	Fourth	1995 Edition through 1996 Addenda
Limerick Generating Station, Units 1 and 2	Second	1989 Edition, no Addenda

2.0 LICENSEE'S PROPOSED ALTERNATIVE

ASME Code Components Affected

All ASME Class 2 and 3 carbon steel plant raw water piping systems.

Applicable Code Requirement

ASME Code, Section XI, IWA-4120(a) of the 1989 Edition (or IWA-4410(a)(b) of the 1995 Edition through 1996 Addenda) requires that the repairs be performed in accordance with the Owner's Design Specification/Owner's Requirements and the original or later Construction Code of the component or system.

ASME Code, Section XI, IWA-4310 of the 1989 Edition (or IWA 4611.1 of the 1995 Edition through 1996 Addenda) requires that the defect be removed or reduced in size in accordance with Article IWA-4000.

Reason for Request

Relief is requested from replacement or internal weld repair of wall thinning conditions resulting from various wall thinning degradation mechanisms such as erosion, corrosion, cavitation, and pitting in Class 2 and 3 carbon steel raw water piping systems in accordance with the design specification/owner's requirements and the original construction code. The licensee stated the primary reason for this request is to provide adequate time for additional examination of adjacent piping so that pipe replacement can be planned to reduce impact on system availability including Maintenance Rule applicability and availability of replacement materials.

Proposed Alternative and Basis for Use

Exelon and AmerGen will implement the requirements of ASME Code Case N-661 for Class 2 and 3 plant raw water piping system repairs resulting from degradation mechanisms such as erosion, corrosion, cavitation, or pitting as an alternative to the requirements of IWA-4000. The licensee stated that these types of defects are typically identified by the discovery of small leaks in the piping system or by pre-emptive examinations performed by the licensee to monitor the degradation mechanisms but which are not required by the ASME Code. The alternative repair technique described in Code Case N-661 involves the application of additional weld metal on the exterior of the piping system, which restores the wall thickness to its required value. The licensee stated that this repair technique will be utilized whenever the engineering evaluation determines that such a repair is suitable for the particular defect or degradation being resolved. The licensee stated that provisions for use of this Code Case will be addressed in the Repair and Replacement Program.

The licensee stated that the provisions will provide that adjacent areas be examined to verify that the entire flawed area will be encompassed by the repair and that there are no other unacceptable degraded locations within a representative area, which is dependent on the degradation mechanism present. The licensee will perform an evaluation of the degradation mechanism to determine the re-examination schedule to be performed over the life of the repair. The repair will be considered to have a maximum service life of two fuel cycles unless examinations during each of the two fuel cycles are performed to establish the expected life of the repair.

Additionally, the licensee stated that the following restrictions will be placed on the use of Code Case N-661, to assure that the use of the Code Case will provide an acceptable alternative pursuant to 10 CFR 50.55a(a)(3)(i):

- (a) If the cause of the degradation has not been determined, the repair is only acceptable for one cycle.
- (b) Weld overlay repair of an area can only be performed once in the same location.

- (c) When through-wall repairs are made by welding on surfaces that are wet or exposed to water, the weld overlay repair is only acceptable until the next refueling outage.

The licensees state that the basis for use of the repair technique described in Code Case N-661 is that Section XI of the ASME Code determined that this repair technique provides an acceptable alternative to the requirements of IWA-4000 and provides an acceptable level of quality and safety. Therefore, the licensees conclude that the proposed alternative is justified per 10 CFR 50.55a(a)(3)(i).

Code Case N-661 was approved by the ASME Section XI Code on July 23, 2002. However, it has not been incorporated into 10 CFR 50.55a and thus is not available for application at nuclear power plants without specific NRC approval. Therefore, Exelon and AmerGen are documenting the request to apply the alternative repair technique described in the Code Case via this relief request.

Duration of Proposed Alternative

The proposed alternative is for the use of the remainder of each plant's ten year ISI interval, or until the NRC publishes Code Case N-661 in a future revision of 10 CFR 50.55a.

3.0 STAFF EVALUATION

By letter dated April 26, 2004, Exelon and AmerGen requested that the NRC approve an alternative to the requirements of IWA-4120(a) and IWA-4310 of the 1989 Edition of the ASME Code Section XI, and IWA-4410(a)(b) and IWA-4611.1 of the 1995 Edition through 1996 Addenda of the ASME Code Section XI. Specifically, the licensees requested that the NRC approve ASME Code Case N-661 for use at Braidwood Station, Units 1 and 2; Byron Station, Units 1 and 2; Clinton Power Station; Dresden Nuclear Power Station, Units 2 and 3; LaSalle County Station, Units 1 and 2; Limerick Generating Station, Units 1 and 2; Oyster Creek Generating Station; Peach Bottom Atomic Power Station, Units 2 and 3; Quad Cities Nuclear Power Station, Units 1 and 2; and Three Mile Island, Unit 1. The request was made pursuant to 10 CFR 50.55a(a)(3)(i) to address replacement or internal weld repair of wall thinning conditions resulting from various wall thinning degradation mechanisms such as erosion, corrosion, cavitation, and pitting in class 2 and 3 carbon steel raw water piping systems. The licensees' stated reason for the request was to provide adequate time for additional examination of adjacent piping so that pipe replacement can be planned to reduce impact on system availability and availability of replacement materials.

