Exelon Generation

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10 CFR 50.55a

RS-13-281
RA-13-119
TMI-13-169

December 12, 2013

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

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Dresden Nuclear Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-237 and 50-249

LaSalle County Station, Units 1 and 2
Facility Operating License Nos. NPF-11 and NPF-18
NRC Docket Nos. 50-373 and 50-374

Limerick Generating Station, Units 1 and 2
Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Oyster Creek Nuclear Generating Station
Renewed Facility Operating License No. DPR-16
NRC Docket No. 50-219

Peach Bottom Atomic Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

Quad Cities Nuclear Power Station, Units 1 and 2
Renewed Facility Operating License Nos. DPR-29 and DPR-30
NRC Docket Nos. 50-254 and 50-265

Three Mile Island Nuclear Station, Unit 1
Renewed Facility Operating License No. DPR-50
NRC Docket No. 50-289

Subject: Response to Request for Additional Information - Proposed Alternative to Utilize Code Case N-786, "Alternative Requirements for Sleeve Reinforcement of Class 2 and 3 Moderate-Energy Carbon Steel Piping Section XI, Division 1"

References:

1) Letter from M. D. Jesse (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Proposed Alternative to Utilize Code Case N-786, "Alternative Requirements for Sleeve Reinforcement of Class 2 and 3 Moderate-Energy Carbon Steel Piping Section XI, Division 1"," dated February 27, 2013

2) E-mail from J. Wiebe (U.S. Nuclear Regulatory Commission) to T. Loomis (Exelon Generation Company, LLC), "Preliminary RAI for Proposed Alternative to Use Code Case N-786," dated April 30, 2013

3) Letter from J. Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information - Proposed Alternative to Utilize Code Case N-786, "Alternative Requirements for Sleeve Reinforcement of Class 2 and 3 Moderate-Energy Carbon Steel Piping Section XI, Division 1"," dated June 24, 2013

4) E-mail from J. Wiebe (U.S. Nuclear Regulatory Commission) to T. Loomis (Exelon Generation Company, LLC), "Preliminary Additional RAI Questions Regarding Use of Code Case N-786," dated November 6, 2013

In the Reference 1 letter, Exelon Generation Company, LLC (Exelon) requested a proposed alternative to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," on the basis that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. In the Reference 2 e-mail, the U.S. Nuclear Regulatory Commission requested additional information. Reference 3 was our response to that request.

In the Reference 4 e-mail, the U.S. Nuclear Regulatory Commission requested additional information. Attached is our response.

There are no commitments contained in this submittal.

If you have any questions, please contact Tom Loomis at 610-765-5510.

Respectfully,

James Barstow
Director - Licensing and Regulatory Affairs
Exelon Generation Company, LLC

Attachments: 1) Response to Request for Additional Information - Proposed Alternative to Utilize Code Case N-786
2) Revised Relief Request (Revision 2)

cc: Regional Administrator - NRC Region I
Regional Administrator - NRC Region III
NRC Senior Resident Inspector - Braidwood Station
NRC Senior Resident Inspector - Byron Station
NRC Senior Resident Inspector - Clinton Power Station
NRC Senior Resident Inspector - Dresden Nuclear Power Station
NRC Senior Resident Inspector - LaSalle County Station
NRC Senior Resident Inspector - Limerick Generating Station
NRC Senior Resident Inspector - Oyster Creek Nuclear Generating Station
NRC Senior Resident Inspector - Peach Bottom Atomic Power Station
NRC Senior Resident Inspector - Quad Cities Nuclear Power Station
NRC Senior Resident Inspector - Three Mile Island Nuclear Station, Unit 1
NRC Project Manager - Braidwood Station
NRC Project Manager - Byron Station
NRC Project Manager - Clinton Power Station
NRC Project Manager - Dresden Nuclear Power Station
NRC Project Manager - LaSalle County Station
NRC Project Manager - Limerick Generating Station
NRC Project Manager - Oyster Creek Nuclear Generating Station
NRC Project Manager - Peach Bottom Atomic Power Station
NRC Project Manager - Quad Cities Nuclear Power Station
NRC Project Manager - Three Mile Island Nuclear Station, Unit 1

