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10 CFR 50
10 CFR 51
10 CFR 54

May 30, 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 Responses to NRC Requests for Additional Information, Fire Water System, 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 15, 2019, NRC identified that additional clarifying information was needed to support the Set 1 responses to the following Fire Water System RAIs:

B.2.1.17-2
B.2.1.17-3

This letter provides revised responses to the above RAIs to address the additional information discussed on May 15, 2019. The enclosed revised RAI responses supersede the responses to RAIs B.2.1.17-2 and B.2.1.17-3 previously submitted in Reference 3.

Enclosure A contains the revised responses to the above Fire Water System requests for additional information.

Enclosure B contains updates to sections of the SLRA (except for the Subsequent License Renewal Commitment List) affected by the revised responses.

Enclosure C provides an update to the Subsequent License Renewal Commitment List (SLRA Appendix A, Section A.5) resulting from these revised responses.

There are no other new or revised regulatory commitments contained in this letter.

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 30th day of May 2019.

Respectfully submitted,

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

Enclosures: A: Revised Responses to Set 1 Fire Water System Requests for Additional Information
B: Subsequent License Renewal Application Updates
C. Subsequent License Renewal Commitment List Updates

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
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Enclosure A

Revised Responses to Set 1
Fire Water System Requests for Additional Information
Peach Bottom Atomic Power Station, Units 2 and 3
Subsequent License Renewal Application (SLRA)

RAI B.2.1.17-2
RAI B.2.1.17-3

4. GALL-SLR AMP XI.M27 Fire Water System

Regulatory Basis:

10 CFR 54.21(a)(3) requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the subsequent period of extended operation. One of the findings that the staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to managing the effects of aging during the subsequent period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. In order to complete its review and enable making a finding under 10 CFR 54.29(a), the staff requires additional information in regard to the matters described below.

RAI B.2.1.17-2

Background:

GALL-SLR AMP XI.M27, Table XI.M27-1, recommends that hydrants be flushed in accordance with NFPA-25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," Section 7.3.2, which requires that: (a) "[e]ach hydrant shall be opened fully and water flowed until all foreign material has cleared;" and (b) "[f]low shall be maintained for not less than 1 minute." The Water-Based Fire Protection Systems Handbook, Fourth Edition, Testing Procedure for [NFPA 25 Section] 7.3.2 states, "[o]pen the hydrant fully and allow the flow to continue until all foreign material has cleared, with a minimum flow period of 1 minute." Page 196 of this document clarifies this requirement by stating, "[f]low test until all foreign material has cleared (not less than one minute)." The plant-specific procedures do not include a requirement that the hydrant flush be maintained for a minimum of one minute and the SLRA does not include an enhancement to address this, or an exception to justify the difference.

NFPA-25, Section 7.3.2, also requires that: (a) "[a]fter operation, dry barrel and wall hydrants shall be observed for proper drainage from the barrel" (b) "[f]ull drainage shall take no longer than 60 minute;" and (c) "[w]here soil conditions or other factors are such that the hydrant barrel does not drain within 60 minutes, or where the groundwater level is above that of the hydrant drain, the hydrant drain shall be plugged and the water in the barrel shall be pumped out." During the audit, the staff's review of plant-specific operating experience revealed that multiple hydrants were found full or a water level was detected within the hydrant. In addition, the plant specific procedure for flushing hydrants states that: (a) the hydrant should be, "drained to a level approximately 3 feet below ground level;" and (b) "[i]f the hydrant is still not drained, or directed by the sign on the fire hydrant, then manually pump it down to 3 feet below the ground." During the audit, it was conveyed to the staff that: (a) the frost line in the vicinity of Peach Bottom is 20 inches to 30 inches deep; and (b) there are some hydrants located in areas where the water table is higher and they might not remain drained following the flush. Table 7.2.2.4 of the NFPA 25 Handbook states that a barrel which contains water or ice could be indicative of a faulty drain, a leaky hydrant valve, or high groundwater table, The recommended corrective action is to "[r]epair and drain; for high groundwater it could be necessary to plug the drain and

pump out the barrel after each use." The SLRA does not include an enhancement to address this, or an exception to justify the difference.

