

## LimerickNPEm Resource

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**From:** Kuntz, Robert  
**Sent:** Thursday, July 19, 2012 1:34 PM  
**To:** 'Christopher.Wilson2@exeloncorp.com'  
**Cc:** 'Anthony Z. Roisman'; 'gfettus@nrdc.org'; Smith, Maxwell; LimerickHearingFile Resource  
**Subject:** DRAFT Teleconference summary  
**Attachments:** Limerick LRA DRAI Teleconference Summary for call 4-5-12.docx; Limerick LRA DRAI Teleconference Summary for call 4-12-12.docx; Limerick LRA DRAI Teleconference Summary for call 6-11-12.docx

Chris,

Attached are teleconference summaries for a calls held April 5, April 12, and June 11, 2012. Let me know if Exelon has any comments by July 23, 2012.

Robert Kuntz  
Sr. Project Manager  
NRR/ADRO/DLR/RPB1  
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**Hearing Identifier:** Limerick\_LR\_NonPublic  
**Email Number:** 1425

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**Subject:** DRAFT Teleconference summary  
**Sent Date:** 7/19/2012 1:34:03 PM  
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**From:** Kuntz, Robert

**Created By:** Robert.Kuntz@nrc.gov

**Recipients:**

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Tracking Status: None

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Tracking Status: None

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Tracking Status: None

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<b>Files</b>	<b>Size</b>	<b>Date &amp; Time</b>	
MESSAGE	284	7/19/2012 1:34:07 PM	
Limerick LRA DRAI Teleconference Summary for call 4-5-12.docx			47856
Limerick LRA DRAI Teleconference Summary for call 4-12-12.docx			51402
Limerick LRA DRAI Teleconference Summary for call 6-11-12.docx			47367

**Options**

**Priority:** Standard

**Return Notification:** No

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**Sensitivity:** Normal

**Expiration Date:**

**Recipients Received:**

LICENSEE: Exelon Generation Company, LLC

FACILITY: Limerick Generating Station

SUBJECT: SUMMARY OF TELEPHONE CONFERENCE CALL HELD ON APRIL 12, 2012, BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION AND EXELON GENERATION COMPANY, LLC, CONCERNING REQUESTS FOR ADDITIONAL INFORMATION PERTAINING TO THE LIMERICK GENERATING STATION, LICENSE RENEWAL APPLICATION (TAC. NOS. ME6555 AND ME6556)

The U.S. Nuclear Regulatory Commission (NRC or the staff) and representatives of Exelon Generation Company, LLC held a telephone conference call on April 12, 2012, to discuss and clarify the staff's requests for additional information (RAIs) concerning the Limerick Generating Station license renewal application. The telephone conference call was useful in clarifying the intent of the staff's RAIs.

Enclosure 1 provides a listing of the participants and Enclosure 2 contains a listing of the RAIs discussed with the applicant, including a brief description on the status of the items.

The applicant had an opportunity to comment on this summary.

Robert F. Kuntz, Senior Project Manager  
Projects Branch 1  
Division of License Renewal  
Office of Nuclear Reactor Regulation

Docket Nos. 50-352 and 50-353

Enclosures:

1. List of Participants
2. List of Requests for Additional Information

cc w/encls: Listserv

LICENSEE: Exelon Generation Company, LLC

FACILITY: Limerick Generating Station

SUBJECT: SUMMARY OF TELEPHONE CONFERENCE CALL HELD ON APRIL 12, 2012, BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION AND EXELON GENERATION COMPANY, LLC, CONCERNING REQUESTS FOR ADDITIONAL INFORMATION PERTAINING TO THE LIMERICK GENERATING STATION, LICENSE RENEWAL APPLICATION (TAC. NOS. ME6555 AND ME6556)

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Letter to First M. Last from First M. Last dated Month, XX, 20XX

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TELEPHONE CONFERENCE CALL  
LIMERICK GENERATING STATION  
LICENSE RENEWAL APPLICATION

LIST OF PARTICIPANTS  
April 5, 2012

PARTICIPANTS

AFFILIATIONS

Robert Kuntz	Nuclear Regulatory Commission (NRC)
Aloysius Obodoako	NRC
Abdul Sheikh	NRC
Ata Istar	NRC
James Gavula	NRC
Seung Min	NRC
Christopher Wilson	Exelon Generation Company, LLC (Exelon)
Gene Kelly	Exelon
Mark Miller	Exelon
Dave Clohecy	Exelon
Ron Hess	Exelon
Jim Jordan	Exelon
Al Fulvio	Exelon

## **DRAI B.2.1.30-1.1**

### Background

The response to RAI B.2.1.30-1, dated February 28, 2012, stated that the American Society of Mechanical Engineers (ASME) Section XI, Subsection IWE (B.2.1.30) and the 10 CFR Part 50, Appendix J (B.2.1.33) programs are credited for managing the loss of material in the steel suppression pool liner; however, inspection of the suppression pool liner coating is performed to ensure that the coatings intended function to "maintain adhesion" is maintained and to ensure that the coating continues to function as a preventive measure to corrosion. These inspection activities, in addition to suppression pool desludging, more frequent ASME Code, Section XI, Subsection, IWE examinations, and the coating maintenance plan as described in LRA Appendix A, Table A.5, Commitment 30 ensure that sufficient thickness margin of the suppression pool liner will be maintained through the period of extended operation.

### Issue

Recoating of the local areas of the suppression pool with general corrosion exhibiting greater than 25 mils plate thickness loss or spot recoating in local areas with pitting greater than 50 mils deep or recoating the liner plates with greater than 25 percent coating depletion prior to the period of extended operation in 2024 for Limerick Generating Station (LGS), Unit 1 and 2029 for LGS, Unit 2 will not ensure that the coating will continue to function as a preventive measure to corrosion. The suppression pool coating has degraded substantially and is beyond its service life since 1990s, as documented in AR # 01063631.

