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-14-124

May 5, 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 16, dated April 3, 2014, related to the Braidwood Station, Units 1 and 2, and Byron 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 Michael P. Gallagher, Exelon, to NRC Document Control Desk, dated January 13, 2014, "Response to NRC Requests for Additional Information, Set 2, dated December 13, 2013, related to the Braidwood Station, Units 1 and 2 and Byron Station, Units 1 and 2 License Renewal Application"

3. Letter from Lindsay R. Robinson, US NRC to Michael P. Gallagher, Exelon, dated April 3, 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 16 (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 Reference 2, Exelon responded to NRC's Set 2 Requests for Additional Information (RAI). After review of these Set 2 responses, the NRC staff requested (in Reference 3) additional information associated with the response to RAI 3.0.3-2.

Enclosure A to this letter provides the information requested in Reference 3.

Enclosure B contains updates to sections of the LRA (except for the License Renewal Commitment List) affected by the response to Reference 3.

Enclosure C provides an update to the License Renewal Commitment List (LRA Appendix A, Section A.5) associated with the response to Reference 3. There are no other new or revised regulatory commitments contained in this letter.

In addition, while preparing this response, Exelon identified a minor discrepancy in two LRA tables that were associated with the Set 2 RAI 3.0.3-2 response. This discrepancy is described at the end of Enclosure A and updates to these tables are provided in Enclosure B.

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 5-5-2014

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**

Responses to Requests for Additional Information

RAI 3.0.3-2a

RAI 3.0.3-2a

Applicability:

Byron Station (Byron) and Braidwood Station (Braidwood), Units 1 and 2

Background:

As amended by letter dated January 13, 2014, Exelon Generation Company, LLC provided the following information:

1. License Renewal Application (LRA) Table 3.2.2-4 states that loss of coating integrity for the safety injection pump oil reservoirs will be managed by the Lubricating Oil Analysis program. The request for additional information (RAI) response states that oil sampling and oil change activities are capable of detecting coating degradation by detecting particulate in the oil which would indicate degradation of the internal lining of the reservoir or of the base metal.

2. The response to RAI 3.0.3-2 states that components associated with the caustic and acid supply to the radwaste system demineralizers, hypochlorite injection to the discharge of the essential service water pumps, and 0C auxiliary building chiller condenser at Byron Station (Byron), all not in service, have internal coatings. The response also states that these coatings are not exposed to the aggressive internal environment for which the coating was required and visual inspections of these components is performed in accordance with the requirements of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program.

   LRA Tables 3.3.2-20 and 3.3.2-22 state that loss of coating integrity will be managed for carbon steel (with internal coating or lining) piping, piping components, tanks, heat exchangers, and valve bodies exposed to waste water by the Internal Surfaces in Miscellaneous Piping and Ducting Components program. LRA Table 3.0-1 states that, "waste water may contain contaminants, including oil and boric acid, depending on location, as well as originally treated water that is no longer monitored by a chemistry program." The Generic Aging Lessons Learned (GALL) Report item AP-281 states that steel components exposed to waste water are susceptible to loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion.

   As amended, LRA Sections A.2.1.25 and B.2.1.25 state that (a) internal coatings of components are visually inspected; (b) a representative sample of components will be inspected each 10-year period during the period of extended operation; and (c) a sample population is defined as components having the same combination of material, environment, and aging effect.

3. The response to RAI 3.0.3-2 states that inspections of coated heat exchangers cooled by the service water system are performed every 2 to 6 years. It also states that inspection frequencies are based on criticality of the heat exchanger, prior inspection results, and service conditions.

4. The response to RAI 3.0.3-2 states that diesel oil storage tank internal inspections, including its coatings, will be conducted once in the 10-year period prior to the period of extended operation and at least once every 10 years during the period of extended operation. LRA Sections A.2.1.18 and B.2.1.18 were revised to state that the Fuel Oil Chemistry program manages loss of coating integrity.

5. The response to the RAI states that 100 percent of the coated surfaces that are accessible upon component disassembly are visually inspected each inspection interval. LRA Tables 3.3.2-20 and 3.3.2-22 state that loss of coating integrity is being managed for piping and piping components.
6. The response to the RAI states that Service Level III coating inspections are performed by individuals certified to American National Standards Institute (ANSI) N45.2.6, “Qualifications of Inspection, Examination, and Testing Personnel for Nuclear Power Plants.” The response also states that Service Level II coatings are inspected by system managers or maintenance personnel using procedural guidance and that they qualified in accordance with the Institute of Nuclear Power Operations (INPO) National Academy for Nuclear Training accredited training program that meets industry standards described in ACAD 92-008, “Guidelines for Training and Qualification of Maintenance Personnel.”
7. The response to the RAI states that the as-found condition of coatings is documented in inspection reports and that previous inspections are used to determine changes in the condition of coatings. The response also states that inspection reports are provided to the site coatings coordinator.
8. The RAI response states, “[a]ny loss of coating integrity such that loss of material of the base metal occurs is considered a coating failure. Localized areas of loss of coating integrity without subsequent loss of material of the base metal are considered acceptable. Plant-specific operating experience has shown that this acceptance criteria is adequate to ensure the intended function(s) of the coated components, and, if applicable, downstream components are maintained.”

Issue:

1. The staff recognizes that oil samples taken from the safety injection pump oil reservoir are capable of detecting particulate from degraded coatings or corrosion products where bare metal had been exposed. However, debris from coating degradation generated between samples could reduce the flow to the pump bearings and result in the loss of the pump’s current licensing basis intended function(s). An internal visual inspection could identify precursor degradation. Additionally, oil changes could result in removing evidence of gradual coating degradation.

