Exelon Generation®

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10 CFR 50
10 CFR 51
10 CFR 54

RS-14-183

July 8, 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: Updated Responses to NRC Set 14 Requests for Additional Information, 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 Lindsay R. Robinson, US NRC to Michael P. Gallagher, Exelon, dated March 18, 2014, "Requests 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 14 (TAC NOS. MF1879, MF1880, MF1881, AND MF1882)"

3. Letter from Michael P. Gallagher, Exelon to NRC Document Control Desk, dated April 17, 2014, "Responses to NRC Requests for Additional Information, Set 14, dated March 18, 2014, related to the Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2, License Renewal Application"

In Reference 1, 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, the NRC requested additional information to support staff review of the LRA. In Reference 3, Exelon provided responses to these NRC requests for additional

information. Subsequent discussions with NRC staff have determined that the staff requires additional information.

To address this need, Enclosure A contains updated responses to NRC Set 14 requests for additional information RAI B.2.1.29-1 and RAI B.2.1.30-3. There are no changes to any of the other RAI responses in the Reference 3 letter.

Enclosure B contains revisions to sections of the LRA (except for the License Renewal Commitment List) resulting from the updated responses to RAI B.2.1.29-1 and RAI B.2.1.30-3.

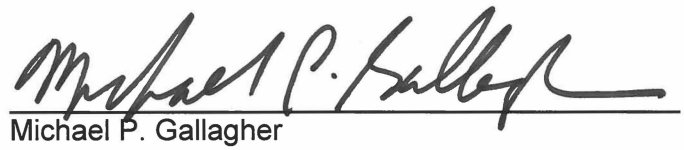
Enclosure C provides revisions to the License Renewal Commitment List (LRA Appendix A, Section A.5) resulting from the updated responses to RAI B.2.1.29-1 and RAI B.2.1.30-3. There are no other new or revised regulatory commitments contained in this letter.

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

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

Executed on 07-08-2014

Respectfully,



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

Enclosures: A: Updated Responses to Requests 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
Updated Responses to Requests for Additional Information

RAI B.2.1.29-1
RAI B.2.1.30-3

This Enclosure contains updates to the responses to RAI B.2.1.29-1 and RAI B.2.1.30-3 that were provided in Exelon letter RS-14-097 dated April 17, 2014. There are no changes to any of the other RAI responses provided by Exelon in that letter.

The update to the Exelon Response to RAI B.2.1.29-1 is summarized as follows:

> New Enhancement 2 is added to the ASME Section XI, Subsection IWE aging management program to refer to the new Structures Monitoring aging management program Enhancement 16 and to ongoing examination activities of the Structures Monitoring and ASME Section XI, Subsection IWL aging management programs in the tendon tunnels. Changing conditions, consisting of the identification of significant corrosion of embedded steel in the tendon tunnel structure, will require an evaluation to determine if augmented examinations in accordance with requirements of IWE-1240 "Surface Areas Requiring Augmented Examination" are required due to the potential for accelerated corrosion at the exterior surface of the containment liner plate. The updates affect LRA Appendix A, Section A.2.1.29, and LRA Appendix B, Section B.2.1.29, as well as LRA Appendix A, Table A.5, Item 29.

The update to the Exelon Response to RAI B.2.1.30-3 is summarized as follows:

> Information originally provided in the response to RAI B.2.1.30-3 is added to Enhancements 2 and 3 of the ASME Section XI, Subsection IWL aging management program to provide additional detail. The updates affect LRA Appendix A, Section A.2.1.30, and LRA Appendix B, Section B.2.1.30, as well as LRA Appendix A, Table A.5, Item 30.

As a result of this update to the response to RAI B.2.1.29-1, a new Enhancement to the IWE program is described in the response. For clarity, the original response is repeated here, in normal font. Changes to the original response are highlighted with ***bolded italics*** for inserted text and ~~strikethroughs~~ for deleted text.

RAI B.2.1.29-1

Applicability:

Byron

Background:

LRA Section B.2.1.29 states that the ASME Section XI, Subsection IWE program is an existing program that, following enhancement, will be consistent with the GALL Report, Revision 2, AMP XI.S1. The "detection of aging effects" program element recommends, in accordance with IWE-1240, that augmented examinations should be performed for containment surface areas subject to degradation. In addition, the GALL Report states that operating experience involving the AMP should provide objective evidence to support a determination that the effects of aging will be adequately managed so that the structure and component intended functions will be maintained during the PEO.

During the audit, the staff performed walkdowns of the Byron main steam and tendon gallery tunnels and observed white material deposits on the concrete walls and tendon gallery tunnel ceilings, indicative of water leakage or seepage through the containment concrete. Through discussions with the applicant, the staff learned that the cracks through which the material appears to be leaching have existed since initial plant construction. The staff noted during its review that on the south side of Byron Unit 1 and north side of Unit 2, the below grade areas between the main steam tunnels and containment structures were in-filled with limestone during the original construction. According to plant operating experience, this area has allowed groundwater infiltration to the below-grade containment concrete. The staff noted that the groundwater at both Byron and Braidwood is considered to be an aggressive environment due to high chloride levels (i.e., >500 ppm).

IWE-1240 states that interior and exterior containment surface areas that are subject to accelerated corrosion, with no or minimal corrosion allowance, require augmented examinations.

Issue:

With the history of aggressive water infiltrating the containment concrete, as evidenced by signs of water intrusion at the tendon gallery ceilings, there is the potential that elevated moisture levels at the outside of the containment concrete could cause moisture to travel through the concrete and come in contact with the carbon steel containment liner. This condition could result in degradation of the containment liner plates caused by accelerated corrosion at exterior surfaces of the containment liner. The applicant has not provided information, based on examination or analysis, on a determination as to whether water has been in contact with the outer surface of the liner or whether there has been any loss of thickness in the carbon steel due to accelerated corrosion in order to ensure the requirements of IWE-1240 are met.

Request:

With regards to the operating experience indicating that water is infiltrating the containment concrete, state whether there has been (or will be) an evaluation in accordance with IWE to determine (1) if the moisture could come into contact with the liner plate and (2) any resulting loss of material thickness due to corrosion. Describe how the IWE AMP will be able to ensure that the liner is not degraded such that the leak-tight integrity of the carbon steel is maintained through the PEO.

