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

February 14, 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 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.

Sincerely,

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 3.1.1.60-1

Background:

SRP-LR Table 3.1.1, item 3.1.1-60 addresses carbon steel piping components exposed to reactor coolant that are being managed for wall thinning due to flow-accelerated corrosion. License renewal application (LRA) Table 3.1.1 states that this item is not applicable because there are no carbon steel piping components exposed to reactor coolant that are susceptible to this aging effect in the reactor coolant system. The staff noted that EPRI 1013013, "An Evaluation of Flow-Accelerated Corrosion in the Bottom Head Drain Lines of Boiling Water Reactors," concluded that both Limerick Generating Station (LGS) units were viewed as having very limited susceptibility to damage from this concern.

Issue:

Although LGS is viewed as having limited susceptibility to damage from this concern, it is unclear to the staff that it can be stated that there are no components susceptible to wall thinning due to flow-accelerated corrosion in the reactor coolant system, as claimed in the LRA.

Request:

Provide the bases for the determination that there are no steel piping components exposed to reactor coolant that are susceptible to flow-accelerated corrosion in the reactor coolant system. Include in the response a description of the susceptibility analysis performed for the bottom head drain line as well as other piping and components in the reactor coolant system.

RAI 3.2.2.1.1-1

Background:

GALL Report AMP XI.M18, "Bolting Integrity" includes periodic volumetric or surface and visual inspections of closure bolting for leakage, loss of material, cracking, and loss of preload/loss of prestress in accordance with the requirements of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Section XI Inservice Inspection, Subsections IWB, IWC, and IWD. In addition, GALL Report AMP XI.M18 recommends system walkdowns at least once per refueling cycle to ensure detection of leakage at bolted joints before the leakage becomes excessive.

LRA Section B.2.1.11 states that inspection activities for bolting in a submerged environment are performed in conjunction with associated component maintenance activities. The following tables in the LRA contain bolting exposed to an external environment of treated water or raw water (i.e., submerged) and managed for loss of material and loss of preload with the Bolting Integrity program:

- Table 3.2.2-02: Core Spray System
- Table 3.2.2-03: High Pressure Coolant Injection System
- Table 3.2.2-04: Reactor Core Isolation Cooling System
- Table 3.2.2-05: Residual Heat Removal System
- Table 3.3.2-11: Fuel Pool Cooling and Cleanup System
- Table 3.4.2-01: Circulating Water System
- Table 3.4.2-03: Condenser and Air Removal System

Issue:

It is unclear to the staff how inspection of submerged bolting during maintenance activities will be capable of detecting loss of material and loss of preload prior to loss of component intended functions and how often these inspections will be conducted given potentially limited opportunities to drain systems and expose the bolting for inspection.

Request:

1. For each system, state the parameters that will be inspected for during opportunistic inspections of normally submerged bolting and the basis for why these parameters will be capable of assessing the condition of the bolting before loss of intended function occurs.

2. For each system, state the minimum number and frequency of inspections that will be conducted during the period of extended operation.

RAI 3.2.2.1.1-2

Background

LRA Tables 3.2.2-03 and 3.2.2-04 include aging management review items for gray cast iron turbine lube oil reservoirs exposed internally to lube oil; however, selective leaching is not considered to be an aging effect. The LRA proposes to manage aging of these components with the Lubricating Oil Analysis and One-Time Inspection programs.

According to the LRA, the Lubricating Oil Analysis program directs the condition monitoring activities (sampling, analyses, and trending) to manage loss of material and reduction of heat transfer in piping, piping components, piping elements, heat exchangers, and tanks. The One-Time Inspection program provides inspections focusing 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. According to the LRA, the inspections will include a representative sample of the system population and will focus on the bounding or lead components most susceptible to aging, due to time in service, and severity of operating conditions.

Selective leaching is known to occur in susceptible materials such as gray cast iron and uninhibited brasses with greater than 15-percent zinc when an electrolyte is present.

Issue

Sufficient information is not available to determine whether susceptible locations (e.g., turbine lube oil reservoirs) will be included in the sample for inspection or not. Moreover, visual inspections alone may not be sufficient to detect selective leaching. Therefore, the staff cannot conclude whether aging of the gray cast iron reservoirs internally exposed to lube oil will be adequately managed or not.

Request

Explain if samples will include susceptible locations to confirm that selective leaching is not occurring in areas where water can accumulate. If it is determined that selective leaching is a relevant aging effect/mechanism to be managed, explain what aging management program and inspection method(s) (e.g., hardness measurement) will be used to manage the loss of material due to selective leaching.

RAI 3.2.2.1.1-3

Background

In the LRA AMR tables, there are several entries for copper alloy with 15-percent zinc or more or gray cast iron components internally exposed to "air/gas – wetted." The LRA states that these components will be managed for loss of material by the Inspection of Internal Surfaces of Miscellaneous Piping and Ducting program. This program uses periodic and opportunistic inspections of the internal surfaces of components augmented by physical manipulation of flexible elastomers where appropriate.