   It is not clear to the staff that the internal coated surfaces of the safety injection pump oil reservoir will be in the sample population of the One-Time Inspection program for components exposed to lubricating oil. In addition, it is not clear to the staff whether a one-time inspection is appropriate for this coating as it continues to age.
2. Although the RAI response states that the coatings for components associated with the caustic and acid supply to the radwaste system demineralizers, hypochlorite injection to the discharge of the essential service water pumps, and 0C auxiliary building chiller condenser at Byron are not exposed to the aggressive internal environment for which the coating was required, the LRA states that these components are exposed to waste water; the GALL Report states that loss of material is an applicable aging effect for these components. The staff concludes that, should the coatings degrade such that base metal is exposed, through-wall corrosion could occur. The staff has the following concerns in relation to use of the Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage loss of coating integrity for these components:
   a. The program is based on a 10-year inspection frequency; whereas, the staff has concluded that the maximum inspection interval should be 6 years, 4 years, or

2 years depending on the conditions detected during inspections and whether the coatings have been recently repaired or replaced.

b. It is not clear to the staff that coated steel components would be considered as a unique sample population.

c. The staff has concluded that the updated final safety analysis report (UFSAR) supplement for programs that will manage loss of coating integrity should include key aspects of the program associated with coating degradation such as followup testing that will be conducted when degradation is determined not to meet acceptance criteria and the basis for the training and qualification of individuals involved in coating inspections. These aspects are not in LRA Section A.2.1.25.

d. The staff has concluded that the programs credited for detecting loss of coating integrity should include a summary description in the LRA of: (a) when baseline inspections will be conducted, (b) the extent of inspections, (c) qualifications for individuals performing activities associated with coating inspections, (d) how monitoring and trending of the coatings will be conducted, (e) acceptance criteria, and (f) corrective actions when coating degradation is detected. These details are not in LRA Section B.2.1.25.

In addition, similar to the issues listed in 2.c. and 2.d. above, LRA Sections A.2.1.11 and B.2.1.11 for the Open-Cycle Cooling Water System program and A.2.1.18 and B.2.1.18 for the Fuel Oil Chemistry program lack sufficient specificity.

3. The staff has concluded that, when peeling, delamination, blisters, rusting, cracking, or flaking has been detected during coating inspections, subsequent inspection intervals are established by a qualified coating specialist. The staff also concluded that intervals should not exceed every other refueling outage interval.

4. The staff has concluded that coating inspections for diesel oil storage tanks may be conducted at the frequency stated in the Fuel Oil Chemistry program as long as: (a) no peeling, delamination, blisters, or rusting are observed during inspections and (b) any cracking and flaking has been found acceptable by a coating specialist. If this is not the case, inspections should be conducted more frequently.

5. While the statement that 100 percent of the coated surfaces that are accessible upon component disassembly are visually inspected each inspection interval is clear in relation to tanks and heat exchangers, it does not provide sufficient clarity for inspections of piping and piping components. The staff has concluded that for piping and piping components, either representative 73 1-foot axial length circumferential segments of piping or 50 percent of the total length of each coating material and environment combination should be inspected in each interval.

6. ANSI N45.2.6 certification is an acceptable basis for qualifying coatings inspectors based on Regulatory Guide (RG) 1.54, "Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants," June 1973, Section C.1., which mandates conformance to the ANSI N45.2 quality assurance standards. Subsequent revisions of RG 1.54 endorsed American Society for Testing and Materials (ASTM) standards which specifically address inspector qualifications as they were released to industry.

   It appears to the staff that the reference to Service Level II coatings (nonsafety-related coatings) would encompass coatings applied to the internal surfaces of components described in the RAI response (e.g., associated with the caustic and acid supply to the radwaste system demineralizers, hypochlorite injection to the discharge of the essential service water pumps, and 0C auxiliary building chiller condenser at Byron). The staff has concluded that any coatings applied to the internal surfaces of an in-scope component where degradation of the coating could prevent satisfactory accomplishment of any of the functions identified under 10 CFR 54.4(a)(1), (a)(2), or (a)(3) should be inspected by personnel qualified in accordance with a standard endorsed in RG 1.54. While the staff has reviewed and endorsed the use of ANSI N45.2.6 as well as ASTM standards referenced in RG 1.54 for inspection personnel, it has not reviewed and endorsed ACAD 92-008. In addition, it is not clear to the staff that system managers would be qualified in accordance with an ACAD standard for training maintenance personnel.

7. The staff has concluded that the coatings specialist should prepare a post-inspection report to include: a list and location of all areas evidencing deterioration, a prioritization of the repair areas into areas that must be repaired before returning the system to service and areas where repair can be postponed to the next refueling outage, and where possible, photographic documentation indexed to inspection locations. The RAI response did not provide this specificity. The post-inspection report should be compiled or approved by a coatings specialist, include sufficient information to ensure that degraded areas are appropriately dispositioned through the corrective action program, and select future inspection locations based on known areas where degradation has occurred.

8. The staff has concluded that:

    a. Indications of peeling and delamination are not acceptable, and the coatings should be repaired or replaced. For coated surfaces that show evidence of delamination or peeling, physical testing should be performed where physically possible (i.e., sufficient room to conduct testing). The test should consist of destructive or nondestructive adhesion testing using ASTM International standards endorsed in RG 1.54. A minimum of three sample points adjacent to the defective area should be tested.

    b. Blisters should be evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54, including staff guidance associated with use of a particular standard. The cause of blisters should be determined if the blister is not repaired. Physical testing should be conducted to ensure that the blister is completely surrounded by sound coating bonded to the surface. If coatings are credited for corrosion prevention, the component's base material in the vicinity of the blister should be inspected to determine if unanticipated corrosion has occurred.

    c. Indications such as cracking, flaking, and rusting should be evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54 including staff guidance associated with use of a particular standard.

The response to the RAI is not consistent with the staff's position. For example, the revised program: (a) would allow peeling or delamination as long as it did not expose the base metal and was accompanied with loss of base material; (b) does not state that a coatings specialist would evaluate blisters, cracking, flaking, or rusting; and (c) does not state that followup physical testing would be conducted when delamination, peeling, or blistering is detected. While the response stated that plant-specific operating experience has shown that the acceptance criteria are adequate, no specific information was provided to justify the statement.

Request:

1. State the basis for why debris from coating degradation generated between samples will not result in flow blockage of the oil supply to the safety injection pump bearings. State the basis for why oil changes will not result in reduced sensitivity to gradual coating degradation.

   State whether the internal coated surfaces of the safety injection pump oil reservoir will be in the sample population of the One-Time Inspection program for components exposed to lubricating oil. State the basis for why a one-time inspection is appropriate for this coating.

2. Respond to the following in relation to components for which loss of coating integrity is being managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components program:

   a. State the basis for why a 10-year inspection frequency is adequate.

   b. State whether coated steel components will be considered as a unique sample population. If not, state the basis for sample selection of these components.

   c. Revise LRA Section A.2.1.25 to include a summary description of followup testing that will be conducted when degradation is determined not to meet acceptance criteria and the basis for the training and qualification of individuals involved in coating inspections.

   d. Revise LRA Section B.2.1.25 to include a summary description of: (a) when baseline inspections will be conducted, (b) the extent of inspections, (c) qualifications for individuals performing activities associated with coating inspections, (d) a summary description of how monitoring and trending of the coatings will be conducted, (e) acceptance criteria, and (f) a summary description of corrective actions when coating degradation is detected.