Issue:

The staff has concluded that to be consistent with GALL-SLR Report AMP XI.M27, a hydrant must be fully open for at least one minute to ensure that an adequate flush was conducted. The staff's position is based on the fact that until the hydrant is fully open, the flow velocity might not be adequate to clear the fire water main of all debris. The SLRA lacks sufficient information to justify this staff-identified difference.

Although the plant-specific procedures require that a hydrant be drained below the frost line, the frost line is based on the soil overcharge. In the case of a hydrant, while soil surrounds the hydrant barrel, the barrel internal temperature could be below freezing for depths greater than the frost line. In addition, as conveyed to the staff during the audit, certain hydrants might refill with water due to the water table height. The SLRA lacks sufficient information to justify: (a) why hydrants are only pumped to 3 feet below the ground; and (b) why the hydrant drain is not plugged and the plant-specific procedures enhanced to state that water in the barrel shall be pumped out where the water table can result in leakage into a hydrant barrel.

Request:

a) State the basis for why an adequate hydrant flush has been conducted when the plant-specific procedures do not include a requirement to fully open the hydrant for at least one minute.

b) Respond to the following: (a) confirm the depth of the frost line; (b) state the basis for why water in the hydrant barrel will not freeze even though it is only pumped down to 3 feet below the ground level; and (c) state why the hydrant drain is not plugged and the plant-specific procedures enhanced to state that water in the barrel shall be pumped out where the water table can result in leakage into a hydrant barrel.

Exelon Response:

a. The PBAPS fire hydrant inspection and flush test procedure requires hydrant flow until clear assuring mud and debris is flushed from the system; however, the test procedure does not specify a minimum flow duration. Enhancement 15 (Commitment 17) is added to the Fire Water System (B.2.1.17) aging management program to include a minimum flow duration of one (1) minute after the hydrant valve is fully open to assure adequate time is allowed to clear the fire water main of all foreign material.

b. The PBAPS fire hydrant inspection and flush test procedure is performed annually in the summer months. A review of completed tests since 2004 indicate that some hydrants have been found with standing water. Water found in hydrants is the result of either ground water entering through the normally open drain port, or a leaking hydrant valve that cannot completely drain through the drain port.

After a hydrant has been flushed and given time to drain, the hydrant flush test procedure requires the hydrant to be checked for standing water. If water is found, the test requires the water be pumped down to three (3) feet below the ground surface. Pumping down to at least three (3) feet ensures the hydrant is drained below the frost line depth of approximately thirty (30) inches.

a) A maximum frost line depth between 20" - 30" is identified by the US Department of Commerce Frost Line Penetration data for the PBAPS location.

b) The basis for why the water in a fire hydrant below three (3) feet will not freeze is that the water (ground water) in the fire hydrant is below the frost line. Water in a fire hydrant that is below the established frost line for a geographical area will not freeze because of heat provided from the earth below the frost line. This is recognized and supported by national standards for the installation of fire service mains and their appurtenances including fire hydrants. National Standards such as NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, Section 10.4.2.1, AWWA M17, Fire Hydrants: Installation Field Testing and Maintenance, Chapter 2, pg.7, NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, Section 3.3.9.1, and the 2018 National Standard Plumbing Code, Section 2.16, require the hydrant main shutoff valve to be installed below the frost line to assure there is no freezing, essentially the same as a buried pipe. There is no additional burial depth specified or required by national standards for hydrants. The hydrant barrel that extends above ground is not considered a factor in determining the hydrant main shutoff valve depth. The valve simply needs to be below the frost line even though there is no disruption in heat loss through the hydrant barrel from the top of the hydrant barrel above ground to the water below the main shutoff valve. Therefore, since heat loss conducted up through the hydrant barrel does not freeze the hydrant water supply below the shutoff valve (provided it is below the frost line), then water in the hydrant barrel above the shutoff valve will not freeze as long as it is also below the frost line.

   In addition, a search of plant operating experience for freezing fire hydrants was performed since 2004. No occurrences of freezing fire hydrants at PBAPS were found. The operating experience confirms that the current fire hydrant flush and drain method that assures water in the hydrant is below the frost line is effective. Therefore, the basis for why water in the hydrant barrel will not freeze even though it is only pumped down to three (3) feet below the ground level is that the frost line is above three (3) feet.

c) A hydrogeological study was performed for PBAPS in 2018 that determined the ground water levels at various locations around the site. The data indicated that ground water levels are below the frost line with margin. The ground water data was used to determine the ground water levels at site fire hydrants. For those fire hydrants that extend below the ground water level, ground water may enter the hydrant barrel through the normally open drain port, but will remain below the frost line and will not freeze. Therefore, plant-specific procedures do not need to be enhanced and a design change to the current hydrant configuration is not necessary.