According to Commitment 30, the coating maintenance plan will be initiated in the 2012 refueling outage for LGS, Unit 1 and the 2013 refueling outage for LGS, Unit 2, and implemented such that the areas exceeding the above criteria are recoated prior to the period of extended operation that starts in 2024 for LGS, Unit 1 and 2029 for LGS, Unit 2. To delay recoating the degraded areas of the suppression pool experiencing more than 25 percent loss by 12 to 17 years (2024 and 2029) is not acceptable especially since four of the 44 floor panels and 2 of the 30 wall panels experienced a loss of greater than 30 percent of the protective coating documented in 2010. One floor panel had a loss of 72 percent of the underwater coating. Areas of the suppression pool liner plate with 25 percent coating depletion cannot continue to function as a preventive measure for corrosion during the period of extended operation.

### Request

Protective coatings help in long term aging management of the suppression pool liner plate by preventing and inhibiting general and pitting corrosion. Therefore, provide additional information on how selectively recoating of the suppression pool carbon steel liner plate, in areas where existing coating has depleted more than 25 percent, will ensure that the coating will continue to function as a preventive measure to corrosion during the period of extended operation.

**Discussion:** The applicant indicated that the request is clear. This DRAI will be sent as a formal RAI.

## **DRAI B.2.1.30-2.1**

### Background

The response to RAI B.2.1.30-2, dated February 28, 2012, stated:

1. The acceptance criterion used for the initial visual examination of the LGS, Unit 1 downcomers in the 1R13 outage, as reported in AR # 01063631, is less than or equal to 60 mils. The technical basis of this owner-established criterion is the design analyses for the downcomers. These analyses conclude that surface defects of less than or equal to 0.0625 inches are acceptable to meet design requirements. The corrosion found on the downcomers during 1R13 outage affected less than 13 percent of the cumulative surface area examined. Loss of metal in the exposed substrate was generally less than 15 mils.
2. Small areas of minimal general corrosion identified on the 1.25-inch thick columns do not affect load bearing capacity or visibly reduce the cross sectional area, and are therefore acceptable.
3. The acceptance criterion used for inspections of the submerged portion of the suppression pool liner for general corrosion is less than or equal to 0.125 inch metal loss. In addition, spot corrosion less than or equal to 2.5 inches in diameter may be 0.1875 inches in depth. The specification and analysis contain acceptance criteria which consider variations in plate thickness due to corrosion in the submerged portion of the suppression pool liner plate. The acceptance criteria varies based on the size of corrosion sites and the surrounding wall thickness. For a plate which is four percent under the theoretical thickness, the lower plate stiffness could create a slight increase in loading on the anchor.
4. The Generic Aging Lessons Learned (GALL) Report does not recommend augmented examinations (Examination Category E-C) of areas with material loss in excess of 10 percent of the nominal containment wall thickness. ASME Code, Section XI, Subsection IWE, specifically IWE-1240, also does not recommend augmented examinations (Examination Category E-C) of areas with material loss in excess of 10 percent of the nominal containment wall thickness. To accept a component for continued service by examination in accordance with IWE-3122.1, the acceptance standards of IWE-3500 must be met. No mention is made in these paragraphs of a 10 percent wall loss criterion. For E-A examinations, the examinations must meet the standards of ASME Code, Section XI, Subsection IWE, specifically IWE-3510.1 and IWE-3510.2, which indicate that the owner shall define the acceptance criteria.

### Issue

1. The response to RAI B.2.1.30-2 states that the owner-established criteria for recoating of downcomers is based on the analysis that surface defects of less than or equal to 0.0625 inches are acceptable to meet design requirements. However, it is not clear if the surface defects considered were for local pitting degradation or for general corrosion. In addition, the staff cannot find any reference to this analysis in the Updated Final Safety Analysis Report (UFSAR).



2. The staff finds the response to RAI B.2.1.30-2 concerning the current condition of the suppression pool support columns acceptable because general corrosion loss of 20 mils is equivalent to less than two percent of the 1.25-inch thick columns, and will not affect the load carrying capacity of the columns. However, the staff is not clear how the aging and trending of corrosion of the support columns will be managed in the future since the support columns are ASME Code, Section XI, Subsection IWF Class MC components and are inspected on a 10 year interval. Commitment 30 requires an ASME Code, Section XI, Subsection IWE, examination of the submerged portion of the suppression pool each inservice inspection (ISI) period.
3. General corrosion in some of the liner plates in LGS, Units 1 and 2 suppression pools is up to 35 mils or 14 percent of the nominal thickness of the liner plate. The response stated that for a plate which is four percent under the theoretical thickness, the lower plate stiffness would create a slight increase in loading on the anchor; however the response has not addressed the effect of this loss in thickness of 14 percent on the capacity liner anchors, including the welds between the liner plate and the anchor.
4. ASME Code, Section XI, Subsection IWE, IWE-1241, "Examination Surface Areas," states that surface areas likely to experience accelerated degradation and aging require the augmented examinations identified in Table IWE-2500-1, Examination Category E-C. Such areas include the interior and exterior containment surface areas that are subject to accelerated corrosion with no or minimal corrosion allowance or areas where the absence or repeated loss of protective coatings has resulted in substantial corrosion and pitting. Typical locations of such areas are those exposed to standing water. The carbon steel liner plate in the suppression pool has standing water and is subject to accelerated corrosion and pitting with substantial loss of protective coating. In addition the coating is beyond its designed life. Therefore, the liner plate surfaces in the suppression pool that is exposed to standing water require augmented inspection in accordance with ASME Code, Section XI, Subsection IWE, IWE-1241.

