Exelon Generation®

200 Exelon Way
Kennett Square, PA 19348

www.exeloncorp.com

10 CFR 50
10 CFR 51
10 CFR 54

June 12, 2019

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Peach Bottom Atomic Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

Subject: Revised Response to NRC Request for Additional Information, Core Shroud Support Fatigue Analysis Reevaluation, related to the Peach Bottom Atomic Power Station, Units 2 and 3, Subsequent License Renewal Application

References:

1. Letter from Michael P. Gallagher, Exelon Generation Company LLC, to NRC Document Control Desk, dated July 10, 2018, "Application for Subsequent Renewed Operating Licenses"

2. E-mail from Bennett Brady, NRC to Michael P. Gallagher, Exelon Generation Company, LLC, dated April 10, 2019, "Requests for Additional Information for the Safety Review of the Peach Bottom Atomic Power Station, Units 2 and 3 Subsequent License Renewal Application – Set 1"

3. Letter from Michael P. Gallagher, Exelon Generation Company LLC, to NRC Document Control Desk, dated May 2, 2019, "Response to NRC Requests for Additional Information, Set 1, dated April 10, 2019 related to the Peach Bottom Atomic Power Station, Units 2 and 3, Subsequent License Renewal Application"

In Reference 1, Exelon Generation Company, LLC (Exelon) submitted the Subsequent License Renewal Application (SLRA) for the Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. In Reference 2, the NRC requested additional information (RAIs) to support staff review of the SLRA. In Reference 3, Exelon submitted the responses to the NRC Set 1 RAIs.

In a conference call held on May 29, 2019, the NRC identified that additional clarifying information was needed to support the Set 1 response to the following Core Shroud Support Fatigue Analysis Reevaluation RAI:

RAI 4.3.6.3-1

This letter provides the revised response to the above RAI to address the additional information discussed on May 29, 2019. The enclosed revised RAI response supersedes the response to RAI 4.3.6.3-1 previously submitted in Reference 3.

The enclosure to this letter contains the revised response to the above Core Shroud Support Fatigue Analysis Reevaluation RAI 4.3.6.3-1.

There are no updates to the SLRA as a result of the revised response.

This letter contains no new regulatory commitments.

If you have any questions, please contact Mr. David J. Distel, Licensing Lead, Peach Bottom Subsequent License Renewal Project, at 610-765-5517.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 12th day of June 2019.

Respectfully submitted,

Michael P. Gallagher
Vice President - License Renewal and Decommissioning
Exelon Generation Company, LLC

Enclosure: Revised Response to Set 1 Core Shroud Support Fatigue Analysis Reevaluation Request for Additional Information (RAI) 4.3.6.3-1

cc: Regional Administrator – NRC Region I
NRC Senior Project Manager (Safety Review), NRR-DMLR
NRC Project Manager (Environmental Review), NRR-DMLR
NRC Project Manager, NRR-DORL- Peach Bottom Atomic Power Station
NRC Senior Resident Inspector, Peach Bottom Atomic Power Station
R.R. Janati, Pennsylvania Bureau of Radiation Protection
D.A. Tancabel, State of Maryland

Enclosure

Revised Response to Set 1
Core Shroud Support Fatigue Analysis Reevaluation
Request for Additional Information
Peach Bottom Atomic Power Station, Units 2 and 3
Subsequent License Renewal Application (SLRA)

RAI 4.3.6.3-1

7. SLRA 4.3.6.3, Core Shroud Support Fatigue Analysis Reevaluation

Regulatory Basis:

In accordance with 10 CFR 54.21(c)(1), a list of time-limited aging analyses, as defined in 10 CFR 54.3, must be provided. The applicant shall demonstrate that: (i) The analyses remain valid for the period of extended operation; (ii) The analyses have been projected to the end of the period of extended operation; or (iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

RAI 4.3.6.3-1

Background:

SLRA Section 4.3.6.3 addresses the reevaluation of the core shroud support fatigue analysis as a time-limited aging analysis (TLAA). In the section, the applicant indicated that the Fatigue Monitoring program is used to manage the aging effect associated with the fatigue analysis for the core shroud support through the subsequent period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

SLRA Section 4.3.6.3 also provides the following information: (1) as described in the first license renewal application of the applicant (July 2, 2001) the core shroud support fatigue analysis was reevaluated in 1998 to consider the effects of the recirculation pump start transient; and (2) the reevaluation described in the first license renewal application conservatively computed a 40-year non-environmental cumulative usage factor (CUF) of 0.834 for the core shroud support.