   Additionally, revise LRA Sections A.2.1.11, B.2.1.11, A.2.1.18, and B.2.1.18 as described in request 2.c. and 2.d. above.

3. For heat exchangers cooled by the service water system, state the basis for why it can be concluded that that there is reasonable assurance that loss of coating integrity will not result in accelerated degradation caused by localized coating failures or degraded downstream component performance due to flow blockage if: (a) prior component inspections detected peeling, delamination, blisters, rusting, cracking, or flaking and (b) subsequent inspections will exceed 2 refueling outage intervals.

   Alternatively, revise the Open-Cycle Cooling Water System program to require inspections at least every other refueling outage interval when peeling, delamination, blisters, rusting, cracking, or flaking has been detected during coating inspections.

4. State the periodicity of inspections for the diesel oil storage tank internal coatings and the basis for the periodicity of inspections, if the prior inspection detected peeling, delamination, blisters, rusting, or unacceptable cracking and flaking.

5. State the minimum inspection size and its basis for internally coated piping and piping components.
6. State the qualification requirements included in the system manager and maintenance personnel INPO accredited training programs that establish proficiency in coating inspections, or revise the applicable aging management programs such that coating inspectors are certified to ANSI N45.2.6 or ASTM Standards endorsed in RG 1.54.
7. State the qualifications of the individual who will approve post-inspection reports and the key information that will be included in the report.
8. State the following in relation to the acceptance criteria for coatings:
   a. The specific basis for why peeling, delamination, blisters, cracking, flaking, or rusting, which does not result in loss of material of the base metal, will not result in loss of function of a component due to corrosion or degradation of downstream component performance prior to the next inspection interval.
   b. The qualifications of the individual who will evaluate indications of blisters, cracking, flaking, or rusting.
   c. Whether followup physical testing will be conducted when delamination, peeling, or blistering is detected, and if not, the basis for not performing physical testing.

Exelon Response:

1. The safety injection pump oil reservoir is a three (3) gallon tank that contains lubricating oil for the pump bearings. This tank acts as the oil sump for the safety injection pump bearing oil system and contains a gear pump that circulates the lubricating oil through the closed loop system. The oil system contains an oil cooler, an oil filter, pressure and temperature instrumentation, and piping and valves to provide pressurized lubricating oil to the bearings.

   The safety injection pump bearing oil is sampled for analysis at least once every three (3) years. The oil samples are subject to testing including spectrochemical analysis to ensure that a wide variety of elements that may be present due to wear or contaminants as well as additives are within acceptable ranges. In addition, the physical properties of the oil are tested including viscosity, total acid number (TAN), water content, and solids content. Any potential degradation of the internal lining of the safety injection pump oil reservoir would be identified through the analysis of the oil.

   The lubricating oil system for the safety injection pumps includes an oil filter that is located such that any particulate or debris is removed from the oil prior to the oil reaching the bearings. Oil filter differential pressure is measured during quarterly surveillance testing of the safety injection pumps. These readings would provide indication if any significant degradation of the coating were to occur and cause coating debris to enter the oil circulation loop.

   Although visual inspections of the internal lining of the safety injection pump lubricating oil reservoir could potentially identify precursors of coating degradation prior to failure, the aging management activities described above are much more sensitive to degradation than visual inspections. In other words, oil analysis is capable of detecting potential coating debris down to a two (2) micron level which would be imperceptible by visual inspection. Similarly, monitoring of oil filter differential pressure would identify the buildup of potential coating debris as small as 130 microns.

In addition to oil sampling and monitoring of oil filter differential pressure, internal visual inspections of the lubricating oil system are performed during routine maintenance activities including filter maintenance and pump overhaul. Although direct inspections of the coated surface are not performed, evidence of coating debris would be identified during routine pump maintenance, if it were to occur.

Although it is possible that coating debris could be removed from the system during oil changes, this will not result in reduced sensitivity to gradual coating degradation since oil samples are taken for analysis whenever oil changes are performed. If coating debris were present in the oil removed from the system during oil changes it would be identified either visually if the debris were large enough or via the analysis of the oil. Therefore, coating debris would not be removed from the system undetected and, thereby, reduce sensitivity to gradual coating degradation.

Since the closed loop lubricating oil system is an integral subsystem of the active safety injection pump, the only potential for “degraded downstream component performance” would manifest as degraded performance of the safety injection pumps themselves. Based on the maintenance activities described above, and the fact that the lubricating oil is filtered prior to reaching the bearings, it is highly unlikely that any potential coating degradation that occurs between samples will result in decreased performance of the safety injection pumps due to flow blockage. However, should degraded performance of the safety injection pumps occur it would be promptly identified during quarterly surveillance testing of the pumps. The quarterly surveillance testing of the safety injection pumps includes measurement of pump flow, pump differential pressure, bearing vibration, oil filter differential pressure, and oil temperature. In the highly unlikely event that flow blockage due to coating degradation between samples occurs, it is likely that the flow blockage will manifest in aberrant results in one of the tested parameters prior to loss of function of the pump.

Based on the above, it is not credible that degradation of the internal lining of the safety injection pump lubricating oil reservoir between oil samples could cause blockage of lubricating oil flow to the pump bearings such that the pump would be unable to perform it’s intended functions.

The internal surfaces of the safety injection pump oil reservoirs will be in the sample population of the One-Time Inspection (B.2.1.20) aging management program. A one-time inspection is appropriate for these components since the one-time inspection is supplemented with the ongoing monitoring activities described above.

2. The response to <u>Request</u> 2 will be provided in two (2) parts. First, the response to <u>Request</u> 2, subparts a, b, c, and d, will be provided for the components for which loss of coating integrity is being managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program. Second, the response to <u>Request</u> 2, subparts c and d only, will be provided for the components for which loss of coating integrity is being managed by the Open-Cycle

Cooling Water System (B.2.1.11) aging management program or the Fuel Oil Chemistry (B.2.1.18) aging management program.