#### Request

1. Provide additional details about the assumption used for developing owner-established criteria for recoating of downcomers. Did the analysis consider surface defects of less than or equal to 0.0625 inches as due to local degradation or as a general corrosion allowance? In addition, provide reference to any design basis document in which the analysis is documented.
2. Clarify if the support columns in the suppression pool will be inspected every ISI period or every ISI interval.
3. Confirm that the effect of the loss in thickness of 35 mils (14 percent) in one liner plate located adjacent to another plate without any loss and of up to 16 percent over nominal thickness of one liner plate on the capacity of liner anchors has been considered in the analysis.
4. Explain why suppression pool liner plates at LGS, Units 1 and 2 that are subject to accelerated corrosion and loss of protective coatings are not selected for augmented

inspection as specified in ASME Code, Section XI, Subsection IWE, specifically IWE-1241.

**Discussion**: The applicant indicated that the request is clear. This DRAI will be sent as a formal RAI.

#### **DRAI B.2.1.30-4.1**

##### **Background**

The response to RAI B.2.1.30-2, dated February 28, 2012, stated that the LGS ASME Section XI, Subsection IWE program as described in LRA Section B.2.1.30 is consistent with GALL Report AMP XI.S1 and ASME Section XI requirements for monitoring and trending. The corrosion of the submerged portion of the suppression pool liner is being trended and is between 1 to 2 mils per year based on data collected during several ASME Code, Section XI, Subsection IWE, inspections performed since 1996 in both LGS, Units 1 and 2. The response further stated that this rate compares well with the corrosion rate of 1.8 mils determined by an engineering analysis for uncoated carbon steel components in the suppression pool for the LGS specific suppression pool water chemistry and operating temperature. The response has also determined that the expected general corrosion rate, if applied to uncoated steel areas for 60 years, will result in a containment liner thickness that meets the liner engineering acceptance criteria for structural integrity.

##### **Issue**

The staff finds the response concerning the general corrosion rate of about 2 mils per year for carbon steel liner plate exposed to standing water in the suppression pool acceptable because it is based on actual measured data over several refueling outages since 1996. However, the pitting corrosion rate is unpredictable and usually 2-10 times more than general corrosion rate. This is evident at the LGS suppression pool liner plate where pitting corrosion of 122 mils has been observed in 2010, about 25 years after the plant started operation. This loss could not have started immediately after plant operation because it takes time for the protective coating to degrade.

##### **Request**

Explain how containment liner thickness will meet the engineering acceptance criteria for structural integrity, in areas of degraded coating, where pitting corrosion continues at the rate of 4 to 20 mils per year for 60 years or even until the period of extended operation starting in 2024 in LGS, Unit 1 and 2029 in LGS, Unit 2 as described in Commitment 30.

**Discussion**: The applicant indicated that the request is clear. The applicant requested that the staff provide a reference for the statement that “the pitting corrosion rate is unpredictable and usually 2-10 times more than general corrosion rate” which appears in the “issue” section of the DRAI. The staff will provide references in the formal RAI. Also, the applicant clarified that the pitting corrosion of 122 mils that the DRAI “issue” section noted was observed in 2010 was actually observed in 2006. The staff will correct the reference in the formal RAI. The remainder of the DRAI will be unchanged and will be sent as a formal RAI.

## **DRAI 3.5.2.11-2**

### Background

The stainless steel bellows are an integral part of the primary containment pressure boundary in nuclear power plants. The Refueling Bellows Assemblies provide accommodation for movements of the reactor vessel caused by operating temperature variations and seismic activities as well as prevent leakage from the reactor well during refueling operations. The NRC issued NUREG/CR-6726 "Aging Management and Performance of Stainless Steel Bellows in Nuclear Power Plants," issued in May 2001, summarizing information on how to evaluate bellows for age-related degradations including aging mechanism results in loss of bellows functionality during the current operations or for the period of extended operations (PEO).

Additionally, NUREG/CR- 7111, "A Summary of Aging Effects and Their Management in Reactor Spent Fuel Pools, Refueling Cavities, Tori, and Safety-Related Concrete Structures," issued in January 2012, identifies the Refueling Bellows to be a possible source of leakage.

The LRA states that the Refueling Bellows Assemblies are evaluated within the license renewal Primary Containment Structure. Table 3.5.2-11 of the LRA identifies the stainless steel portion of the "Refueling Bellows Assembly" as subject to loss of material under a treated water environment, and references line item III.A5.T-14 from the GALL Report (NUREG-1801).

### Issue

GALL Report line item III.A5.T-14, which is referenced in the LRA for the Refueling Bellows Assembly, lists aging effects of cracking due to stress corrosion cracking and loss of material due to pitting and crevice corrosion under treated water or treated borated water environments, for the fuel pool liner of the "Fuel Storage Facility, Refueling Canal." This item in the GALL Report identifies the water chemistry aging management program (AMP) and monitoring of the spent fuel pool level and leakage from leak chase channels as appropriate to manage this aging. The LRA identifies only the Water Chemistry program.

It is unclear to the staff whether LGS has experienced plant specific, and/or considered any industry operating experience(s) of leakage(s) from the Refueling Bellows Assemblies to identify the need to augment the plant specific program requirements for license renewal.

### Requests

- (a) Justify the exclusion of cracking due to stress corrosion cracking as an aging effect requiring management, since this is included in the GALL Report for a related item, as cited in the LRA.
- (b) Provide all plant specific operating experience of leakage from the Refueling Bellows Assemblies, and provide applicability and resolution(s) of condition report(s) (CRs) that may have been generated from the industry operating experience to evaluate the site Refueling Bellows Assemblies.

- (c) Describe how the structural and leak-tight integrities of the Refueling Bellows Assemblies are currently monitored and will be monitored during the PEO.