Attachment 1

Response to Request for Additional Information - Proposed Alternative to Utilize Code Case N-786

"By letter dated February 27, 2013 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML13059A498) as supplemented on June 24, 2013 (ADAMS Accession No. ML13176A143), Exelon Generation Company (Exelon) requested relief from the requirements of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, IWA-4000, for the repair of degraded Class 2 and 3 moderate-energy carbon steel piping systems at Braidwood Station Units 1 and 2, Byron Station Units 1 and 2, Clinton Power Station Unit 1, Dresden Nuclear Power Station Units 2 and 3, LaSalle County Stations Units 1 and 2, Limerick Generating Station Units 1 and 2, Oyster Creek Nuclear Generating Station, Peach Bottom Atomic Power Station Units 2 and 3, Quad Cities Nuclear Power Station Units 1 and 2, and Three Mile Island Nuclear Station Unit 1.

To complete its review, the Nuclear Regulatory Commission (NRC) staff requests the following additional information."

Question:

"1. Exelon's proposed alternative to allow the use of sleeves in lieu of the requirements of the ASME code for the repair of degraded class 2 and 3 moderate energy piping appears to be based primarily on the premise of identifying the corrosion mechanism involved and assuming a corrosion rate of twice the measured corrosion rate at the degraded pipe location or four times the corrosion rate as identified by other means or in other pipe locations (Reference: Exelon's response to RAI Questions Nos. 9 and 10 dated June 24, 2013). However, it is not clear:

(a). how the corrosion mechanism will be determined, i.e., what testing will be conducted and if inside diameter sampling will be conducted to identify the corrosion mechanism such as microbiologically influenced corrosion (MIC);"

Response:

2(a) of the Code Case states: "The material beneath the surface to which the reinforcing sleeve is to be applied shall be ultrasonically measured to establish the existing wall thickness and the extent and *configuration* of degradation to be reinforced." The most common degradation configurations are conical or scalloped, which are indicative of microbiologically influenced corrosion in raw water systems, and gouging, which is indicative of flow accelerated corrosion when located at susceptible geometries in high velocity systems. Evaluation of the configuration of the degradation, along with the system operating fluid, the system configuration, the system operating conditions, and previous experience at that specific plant site (including previous evaluation of operating fluid samples and of removed piping segments to confirm the source of degradation), are generally sufficient for conclusively determining the cause of degradation. If not conclusive, then inside diameter sampling, water samples or other testing needed to determine the cause of degradation, will be required; otherwise, the maximum permitted service life of the reinforcing sleeve shall be the time until the next refueling outage, in accordance with paragraph 8(c) of the Code Case. The Relief Request has been revised on Page 3 (see Attachment 2 of this response) to indicate that corrosion data used must be pertinent to the same plant site.

Question:

"(b). how the corrosion rate will be determined once the corrosion mechanism is identified, i.e., will the identified corrosion rate be based on literature data, other plant data, or on system-specific experimental data;"

Response:

As stated under Section 5 of the Relief Request, Revision 1, Exelon has committed to establishing the degradation rate based on two times the maximum rate observed at that specific location, or if unknown, then based on four times the maximum corrosion rate experienced in that or a similar system at the same plant site for the same degradation mechanism. As explained in response to previous Request for Additional Information (RAI) Question #9 (response submitted June 24, 2013), to measure the degradation rate at a specific location requires mapping the degraded area (using ultrasonic equipment) a minimum of two (2) times with a distinct time interval between each mapping. Measured point degradation rates would equal the change in thickness at various points within the mapped area divided by the time interval, revealing existing corrosion rate(s) and changes in configuration of the area over time. Two (2) times the measured corrosion/degradation rate(s) will be assumed in the design to establish the minimum size and thickness of the reinforcing sleeve (four (4) times the system or similar system maximum observed at that plant site if data is not available for the specific location of the repair).