In its review related to the core shroud support fatigue analysis, the staff noted that the following reference discusses the CUF (non-environmental) for the core shroud support as part of the extended power uprate (EPU) project for the Peach Bottom Atomic Power Station (PBAPS): NEDC-33566P, Revision 0, "Peach Bottom Atomic Power Station Units 2 and 3 Constant Pressure Power Uprate," September 2012. Table 2.2-12 of the reference document indicates that the 60-year non-environmental CUF for the core shroud support is 0.26 under the EPU conditions.

Issue:

SLRA Section 4.3.6.3 and Table 4.3.1-3 (80-year CUF table) do not provide the projected 80-year CUF for the core shroud support in comparison with the existing CUF values for the component. Such comparison with the existing CUF calculations is needed to confirm that the 80-year CUF is a reasonable projection. In addition, the 40-year CUF (0.834) discussed in SLRA 4.3.6.3 is significantly greater than the 60-year CUF (0.26) in the EPU submittal.

Request:

1. Please compare the projected 80-year CUF and CUF_{en} (environmental CUF) values for the core shroud support with the 40-year CUF (0.834) in SLRA Section 4.3.6.3 and the 60-year CUF (0.26) in the 2012, EPU submittal. As part of the response, confirm that the 80-year

CUF is a reasonable projection in comparison with the existing estimates of CUF values (40-year and 60-year).

Exelon Response:

The 2012 EPU license amendment submittal and SLRA Sections 4.3.1 and 4.3.6.3 document various design and projected CUF and CUF_{en} values, ranging from 0.17 to 0.834, for the core shroud support component. The primary driver for this range is the number of "Sudden Start of Pump in Cold Recirculation Loop" transient occurrences assumed in the calculation of these various values. This is because the number of "Sudden Start of Pump in Cold Recirculation Loop" transient occurrences contribute to approximately 80% of the total CUF or CUF_{en} value for this component location.

Below is a description and comparison between: 1) the design 40-year CUF value (0.834) documented in SLRA Section 4.3.6.3; 2) the projected 80-year CUF value (0.2395) documented in SLRA basis reports; 3) the projected 80-year CUF_{en} value (0.726) documented in SLRA Table 4.3.1-3; and 4) the 40 and 60-year CUF values (0.17 and 0.26) documented in the 2012 EPU license amendment submittal.

As described in SLRA Section 4.3.6.3 the 40-year design CUF value of 0.834 for the core shroud support component is based on the following assumptions:

- 130 occurrences of "Design Hydrostatic Test to 1,250 psig" (Table 4.3.1-1 and 4.3.1-2, transient 2);
- 216 occurrences of "Startup and Heatup (100°F/hr. max)" (Table 4.3.1-1 and 4.3.1-2, transient 3 and 3a); and
- 10 occurrences of "Scram – Loss of Feedpumps – Isolation Valves Close" (Table 4.3.1-1 and 4.3.1-2, transient 11);
- 40 occurrences of "Sudden Start of Pump in Cold Recirculation Loop" (SLRA Tables 4.3.1-1 and 4.3.1-2 transient 18).

