Exelon Generation

Michael P. Gallagher
Vice President, License Renewal
Exelon Nuclear

200 Exelon Way
Kennett Square, PA 19348

610 765 5958 Office
610 765 5956 Fax
www.exeloncorp.com

michaelp.gallagher@exeloncorp.com

10 CFR 50
10 CFR 51
10 CFR 54

RS-14-175

June 30, 2014

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

Braidwood Station, Units 1 and 2
Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and STN 50-457

Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: Response to NRC Request for Additional Information, Set 28, dated May 29, 2014, related to the Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2, License Renewal Application

References:

1. Letter from Michael P. Gallagher, Exelon Generation Company LLC (Exelon) to NRC Document Control Desk, dated May 29, 2013, "Application for Renewed Operating Licenses"

2. Letter from Lindsay R. Robinson, US NRC to Michael P. Gallagher, Exelon, dated May 29, 2014, "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 28 (TAC NOS. MF1879, MF1880, MF1881, and MF1882)"

In the Reference 1 letter, Exelon Generation Company, LLC (Exelon) submitted the License Renewal Application (LRA) for the Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2 (BBS). In the Reference 2 letter, the NRC requested additional information to support staff review of the LRA.

Enclosure A contains the response to this request for additional information.

Enclosure B contains updates to sections of the LRA (except for the License Renewal Commitment List) affected by the response.

Enclosure C provides an update to the License Renewal Commitment List (LRA Appendix A, Section A.5). There are no other new or revised regulatory commitments contained in this letter.

If you have any questions, please contact Mr. Al Fulvio, Manager, Exelon License Renewal, at 610-765-5936.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 06-30-2014

Respectfully,

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

Enclosures: A. Response to Request for Additional Information
B. Updates to affected LRA sections
C: License Renewal Commitment List Changes

cc: Regional Administrator – NRC Region III
NRC Project Manager (Safety Review), NRR-DLR
NRC Project Manager (Environmental Review), NRR-DLR
NRC Senior Resident Inspector, Braidwood Station
NRC Senior Resident Inspector, Byron Station
NRC Project Manager, NRR-DORL-Braidwood and Byron Stations
Illinois Emergency Management Agency - Division of Nuclear Safety

Enclosure A

Byron and Braidwood Stations (BBS), Units 1 and 2
License Renewal Application

Response to Request for Additional Information

RAI 3.0.3-2b

RAI 3.0.3-2b

Applicability:

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

Background:

1. The response to request for additional information (RAI) 3.0.3-2a, dated May 5, 2014, Request (4) states that the diesel oil storage tanks are designed such that coating debris will not cause flow blockage of downstream components because the suction lines for the fuel oil transfer pumps are located greater than a foot above the bottom of the tanks and the tank bottoms are sloped such that any debris would accumulate away from the suction line for the fuel oil transfer pumps. In addition, it states that a review of the results of completed tank inspections indicates that significant coating peeling, delamination, blistering, rusting, or unacceptable cracking and flaking have not occurred.

2. The response to RAI 3.0.3-2a Request (8) included changes to license renewal application (LRA) Sections A.2.1.11, A.2.1.18, B.2.1.11, and B.2.1.18 to address acceptance criteria and followup inspections when coating inspections reveal peeling and delamination and other indications.

3. The response to RAI 3.0.3-2a Request (1) states that the safety injection pump oil system includes an oil filter that removes debris and particulate prior to the oil reaching the bearings and the differential pressure across the oil filter is monitored during quarterly surveillances of the pumps.

4. The response to RAI 3.0.3-2 dated January 13, 2014, states that coating inspections for the foam concentrate tanks are performed every 15 years during replacement of the internal bladder.

5. The response to RAI 3.0.3-2a Request (7) discussed qualifications of the individual who will approve post-inspection reports for coatings and the key information that will be included in the reports.

Issue:

1. Insufficient details were provided for the staff to conclude that a 10-year inspection interval for the diesel oil storage tanks is acceptable. For example: (a) even though the tank is sloped and the suction lines are a foot above the tank bottom, depending on the specific gravity of coating debris and the flow velocity, debris could be transported; (b) although corrosion is unlikely for bare metal exposed to fuel, debris and water can collect on the tank bottom and result in loss of material and the RAI response did not address design minimum wall thickness and corrosion allowances; and (c) current inspections are not necessarily an effective indicator of degradation that could occur in the period of extended operation.

2. The changes to LRA Sections A.2.1.11, A.2.1.18, B.2.1.11, and B.2.1.18 are internally inconsistent because one portion would allow degraded coatings that exhibit delamination and peeling to remain in service while an enhancement states that signs of

delamination of the coating from the base metal (e.g., peeling and blistering) are not acceptable. In addition peeling, delamination, and blistering are intermixed, resulting in unclear guidance.

3. The staff has concluded that the quarterly monitoring of the differential pressure across the lubricating oil filter for the safety injection pump lubricating oil system is an important feature of managing loss of coating integrity of the internal coatings on the oil reservoirs. However, neither the updated final safety analysis report (UFSAR) supplement nor the Lubricating Oil Analysis program credits monitoring the differential pressure across the oil filter.

4. The Fire Water System program and UFSAR supplement does not include key aspects and the program does not include summary descriptions of activities associated with managing loss of coating integrity as described in RAI 3.0.3-2a Request (2).

5. Appendix B for the Open-Cycle Cooling Water, Fuel Oil Chemistry, and Fire Water System programs do not include key aspects of the post-inspection reports for coatings, as described in the response to RAI 3.0.3-2a Request (7).

Request:

1. Provide sufficient information for the staff to conclude that neither loss of material nor coating debris would result in loss of the current licensing basis intended functions of the diesel oil storage tanks and downstream in-scope components.

2. Clarify LRA Sections A.2.1.11, A.2.1.18, B.2.1.11, and B.2.1.18 in regard to acceptability of peeling, delamination, and blistering.

3. Revise LRA Sections A.2.1.26 and B.2.1.26 to credit monitoring the differential pressure across the safety injection pump lubricating oil system oil filter.

4. Provide a similar level of detail in the Fire Water System program and UFSAR supplement as described in the response to RAI 3.0.3-2a Request (2).

5. For the Open-Cycle Cooling Water, Fuel Oil Chemistry, and Fire Water System programs include the key information that will be included in the post inspection reports. For the Fire Water System program include a summary description in the LRA of qualifications of the individual who will approve post-inspection reports for coatings.

Exelon Response:

1. There is reasonable assurance that the Fuel Oil Chemistry (B.2.1.18) aging management program will ensure that neither loss of material nor coating debris would result in loss of the current licensing basis intended functions of the emergency diesel generator fuel oil storage tanks or downstream in-scope components based on the following:

- Significant accumulation of water on the bottom of the tank is unlikely

  The fuel oil contained in the emergency diesel generator fuel oil storage tanks is provided from the 125,000 gallon and 50,000 gallon fuel oil storage tanks (not in scope) located in the yard. The fuel oil contained in the 125,000 gallon and 50,000 gallon fuel oil storage tanks is periodically sampled on a 31-day frequency to ensure monitored parameters (e.g., water, sediment, and particulate content, microbe levels) are within acceptable levels. Since the fuel oil is periodically sampled during storage, there is reasonable assurance that the fuel oil is high quality when the fuel oil enters the emergency diesel generator fuel oil storage tanks. Once the fuel oil is within the emergency diesel generator fuel oil storage tanks, additional periodic sampling of the oil is performed, at least quarterly, to ensure that oil quality is maintained at acceptable levels. There is no source for significant water infiltration once the oil is within the emergency diesel generator fuel oil storage tanks since the tanks are located indoors and are not subject to temperature cycles where the potential exists for condensation of moisture from environmental sources. Plant-specific operating experience supports this conclusion. As described in LRA Section B.2.1.18 and the response to RAI 3.0.3-2a (Exelon letter RS-14-124, dated May 5, 2014), an internal inspection of the Braidwood 2A emergency diesel generator fuel oil storage tank performed in 2008 revealed areas of missing coating from original construction. No indications of loss of material were identified at the locations of the missing coating. The areas of missing coating included areas on the floor of the tank where accumulation of water and sedimentation is most likely to occur. Furthermore, areas of potential degraded coating are no more susceptible to loss of material than similar uncoated fuel oil tanks managed by the Fuel Oil Chemistry (B.2.1.18) aging management program. Therefore, the recommendations made in GALL Report AMP XI.M30 for managing loss of material of uncoated tanks (including the 10-year inspection frequency) are sufficient for managing loss of material of the coated emergency diesel generator fuel oil storage tanks.

- The Fuel Oil Chemistry (B.2.1.18) aging management program mitigates aging effects on coated and uncoated surfaces

  Periodic surveillance and maintenance procedures ensure that potentially harmful contaminants are maintained at low concentrations. The fuel oil in the tanks is maintained by monitoring and controlling fuel oil contaminants in accordance with the Technical Specifications and ASTM guidelines. Fuel oil sampling and analysis is performed for new fuel oil and stored fuel oil. The tanks are periodically drained, cleaned, and internally inspected. Any water or sediment that could have potentially accumulated in the tank is removed when the tank is drained and cleaned. Should there be a loss of coating, significant loss of material is not expected since the Fuel Oil Chemistry (B.2.1.18) aging management program activities ensure water, sediment, and particulate contamination, and microbe levels are minimized. Additionally, the Fuel Oil Chemistry (B.2.1.18) AMP, which incorporates the coating inspection activities, requires volumetric wall thickness examination if there is visual evidence of degradation.