Question:

"(c). how the corrosion rate will be determined if the corrosion mechanism is not conclusively determined, i.e., if the corrosion mechanism is not conclusively identified will the mechanism with the highest corrosion rate (probably MIC) be used;"

Response:

As explained above, the corrosion rate used for the design must be based on two times the maximum rate observed at that specific location, and if unknown it must be based on four times the maximum corrosion rate experienced in that or a similar system at the same plant site for the same degradation mechanism. As required by 8(c) of the Code Case, if the degradation mechanism is not conclusively determined, the reinforcing sleeve would have to be removed at the next refueling outage. In this case, four times the maximum degradation rate for all mechanisms in that and similar systems at that plant site would have to be applied to the design of the sleeve. This requirement has been added to Page 3 of the revised Relief Request.

Question:

"(d). whether the same standards for the determination of corrosion rates be applied to temporary repairs (Type A and partial-structural Type B sleeves) and permanent repairs (full-structural Type B sleeves)."

Response:

The Exelon commitment to apply a corrosion rate based on two times the maximum rate observed at that specific location, and if unknown, based on four times the maximum corrosion rate experienced in that or a similar system at the same plant site, applies to the design of all sleeves. This has been clarified on Page 3 of the revised Relief Request.

Question:

"2. The proposed alternative requires examinations of permanent repairs (full-structural Type B sleeves) on the first two refueling outages following repairs and then every fourth refueling outage. It appears that the purpose of these examinations is to verify that the degradation has not spread laterally beyond the sleeve or radially through the sleeve. It also appears that these measurements are proposed as being a means of validating the assumed corrosion rates. The NRC staff does not understand how the proposed ultrasonic examination of the surface of the full-structural Type B sleeve and its welds will fully accomplish the desired purpose. It does not appear that the ultrasonic examination will accurately measure the corrosion rate of the pipe because ultrasonic testing techniques will not likely penetrate the interface between pipe and sleeve as would be required to measure a corrosion rate of the pipe, especially for localized corrosion."

Response:

In the response to Question #5 of the previous RAI (response submitted June 24, 2013), it was stated that Ultrasonic Testing (UT) cannot detect the condition of the base metal beneath the full penetration sleeve since the ultrasonic signal will not transmit through the interface between the rolled plate of the sleeve and the underlying base metal. However, there is no need to measure the on-going corrosion rate of the degraded pipe beneath a full-structural sleeve, because such sleeves are designed to accommodate all loading without reliance on any piping that is encased by the sleeve. What is monitored, measured and verified is the rate of corrosion of the new rolled plate itself, plus any expansion of underlying corrosion into the base metal beneath the partial penetration weld - all of which are initially assumed to corrode at twice the rate of corrosion occurring in the base metal encased by the sleeve - or four times the worst corrosion rate of that or similar system for the same degradation mechanism (or the maximum observed for all degradation mechanisms if the cause of the degradation is unknown). With this conservative design approach, even accelerated corrosion (e.g., from under-sleeve crevice corrosion) would not significantly affect sleeve integrity before the next monitoring activity is performed and the actual corrosion rate is determined.

Question:

"Describe (a) how the proposed ultrasonic examination of the full-structural Type B sleeve will accurately identify the corrosion rate occurring at the site of the repair, especially if the corrosion mechanism is a localized corrosion mechanism such as MIC;"

Response:

As stated under Section 5 in the Relief Request, a thickness examination will be performed for completed full-structural reinforcing sleeves, partial penetration attachment welds, and surrounding areas, followed by subsequent similar thickness monitoring inspections. This ultrasonic examination will accurately measure any degradation of the new rolled plate used for the repair plus any on-going degradation of the base metal beneath or adjacent to the partial penetration attachment weld. Development of three-point curves as described in Section 5 of the Relief Request, Revision 1, will enable validation or adjustment of corrosion rates used for the design of the repair. If the corrosion is found to be increasing or expanding at a rate that will adversely affect the structural or pressure integrity of the repair, then the permitted service life of the repair must be recalculated, and the sleeve must be removed prior to reaching that service life.