SLRA Appendix A, Section A.2.1.17, and Appendix B, Section B.2.1.17 are revised as shown in Enclosure B. SLRA Appendix A, Section A.5, Commitment 17 is also revised as shown in Enclosure C.

RAI B.2.1.17-3

Background:

SLRA Section B.2.1.17, Enhancement No. 4 states," [r]evise procedures to improve guidance for external visual inspections of the in-scope sprinkler systems piping and sprinklers at least every two years to inspect for excessive corrosion..."

NFPA 25 Section 5.2.1.1.2 states that, "[a]ny sprinkler that shows signs of any of the following shall be replaced: (1) leakage; (2) corrosion..."

During its search of plant-specific operating experience, the staff noted four instances of leaking sprinklers.

GALL-SLR Report AMP XI.M27, Table XI.M27-1, footnote 10 states, "[w]here NFPA 25 or this table cite annual testing or inspections, testing and inspections can be conducted on a refueling outage interval if plant-specific OE has shown no loss of intended function of the in-scope SSC due to aging effects being managed for the specific component (e.g., loss of material, flow blockage due to fouling)."

Issue:

a) As recommended by GALL-SLR Report AMP XI.M27, sprinklers exhibiting "corrosion" versus sprinklers exhibiting "excessive corrosion" are to be replaced. The SLRA does not describe the difference between "significant corrosion" and "corrosion" and as a result, the staff cannot conclude whether the changes described in Enhancement No. 4 will be consistent with GALL-SLR Report AMP XI.M27.

b) The SLRA lacks sufficient information for the staff to conclude whether the effects of the leakage identified in the plant-specific operating experience could have adversely affected the sprinkler such that its intended function would not have been met.

Request:

a) State the criteria that differentiate between corrosion and significant corrosion and the basis for why using the criterion of significant corrosion will be effective at identifying sprinkler degradation prior to a loss of intended function.

b) State the percentage of wet pipe sprinklers that exhibited leakage in the past 10 years. State the basis for why the effects of the observed leakage did not result in a loss of intended function of the sprinkler. If the effects could have resulted in a loss of intended function, state the basis for the effectiveness of the proposed sprinkler visual inspections.

Exelon Response:

a. Enhancement 4 (Commitment 17) will be revised to remove the word "excessive" for consistency with GALL-SLR Report AMP XI.M27. If corroded sprinklers are identified during the inspection, the condition will be entered into the corrective action program and the sprinklers will be replaced.

b. The PBAPS power block fire suppression sprinkler systems consist of approximately 1900 total sprinklers. Of the 1900 sprinklers approximately 500 are dry pre-action sprinklers leaving approximately 1400 sprinklers on wet sprinkler systems. A search of

plant operating experience identified five (5) sprinklers on wet pipe sprinkler systems, (0.4 percent) that were found leaking since 2004. The leaks were small (i.e. drops per minute) and found by either plant operators or maintenance personnel performing field work activities.

The basis for why the observed leakage was determined to have no effect on the intended function of the sprinkler is there was no sprinkler assembly corrosion identified or noted on the leaking sprinklers. The leaks did not adversely impact the ability of the sprinkler to perform its design function to actuate at a specific temperature and spray water in an intended spray pattern. Therefore, the intended function of the sprinklers and fire systems were maintained. The leaking sprinklers were replaced.

SLRA Appendix A, Section A.2.1.17, and Appendix B, Section B.2.1.17 are revised as shown in Enclosure B. SLRA Appendix A, Section A.5, Commitment 17 is also revised as shown in Enclosure C.

Enclosure B

Peach Bottom Atomic Power Station, Units 2 and 3
Subsequent License Renewal Application Updates
Resulting from the Revised Response to the following RAIs:

RAI B.2.1.17-1
RAI B.2.1.17-2
RAI B.2.1.17-3
RAI B.2.1.17-4

Notes:

- Updated SLRA Information is provided in the same order as the RAI responses contained in Enclosure A.