The LRA defines "air/gas – wetted" as "air/gas environments containing significant amounts of moisture where condensation or water pooling may occur. This environment includes air with enough moisture to facilitate loss of material in steel caused by general, pitting, and crevice corrosion."

Selective leaching is known to occur in susceptible materials such as gray cast iron and uninhibited brasses with greater than 15-percent zinc when moisture or water (an electrolyte) is present.

Issue

Visual inspections alone may not be sufficient to detect selective leaching. Therefore, the staff cannot conclude whether aging of the copper alloy with 15-percent zinc or more or gray cast iron components internally exposed to "air/gas – wetted" will be adequately managed or not.

Request

Explain why copper alloy with 15-percent zinc or more or gray cast iron components internally exposed to air/gas – wetted are not being managed for selective leaching. If it is determined that selective leaching is an appropriate aging effect/mechanism to be managed, explain what aging management program and inspection method(s) (e.g., hardness measurement) will be used to manage the loss of material due to selective leaching.

RAI 3.3.1.30-1

Background

SRP-LR Table 3.3.1, items 3.3.1-30, 3.3.1-31, and 3.3.1-32 address piping components made with concrete, reinforced concrete, asbestos cement, and cementitious material exposed to raw water. The GALL Report recommends GALL Report AMP XI.M20, "Open-Cycle Cooling Water System," to manage changes in material properties and cracking due to aggressive chemical attack, and cracking due to settling for these component groups. LRA Table 3.3.1 for the corresponding items state that these items are not applicable because there are no cement, reinforced cement or cementitious material piping exposed to raw water with the above aging effects in auxiliary systems. The staff noted that LRA Table 3.3.2-9, "Fire Protection System" cites item 3.3.1-33, which addresses loss of material due to abrasion, cavitation, aggressive chemical attack and leaching in cement piping components exposed to raw water.

Issue

As indicated in LRA Table 3.3.1, item 3.3.1.33, Limerick has cement piping exposed to raw water in the fire protection system. As such, it is unclear to the staff why the aging effects described in LRA Table 3.3.1, items 3.3.1.30 and 31 (i.e., changes in material properties and cracking) would not apply to cement fire protection piping. Additionally, there is insufficient information in the LRA for the staff to conclude that LRA Table item 3.3.1.32 is not applicable to LGS. Specifically, the discussion provided in the LRA table for this item is unclear as to whether the conclusion of applicability was based on the fact that there is no piping at LGS constructed of reinforced concrete or asbestos cement or was based on the fact that such piping is not subject to the aging effects of changes in material properties and cracking.

Request:

1. Provide the basis for concluding that LRA Table 3.3.1, items 3.3.1.30 and 31 (and the associated aging effects) do not apply to concrete fire protection piping at LGS.

2. Clarify whether the conclusion of applicability for LRA Table 3.3.1, item 3.3.1.32, was based on the fact that there is no piping at Limerick constructed of reinforced concrete or asbestos cement or was based on the fact that such piping is not subject to the aging effects of changes in material properties and cracking.

RAI 3.6.2.3-1

Background

In LRA Table 3.6.2-1, corresponding to Table 1 Items 3.6.1.16 and 17, the applicant indicated, via note A, that the combination of component type, material, environment, and aging effect requiring management of fuse holders not part of active equipment is consistent with the GALL Report. The applicant provided information about how it will manage the aging effects by proposing the Fuse Holders program, LRA AMP B.2.1.42. The LRA states that this program is consistent with GALL Report AMP XI.E5. During the onsite audit, the staff noted that certain fuse holders (metallic clamps) were in scope of license renewal (i.e., fuse

holders in the switchyard control house) but were not included in the scope of Fuse Holders program. GALL Report, items VI.A.LP-23 and -31, "Fuse Holders (Not Part of active equipment): Metallic Clamp," identifies the aging/effect mechanism as increased resistance of connection due to chemical contamination, corrosion, oxidation; fatigue due to ohmic heating, thermal cycling, electrical transients, increased resistance of connection due to fatigue caused by frequent manipulation or vibration. The associated GALL Report AMP XI.E5, "Fuse Holders," states that fuse holders within the scope of license renewal should be tested to provide an indication of the condition of the metallic clamps of fuse holders.

Issue

The LRA did not provide technical justifications of why these fuse holders which are in the scope of license renewal are excluded from the applicant's Fuse Holders program.

Request

Provide a list of fuse holders that are within the scope of license renewal and subject to an aging management review (i.e., fuse holders located outside of active equipment). For fuse holders within the scope of license renewal, provide an evaluation that addresses each aging effect/mechanism identified in GALL Report, items VI.A.LP-23 and -31 and identify fuse holders within the scope of license renewal which will be included in the Fuse Holder program (LRA AMP B.2.1.42) and the AMP basis document.

Letter to M. Gallagher from R. Kuntz dated February 14, 2012

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200 Exelon Way
Kennett Square, PA 19348

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/RA/
Robert F. Kuntz, Senior Project Manager
Projects Branch 1
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Office of Nuclear Reactor Regulation

Docket Nos. 50-352 and 50-353

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ADAMS Accession No.: ML12018a033

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