- Design features of the fuel oil system identify tank leakage and system flow blockage

  The emergency diesel generator fuel oil storage tanks are equipped with level instrumentation and alarms that provide indication that leakage is occurring. Flow blockage of downstream components due to debris generated by potential coating degradation is not expected because the suction lines for the fuel oil transfer pumps are located greater than a foot above the bottom of the tanks and the tank bottoms are sloped such that any debris would accumulate away from the suction line for the fuel oil transfer pumps. However, in the unlikely event of coating debris transport, the suction piping for the fuel oil transfer pumps, located downstream from the emergency diesel generator fuel oil storage tanks, are each equipped with strainers to ensure any debris is removed prior to the fuel oil reaching the emergency diesel generator day tanks. The strainers are provided with differential pressure instrumentation and high differential pressure alarms which would provide indication of flow blockage if it were to occur. The fuel oil transfer system is tested at least once every two (2) years and each diesel generator is tested monthly. Strainer differential pressure is monitored continuously via the high differential pressure alarm during the fuel oil transfer system testing and during the emergency diesel generator testing.

LRA Sections A.2.1.18 and B.2.1.18 are revised as shown in Enclosure B to credit the existing activities related to the monitoring of emergency diesel generator fuel oil storage tanks level instrumentation and alarms and fuel oil transfer pump suction strainer differential pressure instrumentation and alarms for aging management review.

2. Delamination is defined in ASTM D4538, *Standard Terminology Relating to Protective Coating and Lining Work for Power Generation Facilities*, as the separation of one coat or layer from another coat or layer or from the substrate. Blisters and peeling are examples of visual indications that delamination of a coating is occurring. Blister delamination occurs when (1) a layer of a coating separates from the substrate, (2) the coating remains intact, and (3) the edge of the delaminated area remains bonded to the substrate. Peeling occurs when (1) a layer of a coating separates from the substrate, (2) the coating does not necessarily remain intact, and (3) at least one edge of the delaminated area is not bonded to the substrate. Coating inspection acceptance criteria will specify that delamination, in any manifestation, is not acceptable. As such, if peeling, blistering, or delamination is identified during an inspection, the condition will be entered into the corrective action program for evaluation. As described below, a coated component exhibiting signs of peeling, blistering, or delamination can be acceptable for return to service if (1) an evaluation concludes that there is reasonable assurance that further degradation of the component will not occur and cause loss of intended function of the coated component or downstream components and (2) the as-left condition of the component is such that the potential for further degradation of the coating is minimized.

   There is reasonable assurance that the programs credited with managing the aging of coated components will provide for appropriate corrective actions in the event that peeling, blistering, or delamination are detected during inspections to ensure that intended functions are maintained consistent with the current licensing basis based on the following:

- All indications of unacceptable coating degradation will be entered into the corrective action program

  As described in the response to RAI 3.0.3-2a (Exelon letter RS-14-124, dated May 5, 2014), if any signs of peeling, blistering, or delamination are identified during a coating inspection, then the condition will be entered into the 10 CFR Part 50 Appendix B corrective action program. Reliance on the corrective action program provides reasonable assurance that appropriate corrective actions are taken such that the current licensing basis intended functions of components within the scope of license renewal are maintained.

- Degraded coatings will be assessed and evaluated by qualified personnel

  Coating inspections will be performed by qualified coating inspectors, as described in the response to RAI 3.0.3-2a (Exelon letter RS-14-124, dated May 5, 2014). The coating inspector will assess the condition of the coating and provide recommendations for corrective actions, including potential repair or replacement of the coating, in the post-inspection report. The results of the inspections included in the post-inspection report will be evaluated by the ASTM D7108 qualified Site Coating Coordinator.

- The evaluation will consider the potential impact on the intended functions of the system

  If evidence of peeling, blistering, or delamination of an internal coating is identified during a coating inspection, then the condition will be evaluated prior to returning the component to service. The evaluation must consider the potential impact on the system, including degraded performance of downstream components due to flow blockage and loss of material of the coated component. Components with internal coatings exhibiting indications of peeling, blistering, or delamination can be returned to service without repairing or replacing the coating if it can be concluded that there is reasonable assurance that further degradation of the component will not occur and cause loss of intended function of the coated component or downstream components. If this conclusion cannot be reached, then repair or replacement of the coating is required prior to returning the component to service. As stated above, the evaluation will be performed by the ASTM D7108 qualified Site Coating Coordinator.

- The as-left condition of the coating is such that the potential for further peeling, blistering, or delamination of the coating is minimized

  Adhesion testing of the coating surrounding areas exhibiting signs of delamination will be performed to ensure that the remaining coating is firmly bonded to the substrate such that there is reasonable assurance that further peeling, blistering, or delamination will not occur if the coating

is not repaired or replaced. In addition, to minimize the potential for further peeling, blistering, or delamination, any coating identified during inspections that is not firmly bonded to the substrate (i.e., loose coating) will be removed to ensure that flow blockage of downstream components does not occur. The only exception to this requirement would be blistering consisting of small discrete intact stable blisters (as presented in ASTM D714, *Standard Test Method for Evaluating Degree of Blistering Paints*). Blistering can be evaluated and accepted by a qualified coating specialist (e.g., ASTM D7108 qualified Site Coating Coordinator) since blistered coatings are not known to fail as a sheet and cause flow blockage of downstream components. However, large blister (i.e., blisters large enough to generate debris capable of causing flow blockage of downstream components if the blister were to rupture) will be removed. Finally, if a coating exhibiting signs of peeling or delamination is not repaired or replaced, the edge of the remaining coating will be feathered to further minimize the potential for any additional delamination.

- The service environments of the coated components at BBS are not aggressive enough to cause accelerated corrosion of the base metal at locations of coating degradation

  If the coated component were exposed to an aggressive internal environment where accelerated loss of material could occur such that failure of the component is possible prior to the next inspection window, then repair of the coating would be required prior to returning the component to service. However, as described in the response to RAI 3.0.3-2a (Exelon letter RS-14-124, dated May 5, 2014), the service environments of the coated components at BBS are not aggressive enough to cause accelerated corrosion of the base metal at locations of loss of coating integrity.

Generally, coatings with indications of peeling, blistering, or delamination are repaired or replaced prior to returning the coated component to service. However, in certain situations, repair or replacement of the coating prior to returning the coated component to service may not be feasible. The process described above provides reasonable assurance that the current licensing basis intended functions of components within the scope of license renewal will be maintained if a coated component exhibiting signs of peeling, blistering, or delamination is returned to service without repairing or replacing the coating.

This approach is consistent with the requirements of ASTM D7167, *Standard Guide for Establishing Procedure to Monitor the Performance of Safety-Related Coating Service Level III Lining Systems in an Operating Nuclear Power Plant*, which has been endorsed by the NRC in Regulatory Guide 1.54. ASTM D7167 does not require the repair or replacement of a coating whenever peeling, blistering, or delamination is identified but instead requires that the determination, regarding whether a degraded component is acceptable to leave as-is, be based on an assessment of the impact of the lining degradation on the operation of the system. Similarly, this approach is consistent with the recommendations made in GALL Report AMP XI.S8, *Protective Coating Monitoring and Maintenance Program*. GALL Report AMP XI.S8 recommends the incorporation of

the guidance contained in ASTM D5163, *Standard Guide for Establishing a Program for Condition Assessment of Coating Service Level I Coating Systems in Nuclear Power Plants*. ASTM D7167 does not require the repair or replacement of a coating whenever peeling, blistering, or delamination is identified but instead requires that areas of coating degradation be prioritized into areas requiring immediate repair and areas where repair can be postponed based on evaluation by a coating specialist.

LRA Sections A.2.1.11, A.2.1.16, A.2.1.18, B.2.1.11, B.2.1.16, and B.2.1.18 are revised as shown in Enclosure B to (1) clarify the acceptability of peeling, blistering, and delamination, (2) specify that evaluations of coatings exhibiting signs of peeling, blistering, or delamination used to return a component to service without repairing or replacing the coating consider the potential impact on the intended functions of the system, and (3) specify that the as-left condition of a coating exhibiting signs of peeling, blistering, or delamination must be such that the potential for further degradation is minimized. LRA Table A.5, Item 11, Item 16, and Item 18 are revised as shown in Enclosure C to reflect these changes.

3. LRA Sections A.2.1.26 and B.2.1.26 are revised as shown in Enclosure B to credit the existing activities related to the measurement of differential pressure across the safety injection pump lubricating oil system oil filter, performed during quarterly surveillance testing of the pumps, for aging management.

4. LRA Sections A.2.1.16 and B.2.1.16 are revised as shown in Enclosure B to include key aspects of the program and summary descriptions of activities associated with managing loss of coating integrity.

5. LRA Sections B.2.1.11, B.2.1.16, and B.2.1.18 are revised as shown in Enclosure B to specify the key information that will be included in the post inspection reports. In addition, LRA Section B.2.1.16 is revised to specify qualifications of the individual who will approve post-inspection reports for coatings.

Enclosure B

Byron and Braidwood Stations, Units 1 and 2
License Renewal Application (LRA) updates resulting
from the response to the following RAI:

RAI 3.0.3-2b

Note: To facilitate understanding, the original LRA pages have been repeated in this Enclosure, with revisions indicated. Existing LRA text, as modified by previous RAI responses, is shown in normal font. Changes are highlighted with ***bolded italics*** for inserted text and ~~strikethroughs~~ for deleted text.

As a result of the response to RAI 3.0.3-2b provided in Enclosure A of this letter, LRA Appendix A, Section A.2.1.11 is revised as shown below. Text inserted as a result of the response to RAI 3.0.3-2b is highlighted by ***bolded italics***. Text deleted as a result of the response to RAI 3.0.3-2b is highlighted by ~~strikethroughs~~. Existing text from the LRA, as modified by previous RAI responses, is shown in normal font.

A.2.1.11 Open-Cycle Cooling Water System

The Open-Cycle Cooling Water System (OCCWS) aging management program is an existing preventive, mitigative, condition monitoring, and performance monitoring program based on the implementation of NRC GL 89-13, which includes (a) surveillance and control of bio-fouling, (b) tests to verify heat transfer, (c) routine inspection and maintenance program, (d) system walkdown inspection, and (e) review of maintenance, operating, and training practices and procedures. The Open-Cycle Cooling Water System program applies to components constructed of various materials, including steel, stainless steel, gray cast iron, copper alloys, nickel alloys, titanium, and polymeric materials.