Question:

"and (b) why an alternate corrosion rate measurement technique is not required or proposed. Alternate techniques could include but are not limited to: use of corrosion coupons in the same piping system, volumetric examination of an area of the pipe which is adjacent to the repair which is undergoing the same form of degradation, or inline inspection of the pipe by robotic means."

Response:

There is no better validation of the rate of localized corrosion than at the specific site of interest. Corrosion coupons would not be reflective of randomly colonized local corrosion sites such as those caused by MIC, and inline inspection by pipe robotics would require capability to accurately measure wall thicknesses at corroded areas. This would be impractical from the internal surface, and not as accurate as UT measurement performed from the external surface at the specific point of localized corrosion. As stated under Section 5 of the Relief Request and in Para. 2(b) of the Code Case, the surrounding area of the sleeve repair shall be examined to verify that there are no other unacceptable locations within the surrounding area that could affect the integrity of the repaired piping. During this examination, susceptible adjacent areas will be identified and subsequently monitored. For clarification, the following sentence has been added to Page 3 of the revised Relief Request: "Surrounding areas showing signs of degradation shall be identified and included in the Owner's plan for thickness monitoring for full-structural reinforcing sleeves."

Question:

"3. The relief request is not clear regarding whether the proposed alternative repair or an ASME Code repair will be made if the pipe degradation is discovered during an outage. Discuss, for the buried pipe and above ground pipe, whether an ASME Code repair or the proposed alternative repair will be performed if degradation is identified during a scheduled refueling outage or an outage other than a scheduled refueling outage."

Response:

Sleeve repair is a viable solution for degradation discovered during an outage, especially for conditions discovered at times when system availability, operating conditions, and/or material procurement required for implementing piping replacement could cause undue delays, place the plant under conditions of increased risk, or result in excessive radiation exposure to personnel. In addition, the ability to install non-intrusive repair sleeves will enable a greater number of corrosion inspections to be scheduled during refueling outages. Rather than schedule time for pipe replacement contingencies, longer extent of condition inspection windows will be possible, resulting in increased inspection coverage, and improved overall plant safety. This is especially true for systems such as Residual Heat Removal Service Water which, due to their safety significance during refueling outages, have small outage windows to begin with. This additional benefit has been incorporated on Page 5 of the revised Relief Request.

Question:

"4. Page 4 of the relief request states that "...Exelon will remove full-structural Type B reinforcing sleeves and perform an ASME Code repair or replacement prior to the time that inservice monitoring indicates that structural integrity could be impaired based on measured degradation between monitoring activities...". The NRC staff notes that, especially for localized corrosion, leak-tight integrity and structural integrity may not be identical. Please provide additional information as to how the proposed alternative addresses leak-tight integrity of piping, especially piping carrying licensed material or environmentally sensitive material."

Response:

Inservice monitoring of full-structural reinforcing sleeves is performed to verify that both structural and pressure (leak tightness) integrity will be maintained until the next inspection. As stated in the response to Question #2 of the previous RAI (response submitted June 24, 2013), radioactive fluid leakage will be monitored and detected in accordance with the standard plant monitoring practices for all buried piping containing radioactive fluids. Exelon's commitment to NEI 07-07, "Industry Ground Water Protection Initiative – Final Guidance Document," dated August 2007, combined with the additional monitoring required by Code Case N-786 provides monitoring in excess of non-repaired piping. For clarification, Page 4 of the revised Relief Request has been changed to address impairment of pressure integrity (leak tightness) in addition to structural integrity.