**Discussion:** The applicant indicated that the bellows described in the NUREG Reports cited in the DRAI were not the same configuration as the refueling bellows at the LGS. The staff will remove this DRAI to further evaluate the need for the information requested. Therefore, this DRAI will not be sent as a formal RAI at this time.

#### **DRAI 3.5.2.3.2-1.1**

##### **Background**

In the response to RAI 3.5.2.3.2-1, PVC roofing scuppers being managed for cracking were added to the Structures Monitoring program. In the response to RAI 3.5.2.3.11-1, fiberglass metal components (permanent drywell shielding) being managed for rips and tears were added to the Structures Monitoring program.

##### **Issue**

LRA Section B.2.1.35, Structures Monitoring, "Program Description," does not include polymeric components being managed for cracking, rips, and tears. In addition, Enhancement No. 2 lists newly added components; however, roofing scuppers and fiberglass metal components (permanent drywell shielding) were not included in the list when the aging management review (AMR) tables were updated.

##### **Request**

Confirm that the Structures Monitoring program will manage polymeric components within the scope of the program for cracking, rips and tears and that the roofing scuppers and fiberglass metal components (permanent drywell shielding) are within the scope of the Structures Monitoring program. Revise the Structures Monitoring program as necessary to address these items.

**Discussion:** The applicant indicated that the request is clear. This DRAI will be sent as a formal RAI.

#### **DRAI B.2.1.7-2.1**

##### **Background**

The response to RAI B.2.1.7-2, provided by letter dated February 15, 2012, stated that the Boiling Water Reactor (BWR) Stress Corrosion Cracking Program includes BWR piping and piping welds made of austenitic stainless steel and nickel alloy regardless of ASME Code classification, consistent with the Generic Aging Lessons Learned (GALL) Report. The response also stated that determination of program scope included screening of all BWR piping and piping welds made of austenitic stainless steel that are four inches or greater in nominal diameter containing reactor coolant at a temperature greater than 93 °C (200 °F) during power operation, regardless of ASME Code classification. The response further stated that this

screening identified only ASME Code Class 1 piping as within the scope of the BWR Stress Corrosion Cracking Program.

In comparison, the revised Update Final Safety Analysis (UFSAR) supplement (LRA Section A.2.1.7) provided in the response states that the BWR Stress Corrosion Cracking aging management program is an existing augmented Inservice Inspection Program that manages intergranular stress corrosion cracking (IGSCC) in reactor coolant pressure boundary piping and piping components made of stainless steel and nickel based alloy, regardless of code classification, as delineated in NUREG-0313, Revision 2, and NRC Generic Letter 88-01 and its Supplement 1.

### Issues

The revision to the UFSAR supplement, which includes the “reactor coolant pressure boundary piping,” is in apparent conflict with the program description provided in response to RAI B.2.1.7-2, which indicates that the scope of program includes all relevant piping regardless of ASME Code classification.

### Request

Justify why the revision to the UFSAR supplement (LRA Section A.2.1.7) includes “reactor coolant pressure boundary piping,” inconsistent with the response indicating that the scope of program includes relevant piping and piping welds regardless of ASME Code classification. Alternatively, revise the UFSAR supplement (LRA Section A.2.1.7) to include “relevant piping and piping welds” without a reference to “reactor coolant pressure boundary piping and piping welds,” consistent with the program description provided in the response to RAI B.2.1.7-2.

**Discussion:** The applicant indicated that the request is clear. This DRAI will be sent as a formal RAI.

### **DRAI B.2.1.13-2.1**

#### Background

The response to RAI B.2.1.13-2, dated February 15, 2012, stated that the loss of material due to cavitation erosion in the reactor enclosure cooling water system piping will be managed by the Closed Treated Water Systems program, which includes an enhancement for periodic condition monitoring using non-destructive examination. The staff notes that LRA Section B.2.1.13 states that the enhancement includes condition and performance monitoring “to verify the effectiveness of the water chemistry control at mitigating aging effects.” In addition, the staff notes that LRA Section B.2.1.13 describes the Closed Treated Water Systems program as a mitigation program that includes water treatment “to modify the chemical composition of the water such that the function of the equipment is maintained and such that the effects of corrosion are minimized.”

The response to RAI B.2.1.13-2 also stated that loss of material due to cavitation erosion was not considered an applicable aging effect, and that cavitation erosion is a design or operating deficiency that is addressed during the current term of operation by the corrective action program. The staff notes that the design or operating deficiency, which is causing the cavitation

erosion in the reactor enclosure cooling water system was not corrected, but instead was addressed by implementing periodic monitoring of the loss of material. The response stated that a recurring task was initiated to periodically monitor this piping for cavitation erosion, with an initial frequency of four years, and once a trend has been established, the inspection frequency will be re-evaluated and adjusted accordingly. The staff notes that these aspects are not reflected in the program enhancement, which does not address “monitoring and trending” and does not describe reevaluating the initial 4-year inspection frequency after a trend has developed.

#### Issue

The loss of material due to cavitation erosion does not appear to be adequately managed by the Closed Treated Water Systems program, because the program minimizes the effects of corrosion through water chemistry controls, and the loss of material due to cavitation erosion is not related to water chemistry control. In addition, although the program enhancement includes condition monitoring activities using non-destructive examinations, the stated purpose of the enhancement is to verify the effectiveness of water chemistry control, and the enhancement does not discuss the initial four-year inspection frequency or the trending activities to adjust the inspection frequency.

In addition, since the loss of material is caused by a design/operating deficiency, it was not clear to the staff whether variations in operating conditions can affect the cavitation erosion rate, and if so, whether the “parameters monitored or inspected” program element needs to monitor temperatures, flow rates, or other parameters in establishing the cavitation erosion trend.