The Open-Cycle Cooling Water System (OCCWS) aging management program manages heat exchangers, piping, piping elements, and piping components in safety-related and nonsafety-related raw water systems that are exposed to a raw water environment for loss of material, loss of coating integrity, and reduction of heat transfer. The guidelines of NRC Generic Letter 89-13 are implemented through the site GL 89-13 activities for heat exchangers and the Raw Water Corrosion program for piping segments. System and component testing, visual inspections, non- destructive examination (NDE) (i.e., ultrasonic testing and eddy current testing), and chemical injection are conducted to ensure that identified aging effects are managed such that system and component intended functions and integrity are maintained.

The OCCWS aging management program includes those systems that transfer heat from safety-related systems, structures, and components to the ultimate heat sink as defined in GL 89-13. Periodic heat transfer testing, visual inspection, and cleaning of safety-related heat exchangers with a heat transfer intended function is performed in accordance with the sites' commitments to GL 89-13 to verify heat transfer capabilities. Additionally, safety-related piping segments are NDE tested periodically to ensure that there is no significant loss of material, which could cause a loss of intended function.

Safety-related and nonsafety-related piping inspections are performed using a 100% scan ultrasonic testing method, where possible, to ensure that localized corrosion indicative of microbiologically influenced corrosion (MIC) is detected. The inspections required by this program are performed at locations that are chosen to be leading indicators of the material condition of the internal surface of components within the scope of the program. The specific locations for inspections are chosen based on commitments made in the Byron and Braidwood responses to NRC GL 89-13, piping configuration, flow conditions (e.g., stagnant or low flow areas), and operating history (e.g., prior inspection results). The maximum interval for re-inspection is based on the calculated remaining life of the component. If required, piping replacement is performed prior to the development of through-wall leakage.

In addition, the internal coatings of components within the scope of this program are periodically visually inspected to ensure that loss of coating integrity is detected prior to (1) loss of component intended function, including loss of function due to accelerated

degradation caused by localized coating failures, and (2) degradation of downstream component performance due to flow blockage. Inspections of internal coatings will be performed by qualified coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. If ***peeling, blistering, or*** delamination ~~(e.g., peeling and blistering)~~ is detected and the coating is not repaired, then physical testing will be conducted to ensure that the remaining coating is tightly bonded to the base metal ***and the as-left condition of the coating will be such that the potential for further degradation of the coating is minimized (i.e., any loose coating is removed, the edge of the remaining coating is feathered)***. The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07). Evidence of unacceptable coating degradation is entered into the corrective action program. The results of inspections of internal coatings are trended and used to adjust inspection frequencies as determined by the ASTM D7108 qualified Site Coating Coordinator.

Nonsafety-related piping segments which have the potential for spatial interactions with safety-related equipment will be NDE tested periodically as delineated in the enhancement described below.

The Open-Cycle Cooling Water System aging management program will be enhanced to:

1. Perform periodic volumetric inspections for loss of material in the non-essential service water system piping at a minimum of two (2) locations on each unit in both the auxiliary building and the turbine building for a total of four (4) periodic inspections per unit every refueling cycle.

2. Require inspections of internal coatings be performed by coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54.

3. Specify that signs of ***peeling, blistering, or*** delamination of the coating from the base metal***,*** ~~(e.g., peeling and blistering) are not acceptable~~ ***if identified, shall be entered into the corrective action program***.

4. Require physical testing of internal coatings, where physically possible, to ensure that remaining coating is tightly bonded to the base metal when ***peeling, blistering, or*** delamination is detected and the coating is not repaired or replaced. The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07).

5. ***Require that evaluations utilized to return a coated component exhibiting signs of peeling, blistering, or delamination to service without repairing or replacing the coating shall consider the potential impact on the intended function of the system. This evaluation shall include consideration of the potential for degraded performance of downstream components due to flow blockage and loss of material of the coated component.***

6. ***Require the as-left condition of a coating that exhibited signs of peeling, blistering, or delamination and that is not repaired or replaced is such that the potential for further degradation of the coating is minimized.***

These enhancements will be implemented prior to the period of extended operation.

As a result of the response to RAI 3.0.3-2b provided in Enclosure A of this letter, LRA Appendix A, Section A.2.1.16 is revised as shown below. Text inserted as a result of the response to RAI 3.0.3-2b is highlighted by ***bolded italics***. Existing text from the LRA, as modified by previous RAI responses, is shown in normal font.

A.2.1.16 Fire Water System

The Fire Water System aging management program is an existing condition monitoring program that provides for system pressure monitoring, system header flushing, buried ring header flow testing, pump performance testing, hydrant full flow flushing and full flow verification, sprinkler and deluge system flushing and flow testing, hydrostatic testing, and inspection activities. Major component types managed by this program include sprinklers, fittings, valves, hydrants, hose stations, standpipes, tanks, pumps, and aboveground and buried piping and components. There are no underground (i.e., below grade but contained within a tunnel or vault) piping and components within the scope of the Fire Water System aging management program. This program manages aging effects of loss of material due to corrosion (including MIC), reduction in heat transfer due to fouling, and flow blockage due to fouling.

Opportunistic visual inspections, performed when the internal surface of the system is made accessible due to normal plant maintenance activities, and existing volumetric non-destructive examinations (i.e., guided wave and ultrasonic inspections) will be credited to ensure age related degradation is identified prior to loss of system intended function. At Byron only, the program will be enhanced to require a minimum of 30 volumetric examinations during each three year interval. In addition, the program will be enhanced to perform additional inspections as described in the Enhancements below. Internal visual inspections are primarily relied upon for detection of flow blockage. Internal visual inspections are only capable of providing qualitative assessments of the internal condition of system piping with respect to loss of material. If unexpected levels of degradation are identified then the condition is entered into the corrective action program for evaluation. Unexpected levels of degradation include excessive accumulation of corrosion products and appreciable localized corrosion (e.g., pitting) beyond a normal oxide layer.

Buried ring header flow tests measure hydraulic resistance and compare results with previous testing as a means of evaluating the internal piping conditions. Monitoring system piping flow characteristics ensures that signs of loss of material will be detected in a timely manner.

System functional tests, flow tests (including air flow tests), flushes, and inspections are performed in accordance with the applicable guidance from National Fire Protection Association (NFPA) codes and standards. The program will be enhanced to include annual main drain testing in accordance with NFPA 25, Section 13.2.5. These activities are performed periodically to ensure that the loss of material due to corrosion aging effect is managed such that the system and component intended functions are maintained.

In addition, the program will be enhanced to require portions of the water-based fire protection system that are: (a) normally dry but periodically subjected to flow and (b) cannot be drained or allow water to collect be subjected to augmented testing beyond that specified in NFPA 25. The augmented testing will include: (1) periodic full flow

tests at the design pressure and flow rate or internal visual inspections and (2) volumetric wall-thickness examinations. Inspections and testing will commence five (5) years prior to the period of extended operation and will be conducted on a five (5) year frequency thereafter.

In addition, the internal coatings of components within the scope of this program are periodically visually inspected to ensure that loss of coating integrity is detected prior to (1) loss of component intended function, including loss of function due to accelerated degradation caused by localized coating failures, and (2) degradation of downstream component performance due to flow blockage. ***Inspections of internal coatings will be performed by qualified coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. If peeling, blistering, or delamination is detected and the coating is not repaired, then physical testing will be conducted to ensure that the remaining coating is tightly bonded to the base metal and the as-left condition of the coating will be such that the potential for further degradation of the coating is minimized (i.e., any loose coating is removed, the edge of the remaining coating is feathered). The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07). Evidence of unacceptable coating degradation is entered into the corrective action program. The results of inspections of internal coatings are trended and used to adjust inspection frequencies as determined by the ASTM D7108 qualified Site Coating Coordinator.***

The Fire Water System aging management program will be enhanced to:

1. Replace sprinkler heads or perform 50-year sprinkler head testing using the guidance of NFPA 25 “Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems” (2002 Edition), Section 5.3.1.1.1. This testing will be performed at the 50-year in-service date and every 10 years thereafter.

2. Provide for chemical addition, accompanied with system flushing to allow for adequate dispersal of the chemicals throughout the system, to prevent or minimize microbiologically induced corrosion (Byron only).

3. Perform main drain testing annually, in accordance with NFPA 25, “Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems,” Section 13.2.5.

4. Perform air flow testing of deluge systems that are not subject to periodic full flow testing on a three (3) year frequency to verify that internal flow blockage is not occurring (Byron only).

5. Perform inspections of Fire Protection System strainers when the system is reset after automatic actuation for signs of internal flow blockage (e.g., buildup of corrosion particles) (Braidwood only).

6. Increase the frequency of visual inspections of the internal surface of the foam concentrate tanks to at least once every ten (10) years. ***At least one (1) inspection will be performed within the ten (10) year period prior to entry into***

the period of extended operation, with subsequent inspections performed every ten (10) years thereafter.

7. Perform radiographic testing or internal visual inspections every five (5) years at the end of one (1) fire main and the end of one (1) sprinkler system branch line in half of the wet pipe sprinkler system within the scope of license renewal. If internal flow blockage that could result in failure of the system to deliver the required flow is identified, then perform an obstruction investigation.

8. Perform augmented testing beyond that specified in NFPA 25 on those portions of the water-based fire protection system that are: (a) normally dry but periodically subjected to flow and (b) cannot be drained or allow water to collect. The augmented testing will include: (1) periodic full flow tests at the design pressure and flow rate or internal visual inspections and (2) volumetric wall-thickness examinations. Inspections and testing will commence five (5) years prior to the period of extended operation and will be conducted on a five (5) year frequency thereafter.

9. Perform a minimum of 30 volumetric examinations of Fire Protection System piping during each three year interval (Byron only).

