April 17, 2014

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

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE BYRON STATION, UNITS 1 AND 2, AND BRAIDWOOD STATION, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION, SET 21 (TAC NOS. MF1879, MF1880, MF1881, AND MF1882)

Dear Mr. Gallagher:

By letter dated May 29, 2013, Exelon Generation Company, LLC, submitted an application pursuant to Title 10 of the *Code of Federal Regulations* Part 54, to renew the operating licenses NPF-37, NPF-66, NPF-72, and NPF-77 for Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2, respectively, 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 John Hufnagel, 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 at 301-415-4115 or e-mail Lindsay.Robinson@nrc.gov.

Sincerely,

/RA/

Lindsay R. Robinson, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-454, 50-455, 50-456, and 50-457

Enclosure:
Request for Additional Information

cc: Listserv

April 17, 2014

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

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE BYRON STATION, UNITS 1 AND 2, AND BRAIDWOOD STATION, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION, SET 21 (TAC NOS. MF1879, MF1880, MF1881, AND MF1882)

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Letter to M.P. Gallagher from Lindsay R. Robinson dated April 17, 2014

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE BYRON STATION, UNITS 1 AND 2, AND BRAIDWOOD STATION, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION, SET 21 (TAC NOS. MF1879, MF1880, MF1881, AND MF1882)

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BYRON STATION, UNITS 1 AND 2,
AND BRAIDWOOD STATION, UNITS 1 AND 2,
LICENSE RENEWAL APPLICATION
REQUEST FOR ADDITIONAL INFORMATION, SET 21
(TAC NOS. MF1879, MF1880, MF1881, AND MF1882)

RAI B.2.1.28-3a

Applicability:

Bryon Station (Byron) and Braidwood Station (Braidwood), all units

Background:

By letter dated January 13, 2014, you responded to the staff's request for additional information (RAI) regarding the use of cathodic protection for buried piping systems. With regard to Enhancement No. 9, Exelon provided additional information regarding the use of soil corrosion probes. Based on its review of the response, the staff has additional questions.

1. The response to RAI B.2.1.28-3 states that if soil corrosion probes indicate a material loss of 1 mil per year (mpy) or less, the cathodic protection system would be considered effective for that given surveillance year and no further evaluation would be required.

2. The response to RAI B.2.1.28-3 states that "[f]or each installation application, two (2) probes will be installed; one connected to the cathodic protection system and one left unprotected."

3. The response to RAI B.2.1.28-3 states that a "remaining life calculation will be based on previous volumetric wall thickness measurements, annual corrosion rates and cumulative total loss of material since the volumetric measurements, and the current years' measured corrosion rate extrapolated through the end of the life of the plant."

4. The response to RAI B.2.1.28-3 states that NACE International Publication 05107 "Report on Corrosion Probes in Soil or Concrete," along with input from vendor, manufacturer, and NACE qualified cathodic protection experts will be used to specific details on the installation and use of the soil corrosion probes.

Issue:

1. Although the 1 mpy acceptance criterion is a standard industry value used to demonstrate an effective cathodic protection system, the staff lacks sufficient information to conclude that there is reasonable assurance that all buried in-scope piping would be capable of meeting its current licensing basis intended function with 60 mils of corrosion that could occur through the end of the period of extended operation.

2. It is not clear to the staff whether the phrase, "for each installation application," applies to each cathodic protection survey data point that did not meet the negative 850mV polarization potential acceptance criterion during cathodic protection surveys.

3. It is not clear to the staff how the existing wall thickness will be determined when the specific location has not been volumetrically examined to determine the wall thickness.

It is also not clear whether nominal wall thickness or maximum wall thickness (e.g., nominal wall thickness plus 12-1/2 percent) will be used to determine the as-found corrosion rate when volumetric examinations have been conducted to determine wall thickness.

4. Neither license renewal application (LRA) Section B.2.1.28 nor Enhancement No. 9 has been revised to include the information sources (described in the Background) on how the soil corrosion probes will be installed and used. The staff considers this information to be necessary to ensure that accurate corrosion rate data will be obtained by the soil corrosion probes.

Request:

1. State whether all buried in-scope components will be able to perform their current licensing basis intended function(s) if 60 mils loss of material were to occur by the end of the period of extended operation. If this is not the case, provide the basis for why the 1 mpy criterion is acceptable.

2. Clarify whether the two probes that will be installed (one connected to the cathodic protection system and one left unprotected) will be installed at each cathodic protection survey data point that did not meet the negative 850mV polarization potential acceptance criterion during the evaluation cathodic protection survey results. If this is not the case, state the basis for how the cathodic protection system will be demonstrated effective at these locations when local probes are not used.

3. Explain:
    a. How the existing wall thickness of buried in-scope components will be determined when the component has not been volumetrically examined to determine the wall thickness.
    b. The basis for how as-found corrosion rates will be determined for buried in-scope piping components.

4. Revise LRA Section B.2.1.28 or Enhancement No. 9 to include pertinent information on installation and use of the soil corrosion probes.