#### Request

Provide a detailed description of the proposed aging management program to manage loss of material due to cavitation erosion in reactor enclosure cooling water system piping. Include a discussion of enhancements to the appropriate program elements of an existing AMP or a discussion of all 10 program elements for a plant-specific AMP. Also include a discussion of any monitoring activities, (e.g., temperatures, flow rates), that may need to be trended in order to establish the cavitation erosion rate.

**Discussion:** The applicant indicated that the request is clear. This DRAI will be sent as a formal RAI.

LICENSEE: Exelon Generation Company, LLC

FACILITY: Limerick Generating Station

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DATE	06/ /12	06/ /12	06/ /12	06/ /12

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TELEPHONE CONFERENCE CALL  
LIMERICK GENERATING STATION  
LICENSE RENEWAL APPLICATION

LIST OF PARTICIPANTS  
April 12, 2012

PARTICIPANTS

AFFILIATIONS

Robert Kuntz	Nuclear Regulatory Commission (NRC)
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Naeem Iqbal	NRC
James Medoff	NRC
Bo Pham	NRC
Ben Parks	NRC
Allen Hiser	NRC
Seung Min	NRC
Emma Wong	NRC
Christopher Wilson	Exelon Generation Company, LLC (Exelon)
Gene Kelly	Exelon
Al Fulvio	Exelon
Deb Spamer	Exelon
Mike Guthrie	Exelon
Ron Hess	Exelon
Jim Jordan	Exelon

## **DRAI 2.3.3.9-2.1**

### Background

The response to RAI 2.3.3.9-2, dated February 16, 2012, stated for passive components in lightning plant protection system (NFPA 78, Lightning Protection Code), that Limerick Generating Station (LGS) does not have a lightning plant protection system. Passive lightning protection components (NFPA 78) are provided for equipment and personnel protection. They are not relied upon to demonstrate compliance with 10 CFR 50.48 and as such do not perform an intended function for license renewal. Therefore, the lightning protection components are not in the scope of license renewal.

### Issues

The response excluded some passive lightning protection components (NFPA 78). The response stated that the equipment passive lightning protection components have no function that supports 10 CFR 50.48 requirements; therefore, they are not within the scope of license renewal and subject to an aging management review (AMR).

### Request

Provide clarification on how the passive lightning protection components are required per the NFPA 78 Lightning Protection Code but are not required for compliance with 10 CFR 50.48. If the components are required for compliance with 10 CFR 50.48 then provide information to demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis (CLB) for the period of extended operation as required by 10 CFR 54.21(a)(3).

**Discussion:** The applicant indicated that the request is clear. This DRAI will be sent as a formal RAI.

## **DRAI 4.2.1-1**

### Background

LRA Section 4.2.1 provides the basis for deriving the 57 effective full power years (EFPY) neutron fluence values for the power operation of LGS, Units 1 and 2, through the period of extended operation. These are inputs to the neutron irradiation embrittlement time-limited aging analyses (TLAA) of the reactor pressure vessel (RPV) beltline shell, nozzle and weld components. The corresponding neutron fluence TLAAs that are derived from these neutron fluence values are in the following LRA sections: (a) Section 4.2.2, "Upper Shelf Energy"; (b) Section 4.2.3, "Adjusted Reference Temperature"; (c) Section 4.2.4, "Pressure – Temperature Limits"; (d) Section 4.2.5, "Axial Weld Inspection"; (e) Section 4.2.6, "Circumferential Weld Inspection," and (f) Section 4.2.7, "Reactor Pressure Vessel Reflood Thermal [Analysis]."

LRA Section 4.2.1 identifies the RAMA code was used to derive the 57 EFPY neutron fluence values for high energy neutrons with kinetic energies greater than 1.0 MeV ( $E > 1.0$  MeV) and that the RAMA code conforms to the staff's recommended regulatory position in Regulatory Guide (RG) 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence" [March 2001], for applying neutron fluence methodologies.

### Issue

LRA Section 4.2.1 does not identify which industry-based RAMA code is being used in the CLB for deriving the high energy neutron fluence values (i.e.,  $E > 1.0$  MeV) for the ferritic RPV beltline components in LGS, Units 1 and 2. The LRA only references the methodology in Electric Power Research Institute (EPRI) Report No. BWRVIP-126, "BWR Vessel and Internals Project, RAMA Fluence Methodology Software," Version 1.0, which represents the software that is used at LGS to derive these fluence values. However, the staff noted that it does not represent the fluence methodology used to conform to RG 1.190.

In contrast, the staff has noted that the P-T limits in the applicant's CLB (refer to facility Operating License Amendment No. 163 to Technical Specification 3.4.6.1, which was approved by NRC safety evaluation dated January 2, 2003) used General Electric (GE) Company Report No. NEDC-32983P-A as the neutron fluence methodology for conforming to RG 1.190.

The LRA does not identify the methodology in GE's report as the basis for the 57 EFPY neutron fluences provided in LRA Section 4.2.1. Thus, the LRA does not present sufficient information to identify the neutron fluence methodology or provide a basis for concluding that the neutron fluence methodology used in the CLB conforms to RG 1.190 and bounds all RPV beltline shell, nozzle, and weld components (including associated axial welds, circumferential welds, and nozzle-to-shell welds).

LRA Section A.4.2.1, which provides the Updated Final Safety Analysis Report (UFSAR) supplement summary description for LRA Section 4.2.1, also does provide this information.