Question:

"5. Localized corrosion is a significant issue in many raw water systems. Localized corrosion often occurs in these piping systems in many locations which are spaced fairly closely. It appears that examination of a somewhat larger area may be required when performing pre-installation and post-installation pipe inspection in order to identify whether additional corrosion is occurring in nearby locations. Justify why it is not necessary to examine the pipe for at least a fixed distance e.g., X pipe diameters or Y sleeve lengths in each direction from the point of degradation during the pre- and post-installation inspection."

Response:

As stated on Page 3 of the revised Relief Request and Para. 2(b) of the Code Case, the surrounding area of the sleeve repair shall be examined to verify that there are no other unacceptable locations within the surrounding area that could affect the integrity of the repaired piping. The dimensions of the surrounding area to be evaluated shall be determined by the Owner, based on the type and rate of degradation present. For example, if the cause of the degradation is flow accelerated corrosion or a single concentrated microbiological colony, the areas of concern would generally be more limited than for wide-spread MIC, under-deposit or general-area corrosion. For clarification, Exelon is adding the following requirement to Page 3 of the revised Relief Request: (This area) "shall extend at least 0.75 $\sqrt{RT_{nom}}$ beyond the edge of any sleeve attachment weld." (This is the distance required to enable full load transfer between the pipe and the sleeve.) As stated in the response to Question 2(b) above, other surrounding areas showing signs of degradation will also be identified and included in the Owner's plan of thickness monitoring for full-structural reinforcing sleeves.

Question:

"6. In response to RAI Question 1(1) dated June 24, 2013, the licensee stated that "...Type B reinforcing sleeves could include new integral branch connections (weldolet or socket welded or threaded half-coupling) when required by design, such as for vent or fill connections for pressure testing, or to replace a degraded section of piping containing a branch connection..." The above statement appears to imply that a branch connection could be attached to a Type B sleeve as part of the repair. However, Code Case N-786 does not specify such a design or configuration. Justify why a branch connection could be attached to a Type B sleeve as part of the proposed repair."

Response:

Small branch connections for venting or filling may be needed for injecting hardenable filler or for system leakage test connections required by the Code Case (see 5(c) & (g) of the Code Case). These would meet Construction Code design requirements, and would impose negligible stress on the reinforcing sleeve. It is unlikely that larger branch connections would be needed on sleeve repairs; therefore, Exelon will limit installation of branch connections on sleeves to filling or venting connections required for installation or testing, and to Nominal Pipe Size (NPS) 1 or smaller. The purpose and size limitation for branch connections have been included on Page 5 of the revised Relief Request.

Attachment 2

Revised Relief Request (Revision 2)

Request to Use Code Case N-786 in Accordance with 10 CFR 50.55a(a)(3)(ii)

1. ASME Code Component(s) Affected:

All ASME Class 2 and 3 moderate energy (i.e., less than or equal to 200°F (93°C) and less than or equal to 275 psig (1.9 MPa) maximum operating conditions) carbon steel piping systems.

2. Applicable Code Edition and Addenda:

PLANT	INTERVAL	EDITION	START	END
Braidwood Station, Units 1 and 2	Third	2001 Edition, through 2003 Addenda	July 29, 2008 October 17, 2008	July 28, 2018 October 16, 2018
Byron Station, Units 1 and 2	Third	2001 Edition, through 2003 Addenda	January 16, 2006	July 15, 2016
Clinton Power Station, Unit 1	Third	2004 Edition	July 1, 2010	June 30, 2020
Dresden Nuclear Power Station, Units 2 and 3	Fifth	2007 Edition, through 2008 Addenda	January 20, 2013	January 19, 2023
LaSalle County Stations, Units 1 and 2	Third	2001 Edition, through 2003 Addenda	October 1, 2007	September 30, 2017
Limerick Generating Station, Units 1 and 2	Third	2001 Edition, through 2003 Addenda	February 1, 2007	January 31, 2017
Oyster Creek Nuclear Generating Station	Fifth	2007 Edition, through 2008 Addenda	January 15, 2013	January 14, 2023
Peach Bottom Atomic Power Station, Units 2 and 3	Fourth	2001 Edition, through 2003 Addenda	November 5, 2008	November 4, 2018
Quad Cities Nuclear Power Station, Units 1 and 2	Fifth	2007 Edition, through 2008 Addenda	April 2, 2013	April 1, 2023
Three Mile Island Nuclear Station, Unit 1	Fourth	2004 Edition	April 20, 2011	April 19, 2022