Exelon Response:

A specific evaluation was conducted in accordance with requirements of IWE-1240 "Surface Areas Requiring Augmented Examination", to identify those areas to be considered for potential augmented inspections during the development of the containment inservice inspection implementation documents in 2001. The following information was considered in making the determinations: material, location, environment, operational conditions, industry concerns, plant examination data, plant unique experience, and other applicable factors such as design loads. There has been no indication of accelerated general corrosion and aging, or potential for accelerated general corrosion and aging of the exterior surfaces of the Byron containment shell liner plates. Therefore, the exterior of the containment liner plates was not included as a potential augmented inspection area. Discussion to support this determination is provided below.

Background Information

Portions of the tendon tunnel that are adjacent to the main steam and auxiliary feedwater tunnel structure have experienced water in-leakage at inactive shrinkage cracks and construction joints since original construction. The water in-leakage at the tendon tunnel has been attributed to surface water runoff that collects and is trapped in a contained area between the following structures: the main steam and auxiliary feedwater tunnels and the containment structure on the sides, and the bedrock foundation at the bottom. Corrective action that was taken in 1997 covered the ground surface above the contained area with pavement. This action substantially reduced water in-leakage into the tendon tunnel. Other portions of the tendon tunnel (not adjacent to the main steam and auxiliary feedwater tunnel) display much less indication of in-leakage as evidenced by the minimal amount of mineral deposits. The heavier mineral deposits in the tendon tunnel adjacent to the main steam and auxiliary feedwater tunnel have been attributed to the backfill material and water in-leakage from the water trapped in the contained area. The backfill material is more specifically described as a dolomite, which is calcium magnesium carbonate $CaMg(CO_3)_2$, and not a limestone, which is calcium carbonate $CaCO_3$. The term dolomite is consistent with the UFSAR Byron Sections 2.5.1 and 2.5.4.5.1.4, and UFSAR Byron Figures 2.5-59, 2.5-61 sheets 1 to 6, and 2.5-62.

Discussion

The exterior surface of the containment shell liner is inaccessible, therefore the conditions present cannot be directly observed. The first section in the discussion below will describe features used in construction to minimize or prevent corrosion of embedded steels. The second and third sections will discuss a bounding environment and a representative indicator that can be monitored for the potential of corrosion at the liner to concrete interface. The fourth section

will provide direct evidence to support there is no detected loss of material due to general corrosion on the exterior surface of the containment liner.

Construction Features
As discussed in section 3.5.2.2.1.3 of the LRA, concrete meeting the requirements of ACI 318, Building Code Requirements for Reinforced Concrete, and the guidance of ACI 201.2R with respect to chlorine ion content was used for the containment concrete in contact with the embedded containment liner. This ensures that contact with the concrete containment shell or concrete base mat will not cause corrosion of the reinforcing steel, liner, liner anchors, or other steel elements embedded in the concrete. In addition, the presence of an abundant amount of calcium hydroxide and relatively small amounts of alkali elements, such as sodium and potassium, gives the water in concrete pore solutions a very high alkalinity with pH of 12 to 13. This pH range is where steel (iron) is either thermodynamically "immune" to corrosion or where a protective passive film is thermodynamically stable on the steel surface regardless of the corrosion potential of the steel as affected by the dissolved oxygen content of the water. Steel in contact with low impurity concrete pore water will not suffer significant corrosion even if sufficient moisture and oxygen are available due to the spontaneous formation of this thin protective passive film.

Bounding Environment
The environment (moisture) that exists at the interior side of the tendon tunnel wall adjacent to the contained area described above in the Exelon Background Information section is a bounding environment with respect to the environment that could potentially exist at the concrete containment shell to metal containment liner interface located above these corresponding sections of the tendon tunnels. The tendon tunnel location with respect to the containment building is such that the top of the tendon tunnel is the bottom of the outer edge of the base mat of the containment structure. The tendon tunnel structure is located 12 feet below the containment liner as shown in UFSAR Figures 3.8-1 and 3.8-2. This configuration results in a higher head of water pressure and establishes a preferential flow path for water infiltrating the concrete at the tendon tunnels, which is below and away from the exterior surface of the containment liner. In addition, the Containment Structure is post-tensioned with hoop and vertical tendons, which close up any shrinkage cracks; therefore the Containment Structure is significantly less permeable with respect to water seepage into the concrete than the tendon tunnels, which are not post-tensioned.

Representative Indicator
Corrosion of carbon steel is strongly dependent on dissolved oxygen levels. The reinforcing steel for the containment and tendon tunnel and the containment liner plate are carbon steel materials. The inside surface of the tendon tunnel is exposed to air, while the three feet six inch (3’-6”) thick containment concrete shell was placed directly against the containment liner plate, limiting the oxygen available for potential corrosion. Oxygen levels in any moisture that may migrate or diffuse to the containment liner concrete interface are expected to be very low because any moisture in this area would be stagnated, and depleted oxygen levels will not be replenished. As a result, the embedded reinforcing steel at the inner surface of the tendon tunnel is less protected from corrosion than the exterior surface of the containment liner plate. Therefore, the condition of the embedded reinforcing steel at the inner surface of the tendon tunnel can be used as a representative indicator for the potential for corrosion at the exterior surface of the containment liner plate.

Routine and ongoing visual and hammer sounding inspections performed at the tendon tunnels have not revealed any degradation of concrete embedded steel or rebar or degradation of concrete due to corrosion of embedded steel, leaching, or chemical attack. Mineral deposits have been cleaned away exposing the cracks at various locations; there have been no appreciable changes at the cracks since original construction and minimal redeposit of mineral deposits. Concrete at the crack locations has been determined to be structurally sound. This provides supporting information that the water in-leakage is not degrading the concrete. The inspection of this representative indicator in a bounding environment and the absence of corrosion of embedded reinforcing steel are used to support the conclusion that corrosion is not occurring at the exterior surface of the containment liner plates. Loss of material due to corrosion of carbon steel embedded in concrete is not expected because even though the groundwater has been characterized as aggressive due to high in chlorides (chlorides > 500 ppm), when a water in-leakage sample taken from the tendon tunnel was tested in 2013, the water was found to be non-aggressive (pH > 5.5, chlorides < 500 ppm, sulfates <1500 ppm). In addition, further evidence will be obtained to support the conclusion that loss of material due to corrosion is not occurring on carbon steel embedded in the tendon tunnel. Enhancement 16 to the Structures Monitoring (B.2.1.34) aging management program, as documented in the response to RAI B.2.1.34-1, will provide this further evidence. This evidence will be obtained by exposing and examining reinforcing steel in the tendon tunnels at locations with water in-leakage and mineral deposits to confirm the absence of loss of material due to corrosion of embedded carbon steel.