### Request

1. Identify the document (include reference number, title, and date) and neutron fluence methodology used in the CLB to conform with RG 1.190. Clarify whether the neutron fluence methodology used has been endorsed for use by the staff. Justify the conclusion that the neutron fluence methodology currently adopted in the CLB for these TLAAs conforms to RG 1.190 and is bounding for all RPV beltline shell, nozzle, and weld components (including associated axial welds, circumferential welds, and nozzle-to-shell welds).
2. Update LRA Section 4.2.1 and A.4.2.1 to identify the document (including reference number, title, and date) and the neutron fluence methodology used in the CLB to conform to RG 1.190. and justify the LGS regulatory basis for using this neutron fluence methodology for the derivation of 57 EFPY neutron fluence values for the ferritic beltline shell, nozzle, and weld components in the LGS, Unit 1 and 2 RPVs.

**Discussion:** The applicant indicated that the use of RAMA code is not the CLB for the LGS. The staff will not issue this DRAI as it considers the LRA's use of a methodology which is not consistent with the CLB. Instead, the staff will consider issuing an RAI on justifying why the LRA is not referencing the neutron fluence methodology that was used and approved for the current plant pressure-temperature (P-T) limit curves as the basis for deriving the 57 EFPY neutron fluence values for the LRA.

#### **DRAI 4.2.1-2**

##### Background

10 CFR Part 50, Appendix H identifies that RPV surveillance programs need to be implemented for all ferritic RPV components with projected end-of-life neutron fluences in excess of  $1.0 \times 10^{17}$  n/cm<sup>2</sup> (E > 1.0 MeV). The background information in RAI 4.2.1-1 is also applicable to RAI 4.2.1-2.

##### Issue

The staff is concerned that there may be additional ferritic shell, nozzle, or weld components in the RPV that need to be added to the list of RPV beltline components because the neutron fluences would not be projected to exceed a fluence value of  $1.0 \times 10^{17}$  n/cm<sup>2</sup> (E > 1.0 MeV) until some point in the proposed period of extended operation.

##### Request

Clarify and justify whether there are any additional ferritic shell, nozzle, or weld components (including circumferential, axial or nozzle-to-vessel welds) in the RPV that needs to be added to the components associated with the beltline regions of the LGS, Unit 1 and 2 RPVs.

If additional ferritic shell, nozzle, or weld components need to be added as RPV beltline components, identify the components and provide the 57 EFPY neutron fluences for these components. In addition, address how these components will be assessed for the neutron irradiation embrittlement TLAAAs that are identified and evaluated for in Sections 4.2.2 – 4.2.7 of the LRA.

**Discussion:** The applicant indicated that the use of RAMA code is not the CLB for the LGS. The staff will not issue this DRAI as it considers the LRA's use of a methodology which is not consistent with the CLB. Instead, the staff will consider issuing an RAI on justifying why the LRA is not referencing the neutron fluence methodology that was used and approved for the current plant P-T limit curves as the basis for deriving the 57 EFPY neutron fluence values for the LRA.

#### **DRAI B.2.1.28-2**

##### Background

The GALL Report recommends that loss of material and degradation of the neutron absorbing material capacity be determined through coupon and/or direct in situ testing.

The response to RAI B.2.1.28-1, provided by letter dated February 28, 2012, stated that the coupons in the LGS, Unit 2 spent fuel pool had experienced only two cycles of high fluence from freshly discharged fuel. The response also stated that the coupons in the LGS, Unit 1 spent fuel pool had not experienced high fluence from freshly discharged fuel since re-racking.

In order for the coupons to obtain environmental conditions bounding of all Boral spent fuel pool racks, the response to RAI B.2.1.28-1 proposes to resume an accelerated exposure configuration for the Boral coupons (i.e., surround the coupons by freshly discharged fuel assemblies) at each of the next five refueling cycles, beginning with the refueling outage in 2013 and 2014 for LGS, Units 1 and 2, respectively.

### Issue

The coupons in the LGS, Units 1 and 2 spent fuel pools have not experienced long exposure to high radiation fluence from freshly discharged fuel, making the exposure time potentially non-conservative and/or not bounding of all the LGS, Unit 1 and 2 Boral spent fuel pool racks. The current environmental conditions of the coupons are not bounding of all Boral racks and; therefore, may not provide acceptable testing data for monitoring loss of material and degradation of the neutron absorbing material capacity.

### Request

Provide justification on how resuming a five cycle radiation exposure period will place the coupons in a bounding condition for all Boral spent fuel pool racks for the LGS, Units 1 and 2 now and in the future. If there is not ample justification that the coupons will be bounding of all the Boral panels in the spent fuel pool (SFP) now or in the future, discuss if another method of monitoring will be used, such as in situ testing.

**Discussion:** The applicant indicated that the request is clear. The staff noted that the request referenced current operating conditions was not necessary for the staff's review of the license renewal application. Therefore, references in the DRAI to the current period of operation will be removed prior to issuance of the formal RAI. The formal RAI will state:

### Background

The GALL Report recommends that loss of material and degradation of the neutron absorbing material capacity be determined through coupon and/or direct in situ testing.

The response to RAI B.2.1.28-1, provided by letter dated February 28, 2012, stated that the coupons in the LGS, Unit 2 spent fuel pool had experienced only two cycles of high fluence from freshly discharged fuel. The response also stated that the coupons in the LGS, Unit 1 spent fuel pool had not experienced high fluence from freshly discharged fuel since re-racking.

In order for the coupons to obtain environmental conditions bounding of all Boral spent fuel pool racks, the response to RAI B.2.1.28-1 proposes to resume an accelerated exposure configuration for the Boral coupons (i.e., surround the coupons by freshly discharged fuel assemblies) at each of the next five refueling cycles, beginning with the refueling outage in 2014 and 2013 for LGS, Units 1 and 2, respectively.

Issue

The coupons in the LGS, Units 1 and 2 spent fuel pools have not experienced long exposure to high radiation fluence from freshly discharged fuel, making the exposure time potentially non-conservative and/or not bounding of all the LGS, Unit 1 and 2 Boral spent fuel pool racks. The environmental conditions of the coupons are not bounding of all Boral racks and; therefore, may not provide acceptable testing data for monitoring loss of material and degradation of the neutron absorbing material capacity.