With respect to components for which loss of coating integrity is being managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program:

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program manages loss of coating integrity for the following components: (1) portions of the Radwaste System associated with the acid and caustic supply for the Radwaste System demineralizers, (2) portions of the Service Water System associated with the hypochlorite injection at the discharge of the essential service water pumps, and (3) the 0C Auxiliary Building chiller condenser at Byron.

The acid and caustic supply equipment was designed to provide acid and caustic to the Radwaste System demineralizers in support of regeneration of the demineralizer resins. Regeneration of Radwaste System demineralizer resins was never performed at Byron and Braidwood and, therefore, this portion of the Radwaste System is not in service. This equipment was provided with an internal lining to prevent contamination of the acid and caustic with iron. A secondary purpose of the coating was to protect the base metal from the relatively slow corrosion expected due to the environment the equipment would have been exposed to had the system been put in service. Since this portion of the system is not permanently physically isolated (e.g., cut and capped), it is conservatively assumed that water could enter the system due to potential valve leak-by. Therefore, the acid and caustic supply equipment is included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) for potential spatial interaction with safety-related SSCs due to leakage or spray. The in-service downstream components (i.e., the Radwaste System demineralizers) are isolated from the acid and caustic supply equipment by closed valves such that any potential coating degradation will not degrade the performance of in-service components. The downstream components do not perform any function related to 10 CFR 54.4(a)(1) or (a)(3). The downstream components are only relied upon to maintain a leakage boundary (i.e., 10 CFR 54.4(a)(2)).

An earlier design of the Service Water System provided for hypochlorite injection at the discharge to the essential service water pumps. This equipment was provided with an internal lining to protect the base metal from rapid degradation due to the aggressive chemical environment the equipment was exposed to when the system was in service. Subsequently, the design of the system was changed to allow for hypochlorite injection at the Circulating Water Pump House at Byron and the Lake Screen Structures at Braidwood to improve system performance. Therefore, the internally lined equipment designed to allow for hypochlorite injection at the discharge of the essential service water pumps is no longer in service. However, since this portion of the system is not permanently physically isolated (e.g., cut and capped), it is conservatively assumed that water could enter the system due to potential valve leak-by. Therefore, this equipment is included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) for potential spatial interaction with safety-related SSCs due to leakage or spray. The in-service downstream components (i.e., the essential service water system) are isolated from the hypochlorite injection equipment by a closed valve such that any potential coating degradation will not degrade the performance of in-service components. Per the original design, the downstream components would have included the safety-related essential service water system equipment when the hypochlorite injection equipment was in service. However, since this equipment is not in service, the only possible flow would be from the pressurized essential service water system to the unpressurized hypochlorite injection equipment. Therefore, there are no downstream components that perform any function related to 10 CFR 54.4(a)(1) or (a)(3).

Byron and Braidwood utilize a CeramAlloy coating on the subcomponents (e.g., heads, cover plates, and tubesheets) of selected service water cooled heat exchangers (including the Auxiliary Building chiller condensers). This coating is used to prevent loss of material due to the turbulent raw water environment when the system is in service and to extend the service life of the heat exchangers (i.e., prevent costly repairs and replacements of heat exchanger subcomponents). At Byron only, the 0C Auxiliary Building chiller condenser has been abandoned in place. However, since the service water supply to the tube side of the condenser has not been permanently physically isolated (e.g., cut and capped), it was conservatively assumed that water could enter the tube side of the condenser due to potential valve leak-by. As such, the Byron 0C Auxiliary Building chiller condenser is included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) for potential spatial interaction with safety-related SSCs due to leakage or spray. The in-service downstream components (i.e., nonsafety-related components in the turbine building) are isolated from the 0C Auxiliary Building chiller by a closed valve such that any potential coating degradation will not degrade the performance of in-service components. In addition, the downstream components do not perform any function related to 10 CFR 54.4(a)(1) or (a)(3). The downstream components are only relied upon to maintain a leakage boundary (i.e., 10 CFR 54.4(a)(2)).

As delineated in draft LR-ISG-2013-01, "Aging Management of Loss of Coating Integrity for Internal Service Level III (Augmented) Coatings," there are two (2) concerns unique to coatings for which specialized aging management is warranted. These two (2) concerns are addressed as follows:

> First, in certain situations a loss of coating integrity can cause accelerated or unanticipated loss of material of the base metal. At Byron and Braidwood credit was not taken for the presence of protective coatings when determining applicable aging effects requiring management. As such, loss of material is a predicted aging effect for coated components managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program and, therefore, loss of material of the base metal is not unanticipated. Accelerated loss of material is possible if the base metal of a coated component becomes directly exposed to an aggressive internal environment when loss of coating integrity occurs. An example of this is a lined carbon steel component with an excessively corrosive internal environment. Accelerated loss of material can also occur if the base metal at a localized coating failure becomes exposed and forms a small anode coupled with a large cathode. An example of this would be a small coating failure on a coated carbon steel component that is electrically coupled with an uncoated stainless steel component such that a strong galvanic cell is formed. The components for which loss of coating integrity is being managed by the

Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program are not in service and are not exposed to aggressive internal environments in which accelerated degradation of the base metal would occur. Nor are these components designed such that a strong galvanic cell would occur if localized coating degradation were to occur. Therefore, specialized aging management of the internal coatings of components managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program, as described in draft LR-ISG-2013-01, is not required to ensure that accelerated or unanticipated loss of material of the base metal is not occurring.

Second, a loss of coating integrity could prevent a downstream component from satisfactorily performing its license renewal intended function due to flow blockage. For example, if a coating system peeled off the protected substrate as a sheet it could potentially block flow through the tubes of a downstream safety-related heat exchanger required to perform a 10 CFR 54.4(a)(1) function. The components for which loss of coating integrity is being managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program are not in service and are physically isolated from in service components downstream. Therefore, specialized aging management of the internal coatings of these components, as described in draft LR-ISG-2013-01, is not required to ensure that flow blockage of downstream components will not prevent the performance of a function identified under 10 CFR 54.4(a)(1), (a)(2), or (a)(3).