The same core shroud support component location is monitored by the PBAPS Fatigue Monitoring program for each unit. SLRA Table 4.3.1-3 location 22 documents an 80-year projected CUF_{en} value of 0.726 for Unit 3, as Unit 3 has the greater 80-year projected CUF_{en} values of the two units. The corresponding 80-year projected CUF value (not adjusted for environmental fatigue) for this same Unit 3 component is 0.2395. These projected values are based on the following 80-year transient projections for Unit 3:

- 52 occurrences of "Design Hydrostatic Test to 1,250 psig" (Table 4.3.1-2 transient 2);
- 144 occurrences of "Startup and Heatup (100°F/hr. max)" (Table 4.3.1-2 transient 3 and 21a); and
- 8 occurrences of "Scram – Loss of Feedpumps – Isolation Valves Close" (Table 4.3.1-2 transient 11);
- 16 occurrences of "Sudden Start of Pump in Cold Recirculation Loop" (SLRA Table 4.3.1-2 transient 18)

Comparison of the above occurrences shows that projected occurrences used for the 80-year projected CUF value for Unit 3 (0.2395) are less than the occurrences assumed in the fatigue

analysis that resulted in the 40-year design CUF value (0.834). The difference between the two CUF values (0.2395 and 0.834) is reasonable, especially when considering that the number of "Sudden Start of Pump in Cold Recirculation Loop" transient occurrences contribute to approximately 80% of the total CUF value for this component location. Also, the projected 80-year CUF_{en} value (0.726) is consistent with the 80-year projected CUF value (0.2395) since the 80-year CUF_{en} value is adjusted for environmental fatigue with an appropriate Fen multiplier, in accordance with the recommendations in NUREG/CR-6909, Revision 1. Therefore, the projected 80-year CUF value of 0.2395 and the projected 80-year CUF_{en} value of 0.726 are reasonable in comparison with the 40-year design CUF value 0.834.

The 60-year CUF value (0.26) in the EPU license amendment submittal was simply scaled from the 40-year value (0.17*1.5) which was calculated in the original core shroud support fatigue analysis developed by GE in the late 1960s and early 1970s. In this original fatigue analysis, GE did not assume the "Sudden Start of Pump in Cold Recirculation Loop" transient. Therefore, the projected 80-year CUF value of 0.2395 and projected 80-year CUF_{en} value of 0.726 are reasonable in comparison with the 40 and 60-year CUF values of 0.17 and 0.26 reported in the EPU license amendment submittal, when considering that the calculation of the 40 and 60-year CUF values did not assume the "Sudden Start of Pump in Cold Recirculation Loop" transient.

In 1998, PBAPS recognized that Unit 3 was experiencing a high rate of events in which an idle reactor recirculation loop with temperature differentials greater than 50°F of reactor coolant was placed in service. Based on this operating experience, an evaluation was performed by Structural Integrity Associates LLC (SIA) to evaluate the impact of the actual occurrences on RPV fatigue analyses. As part of this effort, SIA reevaluated the core shroud support fatigue analysis and added 40 occurrences of the "Sudden Start of Pump in Cold Recirculation Loop" transient, and determined a new design 40-year CUF value of 0.834. Since the 1998 SIA Core Shroud Support fatigue reevaluation is more conservative than the reported EPU license amendment CUF values, and reflects lessons learned from operating experience this analysis became the basis for the "Core Shroud Support (LAS)" monitored component (location 22 on SLRA table 4.3.1-3).

This design 40-year CUF value (0.834) was documented in section 4.3.2.1 of the first PBAPS LRA and is described in section 4.3.6.3 of the SLRA. However, the 2012 EPU license amendment submittal, which was developed by GEH, continued to document the 40-year value of 0.17 and the 60-year value of 0.26.

In conclusion, as described above and documented in SLRA Sections 4.3.1 and 4.3.6.3 the current projected 80-year CUF_{en} value for the core shroud support is 0.726. This value, which is a projection, is less than 80% of the ASME Section III acceptance criterion of 1.0. Should actual accumulated CUF values for this component exceed 80% of the ASME Section III acceptance criterion of 1.0 during the second period of extended operation, then the condition would be entered in the corrective action program.

No updates to the SLRA are required as a result of this response.