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

July 20, 2012

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

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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)
Michael Marshall	NRC
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James Gavula	NRC
Seung Min	NRC
Christopher Wilson	Exelon Generation Company, LLC (Exelon)
Gene Kelly	Exelon
Mark Miller	Exleon
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Ron Hess	Exelon
Jim Jordan	Exelon
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ENCLOSURE 1

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

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.

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/RA/

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