Since the two (2) concerns unique to coatings are not applicable, the specialized aging management activities recommended in draft LR-ISG-2013-01 are not warranted. Should the internal coating of components managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program degrade, the base metal of the component would be exposed to the internal waste water environment. This would allow corrosion of the base metal to occur similar to uncoated carbon steel components exposed to a waste water environment. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program provides reasonable assurance that loss of material of carbon steel components exposed to a waste water internal environment will be adequately managed such that the leakage boundary intended function is maintained consistent with the current licensing basis through the period of extended operation.

a. As described above, the components for which loss of coating integrity is being managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program are not susceptible to the two (2) concerns unique to coatings for which specialized aging management is warranted. Therefore, recommendations made in GALL Report AMP XI.M38, as amended by LR-ISG-2012-02, “Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation,” including the 10-year inspection frequency, are sufficient to provide reasonable assurance that the intended functions of these components are maintained consistent with the current licensing basis through the period of extended operation.

b. As stated in the response to RAI B.2.1.25-1, submitted in Exelon letter RS-14-003, dated January 13, 2014, in each 10-year period during the period of extended operation, a representative sample of 20 percent of the population (defined as components having the same combination of material, environment, and aging effect) or a maximum of 25 components per population is inspected. Since the material (Carbon Steel (with internal coating or lining)) and aging effect (Loss of Coating Integrity) are unique to coated components, the coated components represent a unique sample population in the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program.

c. As described above, the components for which loss of coating integrity is being managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program are not susceptible to the two (2) concerns unique to coatings for which specialized aging management is warranted. Therefore, recommendations made in GALL Report AMP XI.M38, as amended by LR-ISG-2012-02, including requirements for corrective actions (e.g., follow-up testing) and the training and qualifications of personnel, are sufficient to provide reasonable assurance that the intended functions of these components are maintained consistent with the current licensing basis through the period of extended operation. Therefore, no revision to LRA Section A.2.1.25 is required.

d. As described above, the components for which loss of coating integrity is being managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program are not susceptible to the two (2) concerns unique to coatings for which specialized aging management is warranted. Therefore, recommendations made in GALL Report AMP XI.M38, as amended by LR-ISG-2012-02, including (a) timing of baseline inspections, (b) the extent of inspections, (c) the qualification of personnel, (d) monitoring and trending, (e) acceptance criteria, and (f) corrective actions; are sufficient to provide reasonable assurance that the intended functions of these components are maintained consistent with the current licensing basis through the period of extended operation. Therefore, no revision to LRA Section B.2.1.25 is required.

With respect to components for which loss of coating integrity is being managed by the Open-Cycle Cooling Water System (B.2.1.11) aging management program or the Fuel Oil Chemistry (B.2.1.18) aging management program:

c. As described in the response to <u>Request</u> 6 below, inspections of the internal coatings will be performed by certified coating inspectors. Evidence of unacceptable coating degradation will be entered into the corrective action program. The results of inspections of internal coatings will be trended and used to adjust inspection frequencies as determined by the ASTM D7108 qualified Site Coating Coordinator. As described in the response to <u>Request</u> 8c below, if 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. 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. LRA Sections

A.2.1.11, Open-Cycle Cooling Water System, and A.2.1.18, Fuel Oil Chemistry, are revised as shown in Enclosure B.

d. The following six (6) issues are addressed for the Open-Cycle Cooling Water System (B.2.1.11) aging management program and the Fuel Oil Chemistry (B.2.1.18) aging management program as follows:

(a) Timing of Baseline Coating Inspections: The Open-Cycle Cooling Water System (B.2.1.11) aging management program provides for internal inspections of service water cooled CeramAlloy coated heat exchangers. These inspections are performed every two (2) to six (6) years, depending on the heat exchanger, in accordance with existing program requirements. Therefore, at least one (1) inspection of each of the internally coated service water cooled heat exchangers managed by the Open-Cycle Cooling Water System (B.2.1.11) aging management program will be performed during the ten (10) years prior to the period of extended operation.

The Fuel Oil Chemistry (B.2.1.18) aging management program provides for internal inspections of the internal coating of the diesel oil storage tanks. These inspections are performed every ten (10) years in accordance with existing program requirements. Therefore, at least one (1) inspection of each of the diesel oil storage tanks managed by the Fuel Oil Chemistry (B.2.1.18) aging management program will be performed during the ten (10) years prior to the period of extended operation.

(b) Extent of Inspections: As stated in the response to RAI 3.0.3-2, submitted in Exelon letter RS-14-003, dated January 13, 2014, 100% of the coated surfaces that are accessible upon component disassembly or entry of components within the scope of the Open-Cycle Cooling Water System (B.2.1.11) and Fuel Oil Chemistry (B.2.1.18) aging management programs are visually inspected.

(c) Qualifications of Personnel Performing Inspections: As described in the response to Request 6 below, the Open-Cycle Cooling Water System (B.2.1.11) and Fuel Oil Chemistry (B.2.1.18) aging management programs will be revised, as shown in Enclosure B, to require that coating inspectors are certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54.

(d) Monitoring and Trending: As described in the response to RAI 3.0.3-2, submitted in Exelon letter RS-14-003, dated January 13, 2014, 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. Trending of coating degradation is utilized to establish appropriate inspection frequencies.

(e) Acceptance Criteria: The Open-Cycle Cooling Water System (B.2.1.11) and Fuel Oil Chemistry (B.2.1.18) aging management programs provide for inspections by qualified personnel for signs of coating failures and precursors to coating failures including erosion, cracking, flaking, peeling, blistering, delamination, rusting, and mechanical damage. As described in the response to Request 8 below, the

Open-Cycle Cooling Water System (B.2.1.11) and Fuel Oil Chemistry (B.2.1.18) aging management programs are enhanced to state that signs of delamination of the coating from the base metal (e.g., peeling and blistering) are not acceptable. In addition, these programs are revised to require that indications of blisters, cracking, flaking, or rusting be assessed by a certified coatings inspector and documented in a 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.

(f) Corrective Actions: As described in the response to RAI 3.0.3-2, submitted in Exelon letter RS-14-003, dated January 13, 2014, 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. If appropriate, corrective actions may include coating repair or replacement prior to the component being returned to service.

LRA Section B.2.1.11, Open-Cycle Cooling Water System, and LRA Section B.2.1.18, Fuel Oil Chemistry are revised as shown in Enclosure B to address the above issues.

3. Byron and Braidwood utilize a CeramAlloy coating on the subcomponents (e.g., heads, cover plates, and tubesheets) of selected service water cooled heat exchangers to minimize degradation and extend the service life of the coated components. Inspections of the internal coatings of service water cooled heat exchangers will be performed by certified coating inspectors. Evidence of unacceptable coating degradation will be entered into the corrective action program. The results of inspections of internal coatings of service water cooled heat exchangers will be trended and used to adjust inspection frequencies as determined by the ASTM D7108 qualified Site Coating Coordinator.