RAI B.2.1.28-5a

Applicability:

Byron

Background:

RAI B.2.1.28-5 requested that, “[g]iven the plant-specific operating experience in relation to the quality of coatings, state the overall condition of coatings as a preventive action in relation to crediting them for the preventive action categories of LR-ISG-2011-03, Table 4a, ‘Inspections of Buried Pipe’.”

Issue:

Although the RAI response did not state the overall condition of coatings as a preventive action in relation to crediting them for the Preventive Action Inspection categories (i.e., category E or F) of LR-ISG-2011-03 Table 4a for any of the seven systems with in-scope buried piping, the staff found that the information provided was sufficient to resolve the staff's concern in RAI B.2.1.28-5 for all three systems at Braidwood that have buried in-scope piping and for the condensate and fire protection systems at Byron. However, given the results of service water and demineralized water systems inspections conducted at Byron, the staff cannot complete its evaluation of buried in-scope service water and demineralized water piping until it understands whether the existing coating conditions satisfy the criterion for Preventive Action inspection category E or F. Although the staff considers the information provided for the condensate and fire protection systems at Byron acceptable, any inspections that revealed significant coating damage or metal loss should be included in the percentage computation in the request.

Request:

State whether more than 10 percent of the excavated direct visual inspections of in-scope buried piping at Byron have revealed significant coating damage regardless of whether the coating degradation is age-related (except for coating damage occurring during a current excavation), or metal loss.

RAI B.2.1.8-1

Applicability:

Byron and Braidwood

Background:

The Generic Aging Lessons Learned (GALL) Report age management program (AMP) XI.M17, "Flow-Accelerated Corrosion," states that the program relies on implementation of the Electric Power Research Institute (EPRI) guidelines in Nuclear Safety Analysis Center (NSAC)-202L, "Recommendations for an Effective Flow Accelerated Corrosion Program." The NSAC guidelines state that the program addresses wall thinning due to flow-accelerated corrosion and does not address other thinning mechanisms. LRA Section B.2.1.8 states that the program is consistent with the GALL Report AMP XI.M17 and does not cite any enhancements or exceptions.

Several of the Byron operating experience documents indicate that the current Flow-Accelerated Corrosion (FAC) program addresses aging mechanisms other than FAC and also manages components made from stainless steel, which are exempted from the FAC program. This is shown in AR 01415234, which addresses a FAC program examination of a susceptible-not-modeled component, 1DV006-1, and notes that the wall thinning was due to droplet impingement (a non-FAC mechanism). In addition, AR 01416484 addresses a FAC program examination of a stainless steel component, 1SD319. Both aspects are inconsistent with the industry guidance for a FAC program.

Additionally, the staff noted that Exelon manages loss of material due to erosion mechanisms through its procedure ER-AA-430-1004, "Erosion in Piping and Components Guide." Although this procedure is in the same numbering sequence as Exelon's ER-AA-430, "Conduct of

Flow-Accelerated Corrosion Activities," the staff could not determine which AMP uses implementing procedure ER-AA-430-1004 for managing loss of material due to erosion mechanisms.

Issue:

As currently implemented, the FAC program is inconsistent with the GALL Report because it manages wall thinning mechanisms other than FAC and manages stainless steel components that are not susceptible to FAC. It is unclear to the staff whether Exelon will change its current approach to manage these non-FAC mechanisms and components made from non-FAC susceptible materials through an alternate AMP, or whether Exelon will change the LRA to reflect how it currently implements its FAC program.

Request:

Either modify the LRA and the associated program basis documents for the Flow-Accelerated Corrosion program to reflect the current implementation (i.e., that it manages mechanisms other than FAC and components made from stainless steel, which are not susceptible to FAC), or provide details regarding which AMP (either an enhancement to an existing program or a plant specific program) will manage loss of material due to erosion. Include information regarding which AMP(s) will credit Exelon procedure ER-AA-430-1004, "Erosion in Piping and Components Guide."

RAI B.2.1.8-2

Applicability:

Byron and Braidwood

Background:

The GALL Report AMP XI.M17, "Flow-Accelerated Corrosion," states that the program relies on implementation of the EPRI guidelines in NSAC-202L, "Recommendations for an Effective Flow Accelerated Corrosion Program." The GALL Report AMP XI.M17 also states that the program includes the use of a predictive code, such as CHECWORKS, to provide assurance that aging effects caused by FAC are properly managed. The NSAC guidelines state that corporate commitment is essential to an effective FAC program, which includes ensuring that appropriate quality assurance is applied. In addition, the NSAC guidelines recommend that the governing procedures include quality assurance requirements and that several portions of the program be independently checked, to include the susceptibility analysis, the predictive plant model, the selection of inspection locations, and component structural evaluations.