Request

Provide justification on how resuming a five cycle radiation exposure period will place the coupons in a bounding condition for all Boral spent fuel pool racks for the LGS, Units 1 and 2 for the period of extended operation. If there is not ample justification that the coupons will be bounding of all the Boral panels in the SFP, discuss if another method of monitoring will be used, such as in situ testing.

LICENSEE: Exelon Generation Company, LLC

FACILITY: Limerick Generating Station

SUBJECT: SUMMARY OF TELEPHONE CONFERENCE CALL HELD ON JUNE 11, 2012, BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION AND EXELON GENERATION COMPANY, LLC, CONCERNING REQUESTS FOR ADDITIONAL INFORMATION PERTAINING TO THE LIMERICK GENERATING STATION, LICENSE RENEWAL APPLICATION (TAC. NOS. ME6555 AND ME6556)

The U.S. Nuclear Regulatory Commission (NRC or the staff) and representatives of Exelon Generation Company, LLC held a telephone conference call on June 11, 2012, to discuss and clarify the staff's requests for additional information (RAIs) concerning the Limerick Generating Station license renewal application. The telephone conference call was useful in clarifying the intent of the staff's RAIs.

Enclosure 1 provides a listing of the participants and Enclosure 2 contains a listing of the RAIs discussed with the applicant, including a brief description on the status of the items.

The applicant had an opportunity to comment on this summary.

Robert F. Kuntz, Senior Project Manager  
Projects Branch 1  
Division of License Renewal  
Office of Nuclear Reactor Regulation

Docket Nos. 50-352 and 50-353

Enclosures:

1. List of Participants
2. List of Requests for Additional Information

cc w/encls: Listserv



LICENSEE: Exelon Generation Company, LLC

FACILITY: Limerick Generating Station

SUBJECT: SUMMARY OF TELEPHONE CONFERENCE CALL HELD ON MAY 16, 2012, BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION AND EXELON GENERATION COMPANY, LLC, CONCERNING REQUESTS FOR ADDITIONAL INFORMATION PERTAINING TO THE LIMERICK GENERATING STATION, LICENSE RENEWAL APPLICATION (TAC. NOS. ME6555 AND ME6556)

The U.S. Nuclear Regulatory Commission (NRC or the staff) and representatives of Exelon Generation Company, LLC held a telephone conference call on June 11, 2012, to discuss and clarify the staff's requests for additional information (RAIs) concerning the Limerick Generating Station license renewal application. The telephone conference call was useful in clarifying the intent of the staff's RAIs.

Enclosure 1 provides a listing of the participants and Enclosure 2 contains a listing of the RAIs discussed with the applicant, including a brief description on the status of the items.

The applicant had an opportunity to comment on this summary.

Robert F. Kuntz, Senior Project Manager  
Projects Branch 1  
Division of License Renewal  
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Letter to M. Gallagher from R Kuntz dated June xx, 2012

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE.  
LIMERICK GENERATING STATION LICENSE RENEWAL APPLICATION (TAC  
NOS. ME6555, ME6556)

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TELEPHONE CONFERENCE CALL  
LIMERICK GENERATING STATION  
LICENSE RENEWAL APPLICATION

LIST OF PARTICIPANTS  
June 11, 2012

PARTICIPANTS

AFFILIATIONS

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LIMERICK GENERATING STATION  
LICENSE RENEWAL APPLICATION  
DRAFT REQUESTS FOR ADDITIONAL INFORMATION

**DRAI 3.3.2.1.10-1**

Background

SRP-LR Table 3.3.1, item 3.3.1-69, recommends that copper alloy components exposed to fuel oil be managed for loss of material by GALL Report AMPs XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection." However, item 3.3.1-69, states, "[t]he Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.26) program has been substituted and will be used to manage the loss of material in the copper alloy valve bodies associated with dirty fuel oil drain piping in the Emergency Diesel Generator System."

LRA Table 3.3.1, item 3.3.1-70 states that the Fuel Oil Chemistry program and One-Time Inspection program will be used to manage the loss of material in carbon steel piping, piping components, and piping elements, and tanks exposed to fuel oil in the emergency diesel generator system. However, item 3.3.1-70 states that "[t]he Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.26) program has been substituted and will be used to manage the loss of material in the carbon steel Dirty Fuel Oil Drain Tank and dirty fuel oil drain piping in the Emergency Diesel Generator System."

GALL Report AMP XI.M32 recommends that inspections should focus on locations that are isolated from the flow stream, that are stagnant, or have low flow for extended periods and are susceptible to the gradual accumulation or concentration of agents that promote certain aging effects. It also recommends that inspections will include a representative sample size of 20 percent of the population (defined as components having the same material, environment, and aging effect combination), or a maximum of 25 components. These inspections can commence prior to the period of extended operation or be conducted early in the period of extended operation.

GALL Report AMP XI.M38 recommends that inspections be performed during the periodic system and component surveillances or during the performance of maintenance activities when the surfaces are made accessible for visual inspection.

Issue

Given that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program has been substituted for the One-Time Inspection program, it is unclear to the staff that the minimum number of inspections recommended by the GALL Report will be performed. In addition, the inspections conducted by the One-Time Inspection program would have commenced prior to the period of extended operation or been conducted early in the period of extended operation, while those conducted by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program will be conducted during the period of extended operation. It is unclear to the staff how the timing of inspections of the latter program is sufficient.

## Requests

State the basis for why it is acceptable to substitute the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program in place of the One-Time Inspection, given that the number and timing of inspections conducted by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program may not be sufficient to ensure that the intended function(s) of the components within the scope of license renewal will be met in the period of extended operation.