- To facilitate understanding, portions of the original SLRA have been repeated in this Enclosure, with revisions indicated. Previously submitted information is shown in normal font. Changes are highlighted with ***bolded italics*** for inserted text and ~~strikethroughs~~ for deleted text.

- There are no changes from the May 2, 2019 Set 1 RAI response submittal letter (Reference 3).

As a result of the responses to RAIs B.2.1.17-1, B.2.1.17-2, B.2.1.17-3, and B.2.1.17-4 provided in Enclosure A of this letter, SLRA Appendix A, Section A.2.1.17 beginning on page A-25 of the SLRA, is revised to modify Enhancements 1.c and 4, and add Enhancements 15 and 16 as shown below:

A.2.1.17 Fire Water System

Change to Enhancement 1.c

1. Revise flow test procedures to include:

   a. Inspector test flush acceptance criteria for wet pipe sprinkler systems that currently do not include the requirement to record time to flow from the opened test valve.

   b. Acceptance criteria for wet pipe main drain tests. Flowing pressures from test to test will be monitored to determine if there is a 10 percent reduction in full flow pressure when compared to previously performed tests. An issue report shall be generated in the corrective action program to determine the cause and corrective actions.

   c. If ***flow test*** acceptance criteria are not met, ***perform an investigation within the corrective action program that includes review for increased testing and perform*** at least two ***successful*** additional tests. ~~shall be performed~~ ***Additional tests shall be completed within the interval in which the original test was conducted.*** If acceptance criteria are not met during follow-up testing, ***an extent of condition and extent of cause analysis shall be conducted to determine the further extent of tests which includes testing*** ~~The test shall be performed~~ on the same system, on the other unit.

Change to Enhancement 4

4. Revise procedures to improve guidance for external visual inspections of the in scope sprinkler systems piping and sprinklers at least every two years to inspect for ~~excessive~~ corrosion, loss of material, leaks, and proper sprinkler orientation. Corroded, leaking or damaged sprinklers shall be replaced.

Additional Enhancements 15 and 16

15. Revise the fire hydrant inspection and flush test procedure to include a minimum flow duration of one (1) minute after the hydrant valve is fully open to remove all foreign material.

16. Revise the underground fire main flow test to utilize the corrective action program to determine an increased test frequency when established test criteria is not met or when significant degraded trends that could adversely affect system intended function are identified. When test results pass the established test criteria, the test frequency may be extended to a five (5) year frequency IAW NFPA 25.

As a result of the responses to RAIs B.2.1.17-1, B.2.1.17-2, B.2.1.17-3, and B.2.1.17-4 provided in Enclosure A of this letter, SLRA Appendix B, Section B.2.1.17 beginning on page B-102 of the SLRA, is revised to modify Enhancements 1.c and 4 and add Enhancements 15 and 16 as shown below:

B.2.1.17 Fire Water System

Change to Enhancement 1.c

1. Revise flow test procedures to include:

   a. Inspector test flush acceptance criteria for wet pipe sprinkler systems that currently do not include the requirement to record time to flow from the opened test valve.

   b. Acceptance criteria for wet pipe main drain tests. Flowing pressures from test to test will be monitored to determine if there is a 10 percent reduction in full flow pressure when compared to previously performed tests. An issue report shall be generated in the corrective action program to determine the cause and corrective actions.

   c. If ***flow test*** acceptance criteria are not met, ***perform an investigation within the corrective action program that includes review for increased testing and perform*** at least two ***successful*** additional tests. ~~shall be performed~~ ***Additional tests shall be completed within the interval in which the original test was conducted.*** If acceptance criteria are not met during follow-up testing, ***an extent of condition and extent of cause analysis shall be conducted to determine the further extent of tests which includes testing*** ~~The test shall be performed~~ on the same system, on the other unit.