New Enhancement 2 is added to the ASME Section XI, Subsection IWE (B.2.1.29) aging management program to refer to the new Structures Monitoring (B.2.1.34) aging management program Enhancement 16 and to ongoing examination activities of the Structures Monitoring (B.2.1.34) and ASME Section XI, Subsection IWL (B.2.1.30) aging management programs in the tendon tunnels. Changing conditions consisting of the identification of significant corrosion of embedded steel in the tendon tunnel structure will require an evaluation to determine if augmented examinations in accordance with requirements of IWE-1240 "Surface Areas Requiring Augmented Examination" are required due to the potential for accelerated corrosion at the exterior surface of the containment liner plate. LRA Appendix A, Section A.2.1.29, and LRA Appendix B, Section B.2.1.29, as well as LRA Appendix A, Table A.5, Item 29 are revised in Enclosures B and C to reflect these changes.

Direct Evidence

As discussed in section 3.5.2.2.1.3 of the LRA, numerous ultrasonic examinations of the containment liner at the containment floor level (moisture barrier area) revealed that there is no detected corrosion on the exterior surfaces of the liner that is in contact with the concrete containment shell. At least nine of the twenty-one ultrasonic examinations conducted between 2004 and 2012 located in the moisture barrier areas (i.e., areas near the floor elevation inside containment) were above the portions of the tendon tunnel that are adjacent to the main steam and auxiliary feedwater tunnel. Since the moisture barrier area is near the lowest vertical section of the concrete containment shell to liner interface, it is considered a bounding area for revealing any potential impact of moisture on the exterior surfaces of the containment liner. These ultrasonic examinations provide direct, physical evidence that there is no detected corrosion occurring on the exterior of the containment liner plates.

Conclusion

Based on industry operating experience, as documented in NRC sponsored report, "Sandia Report SAND2010-8718, July 2010 Nuclear Containment Steel Liner Corrosion Workshop: Final Summary and Recommendation Report", corrosion starting from the concrete side of the liner and corroding through to the interior surface of the liner has only been discovered as a result of foreign material being left in place during original construction. This industry operating experience corroborates the plant specific information and conclusions provided in the previous discussions, which support a conclusion that corrosion will not occur on the concrete side of the containment liner as a result of water infiltrating the concrete.

Ongoing inspections of the concrete in the tendon tunnels, both by the Structures Monitoring (B.2.1.34) aging management program and the ASME Section XI, Subsection IWL (B.2.1.30) aging management program, together with Enhancement 16 to the Structures Monitoring (B.2.1.34) aging management program as discussed in the response to RAI B.2.1.34-1, will ensure that any adverse changes to current conditions will be identified, documented in the corrective action program, and assessed for any potential impact on other structures and areas, including inaccessible areas. ***These ongoing inspections and Enhancement 16 to the Structures Monitoring (B.2.1.34) aging management program are tied by new Enhancement 2 to the ASME Section XI, Subsection IWE (B.2.1.29) aging management program to ensure that any adverse changes to current conditions will be evaluated to determine if augmented examinations in accordance with requirements of IWE-1240 "Surface Areas Requiring Augmented Examination" are required due to the potential for accelerated corrosion at the exterior surface of the containment liner plate. LRA Appendix A, Section A.2.1.29, and LRA Appendix B, Section B.2.1.29, as well as LRA Appendix A, Table A.5, Item 29 are revised in Enclosures B and C to reflect these changes.***

Based on the above, there is no detected loss of material due to general corrosion of the containment liner at the concrete containment shell to liner interface. Therefore, it is reasonable to conclude that the containment liner at the concrete containment shell to liner interface will not degrade, augmented examinations are not required, and the leak-tight integrity of the carbon steel liner can be adequately managed and maintained through the period of extended operation by the ***enhanced*** ~~existing~~ ASME Section XI, Subsection IWE (B.2.1.29) aging management program.

As a result of this update to the response to RAI B.2.1.30-3, details that were provided in the original Exelon response are now being included in Enhancements 2 and 3 of the ASME Section XI, Subsection IWL aging management program. For clarity, the original response is repeated here, in normal font. Changes to the original response are highlighted with ***bolded italics*** for inserted text. This inserted text describes the impact on the LRA.

RAI B.2.1.30-3

Applicability:

Braidwood

Background:

LRA Section B.2.1.30 states that the ASME Section XI, Subsection IWL AMP is an existing program that, following enhancements, will be consistent with the GALL Report AMP XI.S2, "ASME Section XI, Subsection IWL." LRA Section B.2.1.30 states that "free-water has been found in 3-8% of the tendon inspections at Braidwood Unit 2…the presence of free water has been consistently detected in specific horizontal, vertical, and dome tendons, and this type of condition has also been detected [at] Braidwood Unit 1." The LRA further states that, since Braidwood construction, free water has been found in a "few, specific horizontal and vertical tendon anchorages located below grade." The LRA also states that the water in the dome tendons is due to the degraded dome drainage system and that the water found at vertical tendons and below-grade horizontal tendons is due to the high water table, which is about 20 to 25 feet higher than the bottom of the containment.

LRA Section B.2.1.30 states that to address the presence of water in the tendon sheaths, the applicant has performed augmented inspections on additional tendons beyond those selected for the ASME Section XI, Subsection IWL, Program. These augmented inspections are performed every five years in conjunction with the ASME Section XI, Subsection IWL examinations. The LRA also states that due to the history of water found in containment tendons, the applicant included Enhancements 2 and 3 to the ASME Section XI, Subsection IWL AMP.

Enhancement 2 states:

> A one-time inspection of one (1) vertical and one (1) horizontal tendon on each unit will be performed prior to the period of extended operation. The inspection will consist of visually examining one (1) wire from each of the two (2) types of tendons at a worst-case location based on evidence of free water, grease discoloration, and grease chemistry results. This location will serve as a leading indicator for potential degradation or tendon surface corrosion (Braidwood only).