   The potential for accelerated or unanticipated degradation of the base metal and degraded downstream component performance due to flow blockage as a result of degradation of CeramAlloy coatings for service water cooled heat exchangers are addressed as follows:

   <u>Accelerated or Unanticipated Degradation of the Base Metal</u>:

   At Byron and Braidwood credit was not taken for the presence of protective coatings when determining applicable aging effects requiring management. As such, loss of material is a predicted aging effect for service water cooled heat exchangers with CeramAlloy coatings and, therefore, loss of material of the base metal is not unanticipated.

   As described in the response to <u>Request</u> 2 above, accelerated degradation of the base metal caused by localized coating failures occurs only in situations where either (1) the internal environment is excessively aggressive such that rapid degradation of the base metal occurs or (2) a strong galvanic cell is formed when a small area of the base metal becomes exposed at the location of the coating degradation. The internal environment of the service water cooled heat exchangers is not excessively aggressive. These heat exchangers were designed and originally operated (for over 10 years) without an internal coating. However, continued operation without an internal coating decreases the service life of the heat exchanger components and eventually leads to costly repairs and replacements. Based on the operating experience without an internal coating, a corrosion rate was established. Minimum wall thickness requirements based on design requirements and observed corrosion rates ensure that loss of intended function will not occur between inspections even if the coating were to fail. Based on this, it can be concluded that the service water environment is not sufficiently aggressive such that rapid degradation of the base metal capable of causing loss of function of the coated component will occur prior to the next scheduled inspection. The service water cooled heat exchangers are designed such that, should coating degradation occur, dissimilar metal contact will not cause a strong galvanic cell capable of causing accelerated corrosion of the base metal such that loss of function of the component will occur prior to the next scheduled inspection. Appropriate preventive measures are taken to ensure that accelerated degradation of the base metal does not occur, including chemical treatment and the use of sacrificial anodes, where applicable. A review of inspection results of the coated service water cooled heat exchangers performed over the past ten (10) years (over 150 total inspections) indicates that accelerated corrosion capable of causing loss of component function prior to the next scheduled inspection does not occur when localized coating degradation causes the base metal to become exposed.

In summary, if loss of coating integrity of coated service water cooled heat exchangers occurs, loss of material of the base metal is possible. However, the design and operating conditions of the heat exchangers are such that corrosion rates are low enough that loss of material will be detected during scheduled inspections prior to loss of intended function. A review of plant-specific operating experience confirms this conclusion. Based on the above it can be concluded that there is reasonable assurance that accelerated or unanticipated degradation of the base metal caused by coating failures will not prevent the performance of an intended function during the period of extended operation.

Flow Blockage of Downstream Components:

CeramAlloy coatings have been utilized at Byron and Braidwood for approximately 17 years and are currently in service on over 60 heat exchangers (including both in-scope and not-in-scope heat exchangers). A review of plant-specific operating experience indicates that, when the base metal is properly prepared and the coating is correctly applied, delamination or peeling of the coating does not occur. Age-related coating failures observed to date indicate that the coating flakes or chips off in small pieces due to the erosive effects of turbulent service water and passes out of the heat exchanger. A review of plant-specific operating experience has shown that delamination of CeramAlloy coatings in large sheets capable of causing flow blockage of downstream components due to age-related degradation (i.e., not due to improperly prepared base metal or misapplication of the coating) does not occur. In addition, an INPO industry-wide operating experience review did not identify any instances of age-related CeramAlloy coating failures causing flow blockage of downstream components. Finally, input from the manufacturer of the coating system indicates that all coating failures can be attributed to improper surface preparation or misapplication. At Byron and Braidwood, coating application and repair for the service water cooled heat exchangers is performed by qualified coating applicators in accordance with plant-specific procedures with explicit guidance regarding preparation of the base metal and application of the coating. Based on the above it can be concluded that there is reasonable assurance that loss of coating integrity of the CeramAlloy coatings of service water cooled heat exchangers will not result in degraded performance of downstream components due to flow blockage.

Based on the above it can be concluded that the timing of follow-up inspections, based on prior inspection results, as determined by the ASTM D7108 qualified Site Coating Coordinator will provide reasonable assurance that loss of coating integrity will not result in accelerated or unanticipated degradation of the base metal caused by localized coating failures or degraded downstream component performance due to flow blockage.

4. Internal inspections of the diesel fuel oil storage tanks are performed on a ten (10) year frequency. The inspection frequency is based on Regulatory Guide 1.54 endorsed guidance provided in ASTM D7167, *Standard Guide for Establishing Procedures to Monitor the Performance of Safety-Related Coating Service Level III Lining Systems in an Operating Nuclear Power Plant* and the industry best practices described in EPRI TR-1019157, *Guideline on Nuclear Safety-Related Coatings*.

   Plant-specific operating experience and design features of the tanks further justify the ten (10) year inspection frequency for the internal coating of the diesel oil storage tanks. A review of the results of completed tank inspections indicates that significant coating peeling, delamination, blistering, rusting, or unacceptable cracking and flaking has not occurred. Furthermore, as described in LRA Section B.2.1.18, an internal inspection of the Braidwood 2A diesel oil storage tank performed in 2008 revealed a section of the coating missing from original construction. No indications of loss of material were identified at the location of the missing coating. This operating experience provides objective evidence that loss of intended function due to degradation of the base metal of the tank is highly unlikely even if loss of coating integrity were to occur. In addition, the diesel oil storage tanks are designed such that coating debris will not cause flow blockage of downstream components. The suction lines for the fuel oil transfer pumps are located greater than a foot above the bottom of the tanks. In addition, the tanks are designed with a sloped bottom such that any debris, including coating debris should loss of coating integrity occur, would accumulate away from the suction line for the fuel oil transfer pumps. Therefore, it is highly unlikely that coating debris would cause degraded performance of downstream components due to flow blockage even if loss of coating integrity were to occur.

   Based on the industry guidance and plant-specific operating experience and design features of the tank, the ten (10) year inspection frequency for the internal coating of the diesel oil storage tanks is sufficient to provide reasonable assurance that intended functions are maintained consistent with the current licensing basis through the period of extended operation. Coating inspections will be performed by qualified coating inspectors. Inspection results that do not meet acceptance criteria (i.e., unacceptable peeling, delamination, blisters, rusting, cracking or flaking are detected) will be entered into the corrective action program and corrective actions will be taken including repair, replacement, and/or additional inspections, as appropriate.

