



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

April 16, 2012

Mr. Michael P. Gallagher  
Vice President, License Renewal Projects  
Exelon Generation Company, LLC  
200 Exelon Way  
Kennett Square, PA 19348

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE  
LIMERICK GENERATING STATION, UNITS 1 AND 2, LICENSE RENEWAL  
APPLICATION (TAC NOS. ME6555 AND ME6556)

Dear Mr. Gallagher:

By letter dated June 22, 2011, Exelon Generation Company, LLC submitted an application pursuant to Title 10 of the *Code of Federal Regulations*, Part 54, to renew the operating licenses for Limerick Generating Station, Units 1 and 2, for review by the U.S. Nuclear Regulatory Commission (NRC or the staff). The staff is reviewing the information contained in the license renewal application and has identified, in the enclosure, areas where additional information is needed to complete the review.

These requests for additional information (RAIs) were discussed with Christopher Wilson, and a mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me by telephone at 301- 415-3733 or by e-mail at [Robert.Kuntz@nrc.gov](mailto:Robert.Kuntz@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "Robert F. Kuntz", written over a faint, larger signature.

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

Enclosure:  
Requests for Additional  
Information

cc w/encl: Listserv

LIMERICK GENERATING STATION  
LICENSE RENEWAL APPLICATION  
REQUESTS FOR ADDITIONAL INFORMATION

**RAI 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.

ENCLOSURE

## **RAI 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 1063631, 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 4 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 the 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 2 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 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 a plate which is 4 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 up to 16 percent over nominal thickness 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.

#### **RAI 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 (See; J.A. Gonzales, "Comparison of Rates of General Corrosion and maximum Pitting Penetration of Concrete Embedded Steel Reinforcement," Cement of Concrete Research, Vol. 25, No. 2, pp257-264, Fraser King, "Overview of a Carbon Steel Container Corrosion model for a deep Geological Repository in Sedimentary Rock," Nuclear Waste Management Organization Report TR-2007-01, March 2007, and Xiaodong Sun and Lietai Yang, "Real Time Monitoring of Localized and General Corrosion Rates in Drinking Water Systems Utilizing Coupled Multielectrode Array Sensors," Paper No. 060904, 61 First Annual NACE Conference and Exhibition, 2006). This is evident at the LGS suppression pool liner plate where pitting corrosion of 122 mils has been observed in 2006, 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.

April 16, 2012

Mr. Michael P. Gallagher  
Vice President, License Renewal Projects  
Exelon Generation Company, LLC  
200 Exelon Way  
Kennett Square, PA 19348

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE  
LIMERICK GENERATING STATION, UNITS 1 AND 2, LICENSE RENEWAL  
APPLICATION (TAC NOS. ME6555 AND ME6556)

Dear Mr. Gallagher:

By letter dated June 22, 2011, Exelon Generation Company, LLC submitted an application pursuant to Title 10 of the *Code of Federal Regulations*, Part 54, to renew the operating licenses for Limerick Generating Station, Units 1 and 2, for review by the U.S. Nuclear Regulatory Commission (NRC or the staff). The staff is reviewing the information contained in the license renewal application and has identified, in the enclosure, areas where additional information is needed to complete the review.

These requests for additional information (RAIs) were discussed with Christopher Wilson, and a mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me by telephone at 301- 415-3733 or by e-mail at [Robert.Kuntz@nrc.gov](mailto:Robert.Kuntz@nrc.gov).

Sincerely,

*/RA/*

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

Enclosure:  
Requests for Additional  
Information

cc w/encl: Listserv

DISTRIBUTION:  
See next page

ADAMS Accession No.: ML12082a155

OFFICE	LA:RPB1:DLR	PM:RPB1:DLR	BC:RPB1:DLR	PM: RPB1:DLR
NAME	YEdmonds	RKuntz	DMorey	RKuntz
DATE	03/29/12	03/29/12	04/02/12	04/16/12

OFFICIAL RECORD COPY

Letter to M. Gallagher from R. Kuntz dated April 16, 2012

**SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE LIMERICK GENERATING STATION, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION (TAC NOS. ME6555 AND ME6556)**

**DISTRIBUTION:**

**HARDCOPY:**

DLR RF

**E-MAIL:**

PUBLIC

RidsNrrDir Resource

RidsNrrDirRpb1 Resource

RidsNrrDirRpb2 Resource

RidsNrrDirRerb Resource

RidsNrrDirRarb Resource

RidsNrrDirRasb Resource

RidsNrrDirRapb Resource

RidsNrrDirRpob Resource

RidsNrrPMLimerick Resource

RidsOgcMailCenter Resource

-----  
RKuntz

DMorey

LPerkins

MSmith, OGC

RConte, RI

MModes, RI

GDiPaolo, RI

NSieller, RI