Enhancement 3 states:

> In order to monitor for tendon exposure to free water and moisture and manage any potential adverse effects, a periodic tendon water monitoring and grease sampling program will be implemented (Braidwood only). The program will consist of:

(a) A baseline inspection of tendon grease caps at the bottom of all vertical and dome tendons, as well as all below-grade horizontal tendons, prior to the period of extended operation. The baseline inspection will check for evidence of free water and grease discoloration, with further actions taken based on the condition of the grease.
(b) A follow-up tendon grease cap inspection of all vertical and dome tendons, as well as all below-grade horizontal tendons, will be performed within 10 years of the initial inspection, using the same approach as the baseline inspection.
(c) For those tendons where free water, moisture, and grease did not meet acceptance criteria during the two (2) previous inspections, periodic monitoring of grease chemistry and moisture, free water, and grease discoloration will be performed on a frequency not to exceed 10 years.

Corrective actions will be taken as necessary to ensure that the tendon grease meets ASME Section XI, Subsection IWL requirements.

Issue:

The GALL Report states that "the conditions and operating experience at the plant must be bound by the conditions and operating experience for which the GALL program was evaluated, otherwise it is incumbent on the applicant to augment the GALL program as appropriate to address the additional aging effects." The GALL Report also states that "[o]perating experience involving the AMP, including past corrective actions resulting in program enhancements or additional programs, should provide objective evidence to support a determination that the effects of aging will be adequately managed so that the structure and component intended functions will be maintained during the period of extended operation." The staff noted that the applicant has augmented and will enhance (Enhancements 2 and 3) its IWL AMP to address its plant-specific operating experience regarding the historical exposure of tendons to free water at Braidwood. However, the staff needs additional information regarding how the augmented inspections and enhancements will adequately manage the effects of aging during the period of extended operation. The staff has the following concerns:

- For the augmented inspections of additional tendons, performed every five years in conjunction with the ASME Section XI, Subsection IWL examinations, it is unclear how the locations for additional tendon inspections will be identified.
- Enhancement 2 proposes a one-time inspection of one horizontal and vertical tendon prior to the period of extended operation. It is not clear what the acceptance criteria will be for the one-time inspection of the corrosion protection medium and tendon wires and what further actions will be taken if the acceptance criteria are not met. Additionally, the enhancement does not include inspection of dome tendons, and the basis for this exclusion is not clear.
- Enhancement 3 states that a follow-up inspection will be performed within 10 years after the first baseline inspection. The enhancement also states that tendons that do not meet the acceptance criteria during the two previous inspections will be subject to periodic monitoring at a frequency not to exceed 10 years. The staff is concerned that tendons that meet the acceptance criteria during the baseline inspection but do not meet the acceptance criteria in the follow-up inspection will not be subject to periodic monitoring. For sites with multiple plants, IWL-2421(b) states that when the conditions on IWL-2421(a) are met, the

examinations required by IWL-2500 can be performed at a 10-year frequency instead of every five years. A 10-year frequency is the maximum frequency (less conservative approach) allowed by the IWL Code for a site with multiple plants. It is unclear as to how a frequency of examinations not to exceed 10 years will be adequate to address the additional aging effects at Braidwood.

Request:

1. Describe how the locations for augmented inspections of additional tendons will be identified.
2. Regarding Enhancement 2, state (1) the acceptance criteria for the one-time inspections, (2) what actions will be taken if the acceptance criteria are not met, and (3) the justification for not performing a one-time inspection of the dome tendons
3. Regarding Enhancement 3, state (1) what actions will be taken for those tendons where the corrosion protection medium meets the acceptance criteria during the baseline inspection but are found not acceptable during the follow-up inspection, and (2) how the proposed frequency of inspections (not to exceed 10 years) will ensure that possible age-related degradation due to water inleakage to the tendons will be detected in a timely manner and managed such that the tendons will continue to perform their intended functions during the PEO.

Exelon Response:

1. The locations of augmented inspections of tendons performed every five (5) years, beyond those selected for ASME Section XI, Subsection IWL, as described in LRA Section B.2.1.30, have previously been identified by the Responsible Engineer. These augmented tendon locations have been associated with tendons that have previously been examined and found to exhibit significant quantities (e.g., more than eight ounces) of free water, as well as other tendons of potential susceptibility and interest, as determined by the Responsible Engineer. Augmented inspections of other tendons of interest consist of those nearby and adjacent to ones which have previously exhibited free water. These augmented inspections, performed every five (5) years, will continue until implementation of Enhancement 3.

   Upon implementation of Enhancement 3, augmented inspections of tendons will include an initial baseline inspection of the bottom of all vertical and dome tendons, as well as all below-grade horizontal tendons, prior to the period of extended operation. A follow-up inspection of all vertical and dome tendons, as well as all below-grade horizontal tendons, will also be performed within ten (10) years of the initial baseline inspection. Following this second inspection, additional periodic augmented inspections and monitoring will be conducted for those tendons where free water, moisture, and grease did not meet acceptance criteria during the two (2) previous inspections. Additional information on the frequency of these periodic augmented inspections and monitoring is provided below in the response to *Request* 3.

   LRA Appendix A, Section A.2.1.30, and LRA Appendix B, Section B.2.1.30, as well as LRA Appendix A, Table A.5, Item 30 are revised in Enclosures B and C to provide additional detail in Enhancement 3.

2. The one-time inspections identified in Enhancement 2 to the ASME Section XI, Subsection IWL, (B.2.1.30) aging management program will consist of visual inspections of one wire taken from a horizontal tendon and one wire taken from a vertical tendon. The visual inspection of these wires will be performed in accordance with existing station procedures used for inspections consistent with IWL-2523.2. The acceptance criteria will consist of each wire being free of any active corrosion, including general and pitting corrosion.

   The intent of these one-time inspections is to verify the effectiveness of the grease in providing corrosion protection to the tendon wires, especially for tendons which have historically experienced greater quantities of free water and moisture. In the event that the acceptance criteria are not met and corrosion is identified, the condition would be entered into the corrective action program. The condition would be evaluated to characterize the corrosion, determine the cause of the corrosion, the location, depth, extent of the condition, and applicability of the condition to other wires that comprise that tendon. Corrective actions may include activities such as grease analysis, replacement of grease within the tendon duct, additional wire inspections from the same tendon, evaluation of the tendon capacity, potential replacement of the tendon, and augmented inspections and grease sampling of other leading indicator tendons, based, in part, on previous evidence of free water, observed grease leakage, grease discoloration, and grease chemistry results. Specific corrective actions would depend upon the cause, extent of condition, and grease properties. These corrective actions are consistent with those actions which would be evaluated during periodic required IWL examinations.