Program Elements Affected: Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Acceptance Criteria (Element 6), and Corrective Actions (Element 7)

Change to Enhancement 4

4. Revise procedures to improve guidance for external visual inspections of the in scope sprinkler systems piping and sprinklers at least every two years to inspect for ~~excessive~~ corrosion, loss of material, leaks, and proper sprinkler orientation. Corroded, leaking or damaged sprinklers shall be replaced. **Program Elements Affected: Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)**

Additional Enhancements 15 and 16

15. Revise the fire hydrant inspection and flush test procedure to include a minimum flow duration of one (1) minute after the hydrant valve is fully open to remove all foreign material. Program Element Affected: Preventative Actions (Element 2), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4)

16. Revise the underground fire main flow test to utilize the corrective action program to determine an increased test frequency when established test criteria is not met or when significant degraded trends that could adversely affect system intended function are identified. When test results pass the established test criteria, the test frequency may be extended to a five (5) year frequency IAW NFPA 25. Program Elements Affected: Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), and Acceptance Criteria (Element 6), Corrective Actions (Element 7)

Enclosure C

PBAPS Subsequent License Renewal Commitment List Updates

This Enclosure identifies commitments made in this document and is an update to the PBAPS SLRA Appendix A, Section A.5 Subsequent License Renewal Commitment List. Any other actions discussed in the submittal represent intended or planned actions. They are described to the NRC for the NRC's information and are not regulatory commitments.

Changes to the PBAPS SLRA Appendix A, Section A.5 Subsequent License Renewal Commitment List are as a result of the Exelon response to the following revised RAI responses:

RAI B.2.1.17-1
RAI B.2.1.17-2
RAI B.2.1.17-3
RAI B.2.1.17-4

Note: To facilitate understanding, relevant portions of the previously submitted Subsequent License Renewal Commitment List have been repeated in this Enclosure, with revisions indicated. Previously submitted information is shown in normal font. Changes due to this submittal are highlighted with ***bolded italics*** for inserted text and ~~strikethroughs~~ for deleted text.

There are no changes from the May 2, 2019 Set 1 RAI response submittal letter (Reference 3) other than the addition of the May 30, 2019 letter in the Source column of the commitment table for Commitment 17, Item 4.

As a result of the responses to RAIs B.2.1.17-1, B.2.1.17-2, B.2.1.17-3, and B.2.1.17-4 provided in Enclosure A of this letter, SLRA Appendix A, Section A.5, Commitment 17, beginning on page A-95 of the SLRA, is revised as shown below:

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE*	SOURCE
17	Fire Water System	Fire Water System is an existing program that will be enhanced to: 1. Revise flow test procedures to include: a. Inspector test flush acceptance criteria for wet pipe sprinkler systems that currently do not include the requirement to record time to flow from the opened test valve. b. Acceptance criteria for wet pipe main drain tests. Flowing pressures from test to test will be monitored to determine if there is a 10 percent reduction in full flow pressure when compared to previously performed tests. An issue report shall be generated in the corrective action program to determine the cause and corrective actions. c. If ***flow test*** acceptance criteria are not met, ***perform an investigation within the corrective action program that includes review for increased testing and perform*** at least two ***successful*** additional tests. ~~shall be performed~~ ***Additional tests shall be completed within the interval in which the original test was conducted.*** If acceptance criteria are not met during follow-up testing, ***an extent of condition and extent of cause analysis shall be conducted to determine the further extent of tests which includes testing*** ~~The test shall be performed~~ on the same system, on the other unit. 4. Revise procedures to improve guidance for external visual inspections of the in scope sprinkler systems piping and sprinklers at least every two years to inspect for ~~excessive~~ corrosion, loss of material, leaks, and proper sprinkler orientation. Corroded, leaking or damaged sprinklers shall be replaced.	Program will be enhanced no later than six months prior to the second period of extended operation. Inspections that are to be completed prior to the second period of extended operation will be completed no later than six months prior to the second period of extended operation, or no later than the last refueling outage prior to the second period of extended operation.	Section A.2.1.17 ***Exelon Letter PBAPS SLRA RAI Response, dated May 2, 2019*** ***Exelon Letter PBAPS SLRA RAI Response, dated May 30, 2019***

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE*	SOURCE
		15. Revise the fire hydrant inspection and flush test procedure to include a minimum flow duration of one (1) minute after the hydrant valve is fully open to remove all foreign material. ***16. Revise the underground fire main flow test to utilize the corrective action program to determine an increased test frequency when established test criteria is not met or when significant degraded trends that could adversely affect system intended function are identified. When test results pass the established test criteria, the test frequency may be extended to a five (5) year frequency IAW NFPA 25.***		***Exelon Letter PBAPS SLRA RAI Response, dated May 2, 2019***