IWA-4120(a) and IWA-4410(a)(b) of the 1989 Edition and 1995 Edition through 1996 Addenda, respectively, of the ASME Code Section XI, require that repairs be performed in accordance with the Owner's Design Specification and original Construction Code of the component or system. IWA-4310 and IWA-4611.1 of the 1989 Edition and 1995 Edition through 1996 Addenda, respectively, of the ASME Code Section XI, require that the defect be removed or reduced in size in accordance with Article 4000. The licensee is proposing to use the provisions of Code Case N-661 to perform an alternative repair of degraded components which involves the application of weld metal overlay on the exterior of the piping system to restore the wall thickness of the component. The licensee stated that this repair technique will be utilized whenever engineering evaluations determine that such a repair is suitable for the particular

defect or degradation being resolved. Provisions for use of this Code Case will be addressed in the licensee's Repair and Replacement Program. The licensee stated that those provisions will provide that adjacent areas be examined to verify that the entire flawed area will be encompassed by the repair and that there are no other unacceptable degraded locations within a representative area dependent on the degradation mechanism present. An evaluation of the degradation mechanism will be performed by the licensee to determine the re-examination schedule to be performed over the life of the repair. The licensee stated the repair will be considered to have a maximum service life of two fuel cycles unless examinations during each of the two fuel cycles are performed to establish the expected life of the repair.

The staff finds the licensee's reasoning in support of its request for relief acceptable. This finding is based on the staff's prior review of Code Case N-661 and the staff's conclusion that the Code Case be approved for inclusion in Regulatory Guide 1.147 as described below..

As part of the staff's previous review of the Code Case, the following three areas of concern were identified:

- (a) If the root cause of the degradation has not been determined, a suitable reinspection frequency cannot be established.
- (b) Weld overlay repair of an area can only be performed once to ensure that ineffective repairs are not being repeatedly implemented in the same location.
- (c) Performing through-wall weld repairs on surfaces that are wet or exposed to water would produce welds that include weld defects such as porosity, lack of fusion, and cracks. It is highly unlikely that a weld can be made on an open root joint with water present on the backside of the weld without having several weld defects. These types of weld defects can, and many times do, lead to premature failure of a weld joint.

Due to the above concerns, the staff concluded that certain conditions must be implemented that restrict use of the Code Case. The staff believes that use of the Code Case combined with the conditions listed below is justified because (1) use of the Code Case is restricted to low pressure raw water systems, (2) repairs are limited to minor piping system degradation (e.g., pipe thinning or pin-hole through wall leakage), (3) weld overlays that restore the original piping thickness must be inspected for quality upon completion of the weld as addressed in the Code Case, and (4) the Code Case repairs are only temporary and further limited by the conditions set forth by the staff. The following conditions, which correspond to the staff's concerns identified above, were proposed by the licensee and found acceptable by the staff:

- (a) If the root cause of the degradation has not been determined, the repair is only acceptable for one cycle.
- (b) Weld overlay repair of an area can only be performed once in the same location.
- (c) When through-wall repairs are made by welding on surfaces that are wet or exposed to water, the weld overlay is only acceptable until the next refueling outage.

4.0 CONCLUSION

Based on the foregoing, the NRC staff concludes that the licensee has provided an acceptable alternative to the requirements of IWA-4120(a) of the 1989 Edition (or IWA-4410(a) and (b) of the 1995 Edition through 1996 Addenda) of ASME Code, Section XI, and IWA-4310 of 1989 Edition (or IWA-4611.1 of the 1995 Edition through 1996 Addenda) of ASME Code Section XI, subject to the following three conditions which were proposed in the licensee's application and must be met when using Code Case N-661. These conditions are: (a) if the root cause of the degradation has not been determined, the repair is only acceptable for one cycle, (b) weld overlay repair of an area can only be performed once in the same location and (c) when through-wall repairs are made by welding on surfaces that are wet or exposed to water, the weld overlay repair is only acceptable until the next refueling outage.

The staff concludes that the proposed alternative, as supplemented by the three conditions listed above, provides reasonable assurance of structural integrity and an acceptable level of quality and safety. Therefore, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for Braidwood Station, Units 1 and 2; Byron Station, Units 1 and 2; Clinton Power Station; Dresden Nuclear Power Station, Units 2 and 3; LaSalle County Station, Units 1 and 2; Oyster Creek Generating Station; Peach Bottom Atomic Power Station, Units 2 and 3; Quad Cities Nuclear Power Station, Units 1 and 2; Three Mile Island, Unit 1; and Limerick Generating Station, Units 1 and 2, for each plant specific current 10-year ISI interval, or until Code Case N-661 is approved for general use by reference in 10 CFR 50.55a. After that time, the licensee must follow the conditions, if any, specified in the appropriate revision of Regulatory Guide 1.147, as incorporated into the rule. All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

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