   The one-time inspections specified in Enhancement 2 to the ASME Section XI, Subsection IWL (B.2.1.30) aging management program were not specified for the dome tendons due to relatively few instances of significant free water being found in the dome tendons, in comparison to the vertical and below-grade horizontal tendons. All three tendon groups (vertical, horizontal, dome) are of the same design with respect to configuration, tendon sheathing, and protective grease. Since the below-grade horizontal tendons and the bottom ends of the vertical tendons have historically shown greater exposure to free water due to their location at or below the ground-water table, the environmental conditions to which these tendons are exposed are considered to bound that of the dome tendons. In addition, repairs to the containment roof drain system were recently completed in 2011 and 2012 for both units, which are expected to reduce the potential of future water intrusion into the dome tendon sheaths. Therefore, selection of wires from a worst-case below-grade horizontal and select vertical tendon will serve as leading indicators for potential degradation or tendon surface corrosion.

   In order to address the limited number of instances in which significant free water has been found in the dome tendons, however, periodic tendon water monitoring and grease sampling activities outlined in Enhancement 3 to the ASME Section XI, Subsection IWL (B.2.1.30) program includes the dome tendons. Therefore, potential free water in the dome tendon sheaths will be managed to ensure that the tendons continue to perform their intended function through the period of extended operation.

   LRA Appendix A, Section A.2.1.30, and LRA Appendix B, Section B.2.1.30, as well as LRA Appendix A, Table A.5, Item 30 are revised in Enclosures B and C to provide additional detail in Enhancement 2.

3. Regarding Enhancement 3 to the ASME Section XI, Subsection IWL (B.2.1.30) aging management program, any tendons which meet the acceptance criteria during the initial baseline examination of all vertical, dome, and below-grade horizontal tendons, but fail to meet the acceptance criteria during the subsequent examination ten (10) years later, will be subject to additional periodic monitoring. Tendons which exhibit significant quantities of free water during periodic monitoring will be inspected more often, with the timing of follow-up inspections increased until a frequency is achieved which no longer results in significant amounts of free water observed during successive inspections. Tendon water inspection and draining frequencies may vary from annual to every ten (10) years, depending upon grease chemistry and moisture parameters meeting IWL acceptance criteria. By continuing to increase the frequency of inspection for, and removal of, free water until significant amounts are no longer observed, the condition of the grease will be maintained and continue to provide corrosion protection to the tendon wires, thereby, ensuring that the intended function of the containment tendons is maintained during the period of extended operation.

   The maximum ten (10) year periodic frequency allowed in part 'c' of Enhancement 3 is meant to address any tendons which exhibit evidence of free water but the quantity is observed to be insignificant, with no observable grease discoloration, and given that the tendon wasn't inspected for at least ten (10) years prior. Tendons, which meet these criteria, are not considered as susceptible to potential degradation due to the historical performance of the tendon grease, which has been proven capable of providing adequate corrosion protection. In instances such as these, since it previously took at least ten (10) years to accumulate an insignificant quantity of free water with no anticipated detrimental effects on the tendon and wires, a ten (10) year subsequent re-inspection is sufficient. More frequent follow-up inspections will be performed for tendons which exhibit insignificant quantities of free water, but were inspected within the ten (10) years prior. Any tendons which exhibit significant quantities of free water or grease discoloration will also be inspected more frequently. In all cases, the frequency of inspections for water in individual tendons will be adjusted to be commensurate with the severity of the conditions found during each subsequent examination.

   Based on past examination results, the high quality grease, which is used as a corrosion protection medium to protect the tendons and is tolerant of excessive quantities of moisture, has been adequate to prevent corrosion of the tendons exposed to water. All of the examination evidence to-date, including the current augmented examinations on additional tendons beyond those selected for ASME Section XI, Subsection IWL scheduling requirements, reveals that the tendons are being adequately managed, even with the exposure to water. Therefore, the ASME Section XI, Subsection IWL (B.2.1.30) aging management program, including the proposed enhancements related to monitoring and maintenance of the tendons and grease condition, will manage the condition of the tendons such that they will continue to perform their intended functions through the period of extended operation.

   LRA Appendix A, Section A.2.1.30, and LRA Appendix B, Section B.2.1.30, as well as LRA Appendix A, Table A.5, Item 30 are revised in Enclosures B and C to provide additional detail in Enhancement 3.

Enclosure B

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

RAI B.2.1.29-1
RAI B.2.1.30-3

Consistent with the updates to the responses to RAI B.2.1.29-1 and RAI B.2.1.30-3 provided in Enclosure A, several sections of the LRA are updated, as shown in this Enclosure.

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

As a result of this update to the response to RAI B.2.1.29-1, described in Enclosure A of this letter, LRA Appendix A, Section A.2.1.29, page A-32, is revised as shown below to add Enhancement 2. Changes are highlighted with ***bolded italics*** for inserted text and ~~strikethroughs~~ for deleted text.

A.2.1.29 ASME Section XI, Subsection IWE

The ASME Section XI, Subsection IWE aging management program is an existing program based on ASME Section XI, Subsection IWE requirements and complies with the provisions of 10 CFR 50.55a. This program is in accordance with ASME Section XI, Subsection IWE, 2001 edition through the 2003 Addenda.

The program consists of periodic visual and volumetric examination of pressure retaining components of steel and concrete containments for signs of degradation, assessment of damage, and corrective actions. The program includes aging management of surfaces and components such as bolting for containment closure, containment liner, containment penetrations (electrical, instrumentation, and control assemblies), mechanical penetrations, penetration bellows at the containment boundary, penetration sleeves at the containment boundary, and the personnel airlock and equipment hatch. The moisture barrier, which is a sealant between the bottom of the containment liner and the base mat, is included within the scope of the program.