10. Require inspections of internal coatings be performed by coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54.

11. Specify that signs of peeling, blistering, or delamination of the coating from the base metal, if identified, shall be entered into the corrective action program.

12. Require physical testing of internal coatings, where physically possible, to ensure that remaining coating is tightly bonded to the base metal when peeling, blistering, or delamination is detected and the coating is not repaired or replaced. The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07).

13. Require that evaluations utilized to return a coated component exhibiting signs of peeling, blistering, or delamination to service without repairing or replacing the coating shall consider the potential impact on the intended function of the system. This evaluation shall include consideration of the potential for degraded performance of downstream components due to flow blockage and loss of material of the coated component.

14. Require the as-left condition of a coating that exhibited signs of peeling, blistering, or delamination and that is not repaired or replaced is such that the potential for further degradation of the coating is minimized.

These enhancements will be implemented prior to the period of extended operation, with the testing and inspections performed in accordance with the schedule described above.

As a result of the response to RAI 3.0.3-2b provided in Enclosure A of this letter, LRA Appendix A, Section A.2.1.18 is revised as shown below. Text inserted as a result of the response to RAI 3.0.3-2b is highlighted by ***bolded italics***. Text deleted as a result of the response to RAI 3.0.3-2b is highlighted by ~~strikethroughs~~. Existing text from the LRA, as modified by previous RAI responses, is shown in normal font.

A.2.1.18 Fuel Oil Chemistry

The Fuel Oil Chemistry program is an existing mitigative and condition monitoring program that manages loss of material, loss of coating integrity, and reduction in heat transfer in piping, piping elements, piping components, tanks, and heat exchangers. The Fuel Oil Chemistry aging management program relies on a combination of surveillance procedures and maintenance activities being implemented to provide assurance that contaminants are monitored and controlled in fuel oil for systems and components within the scope of license renewal. The program requires fuel oil parameters to be maintained at acceptable levels in accordance with Technical Specifications, Technical Requirement Manual, and ASTM Standards (ASTM D 0975-98/-06b, D 2709-96e, D 4057-95, and D 5452-98). Fuel oil sampling and analysis is performed in accordance with approved procedures for new and stored fuel oil. Fuel oil tanks are periodically drained of accumulated water, cleaned, and internally inspected to minimize exposure to fuel oil contaminants. During these inspections, the internal coatings of the tanks are visually inspected to ensure that loss of coating integrity is detected prior to (1) loss of component intended function, including loss of function due to accelerated degradation caused by localized coating failures, and (2) degradation of downstream component performance due to flow blockage. These activities effectively manage the effects of aging by maintaining contaminants at acceptably low concentrations.

Inspections of internal coatings will be performed by qualified coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. If ***peeling, blistering, or*** delamination ~~(e.g., peeling and blistering)~~ is detected and the coating is not repaired, then physical testing will be conducted to ensure that the remaining coating is tightly bonded to the base metal ***and the as-left condition of the coating will be such that the potential for further degradation of the coating is minimized (i.e., any loose coating is removed, the edge of the remaining coating is feathered)***. The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07). Evidence of unacceptable coating degradation is entered into the corrective action program. The results of inspections of internal coatings are trended and used to adjust inspection frequencies as determined by the ASTM D7108 qualified Site Coating Coordinator. ***In addition, the instrumentation and alarms related to emergency diesel generator fuel oil storage tank level and fuel oil transfer pump suction strainer differential pressure are monitored. Monitoring of instrumentation related to the coated emergency diesel generator fuel oil storage tank ensures that an adequate fuel oil supply is available such that the intended functions of the emergency diesel generators are maintained. High differential pressure across the fuel oil transfer pump suction strainer would provide indication if any significant degradation of the coating were to occur and cause coating debris to enter the fuel oil transfer system.***

The Fuel Oil Chemistry aging management program will be enhanced to:

1. Provide for the periodic cleaning of the Fire Protection Fuel Oil Storage Tank (Byron only).

2. Provide for periodic draining of water from the Auxiliary Feedwater Day Tanks, Diesel Generator Day Tanks, Essential Service Water Make/Up Pump Fuel Oil Storage Tanks (Byron only), and Fire Protection Fuel Oil Storage Tanks.

3. Include analysis for the levels of microbiological organisms in the Auxiliary Feedwater Day Tanks and Essential Service Water Make-up Pumps Diesel Oil Storage Tanks (Byron only).

4. Include analysis for water and sediment content, particulate concentration, and the levels of microbiological organisms for the Diesel Generator Day Tanks.

5. Include analysis for water and sediment content and the levels of microbiological organisms for the Diesel Generator Fuel Oil Storage Tanks.

6. Include analysis for particulate concentration and the levels of microbiological organisms for the Fire Protection Fuel Oil Storage Tanks.

7. Include internal inspections of the Fire Protection Fuel Oil Storage Tanks at least once during the 10 year period prior to the period of extended operation, and at least once every 10 years during the period of extended operation. Each diesel fuel tank will be drained and cleaned, the internal surfaces visually inspected (if physically possible), and, if evidence of degradation is observed during inspections, or if visual inspection is not possible, these diesel fuel tanks will be volumetrically inspected.

8. Include monitoring and trending for the levels of microbiological organisms for the Auxiliary Feedwater Day Tanks and Essential Service Water Make-up Pumps Diesel Oil Storage Tanks (Byron only).

9. Include monitoring and trending for water and sediment content, particulate concentration, and the levels of microbiological organisms for the Diesel Generator Day Tanks.

10. Include monitoring and trending for water and sediment content and the levels of microbiological organisms for the Diesel Generator Fuel Oil Storage Tanks.

11. Include monitoring and trending for total particulate concentration and the levels of microbiological organisms for the Fire Protection Fuel Oil Storage Tanks.

12. Require inspections of internal coatings be performed by coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54.

13. Specify that signs of ***peeling, blistering, or*** delamination of the coating from the base metal***,*** ~~(e.g., peeling and blistering) are not acceptable~~ ***if identified, shall be entered into the corrective action program***.

14. Require physical testing of internal coatings, where physically possible, to ensure that remaining coating is tightly bonded to the base metal when ***peeling, blistering, or*** delamination is detected and the coating is not repaired or replaced. The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07).

15. Require that evaluations utilized to return a coated component exhibiting signs of peeling, blistering, or delamination to service without repairing or replacing the coating shall consider the potential impact on the intended function of the system. This evaluation shall include consideration of the potential for degraded performance of downstream components due to flow blockage and loss of material of the coated component.

16. Require the as-left condition of a coating that exhibited signs of peeling, blistering, or delamination and that is not repaired or replaced is such that the potential for further degradation of the coating is minimized.

These enhancements will be implemented prior to the period of extended operation.

As a result of the response to RAI 3.0.3-2b provided in Enclosure A of this letter, LRA Appendix A, Section A.2.1.26 is revised as shown below. Text inserted as a result of the response to RAI 3.0.3-2b is highlighted by ***bolded italics***. Existing text from the LRA, as modified by previous RAI responses, is shown in normal font.

A.2.1.26 Lubricating Oil Analysis

The Lubricating Oil Analysis aging management program is an existing preventive and mitigative program that ensures that the oil environment in the mechanical systems is maintained to the required quality to prevent or mitigate age-related degradation of components within the scope of this program. The Lubricating Oil Analysis program ensures that oil systems are maintained free of contaminants (primarily water and particulates), thereby, preserving an environment that is not conducive to loss of material or reduction of heat transfer in piping, piping components, piping elements, valve bodies, pump casings, gear boxes, tanks, and heat exchangers exposed to an oil environment. Testing activities include sampling and analysis of lubricating oil for detrimental contaminants. The presence of oil contaminants (e.g., water or particulates) may also indicate in-leakage and corrosion product buildup. Loss of coating integrity for coated or lined components within the scope of this program will be detected by the presence of particulates in the oil. ***In addition, the differential pressure across the safety injection pump lubricating oil system oil filter is measured. These readings would provide indication if any significant degradation of the safety injection pump lubricating oil reservoir coating were to occur and cause coating debris to enter the lubricating oil system.***

As a result of the response to RAI 3.0.3-2b provided in Enclosure A of this letter, LRA Appendix B, Section B.2.1.11 is revised as shown below. Text inserted as a result of the response to RAI 3.0.3-2b is highlighted by *bolded italics*. Text deleted as a result of the response to RAI 3.0.3-2b is highlighted by ~~strikethroughs~~. Existing text from the LRA, as modified by previous RAI responses, is shown in normal font.

B.2.1.11 Open-Cycle Cooling Water System

Program Description

The Open-Cycle Cooling Water System (OCCWS) aging management program is an existing preventive, mitigative, condition monitoring, and performance monitoring program that manages heat exchangers, piping, piping elements, and piping components in safety-related and nonsafety-related raw water systems that are exposed to a raw water environment for loss of material, loss of coating integrity, and reduction of heat transfer. The activities for this program are consistent with the site commitments to the requirements of GL 89-13 and provide for management of aging effects in raw water cooling systems through tests, inspections, and component cleaning. System and component testing, visual inspections, non-destructive examination (NDE) (i.e., ultrasonic testing and eddy current testing), and biocide and chemical treatment are conducted to ensure that identified aging effects are managed such that system and component intended functions are maintained.

The OCCWS includes those systems that transfer heat from safety-related systems, structures, and components to the ultimate heat sink as defined in GL 89-13 as well as those raw water systems which are in scope for license renewal for potential spatial interaction but have no safety-related heat transfer function.

The guidelines of GL 89-13 are utilized for the surveillance and control of bio-fouling for the OCCWS aging management program. Procedures provide instructions and controls for chemical and biocide injection. Periodic inspections are performed for the presence of Asiatic clams, bryozoa (Braidwood only), and mollusks and biocide treatments are applied as necessary.