3. Applicable Code Requirement:

ASME Code, Section XI, IWA-4400 of 2001 Edition through 2003 Addenda, 2004 Edition, and 2007 Edition through 2008 Addenda provides requirements for welding, brazing, metal removal, and installation of repair/replacement activities.

4. Reason for Request:

In accordance with 10 CFR 50.55a(a)(3)(ii), Exelon Generation Company, LLC (Exelon) is requesting proposed alternatives from the requirement for replacement or internal weld repair of wall thinning conditions resulting from degradation in Class 2 and Class 3 moderate energy carbon steel piping systems in accordance with IWA-4000. Such degradation may be the result of mechanisms such as localized erosion, corrosion, cavitation, and pitting, but excluded are conditions involving any form of cracking. IWA-4000 requires repair or replacement in accordance with the Owner's Requirements and the original or later Construction Code.

One reason for this request is to permit installation of technically sound temporary repairs, in the form of Type A or partial-structural Type B reinforcing sleeves, to provide adequate time for evaluation, design, material procurement, planning and scheduling of appropriate permanent repair or replacement of the defective piping, considering the impact on system availability, maintenance rule applicability, and availability of replacement materials.

The other reason for this request is to permit installation of long-term repairs, in the form of full-structural Type B reinforcing sleeves, for locally degraded portions of piping systems. The design, construction, and inservice monitoring of such sleeves provide a technically sound equivalent replacement for the segment of degraded piping that is encompassed.

5. Proposed Alternative and Basis for Use:

Exelon proposes to implement the requirements of ASME Code Case N-786, "Alternative Requirements for Sleeve Reinforcement of Class 2 and 3 Moderate-Energy Carbon Steel Piping Section XI, Division 1," for repair of degradation in Class 2 and 3 moderate energy carbon steel piping systems resulting from mechanisms such as localized erosion, corrosion, cavitation, or pitting, but excluding conditions involving any form of cracking. These types of defects are typically identified by small leaks in the piping system or by pre-emptive non-code required examinations performed to monitor the degradation mechanisms. Code Case N-786, which is included as part of this relief request, is attached.

This code case invokes the design requirements of the original Construction Code or ASME Code, Section III. Reconciliation and use of editions and addenda of ASME Section III will be in accordance with ASME Section XI, IWA-4220, and only editions and addenda of ASME Section III that have been accepted by 10 CFR 50.55a may be used. The Code of Record for the specific 10-year ISI interval at each nuclear unit as identified under Section 2 above, will be used when applying the various IWA paragraphs of Section XI unless specific regulatory relief to use other editions or addenda is approved.

The alternative repair technique described in Code Case N-786 involves the application of Type A and Type B full encirclement sleeve halves welded together with full penetration longitudinal seam welds to reinforce structural integrity in the degraded area. In the case of Type B reinforcing sleeves, the ends are also welded to the piping in order to restore pressure integrity. This repair technique will be utilized when it is determined that this repair method is suitable for the particular defect or degradation being resolved without flaw removal. Use of this repair method will be limited to pipe and fittings; as a result the following condition shall apply to the application of Code Case N-786:

> Reinforcing sleeves may not be applied to pumps, valves, expansion joints, vessels, heat exchangers, tubing, or flanges; and may not be applied over flanged joints, socket welded or threaded joints, or branch connection welds.