Examination methods include visual and volumetric testing as required by ASME Section XI, Subsection IWE. Observed conditions that have the potential for impacting an intended function are evaluated for acceptability in accordance with ASME requirements and corrected in accordance with corrective action program***.***

The ASME Section XI, Subsection IWE aging management program will be enhanced to:

1. Provide guidance for specification of bolting material, lubricant and sealants, and installation torque or tension to prevent or mitigate degradation and failure of structural bolting.
2. ***Use the condition of the embedded reinforcing steel at the inner surface of the tendon tunnel as a representative indicator for the potential for corrosion at the exterior surface of the containment liner plate. Use the results of Structures Monitoring (B.2.1.34) aging management program, Enhancement 16 activities and results from ongoing examinations of the tendon tunnel performed as part of the ASME Section XI, Subsection IWL (B.2.1.30) and Structures Monitoring (B.2.1.34) aging management programs to identify changing conditions. Changing conditions consisting of the identification of significant corrosion of embedded steel in the tendon tunnel structure require an evaluation to determine if augmented examinations in accordance with requirements of IWE-1240 "Surface Areas Requiring Augmented Examination" are required due to the potential for accelerated corrosion at the exterior surface of the containment liner plate.***

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

As a result of the update to the response to RAI B.2.1.29-1, described in Enclosure A of this letter, LRA Appendix B, Section B.2.1.29, page B-187, is revised as shown below to add Enhancement 2. Changes are highlighted with ***bolded italics*** for inserted text.

Enhancements

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

1. Provide guidance for specification of bolting material, lubricant and sealants, and installation torque or tension to prevent or mitigate degradation and failure of structural bolting. **Program Element Affected: Preventive Actions (Element 2)**

2. Use the condition of the embedded reinforcing steel at the inner surface of the tendon tunnel as a representative indicator for the potential for corrosion at the exterior surface of the containment liner plate. Use the results of Structures Monitoring (B.2.1.34) aging management program, Enhancement 16 activities and results from ongoing examinations of the tendon tunnel performed as part of the ASME Section XI, Subsection IWL (B.2.1.30) and Structures Monitoring (B.2.1.34) aging management programs to identify changing conditions. Changing conditions consisting of the identification of significant corrosion of embedded steel in the tendon tunnel structure require an evaluation to determine if augmented examinations in accordance with requirements of IWE-1240 "Surface Areas Requiring Augmented Examination" are required due to the potential for accelerated corrosion at the exterior surface of the containment liner plate. Program Elements Affected: Detection of Aging Effects (Element 4) and Monitoring and Trending (Element 5)

As a result of the update to the response to RAI B.2.1.30-3, described in Enclosure A of this letter, LRA Appendix A, Section A.2.1.30, pages A-32 and A-33, is revised as shown below to add detail to Enhancement 2 and Enhancement 3. Changes are highlighted with ***bolded italics*** for inserted text.

A.2.1.30 ASME Section XI, Subsection IWL

The ASME Section XI, Subsection IWL aging management program is an existing program that consists of (a) periodic visual inspection of concrete surfaces for reinforced and unbonded, prestressed concrete containments, and (b) periodic visual inspection and sample tendon testing of unbonded post-tensioning systems for prestressed concrete containments for signs of degradation, assessment of damage, and corrective actions, and testing of the tendon corrosion protection medium and free water. Measured tendon lift-off forces are compared to predicted tendon forces calculated in accordance with RG 1.35.1.

Reinforced concrete surfaces are inspected for material degradation, including loss of material, cracking, increase in porosity and permeability, and loss of bond. A sample of each tendon wire type (vertical, hoop, dome) for the post-tensioning system is tested for loss of prestress. One tendon wire of each type is also examined for loss of material and subject to physical testing to determine yield strength, ultimate tensile strength, and elongation. The end anchorage for the unbonded post-tensioning system is inspected for loss of material.

This program is in accordance with ASME Section XI, Subsection IWL, 2001 edition through the 2003 addenda, and complies with the provisions of 10 CFR 50.55a.

The ASME Section XI, Subsection IWL aging management program will be enhanced to:

1. Include additional augmented examination requirements after post-tensioning system repair/replacement activities in accordance with Table IWL-2521-2.

2. A one-time inspection of one (1) vertical and one (1) horizontal tendon on each unit will be performed prior to the period of extended operation. The inspection will consist of visually examining one (1) wire from each of the two (2) types of tendons at a worst-case location based on evidence of free water, grease discoloration, and grease chemistry results. This location will serve as a leading indicator for potential degradation or tendon surface corrosion***. The visual inspection of these wires will be performed in accordance with existing station procedures used for inspections consistent with IWL-2523.2. The acceptance criteria will consist of each wire being free of any active corrosion, including general and pitting corrosion. In the event that the acceptance criteria are not met and corrosion is identified, the condition will be entered into the corrective action program. The condition will be evaluated to characterize the corrosion, determine the cause of the corrosion, the location, depth, extent of the condition, and applicability of the condition to other wires that comprise that tendon. Corrective actions may include activities such as grease analysis, replacement of grease within the tendon duct, additional wire inspections from the same tendon, evaluation of the***

tendon capacity, potential replacement of the tendon, and augmented inspections and grease sampling of other leading indicator tendons, based, in part, on previous evidence of free water, observed grease leakage, grease discoloration, and grease chemistry results. Specific corrective actions will depend upon the cause, extent of condition, and grease properties. These corrective actions will be consistent with those actions which would be evaluated during periodic required IWL examinations (Braidwood only).

3. In order to monitor for tendon exposure to free water and moisture and manage any potential adverse effects, a periodic tendon water monitoring and grease sampling program will be implemented (Braidwood only). The program will consist of:

    a. A baseline inspection of tendon grease caps at the bottom of all vertical and dome tendons, as well as all below-grade horizontal tendons, prior to the period of extended operation. The baseline inspection will check for evidence of free water and grease discoloration, with further actions taken based on the condition of the grease.

    b. A follow-up tendon grease cap inspection of all vertical and dome tendons, as well as all below-grade horizontal tendons, will be performed within 10 years of the initial inspection, using the same approach as the baseline inspection.