Periodic heat transfer testing, visual inspection and cleaning of safety-related heat exchangers with a heat transfer intended function is performed in accordance with the site commitments to GL 89-13 to verify heat transfer capabilities. Additionally, safety-related piping segments are tested periodically to ensure that there is no significant loss of material, which could cause a loss of intended function. Nonsafety-related piping segments have potential for spatial interactions with safety-related equipment, and will be NDE tested periodically as delineated in the enhancement described below.

Safety-related and nonsafety-related piping inspections are performed using a 100% scan ultrasonic testing method, where possible, to ensure that localized corrosion indicative of microbiologically influenced corrosion (MIC) is detected. The inspections required by this program are performed at locations that are chosen to be leading indicators of the material condition of the internal surface of components within the scope of the program. The specific locations for inspections are chosen based on commitments made in the Byron and Braidwood responses to NRC GL 89-13, piping configuration, flow conditions (e.g., stagnant or low flow areas), and operating history

(e.g., prior inspection results). The maximum interval for re-inspection is based on the calculated remaining life of the component. If required, piping replacement is performed prior to the development of through-wall leakage.

Routine inspections and maintenance ensure that corrosion, erosion, sediment deposition (silting), scaling (Braidwood only), and bio-fouling do not degrade the performance of safety-related systems serviced by OCCWS aging management program.

No credit is taken for protective coatings on safety-related components in the OCCWS aging management program in determining potential aging effects. However, this program is used to assure the lining/coating integrity. At Byron and Braidwood, protective coatings are utilized on selected safety-related and nonsafety-related heat exchangers within the scope of this program and are periodically inspected and repaired, as necessary. Periodic visual inspections of the internal coatings of components within the scope of this program are performed every one to six years, depending on the heat exchanger. The visual inspections ensure that loss of coating integrity is detected prior to (1) loss of component intended function, including loss of function due to accelerated degradation caused by localized coating failures, and (2) degradation of downstream component performance due to flow blockage.

Inspections of internal coatings will be performed by coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. The as found condition of the coating is documented in inspection reports and the results of prior inspections are reviewed to determine changes in the condition of the coating over time. The program provides for inspections for signs of coating failures and precursors to coating failures including erosion, cracking, flaking, ***peeling, blistering,*** delamination ~~(e.g., peeling and blistering)~~, rusting, and mechanical damage. Evidence of unacceptable coating degradation is entered into the corrective action program. ***Coating inspection acceptance criteria will specify that peeling, blistering, and delamination is not acceptable.*** Signs of ***peeling, blistering, or*** delamination of the coating from the base metal***,*** ~~(e.g., peeling and blistering) are not acceptable~~ ***if identified, shall be entered into the corrective action program***. If ***peeling, blistering, or*** delamination ~~(e.g., peeling and blistering)~~ is detected and the coating is not repaired or replaced, then physical testing will be conducted to ensure that the remaining coating is tightly bonded to the base metal ***and the as-left condition of the coating will be such that the potential for further degradation of the coating is minimized (i.e., any loose coating is removed, the edge of the remaining coating is feathered)***. The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07). A minimum of three (3) sample points adjacent to the defective area will be tested. Indications of blisters, cracking, flaking, or rusting will be assessed by a certified coatings inspector and documented in a post-inspection report. ***Areas or items exhibiting coating degradation will be documented, photographed, and reported to the ASTM D7108 qualified Site Coating Coordinator in a post-inspection report. Recommendations for immediate coating repair or replacement prior to returning the system to service or postponement of coating repair or replacement to the next inspection window will be provided in the post-inspection report***. The results of the inspection contained in the post-inspection report will be evaluated by the ASTM D7108 qualified Site Coating Coordinator. ***Evaluations used to determine whether repair or replacement of coatings***

exhibiting signs of peeling, blistering, or delamination are required prior to returning the component to service will consider the potential impact on the system, including degraded performance of downstream components due to flow blockage and loss of material of the coated component. The results of inspections of internal coatings are trended and used to adjust inspection frequencies as determined by the ASTM D7108 qualified Site Coating Coordinator. 100% of the coated surfaces that are accessible upon component disassembly or entry are inspected. At least one inspection of each of the coated heat exchangers within the scope of this program will be performed during the ten (10) years prior to the period of extended operation to establish a baseline. Evaluations are performed for inspections that do not satisfy established criteria and the conditions are entered into the 10 CFR 50 Appendix B corrective action program. The corrective action program ensures that conditions adverse to quality are promptly corrected. Corrective actions may include performing coating repairs or replacements prior to the component being returned to service.

The Buried and Underground Piping (B.2.1.28) aging management program activities are adequate for managing the aging effects of external surfaces of buried and underground piping and components. The external surface of the aboveground raw water piping and heat exchangers is managed by the External Surfaces Monitoring of Mechanical Components (B.2.1.23) aging management program. However, the internal and external surfaces of the piping exposed to raw water in the Essential Service Water Cooling Tower (Byron only) will be managed by the Open-Cycle Cooling Water System program.

Examination of polymeric materials in systems serviced by the Open-Cycle Cooling Water System program will be consistent with examinations described in the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program.

NUREG-1801 Consistency

The Open-Cycle Cooling Water System aging management program will be consistent with the ten elements of aging management program XI.M20, "Open-Cycle Cooling Water System," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

1. Perform periodic volumetric inspections for loss of material in the non-essential service water system piping at a minimum of two (2) locations on each unit in both the auxiliary building and the turbine building for a total of four (4) periodic inspections per unit every refueling cycle. **Program Elements Affected: Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4)**

2. Require inspections of internal coatings be performed by coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. **Program Elements Affected: Detection of Aging Effects (Element 4)**

3. Specify that signs of ***peeling, blistering, or*** delamination of the coating from the base metal***,*** ~~(e.g., peeling and blistering) are not acceptable~~ ***if identified, shall be entered into the corrective action program***. **Program Elements Affected: Acceptance Criteria (Element 6)**

4. Require physical testing of internal coatings, where physically possible, to ensure that remaining coating is tightly bonded to the base metal when ***peeling, blistering, or*** delamination is detected and the coating is not repaired or replaced. The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07). **Program Elements Affected: Acceptance Criteria (Element 6)**

5. Require that evaluations utilized to return a coated component exhibiting signs of peeling, blistering, or delamination to service without repairing or replacing the coating shall consider the potential impact on the intended function of the system. This evaluation shall include consideration of the potential for degraded performance of downstream components due to flow blockage and loss of material of the coated component. Program Elements Affected: Monitoring and Trending (Element 5), Acceptance Criteria (Element 6), Corrective Actions (Element 7)

6. Require the as-left condition of a coating that exhibited signs of peeling, blistering, or delamination and that is not repaired or replaced is such that the potential for further degradation of the coating is minimized. Program Elements Affected: Monitoring and Trending (Element 5), Corrective Actions (Element 7)

As a result of the response to RAI 3.0.3-2b provided in Enclosure A of this letter, LRA Appendix B, Section B.2.1.16 is revised as shown below. Text inserted as a result of the response to RAI 3.0.3-2b is highlighted by ***bolded italics***. Existing text from the LRA, as modified by previous RAI responses, is shown in normal font.

B.2.1.16 Fire Water System

Program Description

The Fire Water System aging management program is an existing condition monitoring program that manages the loss of material aging effect for the water-based fire protection system and associated components, through the use of system pressure monitoring, system header flushing, buried ring header flow testing, pump performance testing, hydrant full flow flushing and full flow verification, sprinkler and deluge system flushing and flow testing, hydrostatic testing, and inspection activities. This program manages aging effects of loss of material due to corrosion (including MIC), reduction in heat transfer due to fouling, and flow blockage due to fouling. In addition, the Fire Water System aging management program manages the loss of coating integrity aging effect for the components with internal coatings within the scope of the program.

The program applies to water-based fire protection systems that consist of sprinklers, fittings, valves, hydrants, hose stations, standpipes, tanks, pumps, and aboveground and buried piping and components. The program manages aging of fire protection components exposed to outdoor air and raw water. There are no underground (i.e., below grade but contained within a tunnel or vault) piping and components within the scope of the Fire Water System aging management program at Byron and Braidwood Stations. Aging of the external surfaces of buried fire main piping is managed as described in the Buried and Underground Piping (B.2.1.28) aging management program.

The fire water system is maintained at the required normal operating pressure and monitored such that a loss of system pressure is immediately detected and corrective actions initiated. The program ensures that testing and inspection activities are performed and the results are documented and reviewed by the Fire Protection system manager for analysis and trending. These monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant age-related degradation.

Opportunistic visual inspections, performed when the internal surface is made accessible due to normal plant maintenance activities, and existing volumetric non-destructive examinations (i.e., guided wave and ultrasonic inspection) of piping will be credited to ensure age related degradation is identified prior to loss of system intended function. Selected portions of the fire protection system piping located aboveground and exposed to water will be inspected by non-intrusive volumetric examinations, to ensure that aging effects are managed and that pipe wall thickness is within acceptable limits. Pipe wall thickness inspections will be performed before the end of the current operating term and continued at a frequency of at least once every 3 years during the period of extended operation. At Byron only, as a result of operating experience, the program will be enhanced to require a minimum of 30 volumetric examinations during each three year interval. These inspections will be capable of evaluating pipe wall thickness to ensure against loss of system intended function. Wall

thickness evaluations will not be used in lieu of conducting flow tests or inspections for flow blockage. The program will be enhanced to perform additional inspections as described in the Enhancements below. Internal visual inspections or radiographic testing will be performed at the end of one (1) fire main and the end of one (1) branch line on half of the wet pipe sprinkler system every five (5) years. The wet pipe sprinkler systems that are not inspected during a five (5) year period will be inspected during the subsequent five (5) year period. Internal visual inspections are primarily relied upon for detection of flow blockage. Internal visual inspections are only capable of providing qualitative assessments of the internal condition of system piping with respect to loss of material. If unexpected levels of degradation are identified then the condition is entered into the corrective action program for evaluation. Unexpected levels of degradation include excessive accumulation of corrosion products and appreciable localized corrosion (e.g., pitting) beyond a normal oxide layer.