**Discussion:** The applicant indicated that the information requested in this DRAI was previously provided in response to RAI B.2.1.26-2 which was transmitted to the NRC by letter dated February 15, 2012. The staff reviewed the response to RAI B.2.1.26-2 and agrees that the information requested had previously been provided. Therefore, this DRAI will not be sent as a formal RAI.

## **DRAI B.1.4-2**

### Background

Request for additional information (RAI) B.1.4-1, issued on February 16, 2012, requested a description of the programmatic activities that will be used to continually identify aging issues, evaluate them, and as necessary, enhance the aging management programs (AMPs) or develop new AMPs for license renewal. The response dated March 13, 2012, provided additional information regarding the Limerick Generating Station (LGS) Operating Experience program.

On March 16, 2012, the NRC issued LR-ISG-2011-05, "Ongoing Review of Operating Experience" to clarify the staff's position that license renewal AMPs should be informed, and enhanced when necessary, based on the ongoing review of both plant-specific and industry operating experience.

### Issue

The response to B.1.4-1 described LGS's plant-specific programmatic framework for considering operating experience. However, in reviewing aspects of the LGS program against the guidance set forth in LR-ISG-2011-05, the staff needs further clarification on the implementation timeframe of the proposed enhancements.

### Request

Where the March 13, 2012, response states that enhancements to the Operating Experience program "will be implemented prior to the period of extended operation," provide further clarification regarding the approximate timeframe this would take place with respect to the period of extended operation. Include any relevant practical consideration that would impact the implementation timeframe.

**Discussion:** The applicant indicated that the request is clear. This DRAI will be sent as a formal RAI.

## **DRAI B.2.1.25-1.1**

### Background

The response to RAI B.2.1.25-1, provided by letter dated February 15, 2012, states that stress corrosion cracking (SSC) is not applicable for stainless steel surfaces in an outdoor air environment in auxiliary and steam and power conversion systems because:

- Although chlorine, as sodium hypochlorite, is added to the water in the cooling towers, prevailing wind direction is such that the cooling tower plume is directed away from the plant
- A review of plant operating experience has revealed no occurrences of cracking in outdoor stainless steel components.
- Recent inspections performed on the external surfaces of large outdoor stainless steel components have revealed that these components are in good material condition.

### Issue

Experimental studies and industry operating experience in chloride-containing (coastal) environments have shown that stainless steel exposed to an outdoor air environment can crack at temperatures as low as 104 to 120 degrees F, depending on humidity, component surface temperature, and contaminant concentration and composition. The staff noted that while the experimental studies demonstrated that cracking can occur in 4 to 52 weeks, the industry operating experience failures did not necessarily occur early in plant life and therefore, the staff cannot conclude that recent inspections are sufficient to demonstrate an aging effect will not occur during the period of extended operation.

Given that a prevailing wind direction does not result in the absence of contaminant deposition by the cooling tower plume, and that information has not been provided on the potential for chloride contamination from the onsite soil or nearby agricultural and industrial sources, the staff lacks sufficient information to conclude that SCC cannot occur in stainless steel components located in an outdoor air environment.

### Request

- 1) In light of industry operating experience in chloride-containing environments, state the basis for why the chemical compounds in the cooling tower plume cannot result in SCC if plume fallout (regardless of prevailing wind direction) accumulates on the external surfaces of stainless steel piping within the scope of license renewal.
- 2) State the basis for why chloride contamination is not expected to accumulate on stainless steel components within the scope of license renewal from the soil or nearby agricultural and industrial sources.

**Discussion:** The applicant indicated that the request is clear. This DRAI will be sent as a formal RAI.

## **DRAI 4.3-10.2**

### Background

The response to RAI 4.3-10.1, provided by letter dated May 4, 2012, stated that the steam dryer support brackets were evaluated in the reactor pressure vessel (RPV) stress report and the report stated that "exemption from fatigue analysis per N-415.1 (of the design code) is satisfied." The design code of the brackets was the 1968 Edition of the American Society of Mechanical Engineers (ASME) Code Section III with Addenda through summer 1969. The response also indicated that the control rod guide tube was exempted from fatigue analysis per Paragraph NG-3222.4(d) of the ASME Code Section III.

### Issue

The staff noted that the fatigue waiver provisions in N-415.1 of the 1968 Edition of ASME Code Section III with Addenda through summer 1969 discussed that fatigue analyses were not required when all four specific conditions were met. In particular, the staff noted that Condition (a) of N-415.1 required that the specified numbers of times (including startup and shutdown) that the pressure will be cycled from atmospheric pressure to the operating pressure and back to atmospheric pressure shall not exceed certain requirements. The staff noted that the fatigue waiver provision depended on the assumption of the number of occurrence of transients (such as startup and shutdown), which is a time-dependent parameter. The staff noted that the fatigue waiver provisions in Paragraphs NG-3222.4(d) and NB-3222.4(d) of the ASME Code Section III also contained similar transient cycles conditions. The response to RAI 4.3-10.1 did not provide a justification of why the fatigue waivers were not identified as time limited aging analysis (TLAAs) in the License Renewal Application (LRA) in accordance with 10 CFR 54.21(c)(1).

### Request

- 1) Clarify how the fatigue waiver provisions in ASME Code, Section III, compare to the six criteria for TLAAs in 10 CFR 54.3, and justify whether or not the fatigue waivers for the control rod guide tube and the steam dryer support brackets should be identified as TLAAs for the LRA. If the fatigue waivers need to be identified as TLAAs, provide necessary information and LRA revision to support the TLAA disposition.
- 2) Confirm that all fatigue waiver provisions in the ASME Code, Section III, have been identified as TLAAs, as applicable.

**Discussion:** The applicant indicated that the request is clear. This DRAI will be sent as a formal RAI.