    c. For those tendons where free water, moisture, and grease did not meet acceptance criteria during the two (2) previous inspections, periodic monitoring of grease chemistry and moisture, free water, and grease discoloration will be performed on a frequency not to exceed 10 years. ***Tendons, which exhibit significant quantities of free water (e.g., more than eight ounces***) ***during periodic monitoring, will be inspected more often, with the timing of follow-up inspections increased until a frequency is achieved that no longer results in significant amounts of free water observed during successive inspections. Tendon water inspection and draining frequencies may vary from annual to every ten (10) years, depending upon grease chemistry and moisture parameters meeting IWL acceptance criteria***. ***The maximum ten (10) year periodic frequency is meant to address any tendons which exhibit evidence of free water but the quantity is observed to be insignificant, with no observable grease discoloration, and given that the tendon wasn't inspected for at least ten (10) years prior. More frequent follow-up inspections will be performed for tendons which exhibit insignificant quantities of free water, but were inspected within the ten (10) years prior. In all cases, the frequency of inspections for water in individual tendons will be adjusted to be commensurate with the severity of the conditions found during each examination.***

d. Braidwood has performed augmented inspections on additional tendons beyond those selected for the ASME Section XI, Subsection IWL program. The Braidwood augmented inspections are performed on a 5 year frequency, in conjunction with the ASME Section XI, Subsection IWL aging management program. The current augmented examinations of additional tendons will continue until the periodic tendon water monitoring and grease sampling program described above is implemented.

Corrective actions will be taken as necessary to ensure that the tendon grease meets ASME Section XI, Subsection IWL requirements.

4. Explicitly require that areas of concrete deterioration and distress be recorded in accordance with the guidance provided in ACI 349.3R.

5. Include quantitative acceptance criteria, based on the "Evaluation Criteria" provided in Chapter 5 of ACI 349.3R, that will be used to augment the qualitative assessment of the Responsible Engineer.

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

As a result of the update to the response to RAI B.2.1.30-3, described in Enclosure A of this letter, LRA Appendix B, Section B.2.1.30, pages B-195 and B-196, is revised as shown below to add detail to Enhancement 2 and Enhancement 3. Changes are highlighted with ***bolded italics*** for inserted text.

Enhancements

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

1. Include additional augmented examination requirements after post-tensioning system repair/replacement activities in accordance with Table IWL-2521-2. **Program Element Affected: Parameters Monitored / Inspected (Element 3**)

2. A one-time inspection of one (1) vertical and one (1) horizontal tendon on each unit will be performed prior to the period of extended operation. The inspection will consist of visually examining one (1) wire from each of the two (2) types of tendons at a worst-case location based on evidence of free water, grease discoloration, and grease chemistry results. This location will serve as a leading indicator for potential degradation or tendon surface corrosion***. The visual inspection of these wires will be performed in accordance with existing station procedures used for inspections consistent with IWL-2523.2. The acceptance criteria will consist of each wire being free of any active corrosion, including general and pitting corrosion. In the event that the acceptance criteria are not met and corrosion is identified, the condition will be entered into the corrective action program. The condition will be evaluated to characterize the corrosion, determine the cause of the corrosion, the location, depth, extent of the condition, and applicability of the condition to other wires that comprise that tendon. Corrective actions may include activities such as grease analysis, replacement of grease within the tendon duct, additional wire inspections from the same tendon, evaluation of the tendon capacity, potential replacement of the tendon, and augmented inspections and grease sampling of other leading indicator tendons, based, in part, on previous evidence of free water, observed grease leakage, grease discoloration, and grease chemistry results. Specific corrective actions will depend upon the cause, extent of condition, and grease properties. These corrective actions will be consistent with those actions which would be evaluated during periodic required IWL examinations*** (Braidwood only). **Program Element Affected: Parameters Monitored / Inspected (Element 3), Program Element Affected: Detection of Aging Effects (Element 4)**

3. In order to monitor for tendon exposure to free water and moisture and manage any potential adverse effects, a periodic tendon water monitoring and grease sampling program will be implemented (Braidwood only). The program will consist of:

    a. A baseline inspection of tendon grease caps at the bottom of all vertical and dome tendons, as well as all below-grade horizontal tendons, prior to the period of extended operation. The baseline inspection will check for evidence of free water and grease discoloration, with further actions taken based on the condition of the grease.

    b. A follow-up tendon grease cap inspection of all vertical and dome tendons, as well as all below-grade horizontal tendons, will be performed within 10 years of the initial inspection, using the same approach as the baseline inspection.

    c. For those tendons where free water, moisture, and grease did not meet acceptance criteria during the two (2) previous inspections, periodic monitoring of grease chemistry and moisture, free water, and grease discoloration will be performed on a frequency not to exceed 10 years. ***Tendons, which exhibit significant quantities of free water (e.g., more than eight ounces***) ***during periodic monitoring, will be inspected more often, with the timing of follow-up inspections increased until a frequency is achieved that no longer results in significant amounts of free water observed during successive inspections. Tendon water inspection and draining frequencies may vary from annual to every ten (10) years, depending upon grease chemistry and moisture parameters meeting IWL acceptance criteria***. ***The maximum ten (10) year periodic frequency is meant to address any tendons which exhibit evidence of free water but the quantity is observed to be insignificant, with no observable grease discoloration, and given that the tendon wasn't inspected for at least ten (10) years prior. More frequent follow-up inspections will be performed for tendons which exhibit insignificant quantities of free water, but were inspected within the ten (10) years prior. In all cases, the frequency of inspections for water in individual tendons will be adjusted to be commensurate with the severity of the conditions found during each examination.***

    d. Braidwood has performed augmented inspections on additional tendons beyond those selected for the ASME Section XI, Subsection IWL program. The Braidwood augmented inspections are performed on a 5 year frequency, in conjunction with the ASME Section XI, Subsection IWL aging management program. The current augmented examinations of additional tendons will continue until the periodic tendon water monitoring and grease sampling program described above is implemented.

Corrective actions will be taken as necessary to ensure that the tendon grease meets ASME Section XI, Subsection IWL requirements. **Program Element Affected: Preventive Actions (Element 2), Program Element Affected: Parameters Monitored /Inspected (Element 3), Program Element Affected: Detection of Aging Effects (Element 4), Program Element Affected: Monitoring and Trending (Element 5), Program Element Affected: Corrective Actions (Element 7)**

4. Explicitly require that areas of concrete deterioration and distress be recorded in accordance with the guidance provided in ACI 349.3R. **Program Element Affected: Acceptance Criteria (Element 6)**

5. Include quantitative acceptance criteria, based on the "Evaluation Criteria" provided in Chapter 5 of ACI 349.3R, that will be used to augment the qualitative assessment of the Responsible Engineer. **Program Element Affected: Acceptance Criteria (Element 6)**

Enclosure C

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

This Enclosure identifies new or revised 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 License Renewal Commitment List are as a result of the updates to the Exelon responses to the following RAIs:

RAI B.2.1.29-1
RAI B.2.1.30-3

Notes:

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

As a result of the update to the response to RAI B.2.1.29-1 provided in Enclosure A of this letter, LRA Table A.5, Item 29, page A-82, is revised as shown below to add Enhancement 2. Additions are indicated with ***bolded italics***.