In addition, periodic visual inspections of components with internal coatings are performed. The visual inspections ensure that loss of coating integrity is detected prior to (1) loss of component intended function, including loss of function due to accelerated degradation caused by localized coating failures, and (2) degradation of downstream component performance due to flow blockage. ***Inspections of internal coatings will be performed by coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. The as found condition of the coating is documented in inspection reports and the results of prior inspections are reviewed to determine changes in the condition of the coating over time. The program provides for inspections for signs of coating failures and precursors to coating failures including erosion, cracking, flaking, peeling, blistering, delamination, rusting, and mechanical damage. Evidence of unacceptable coating degradation is entered into the corrective action program. Coating inspection acceptance criteria will specify that peeling, blistering, and delamination is not acceptable. Signs of peeling, blistering, or delamination of the coating from the base metal, if identified, shall be entered into the corrective action program. If peeling, blistering, or delamination is detected and the coating is not repaired or replaced, then physical testing will be conducted to ensure that the remaining coating is tightly bonded to the base metal and the as-left condition of the coating will be such that the potential for further degradation of the coating is minimized (i.e., any loose coating is removed, the edge of the remaining coating is feathered). The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07). A minimum of three (3) sample points adjacent to the defective area will be tested. Indications of blisters, cracking, flaking, or rusting will be assessed by a certified coatings inspector and documented in a post-inspection report. Areas or items exhibiting coating degradation will be documented, photographed, and reported to the ASTM D7108 qualified Site Coating Coordinator in a post-inspection report. Recommendations for immediate coating repair or replacement prior to returning the system to service or postponement of coating repair or replacement to the next inspection window will be provided in the post-inspection report. The results of the inspection contained in the post-inspection report will be evaluated by the ASTM D7108 qualified Site Coating Coordinator. Evaluations used to determine whether repair or replacement of coatings exhibiting signs of peeling, blistering, or delamination are required prior to returning the component to service will consider the potential impact on the system, including degraded performance of***

downstream components due to flow blockage and loss of material of the coated component. The results of inspections of internal coatings are trended and used to adjust inspection frequencies as determined by the ASTM D7108 qualified Site Coating Coordinator. 100% of the coated surfaces that are accessible upon component disassembly or entry are inspected. At least one inspection of each of the coated foam concentrate tanks within the scope of this program will be performed during the ten (10) years prior to the period of extended operation to establish a baseline. Evaluations are performed for inspections that do not satisfy established criteria and the conditions are entered into the 10 CFR 50 Appendix B corrective action program. The corrective action program ensures that conditions adverse to quality are promptly corrected. Corrective actions may include performing coating repairs or replacements prior to the component being returned to service.

Buried ring header flow tests measure hydraulic resistance and compare results with previous testing as a means of evaluating the internal piping conditions. Monitoring system piping flow characteristics ensures that signs of loss of material will be detected in a timely manner.

50-year sprinkler head testing will be conducted using the guidance provided in NFPA 25. Performance of the initial 50-year tests will be determined based on the date of the sprinkler system installation. Subsequent inspections will be performed every 10 years after the initial 50-year testing.

At Byron only, as a result of operating experience, an enhancement to allow for chemical addition, accompanied with system flushing to allow for adequate dispersal of the chemicals throughout the system, to prevent or minimize microbiologically induced corrosion has been included in the Fire Water System aging management program. In addition, the program is enhanced to require a minimum of 30 volumetric examinations during each three year interval to address Byron operating experience.

System functional tests, flow tests (including air flow tests), flushes, and inspections are performed in accordance with the applicable guidance from National Fire Protection Association (NFPA) codes and standards. The program will be enhanced to include annual main drain testing in accordance with NFPA 25, Section 13.2.5. These activities are performed periodically to ensure that the loss of material due to corrosion aging effect is managed such that the system and component intended functions are maintained.

For portions of the water-based fire protection system that are: (a) normally dry but periodically subjected to flow and (b) cannot be drained or allow water to collect the Fire Water System (B.2.1.16) aging management program will be enhanced to require augmented testing beyond that specified in NFPA 25. Augmented testing of these portions of the water-based fire protection system will be performed as follows:

a. Full flow testing at the design pressure and flow rate or internal visual inspections of the internal surface of portions of the system that meet the above criteria will be periodically performed to ensure flow blockage is not occurring. In addition, volumetric examinations will be performed to verify that significant loss of material is not occurring.

b. Flow testing and visual inspections will be capable of detecting flow blockage. Volumetric examinations will measure wall thickness and detect age-related loss of material.
c. Inspections and testing will commence five (5) years prior to the period of extended operation and will be conducted on a five (5) year frequency thereafter.
d. Flow testing and visual inspections will monitor for flow blockage in 100% of the applicable portions of the water-based fire protection system. Volumetric examinations will be performed on 20% of the applicable portions of the water-based fire protection system. The 20% of piping that is inspected in each five year interval will be in different locations than previously inspected.
e. Reduction in flow such that the system is not capable of performing its intended function will be entered into the corrective action program. Wall thickness measurements below nominal wall thickness will be entered into the corrective action program.

NUREG-1801 Consistency

The Fire Water System aging management program will be consistent with the ten elements of aging management program XI.M27, "Fire Water System," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

1. Replace sprinkler heads or perform 50-year sprinkler head testing using the guidance of NFPA 25 "Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems" (2002 Edition), Section 5.3.1.1.1. This testing will be performed at the 50- year in-service date and every 10 years thereafter. **Program Elements Effected: Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4)**

2. Provide for chemical addition, accompanied with system flushing to allow for adequate dispersal of the chemicals throughout the system, to prevent or minimize microbiologically induced corrosion (Byron only). **Program Elements Effected: Preventive Actions (Element 2)**

3. Perform main drain testing annually, in accordance with NFPA 25, "Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems," Section 13.2.5. **Program Elements Effected: Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4)**

4. Perform air flow testing of deluge systems that are not subject to periodic full flow testing on a three (3) year frequency to verify that internal flow blockage is not occurring (Byron only). **Program Elements Effected: Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4)**

5. Perform inspections of Fire Protection System strainers when the system is reset after automatic actuation for signs of internal flow blockage (e.g., buildup of corrosion particles) (Braidwood only). **Program Elements Effected: Detection of Aging Effects (Element 4)**

6. Increase the frequency of visual inspections of the internal surface of the foam concentrate tanks to at least once every ten (10) years. ***At least one (1) inspection will be performed within the ten (10) year period prior to entry into the period of extended operation, with subsequent inspections performed every ten (10) years thereafter.*** **Program Elements Effected: Detection of Aging Effects (Element 4)**

7. Perform radiographic testing or internal visual inspections every five (5) years at the end of one (1) fire main and the end of one (1) sprinkler system branch line in half of the wet pipe sprinkler system within the scope of license renewal. If internal flow blockage that could result in failure of the system to deliver the required flow is identified, then perform an obstruction investigation. **Program Elements Effected: Detection of Aging Effects (Element 4)**

8. Perform augmented testing beyond that specified in NFPA 25 on those portions of the water-based fire protection system that are: (a) normally dry but periodically subjected to flow and (b) cannot be drained or allow water to collect. The augmented testing will include: (1) periodic full flow tests at the design pressure and flow rate or internal visual inspections and (2) volumetric wall-thickness examinations. Inspections and testing will commence five (5) years prior to the period of extended operation and will be conducted on a five (5) year frequency thereafter. **Program Elements Effected: Scope of Program (Element 1), Detection of Aging Effects (Element 4)**

9. Perform a minimum of 30 volumetric examinations of Fire Protection System piping during each three year interval (Byron only). **Program Elements Effected: Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4)**

10. ***Require inspections of internal coatings be performed by coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. Program Elements Affected: Detection of Aging Effects (Element 4)***

11. ***Specify that signs of peeling, blistering, or delamination of the coating from the base metal, if identified, shall be entered into the corrective action program. Program Elements Affected: Acceptance Criteria (Element 6)***

12. ***Require physical testing of internal coatings, where physically possible, to ensure that remaining coating is tightly bonded to the base metal when peeling, blistering or delamination is detected and the coating is not repaired or replaced. The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM***

D4541-09 or ASTM D6677-07). Program Elements Affected: Acceptance Criteria (Element 6)

13. ***Require that evaluations utilized to return a coated component exhibiting signs of peeling, blistering, or delamination to service without repairing or replacing the coating shall consider the potential impact on the intended function of the system. This evaluation shall include consideration of the potential for degraded performance of downstream components due to flow blockage and loss of material of the coated component. Program Elements Affected: Monitoring and Trending (Element 5), Acceptance Criteria (Element 6), Corrective Actions (Element 7)***

14. ***Require the as-left condition of a coating that exhibited signs of peeling, blistering, or delamination and that is not repaired or replaced is such that the potential for further degradation of the coating is minimized. Program Elements Affected: Monitoring and Trending (Element 5), Corrective Actions (Element 7)***

As a result of the response to RAI 3.0.3-2b provided in Enclosure A of this letter, LRA Appendix B, Section B.2.1.18 is revised as shown below. Text inserted as a result of the response to RAI 3.0.3-2b is highlighted by ***bolded italics***. Text deleted as a result of the response to RAI 3.0.3-2b is highlighted by ~~strikethroughs~~. Existing text from the LRA, as modified by previous RAI responses, is shown in normal font.