5. The only internally coated piping, piping components, and piping elements within the scope of license renewal at Byron and Braidwood are (1) portions of the Radwaste System associated with the acid and caustic supply for the Radwaste System demineralizers and (2) portions of the Service Water System associated with the hypochlorite injection at the discharge of the essential service water pumps. Loss of coating integrity is being managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) for these portions of the Radwaste System and Service Water System. As described in the response to Request 2 above, the components for which loss of coating integrity is being managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program are not susceptible to the two (2) concerns unique to coatings for which specialized aging management is warranted. Therefore, recommendations made in GALL Report AMP XI.M38, as amended by LR-ISG-2012-02, including the minimum inspection size (described in the response to Request 2b above), are sufficient to provide reasonable assurance that the intended functions of these components are maintained consistent with the current licensing basis through the period of extended operation.

6. The Open-Cycle Cooling Water System (B.2.1.11) and Fuel Oil Chemistry (B.2.1.18) aging management programs will be revised to require that coating inspectors are certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. LRA Sections A.2.1.11, A.2.1.18, B.2.1.11, and B.2.1.18 are revised as shown in Enclosure B to reflect this change. LRA Table A.5, Item 11 and Item 18 are revised as shown in Enclosure C to reflect this change.

   As described in the response to Request 2 above, the components for which loss of coating integrity is being managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program are not susceptible to the two (2) concerns unique to coatings for which specialized aging management is warranted. Therefore, recommendations made in GALL Report AMP XI.M38, as amended by LR-ISG-2012-02, including the requirements for qualification of inspection personnel, are sufficient to provide reasonable assurance that the intended functions of these components are maintained consistent with the current licensing basis through the period of extended operation.

7. Post-inspection reports will be prepared by coating inspectors that are certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. The reports will be reviewed by the Site Coating Coordinator who will be qualified as a coating specialist in accordance with the requirements of ASTM D7108. Areas or items exhibiting coating degradation will be documented, photographed, and reported to the Site Coating Coordinator. 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 inspection reports. Therefore, sufficient information is provided in the reports to ensure that degraded areas are appropriately dispositioned through the corrective action program, and future inspection locations are selected based on known areas where degradation has occurred.

8. a. As discussed in the response to Request 3 above, operating experience indicates that when the base metal is properly prepared and the coating is correctly applied, delamination or peeling of the coating (i.e., failure of the coating as a sheet such that flow blockage in downstream components is possible) does not occur with the coating systems used at Byron and Braidwood. As such, existing inspection guidance does not currently include explicit acceptance criteria with respect to peeling or delamination. Regardless, the Open-Cycle Cooling Water System (B.2.1.11) and Fuel Oil Chemistry (B.2.1.18) aging management programs will be revised to specify that signs of delamination of the coating from the base metal (e.g., peeling and blistering) are not acceptable. LRA Sections A.2.1.11, A.2.1.18, B.2.1.11, and B.2.1.18 are revised as shown in Enclosure B to reflect this change. LRA Table A.5, Item 11 and Item 18 are revised as shown in Enclosure C to reflect this change.

   Minor localized coating degradation due to erosive effects of the service environment, as indicated by flaking, cracking, or surface rusting, produces debris that is small enough to pass through the system without causing flow blockage. Therefore, this type of coating degradation is acceptable as long as loss of material of the base metal is not occurring. Minor localized coating degradation is routinely identified when performing inspections. A review of inspection results over the past ten (10) years (over 150 total inspections) indicates that, for the service environments and designs of coated components at Byron and Braidwood, accelerated degradation of the base metal does not occur. Minimum wall thickness requirements for the coated components based on design requirements and observed corrosion rates ensure that loss of intended function will not occur between inspections even if the coatings were to fail. Inspection intervals are set such that any degradation of the component is identified prior to loss of intended function. When minor localized coating degradation is identified during inspection, the remaining coating is inspected to ensure that it is intact and tightly adhering. Furthermore, the results of the completed inspections confirm that coating debris caused by minor localized coating degradation does not cause flow blockage of downstream components. Therefore, there is reasonable assurance that minor localized coating degradation as indicated by flaking, cracking, or surface rusting will not result in loss of function of a component due to accelerated corrosion or degradation of downstream component performance prior to the next inspection interval.

   b. As discussed in the response to Request 6 above, the Open-Cycle Cooling Water System (B.2.1.11) and Fuel Oil Chemistry (B.2.1.18) aging management programs will be revised to require that coating inspectors are certified to ANSI N45.2.6 or ASTM Standards endorsed in Regulatory Guide 1.54. The coating inspectors assess indications of coating degradation (e.g., blisters, cracking, flaking, rusting) and provide corrective action recommendations in a 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. LRA Sections A.2.1.11, A.2.1.18, B.2.1.11, and B.2.1.18 are revised as shown in Enclosure B to reflect this change. LRA Table A.5, Item 11 and Item 18 are revised as shown in Enclosure C to reflect this change.

   c. The Open-Cycle Cooling Water System (B.2.1.11) and Fuel Oil Chemistry (B.2.1.18) aging management programs will be revised to require that if 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. 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. LRA Sections A.2.1.11, A.2.1.18, B.2.1.11, and B.2.1.18 are revised as shown in Enclosure B to reflect this change. LRA Table A.5, Item 11 and Item 18 are revised as shown in Enclosure C to reflect this change.

During the preparation of the response to this RAI, a discrepancy in the LRA Table 2.3.3-22 and Table 3.3.2-22 mark-ups associated with the response to RAI 3.0.3-2, submitted in Exelon letter RS-14-003, dated January 13, 2014, was identified. The only pump cubicle cooler heat exchangers with an internal coating are the Byron 1B and 2A SI pump cubicle coolers. The remainder of the pump cubicle cooler heat exchangers do not have an internal coating. LRA Table 2.3.3-22 and Table 3.3.2-22 are revised as shown in Enclosure B to correctly identify the pump cubicle cooler heat exchangers with an internal coating.