LRA Section B.2.1.8 states that the program is consistent with the GALL Report AMP XI.M17 and does not cite any enhancements or exceptions. The LRA also states that the program is based on NSAC-202L and that the analyses to determine critical locations are performed using the predictive code (software), CHECWORKS. The LRA further states that the FAC program is implemented as required by NRC Generic Letter (GL) 89-08, "Erosion/Corrosion Induced Pipe Wall Thinning." In its response to GL 89-08, dated July 21, 1989, Exelon states that all stations have implemented erosion/corrosion inspection programs, and that corporate guidance, which was provided to ensure a consistent approach at each site, meets or exceeds the recommendations of industry organizations such as EPRI. In addition, LRA Section A.2.1.8

states that the program activities "include analyses to determine critical locations." The staff also noted that Exelon Procedure ER-AA-430, "Conduct of Flow Accelerated Corrosion Activities," Section 4.6, "Evaluation of Inspection Data," states, "Ultrasonic inspection data should be evaluated using an approved (i.e., validated and verified) software program."

Based on discussions during the NRC's AMP Audit, Exelon categorized the CHECWORKS software as Class DD, "Screened," in accordance with IT-AA-101, "Digital Technology Software Quality Assurance (DTSQA) Procedure." According to statements in IT-AA-101, the Class DD designation applies to software whose failure to perform would have little or no risk of operational impact. The staff noted that Exelon does not categorize CHECWORKS as Class BB, "Nuclear Regulatory Related," which includes software required by either nuclear licensing or regulations or whose failure to operate as expected would have an indirect effect on nuclear plant safety. The staff noted that the DTSQA procedure includes a number of documentation requirements for Class BB software, including a validation and verification plan, whereas Class DD software requires minimal documentation and does not require or suggest validation and verification. The staff noted that, although EPRI (the developer and provider of CHECWORKS) currently validates and verifies the software, these activities are not required by Exelon's DTSQA procedure based on its current categorization.

Issue:

Although not required by GL 89-08, the industry's initial recommendations for effective FAC programs included the use of predictive software to identify locations for inspections. Exelon's response to GL 89-08 states that corporate guidance for long-term erosion-corrosion inspection programs met or exceeded the industry's recommendations. Exelon uses CHECWORKS as the predictive software to perform "analyses to determine critical locations." Although the use of CHECWORKS is not required by nuclear licensing or regulations, Exelon uses it to satisfy its current commitments to GL 89-08, and its future commitments in license renewal. Although the LRA states that a validated and verified computer program such as FAC Manager is also used in conjunction with CHECWORKS, it is not clear that validation and verification activities are programmatic requirements for any of the software used by the FAC program.

In addition, although Exelon Procedure ER-AA-430-1001, "Guidelines for Flow Accelerated Corrosion Activities," requires independent verification or independent review of several FAC activities, it is not clear that the appropriate quality assurance has been applied to all of the program aspects recommended by NSAC-202L. In particular, it is not clear whether predictive plant models have been independently checked to ensure that the susceptibility analyses provide valid results.

Request:

For software used by the FAC program (e.g., CHECWORKS and FAC Manager), provide information to demonstrate that appropriate quality assurance measures are being applied with regard to validation and verification. Specifically discuss how software discussed in Section 4.6 of Procedure ER-AA-430 (noted above) is being addressed.

For the portions of the FAC program that NSAC-202L recommends be independently checked, provide information demonstrating that implementing procedures apply appropriate quality assurance measures to these activities. Specifically discuss whether predictive plant models have been independently checked.

RAI B.2.1.11-1

Applicability:

Byron and Braidwood

Background:

The GALL Report AMP XI.M20, "Open-Cycle Cooling Water System," states that the program relies on implementation of the recommendations of NRC's Generic Letter (GL) 89-13, "Service Water System Problems Affecting Safety-Related Equipment." LRA Section B.2.1.11 states that the activities for this program are consistent with the site commitments to the requirements of GL 89-13. By letter dated January 29, 1990, Exelon responded to GL 89-13 and addressed Item III (with respect to establishing maintenance program activities to ensure that corrosion of piping and components cannot degrade the performance of safety-related systems supplied by service water), by stating, "Corrosion rates are continuously monitored with a corrator and with corrosion coupons of the appropriate metallurgy."

During its review of the program basis document, BB-PBD-AMP-XI.M20, "Open-Cycle Cooling Water System," the staff noted that it did not discuss monitoring corrosion rates with a corrator or with corrosion coupons, as noted in the site's response to GL 89-13. During the AMP audit at Braidwood, Exelon personnel stated that site activities are performed through the chemistry department and are consistent with its commitments to GL 89-13.

Issue:

The program basis document states that the activities for this program are consistent with the site commitments to GL 89-13. However the program basis document did not describe the maintenance activities associated with evaluating corrosion rates using corrosion coupons, even though the sites are apparently performing these maintenance activities consistent with the site's commitments to GL 89-13.

Request:

Reconcile the apparent discrepancy between the program activities being performed by the sites relating to the monitoring of corrosion rates, and the program activities described in the Open-Cycle Cooling Water System program basis document.