B.2.1.18 Fuel Oil Chemistry

Program Description

The Fuel Oil Chemistry program is an existing mitigative and condition monitoring program that manages loss of material, loss of coating integrity, and reduction in heat transfer in piping, piping elements, piping components, tanks, and heat exchangers in a fuel oil environment. The Fuel Oil Chemistry aging management program relies on a combination of surveillance procedures and maintenance activities being implemented to provide assurance that contaminants are monitored and controlled in fuel oil for systems and components within the scope of license renewal. The program requires fuel oil parameters to be maintained at acceptable levels in accordance with Technical Specifications, Technical Requirement Manual, and ASTM Standards (ASTM D 0975-98/-06b, D 2709-96e, D 4057-95, and D 5452-98). Fuel oil sampling and analysis is performed in accordance with approved procedures for new and stored fuel oil. Monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant age-related degradation. Fuel oil tanks are periodically drained of accumulated water, cleaned, and internally inspected to minimize exposure to fuel oil contaminants. During these inspections, the internal coatings of the tanks are visually inspected to ensure that loss of coating integrity is detected prior to (1) loss of component intended function, including loss of function due to accelerated degradation caused by localized coating failures, and (2) degradation of downstream component performance due to flow blockage. These activities effectively manage the effects of aging by maintaining contaminants at acceptably low concentrations.

Inspections of internal coatings will be performed by coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. The as found condition of the coating is documented in inspection reports and the results of prior inspections are reviewed to determine changes in the condition of the coating over time. The program provides for inspections for signs of coating failures and precursors to coating failures including erosion, cracking, flaking, ***peeling, blistering,*** delamination ~~(e.g., peeling and blistering)~~, rusting, and mechanical damage. Evidence of unacceptable coating degradation is entered into the corrective action program. ***Coating inspection acceptance criteria will specify that peeling, blistering, and delamination is not acceptable.*** Signs of ***peeling, blistering, or*** delamination of the coating from the base metal***,*** ~~(e.g., peeling and blistering) are not acceptable~~ ***if identified, shall be entered into the corrective action program***. If ***peeling, blistering, or*** delamination ~~(e.g., peeling and blistering)~~ is detected and the coating is not repaired or replaced, then physical testing will be conducted to ensure that the remaining coating is tightly bonded to the base metal ***and the as-left condition of the coating will be such that the potential for further degradation of the coating is minimized (i.e., any loose coating is removed, the edge of the remaining coating is feathered)***. The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07). A

minimum of three (3) sample points adjacent to the defective area will be tested. Indications of blisters, cracking, flaking, or rusting will be assessed by a certified coatings inspector and documented in a post-inspection report. ***Areas or items exhibiting coating degradation will be documented, photographed, and reported to the ASTM D7108 qualified Site Coating Coordinator in a post-inspection report. Recommendations for immediate coating repair or replacement prior to returning the system to service or postponement of coating repair or replacement to the next inspection window will be provided in the post-inspection report***. The results of the inspection contained in the post-inspection report will be evaluated by the ASTM D7108 qualified Site Coating Coordinator. ***Evaluations used to determine whether repair or replacement of coatings exhibiting signs of peeling, blistering, or delamination are required prior to returning the component to service will consider the potential impact on the system, including degraded performance of downstream components due to flow blockage and loss of material of the coated component.*** The results of inspections of internal coatings are trended and used to adjust inspection frequencies as determined by the ASTM D7108 qualified Site Coating Coordinator. 100% of the coated surfaces that are accessible upon component disassembly or entry are inspected. At least one inspection of each of the coated fuel oil storage tanks within the scope of this program will be performed during the ten (10) years prior to the period of extended operation to establish a baseline. Evaluations are performed for inspections that do not satisfy established criteria and the conditions are entered into the 10 CFR 50 Appendix B corrective action program. The corrective action program ensures that conditions adverse to quality are promptly corrected. Corrective actions may include performing coating repairs or replacements prior to the component being returned to service. ***In addition, the instrumentation and alarms related to emergency diesel generator fuel oil storage tank level and fuel oil transfer pump suction strainer differential pressure are monitored. Monitoring of instrumentation related to the emergency diesel generator fuel oil storage tank ensures that an adequate fuel oil supply is available such that the intended functions of the emergency diesel generators are maintained. High differential pressure across the fuel oil transfer pump suction strainer would provide indication if any significant degradation of the coating were to occur and cause coating debris to enter the fuel oil transfer system.***

NUREG-1801 Consistency

The Fuel Oil Chemistry aging management program will be consistent with the ten elements of aging management program XI.M30, “Fuel Oil Chemistry,” specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

1. Provide for periodic cleaning of the Fire Protection Fuel Oil Storage Tank (Byron only). **Program Element Affected: Preventive Actions (Element 2)**

2. Provide for periodic draining of water from the Auxiliary Feedwater Day Tanks, Diesel Generator Day Tanks, Essential Service Water Make/Up Pump Fuel Oil Storage Tanks (Byron only), and Fire Protection Fuel Oil Storage Tanks. **Program Element Affected: Preventive Actions (Element 2)**

3. Include analysis for the levels of microbiological organisms in the Auxiliary Feedwater Day Tanks and Essential Service Water Make-up Pumps Diesel Oil Storage Tanks (Byron only). **Program Element Affected: Parameters Monitored/Inspected (Element 3)**

4. Include analysis for water and sediment content, particulate concentration, and the levels of microbiological organisms for the Diesel Generator Day Tanks. **Program Element Affected: Parameters Monitored/Inspected (Element 3)**

5. Include analysis for water and sediment content and the levels of microbiological organisms for the Diesel Generator Fuel Oil Storage Tanks. **Program Element Affected: Parameters Monitored/Inspected (Element 3)**

6. Include analysis for particulate concentration and the levels of microbiological organisms for the Fire Protection Fuel Oil Storage Tanks. **Program Element Affected: Parameters Monitored/Inspected (Element 3)**

7. Include internal inspections of the Fire Protection Fuel Oil Storage Tanks at least once during the 10 year period prior to the period of extended operation, and at least once every 10 years during the period of extended operation. Each diesel fuel tank will be drained and cleaned, the internal surfaces visually inspected (if physically possible), and, if evidence of degradation is observed during inspections, or if visual inspection is not possible, these diesel fuel tanks will be volumetrically inspected. **Program Element Affected: Detection of Aging Effects (Element 4)**

8. Include monitoring and trending for the levels of microbiological organisms for the Auxiliary Feedwater Day Tanks and Essential Service Water Make-up Pumps Diesel Oil Storage Tanks (Byron only). **Program Element Affected: Monitoring and Trending (Element 5)**

9. Include monitoring and trending for water and sediment content, particulate concentration, and the levels of microbiological organisms for the Diesel Generator Day Tanks. **Program Element Affected: Monitoring and Trending (Element 5)**

10. Include monitoring and trending for water and sediment content and the levels of microbiological organisms for the Diesel Generator Fuel Oil Storage Tanks. **Program Element Affected: Monitoring and Trending (Element 5)**

11. Include monitoring and trending for total particulate concentration and the levels of microbiological organisms for the Fire Protection Fuel Oil Storage Tanks. **Program Element Affected: Monitoring and Trending (Element 5)**

12. Require inspections of internal coatings be performed by coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. **Program Elements Affected: Detection of Aging Effects (Element 4)**

13. Specify that signs of ***peeling, blistering, or*** delamination of the coating from the base metal***,*** ~~(e.g., peeling and blistering) are not acceptable~~ ***if identified, shall be entered into the corrective action program***. **Program Elements Affected: Acceptance Criteria (Element 6)**

14. Require physical testing of internal coatings, where physically possible, to ensure that remaining coating is tightly bonded to the base metal when ***peeling, blistering, or*** delamination is detected and the coating is not repaired or replaced. The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07). **Program Elements Affected: Acceptance Criteria (Element 6)**

15. Require that evaluations utilized to return a coated component exhibiting signs of peeling, blistering, or delamination to service without repairing or replacing the coating shall consider the potential impact on the intended function of the system. This evaluation shall include consideration of the potential for degraded performance of downstream components due to flow blockage and loss of material of the coated component. Program Elements Affected: Monitoring and Trending (Element 5), Acceptance Criteria (Element 6), Corrective Actions (Element 7)

16. Require the as-left condition of a coating that exhibited signs of peeling, blistering, or delamination and that is not repaired or replaced is such that the potential for further degradation of the coating is minimized. Program Elements Affected: Monitoring and Trending (Element 5), Corrective Actions (Element 7)

As a result of the response to RAI 3.0.3-2b provided in Enclosure A of this letter, LRA Appendix B, Section B.2.1.26 is revised as shown below. Text inserted as a result of the response to RAI 3.0.3-2b is highlighted by ***bolded italics***. Existing text from the LRA, as modified by previous RAI responses, is shown in normal font.

B.2.1.26 Lubricating Oil Analysis

Program Description

The Lubricating Oil Analysis aging management program is an existing preventive and mitigative program that ensures the oil environment in mechanical systems subject to aging management review is maintained to the required quality to prevent or mitigate age-related degradation of components within the scope of this program. The Lubricating Oil Analysis program maintains oil systems contaminants within acceptable limits through periodic sampling and analysis, and comparing the analytical results to pre-determined limits that are associated with corrective actions such as filtering or oil replacement in order to manage the aging effects of loss of material due to corrosion or reduction of heat transfer due to fouling. The program directs scheduled activities that include routine sampling, analyses, and trending, thereby, preserving an oil environment in piping, piping components, piping elements, valve bodies, pump casings, gear boxes, tanks, and heat exchangers that is not conducive to loss of material or reduction of heat transfer. The lubricating oil testing (sampling and analysis) and condition monitoring activities identify detrimental contaminants such as water, sediments, specific wear elements, and elements from an outside source. The sampling activities included in this program are sufficient to detect particulate indicative of degradation or failure of internal linings or coatings. The oil contaminant levels (e.g., water and particulates) are trended. Any result that is outside of the acceptance criteria is entered into the corrective action program to evaluate the condition, which could include in-leakage, corrosion product buildup or loss of coating integrity for coated or lined components, and implement corrective actions such as component repairs, filtering, or oil replacement to maintain the lubricating oil contaminants within acceptable limits.

In addition, the differential pressure across the safety injection pump lubricating oil system oil filter is measured during quarterly surveillance testing of the pumps. These readings would provide indication if any significant degradation of the safety injection pump lubricating oil reservoir coating were to occur and cause coating debris to enter the lubricating oil system.