A.5 License Renewal Commitment List

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
29	ASME Section XI, Subsection IWE	ASME Section XI, Subsection IWE is an existing program that will be enhanced to: 1. Provide guidance for specification of bolting material, lubricant and sealants, and installation torque or tension to prevent or mitigate degradation and failure of structural bolting. ***2. Use the condition of the embedded reinforcing steel at the inner surface of the tendon tunnel as a representative indicator for the potential for corrosion at the exterior surface of the containment liner plate. Use the results of Structures Monitoring (B.2.1.34) aging management program, Enhancement 16 activities and results from ongoing examinations of the tendon tunnel performed as part of the ASME Section XI, Subsection IWL (B.2.1.30) and Structures Monitoring (B.2.1.34) aging management programs to identify changing conditions. Changing conditions consisting of the identification of significant corrosion of embedded steel in the tendon tunnel structure require an evaluation to determine if augmented examinations in accordance with requirements of IWE-1240 "Surface Areas Requiring Augmented Examination" are required due to the potential for accelerated corrosion at the exterior surface of the containment liner plate.***	Program to be enhanced prior to the period of extended operation.	Section A.2.1.29 ***Exelon Letter RS-14-183 7/8/2014*** ***Updated response to RAI B.2.1.29-1***

As a result of the update to the response to RAI B.2.1.30-3 provided in Enclosure A of this letter, LRA Table A.5, Item 30, pages A-82 through A-84, is revised as shown below to add detail to Enhancement 2 and Enhancement 3. Additions are indicated with ***bolded italics***.

A.5 License Renewal Commitment List

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
30	ASME Section XI, Subsection IWL	ASME Section XI, Subsection IWL is an existing program that will be enhanced to: 1. Include additional augmented examination requirements after post-tensioning system repair/replacement activities in accordance with Table IWL-2521-2. 2. A one-time inspection of one (1) vertical and one (1) horizontal tendon on each unit will be performed prior to the period of extended operation. The inspection will consist of visually examining one (1) wire from each of the two (2) types of tendons at a worst-case location based on evidence of free water, grease discoloration, and grease chemistry results. This location will serve as a leading indicator for potential degradation or tendon surface corrosion***. The visual inspection of these wires will be performed in accordance with existing station procedures used for inspections consistent with IWL-2523.2. The acceptance criteria will consist of each wire being free of any active corrosion, including general and pitting corrosion. In the event that the acceptance criteria are not met and corrosion is identified, the condition will be entered into the corrective action program. The condition will be evaluated to characterize the corrosion, determine the cause of the corrosion, the location, depth, extent of the condition, and applicability of the condition to other wires that comprise that tendon. Corrective actions may include activities such as grease analysis, replacement of grease within the tendon duct, additional wire inspections from the same tendon,***	Program to be enhanced prior to the period of extended operation.	Section A.2.1.30 ***Exelon Letter RS-14-183 7/8/2014*** ***Updated response to RAI B.2.1.30-3***

		evaluation of the tendon capacity, potential replacement of the tendon, and augmented inspections and grease sampling of other leading indicator tendons, based, in part, on previous evidence of free water, observed grease leakage, grease discoloration, and grease chemistry results. Specific corrective actions will depend upon the cause, extent of condition, and grease properties. These corrective actions will be consistent with those actions which would be evaluated during periodic required IWL examinations (Braidwood only) Note 3. 3. In order to monitor for tendon exposure to free water and moisture and manage any potential adverse effects, a periodic tendon water monitoring and grease sampling program will be implemented (Braidwood only) Note 3. The program will consist of: a. A baseline inspection of tendon grease caps at the bottom of all vertical and dome tendons, as well as all below-grade horizontal tendons, prior to the period of extended operation. The baseline inspection will check for evidence of free water and grease discoloration, with further actions taken based on the condition of the grease. b. A follow-up tendon grease cap inspection of all vertical and dome tendons, as well as all below-grade horizontal tendons, will be performed within 10 years of the initial inspection, using the same approach as the baseline inspection. c. For those tendons where free water, moisture, and grease did not meet acceptance criteria during the two (2) previous inspections, periodic monitoring of grease chemistry and moisture, free water, and grease discoloration will be performed on a frequency not to exceed 10 years. ***Tendons, which exhibit significant quantities of free water (e.g., more than eight ounces*** ***during periodic monitoring, will be inspected more often, with the timing of follow-up inspections increased until a frequency is achieved that no longer results in significant amounts of free water observed during successive inspections. Tendon water inspection and draining frequencies may vary from annual to every ten (10) years, depending upon grease chemistry and moisture parameters meeting IWL***		

		acceptance criteria**. **The maximum ten (10) year periodic frequency is meant to address any tendons which exhibit evidence of free water but the quantity is observed to be insignificant, with no observable grease discoloration, and given that the tendon wasn't inspected for at least ten (10) years prior. More frequent follow-up inspections will be performed for tendons which exhibit insignificant quantities of free water, but were inspected within the ten (10) years prior. In all cases, the frequency of inspections for water in individual tendons will be adjusted to be commensurate with the severity of the conditions found during each examination. ***d. Braidwood has performed augmented inspections on additional tendons beyond those selected for the ASME Section XI, Subsection IWL program. The Braidwood augmented inspections are performed on a 5 year frequency, in conjunction with the ASME Section XI, Subsection IWL aging management program. The current augmented examinations of additional tendons will continue until the periodic tendon water monitoring and grease sampling program described above is implemented.*** Corrective actions will be taken as necessary to ensure that the tendon grease meets ASME Section XI, Subsection IWL requirements 4. Explicitly require that areas of concrete deterioration and distress be recorded in accordance with the guidance provided in ACI 349.3R. 5. Include quantitative acceptance criteria, based on the "Evaluation Criteria" provided in Chapter 5 of ACI 349.3R, that will be used to augment the qualitative assessment of the Responsible Engineer.		