Enclosure B

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

RAI 3.0.3-2a

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

In order to address the discrepancy described in the last paragraph of Enclosure A of this letter, LRA Table 2.3.3-22, Service Water System is revised as follows:

Table 2.3.3-22 Service Water System
Components Subject to Aging Management Review

Component Type	Intended Function
Heat Exchanger - ([~~1A, 1B, and 2A~~ CV, 1A and 2B SI, RH, ~~1A, 1B, and 2A~~ CS, SX] Pump Cubicle Cooler – Byron only) Tube Sheet	Pressure Boundary
Heat Exchanger - ([~~2B CV,~~ 1B and 2A SI~~, RH, 2B CS, SX~~] Pump Cubicle Cooler – Byron only) Tube Sheet	Pressure Boundary
Heat Exchanger - ([~~1A, 1B, and 2A~~ CV, 1A and 2B SI, RH, ~~1A, 1B, and 2A~~ CS, SX] Pump Cubicle Cooler – Byron only) Tube Side Components	Pressure Boundary
Heat Exchanger - ([~~2B CV,~~ 1B and 2A SI~~, RH, 2B CS, SX~~] Pump Cubicle Cooler – Byron only) Tube Side Components	Pressure Boundary

In order to address the discrepancy described in the last paragraph of Enclosure A of this letter, LRA Table 3.3.2-22, Service Water System Summary of Aging Management Evaluation is revised as follows:

Table 3.3.2-22 Service Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger - ([~~1A, 1B, and 2A~~ CV, 1A and 2B SI, RH, ~~1A, 1B, and 2A~~ CS, SX] Pump Cubicle Cooler – Byron only) Tube Sheet	Pressure Boundary	Carbon Steel	Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.11)	VII.C1.AP-183	3.3.1-38	A
Heat Exchanger - ([~~2B CV,~~ 1B and 2A SI~~, RH, 2B CS, SX~~] Pump Cubicle Cooler – Byron only) Tube Sheet	Pressure Boundary	Carbon Steel (with internal coating or lining)	Raw Water (Internal)	Loss of Coating Integrity	Open-Cycle Cooling Water System (B.2.1.11)			H, 8
				Loss of Material	Open-Cycle Cooling Water System (B.2.1.11)	VII.C1.AP-183	3.3.1-38	A
Heat Exchanger - ([~~1A, 1B, and 2A~~ CV, 1A and 2B SI, RH, ~~1A, 1B, and 2A~~ CS, SX] Pump Cubicle Cooler – Byron only) Tube Side Components	Pressure Boundary	Carbon Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B.2.1.4)	VII.I.A-79	3.3.1-9	A
					External Surfaces Monitoring of Mechanical Components (B.2.1.23)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.11)	VII.C1.AP-183	3.3.1-38	A

Table 3.3.2-22 Service Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger - ([~~2B CV,~~ 1B and 2A SI~~, RH, 2B CS, SX~~] Pump Cubicle Cooler – Byron only) Tube Side Components	Pressure Boundary	Carbon Steel (with internal coating or lining)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B.2.1.4)	VII.I.A-79	3.3.1-9	A
					External Surfaces Monitoring of Mechanical Components (B.2.1.23)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Coating Integrity	Open-Cycle Cooling Water System (B.2.1.11)			H, 8
				Loss of Material	Open-Cycle Cooling Water System (B.2.1.11)	VII.C1.AP-183	3.3.1-38	A

As a result of the response to RAI 3.0.3-2 provided in Enclosure A of this letter, LRA Section A.2.1.11, Open-Cycle Cooling Water System is revised as follows:

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 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. 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 delamination of the coating from the base metal (e.g., peeling and blistering) are not acceptable.***

4. ***Require physical testing of internal coatings, where physically possible, to ensure that remaining coating is tightly bonded to the base metal when 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).***

~~This~~ ***These*** enhancement***s*** will be implemented prior to the period of extended operation.

As a result of the response to RAI 3.0.3-2a provided in Enclosure A of this letter, LRA Section A.2.1.18, Fuel Oil Chemistry is revised as follows:

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 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. 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 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 delamination of the coating from the base metal (e.g., peeling and blistering) are not acceptable.***

14. ***Require physical testing of internal coatings, where physically possible, to ensure that remaining coating is tightly bonded to the base metal when 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).***

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

As a result of the response to RAI 3.0.3-2a provided in Enclosure A of this letter, the Program Description and NUREG-1801 Consistency sections of LRA Section B.2.1.11, Open-Cycle Cooling Water System are revised as follows:

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, delamination (e.g., peeling and blistering), rusting, and mechanical damage. Evidence of unacceptable coating degradation is entered into the corrective action program. Signs of delamination of the coating from the base metal (e.g., peeling and blistering) are not acceptable. If 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. 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. The results of the inspection contained in the post-inspection report will be evaluated by the ASTM D7108 qualified Site Coating Coordinator. 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 enhancement***s*** 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 delamination of the coating from the base metal (e.g., peeling and blistering) are not acceptable. 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 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)***

As a result of the response to RAI 3.0.3-2a provided in Enclosure A of this letter, the Program Description and NUREG-1801 Consistency sections of LRA Section B.2.1.18, Fuel Oil Chemistry are revised as follows:

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, delamination (e.g., peeling and blistering), rusting, and mechanical damage. Evidence of unacceptable coating degradation is entered into the corrective action program. Signs of delamination of the coating from the base metal (e.g., peeling and blistering) are not acceptable. If 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. 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. The results of the inspection contained in the post-inspection report will be evaluated by the ASTM D7108 qualified Site Coating Coordinator.

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.

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 delamination of the coating from the base metal (e.g., peeling and blistering) are not acceptable. 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 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)***

Enclosure C

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

This Enclosure identifies commitments made 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 3.0.3-2a

Notes:

- To facilitate understanding, portions of the original License Renewal Commitment List have been repeated in this Enclosure, with revisions indicated.
- Pre-existing LRA text is shown in normal font. Additions are highlighted with ***bolded italics***.

As a result of the response to RAI 3.0.3-2a provided in Enclosure A of this letter, LRA Appendix A, Table A.5 License Renewal Commitment List, line item 11 on page A-74 and line item 18 on page A-77, are revised as shown below. Pre-existing text, from the LRA is formatted in normal font. Additions are indicated with ***bolded italics***.

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 delamination of the coating from the base metal (e.g., peeling and blistering) are not acceptable.*** ***4. Require physical testing of internal coatings, where physically possible, to ensure that remaining coating is tightly bonded to the base metal when 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 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***
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	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***

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
		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. 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.		

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
		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 delamination of the coating from the base metal (e.g., peeling and blistering) are not acceptable.* *14. Require physical testing of internal coatings, where physically possible, to ensure that remaining coating is tightly bonded to the base metal when 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).*		