To verify the effectiveness of the Lubricating Oil Analysis program, selected components will be inspected as described in the One-Time Inspection (B.2.1.20) program, to ensure that age-related degradation is not occurring and component intended functions are maintained during the period of extended operation.

Enclosure C

Byron and Braidwood Stations (BBS) Units 1 and 2
License Renewal Commitment List Changes

This Enclosure identifies commitments made or revised in this document and is an update to the Byron and Braidwood Station (BBS) LRA Appendix A, Table A.5 License Renewal Commitment List. Any other actions discussed in the submittal represent intended or planned actions and are described to the NRC for the NRC's information and are not regulatory commitments. Changes to the BBS LRA Appendix A, Table A.5 License Renewal Commitment List are as a result of the Exelon response to the following RAI:

RAI 3.0.3-2b

Notes:

- To facilitate understanding, portions of the original License Renewal Commitment List have been repeated in this Enclosure, with revisions indicated.
- Existing LRA text, as modified by previous RAI responses, is shown in normal font. Changes are highlighted with ***bolded italics*** for added text and ~~strikethroughs~~ for deleted text.

As a result of the response to RAI 3.0.3-2b provided in Enclosure A of this letter, LRA Appendix A, Table A.5 License Renewal Commitment List, line items 11, 16, and 18 are revised as shown below. Text inserted as a result of the response to RAI 3.0.3-2b is highlighted by ***bolded italics***. Text deleted as a result of the response to RAI 3.0.3-2b is highlighted by ~~strikethroughs~~. Existing text from the LRA, as modified by previous RAI responses, is shown in normal font.

A.5 LICENSE RENEWAL COMMITMENT LIST

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
11	Open-Cycle Cooling Water System	Open-Cycle Cooling Water System is an existing program that will be enhanced to: 1. Perform periodic volumetric inspections for loss of material in the non-essential service water system piping at a minimum of two (2) locations on each unit in both the auxiliary building and the turbine building for a total of four (4) periodic inspections per unit every refueling cycle. 2. Require inspections of internal coatings be performed by coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. 3. Specify that signs of ***peeling, blistering, or*** delamination of the coating from the base metal***,*** ~~(e.g., peeling and blistering) are not acceptable~~ ***if identified, shall be entered into the corrective action program***. 4. Require physical testing of internal coatings, where physically possible, to ensure that remaining coating is tightly bonded to the base metal when ***peeling, blistering, or*** delamination is detected and the coating is not repaired or replaced. The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07). ***5. Require that evaluations utilized to return a coated component exhibiting signs of peeling, blistering, or delamination to service without repairing or replacing the coating shall consider the potential impact on the intended function of the system. This evaluation shall include consideration of the potential for degraded performance of downstream components due to flow blockage and loss of material of the coated component.***	Program to be enhanced prior to the period of extended operation.	Section A.2.1.11 Exelon letter RS-14-124 05/05/2014 RAI 3.0.3-2a ***Exelon letter RS-14-175 06/30/2014*** ***RAI 3.0.3-2b***

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
		6. Require the as-left condition of a coating that exhibited signs of peeling, blistering, or delamination and that is not repaired or replaced is such that the potential for further degradation of the coating is minimized.		
16	Fire Water System	Fire Water System is an existing program that will be enhanced to: 1. Replace sprinkler heads or perform 50-year sprinkler head testing using the guidance of NFPA 25 "Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems" (2002 Edition), Section 5.3.1.1.1. This testing will be performed at the 50-year in-service date and every 10 years thereafter. 2. Provide for chemical addition accompanied with system flushing to allow for adequate dispersal of the chemicals throughout the system, to prevent or minimize microbiologically induced corrosion (Byron only) Note 3. 3. Perform main drain testing annually, in accordance with NFPA 25, "Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems," Section 13.2.5. 4. Perform air flow testing of deluge systems that are not subject to periodic full flow testing on a three (3) year frequency to verify that internal flow blockage is not occurring (Byron only)Note 1. 5. Perform inspections of Fire Protection System strainers when the system is reset after automatic actuation for signs of internal flow blockage (e.g., buildup of corrosion particles) (Braidwood only)Note 1. 6. Increase the frequency of visual inspections of the internal surface of the foam concentrate tanks to at least once every ten (10) years. ***At least one (1) inspection will be performed within the ten (10) year period prior to entry into the period of extended operation, with subsequent inspections performed every ten (10) years thereafter.*** 7. Perform radiographic testing or internal visual inspections every five (5) years at the end of one (1) fire main and the end of one (1) sprinkler system branch line in half of the wet pipe sprinkler	Program to be enhanced prior to the period of extended operation. Inspection schedule identified in commitment.	Section A.2.1.16 Exelon letter RS-14-078 03/13/2014 RAI B.2.1.16-1 RAI B.2.1.16-2 Exelon letter RS-14-169 06/16/2014 RAI B.2.1.16-1a ***Exelon letter RS-14-175 06/30/2014*** ***RAI 3.0.3-2b***

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
		system within the scope of license renewal. If internal flow blockage that could result in failure of the system to deliver the required flow is identified, then perform an obstruction investigation. 8. Perform augmented testing beyond that specified in NFPA 25 on those portions of the water-based fire protection system that are: (a) normally dry but periodically subjected to flow and (b) cannot be drained or allow water to collect. The augmented testing will include: (1) periodic full flow tests at the design pressure and flow rate or internal visual inspections and (2) volumetric wall-thickness examinations. Inspections and testing will commence five (5) years prior to the period of extended operation and will be conducted on a five (5) year frequency thereafter. 9. Perform a minimum of 30 volumetric examinations of Fire Protection System piping during each three year interval (Byron only)[Note 3]. ***10. Require inspections of internal coatings be performed by coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54.*** ***11. Specify that signs of peeling, blistering, or delamination of the coating from the base metal, if identified, shall be entered into the corrective action program.*** ***12. Require physical testing of internal coatings, where physically possible, to ensure that remaining coating is tightly bonded to the base metal when peeling, blistering, or delamination is detected and the coating is not repaired or replaced. The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07).*** ***13. Require that evaluations utilized to return a coated component exhibiting signs of peeling, blistering, or delamination to service without repairing or replacing the coating shall consider the potential impact on the intended function of the system. This evaluation shall include consideration of the potential for degraded performance of downstream components due to flow blockage and loss of***		

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
		material of the coated component. ***14. Require the as-left condition of a coating that exhibited signs of peeling, blistering, or delamination and that is not repaired or replaced is such that the potential for further degradation of the coating is minimized.***		
18	Fuel Oil Chemistry	Fuel Oil Chemistry is an existing program that will be enhanced to: 1. Provide for the periodic cleaning of the Fire Protection Fuel Oil Storage Tank (Byron only) Note 1. 2. Provide for periodic draining of water from the Auxiliary Feedwater Day Tanks, Diesel Generator Day Tanks, Essential Service Water Make/Up Pump Fuel Oil Storage Tanks (Byron only) Note 2, and Fire Protection Fuel Oil Storage Tanks. 3. Include analysis for the levels of microbiological organisms in the Auxiliary Feedwater Day Tanks and Essential Service Water Make-up Pumps Diesel Oil Storage Tanks (Byron only) Note 2. 4. Include analysis for water and sediment content, particulate concentration, and the levels of microbiological organisms for the Diesel Generator Day Tanks. 5. Include analysis for water and sediment content and the levels of microbiological organisms for the Diesel Generator Fuel Oil Storage Tanks. 6. Include analysis for particulate concentration and the levels of microbiological organisms for the Fire Protection Fuel Oil Storage Tanks. 7. Include internal inspections of the Fire Protection Fuel Oil Storage Tanks at least once during the 10-year period prior to the period of extended operation, and at least once every 10 years during the period of extended operation. Each diesel fuel tank will be drained and cleaned, the internal surfaces visually inspected (if physically possible), and, if evidence of degradation is observed during inspections, or if visual inspection is not possible, these diesel fuel tanks will be volumetrically inspected.	Program to be enhanced prior to the period of extended operation.	Section A.2.1.18 Exelon letter RS-14-124 05/05/2014 RAI 3.0.3-2a ***Exelon letter RS-14-175 06/30/2014*** ***RAI 3.0.3-2b***

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
		8. Include monitoring and trending for the levels of microbiological organisms for the Auxiliary Feedwater Day Tanks and Essential Service Water Make-up Pumps Diesel Oil Storage Tanks (Byron only) Note 2. 9. Include monitoring and trending for water and sediment content, particulate concentration, and the levels of microbiological organisms for the Diesel Generator Day Tanks. 10. Include monitoring and trending for water and sediment content and the levels of microbiological organisms for the Diesel Generator Fuel Oil Storage Tanks. 11. Include monitoring and trending for total particulate concentration and the levels of microbiological organisms for the Fire Protection Fuel Oil Storage Tanks. 12. Require inspections of internal coatings be performed by coating inspectors certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. 13. Specify that signs of ***peeling, blistering, or*** delamination of the coating from the base metal~~, (e.g., peeling and blistering) are not acceptable~~ ***if identified, shall be entered into the corrective action program***. 14. Require physical testing of internal coatings, where physically possible, to ensure that remaining coating is tightly bonded to the base metal when ***peeling, blistering, or*** delamination is detected and the coating is not repaired or replaced. The testing will consist of adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., ASTM D4541-09 or ASTM D6677-07). ***15. Require that evaluations utilized to return a coated component exhibiting signs of peeling, blistering, or delamination to service without repairing or replacing the coating shall consider the potential impact on the intended function of the system. This evaluation shall include consideration of the potential for degraded performance of downstream components due to flow blockage and loss of***		

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
		material of the coated component. ***16. Require the as-left condition of a coating that exhibited signs of peeling, blistering, or delamination and that is not repaired or replaced is such that the potential for further degradation of the coating is minimized.***		