The Code Case requires that the cause of the degradation be determined and that the extent and rate of degradation in the piping be evaluated to ensure that there are no other unacceptable locations within the surrounding area that could affect the integrity of the repaired piping. Surrounding areas showing signs of degradation shall be identified and included in the Owner's plan for thickness monitoring for full-structural reinforcing sleeves. The area of evaluation will be dependent on the degradation mechanism present, but shall extend at least $0.75\sqrt{RT_{nom}}$ beyond the edge of any sleeve attachment weld. If the cause of the degradation is not determined, the maximum permitted service life of any reinforcing sleeve shall be the time until the next refueling outage. In addition, the following condition shall apply to the application of Code Case N-786:

> The initial degradation rate selected for design of all sleeves shall be equal to or greater than two (2) times the maximum rate observed at the location of the repair. If the degradation rate for that location is unknown, four (4) times the estimated maximum degradation rate for that or a similar system at the same plant site for the same degradation mechanism shall be applied. If both the degradation rate for that location and the cause of the degradation are not conclusively determined, four (4) times the maximum degradation rate observed for all degradation mechanisms for that or a similar system at the same plant site shall be applied.

"Full-structural Type B" means that the sleeve and attachment welds alone maintain full capability to withstand structural (mechanical) and pressure loading for which the piping is presently designed without need for additional support or reinforcement, and without reliance on any piping that is encased by the sleeve. Type A and partial-structural Type B sleeves rely on the encased underlying piping to provide some structural (mechanical) and/or pressure retaining integrity.

Type B reinforcing sleeves may be applied to leaking systems by installing a gasket or sealant between the sleeve and the pipe as permitted by the Code Case, and then clamping the reinforcing sleeve halves to the piping prior to welding. Residual moisture is then removed by heating prior to welding. If welding of any type of sleeve occurs on a wet surface, the maximum permitted life of the sleeve shall be the time until the next refueling outage.

The Code Case requires that the Owner shall prepare and implement a plan for thickness monitoring by inspection of full-structural reinforcing sleeves and their attachment welds. To accomplish this, a baseline thickness examination will be performed for completed full-structural Type B reinforcing sleeves, partial penetration attachment welds, and surrounding areas, followed by similar thickness monitoring inspections during the first two refueling outages after installation and at least every fourth refueling outage thereafter, except that for degradation caused by cavitation, the following condition shall apply to the application of Code Case N-786:

> For degradation caused by cavitation, thickness monitoring by inspection is required to be performed at a minimum of every refueling outage for the life of the repair.

Combining all of these data will establish 3-point curves from which the maximum actual degradation rates at the sleeve and partial penetration attachment welds can be determined. Subsequent thickness monitoring examinations will be scheduled based on the maximum rates observed over those two cycles, such that the required design thicknesses will not be infringed upon before each subsequently scheduled thickness monitoring examination.

Partial-structural Type B reinforcing sleeves and Type A reinforcing sleeves completely encompass the degraded areas. These sleeves are designed to accommodate predicted maximum degradation and must be removed at the next refueling outage. Accordingly, the Code Case does not require inservice monitoring for these sleeves. However, because of NRC concerns discussed in the May 10, 2012, NRC Safety Evaluation Report for the Exelon Generation Company, LLC, sites concerning the approval to apply Code Case N-789 (ML12121A637), the following condition shall apply to the application of Code Case N-786:

> Type A reinforcing sleeves and partial-structural Type B reinforcing sleeves shall be visually observed at least once per month to monitor for evidence of leakage. If the areas containing these sleeves are not accessible for direct observation, then monitoring will be accomplished by visual assessment of surrounding areas or ground surface areas above such sleeves on buried piping, or monitoring of leakage collection systems, if available.

When used on buried piping, the area of full-structural Type B reinforcing sleeves will need to be physically accessible for the examinations required by the Code Case, which could necessitate installation of removable barriers at the repair location in lieu of backfilling the pipe at that location. For Type A and partial-structural Type B reinforcing sleeves installed on buried piping, the monitoring will be based on visual assessment as discussed above.

Type A reinforcing sleeves and partial-structural Type B reinforcing sleeves shall have a maximum permitted service life of the time until the next refueling outage, when a permanent repair or replacement must be performed. Neither the Type A nor the partial-structural Type B reinforcing sleeve may remain in service beyond the end of the next refueling outage after they are installed, unless specific regulatory relief is obtained. This means that if such a repair is performed in mid-cycle (e.g., one month before the scheduled refueling outage) the reinforcing sleeve would be removed no later than the upcoming refueling outage (e.g., in one month) unless specific regulatory relief is obtained. Even if removal during the next scheduled refueling outage becomes challenging (e.g., it is installed on a system required to be functional during the refueling outage), it would still need to be removed when the system is not required to be functional and prior to the conclusion of the next scheduled refueling outage after it was installed.

A similar situation exists with common cooling lines that require a dual unit outage in order to remove them from service. Unless a full-structural Type B reinforcing sleeve is installed, specific regulatory approval would need to be obtained in order to defer removal of a Type A or partial-structural Type B reinforcing sleeve beyond the next upcoming refueling outage of either unit.

Full-structural Type B reinforcing sleeves will be removed and an IWA-4000 repair or replacement will be performed prior to the time that inservice monitoring indicates that pressure integrity (leak tightness) or structural integrity could be impaired based on measured degradation between monitoring activities. Additional requirements for design, installation, examination (including volumetric examination in accordance with NC-5200 and NC-5300, or ND-5200 and ND-5300), pressure testing, and inservice examination of reinforcing sleeves are provided in Code Case N-786, with the following additional condition:

Branch connections may be installed on reinforcing sleeves only for filling or venting purposes during installation or leakage testing of the sleeve, and shall be limited to Nominal Pipe Size (NPS) 1 or smaller in size.

All other ASME Section XI requirements for which relief was not specifically requested and authorized by the NRC staff will remain applicable including third party review by the Authorized Nuclear Inservice Inspector.

Performing code repair/replacement in lieu of implementing this Relief Request would in some cases necessitate extending Technical Specification Actions to install a permanent repair/replacement, putting the plant at higher safety risks than warranted compared with the short time necessary to install a technically sound sleeve repair. Without the use of this Code Case in some situations, it may be necessary to shut the plant down in order to perform a code repair/replacement activity; however, this results in an unnecessary plant transient and the loss of safety system availability as compared to maintaining the plant online.

Implementing this Relief Request during refueling outages will enable a greater number of scheduled corrosion inspections during the outages. The ability to install non-intrusive repair sleeves rather than scheduling contingency plans for piping replacement, will enable longer corrosion inspection windows, increased scope of inspection, and improved overall plant safety.

Based on the above, the use of Code Case N-786 for full-structural Type B reinforcing sleeves and for Type A and partial-structural Type B reinforcing sleeves will apply when compliance with the specified Code requirements of ASME Section XI would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Code Case N-786 was approved by the ASME Board on Nuclear Codes and Standards on March 24, 2011; however, it has not been incorporated into NRC Regulatory Guide 1.147 "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," and thus is not available for application at nuclear power plants without specific NRC approval. Therefore, Exelon requests use of the alternative repair techniques described in the Code Case via this relief request.

6. Duration of Proposed Alternative:

The proposed alternative is for use of the Code Case for the remainder of each plant's 10-year inspection interval as specified in Section 2. Installation of reinforcing sleeves in accordance with this request cannot take place after the end of the 10-year ISI interval for the unit. Any Type A and partial-structural Type B reinforcing sleeves installed before the end of the 10-year inservice inspection interval will be removed during the next refueling outage, even if that refueling outage occurs after the end of the 10-year ISI interval.

7. Precedent:

A similar Exelon relief request, for Code Case N-789 (Reinforcing Pads for Class 2 and Class 3 Moderate Energy Raw Water Systems) was approved by NRC Safety Evaluation dated May 10, 2012, ADAMS Accession No. ML12121A637.