UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
2443 WARRENVILLE RD. SUITE 210
LISLE, IL 60532-4352

November 7, 2014

Mr. Michael J. Pacilio
Senior VP, Exelon Generation Co., LLC
President and CNO, Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BYRON STATION, UNITS 1 AND 2 – NRC LICENSE RENEWAL SCOPING, SCREENING, AND AGING MANAGEMENT INSPECTION REPORT 05000454/2014008; 05000455/2014008

Dear Mr. Pacilio:

On November 5, 2014, the U.S. Nuclear Regulatory Commission (NRC) completed a License Renewal inspection at your Byron Station, Units 1 and 2. The enclosed report documents the inspection results, which were discussed on November 5, 2014, with members of your staff.

The purpose of this inspection was to examine activities that support the license renewal application for Byron Station, Units 1 and 2. The inspection addressed the processes of scoping and screening plant equipment to select equipment subject to an aging management review, and development and implementation of aging management programs to support a period of extended operation. As part of the inspection, the NRC examined procedures and representative records, interviewed personnel, and visually examined accessible portions of various systems, structures, or components, to verify license renewal boundaries, and to observe any equipment aging effects.

The team concluded that the scoping, screening, and existing aging management license renewal activities, were generally conducted as described in the Byron Station, Units 1 and 2, license renewal application and, as supplemented through your responses to requests for additional information from the NRC. The team also concluded that documentation supporting the application was generally in an auditable and retrievable form. In addition, the team concluded the implementation of the proposed aging management programs, as described in the License Renewal Application with the proposed enhancements and, as supplemented through your responses to NRC requests for additional information and inspection observations, should provide reasonable assurance that the intended functions of vital plant systems, structures, and components will be maintained through the period of extended operation.

In accordance with Title 10, *Code of Federal Regulations* (CFR), Section 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any), will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records System (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Ann Marie Stone, Chief
Engineering Branch 2
Division of Reactor Safety

Docket Nos. 50-454; 50-455
License Nos. NPF-37; NPF-66

Enclosure:
Inspection Report 05000454/2014008;
05000455/2014008
w/Attachments: Supplemental Information
and Exit Meeting Presentation Slides

cc w/encl: Distribution via LISTSERV®

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-454; 50-455
License Nos:	NPF-37; NPF-66
Report No:	05000454/2014008; 05000455/2014008
Licensee:	Exelon Generation Company, LLC
Facility:	Byron Station, Units 1 and 2
Location:	Byron, IL
Dates:	August 4 through November 5, 2014
Inspectors:	M. Holmberg, Reactor Inspector (Lead) J. Corujo-Sandin, Reactor Inspector N. Féliz-Adorno, Reactor Inspector I. Hafeez, Reactor Inspector M. Jones, Reactor Inspector J. Neurauter, Reactor Inspector
Approved by:	Ann Marie Stone, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

TABLE OF CONTENTS

SUMMARY OF FINDINGS

Inspection Report (IR) 05000454/2014008; 05000455/2014008; 08/04/2014 – 11/05/2014; Byron Station, Units 1 and 2; License Renewal Inspection

This inspection of the applicant's license renewal scoping, screening, and aging management processes was performed by six inspectors based in the Region III office. The team applied NRC Manual Chapter 2516 and NRC Inspection Procedure 71002 as guidance for performing this inspection. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated July 9, 2013. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process" Revision 5, dated February 2014. No findings as defined in NRC Manual Chapter 0612 were identified.

A. NRC-Identified and Self-Revealing Findings

No findings of significance were identified

B. Licensee-Identified Violations

No violations of significance were identified.

REPORT DETAILS

1. INSPECTION SCOPE

This inspection was conducted by NRC Region III inspectors. The inspection was performed in accordance with NRC Manual Chapter 2516 and NRC Inspection Procedure (IP) 71002, "License Renewal Inspection," dated November 23, 2011.

This inspection looked at both the applicant's scoping and screening methodology and aging management programs, as described in the applicant's license renewal application (LRA) titled "Application for Renewed Operating Licenses," dated May 29, 2013, (ADAMS Accession No. ML13155A387), and as revised in subsequent applicant's correspondences to the NRC.

The team also reviewed four of the five regulated events specified for inclusion in 10 CFR 54.4(a)(3) including, Environmental Qualification (EQ), Pressurized Thermal Shock (PTS), Station Blackout (SBO), and Anticipated Transient Without Scram (ATWS). The team reviewed license renewal (LR) boundary drawings, the LRA, scoping and screening reports, and the Updated Final Safety Analysis Report (UFSAR). Based on the reviewed documentation, the team concluded the applicant had performed scoping and screening for the regulated events in accordance with the methodology described in the LRA and the rule.

The Attachments to this report list the documents reviewed, and the acronyms used.

2. VISUAL OBSERVATION OF PLANT EQUIPMENT

During this inspection, the team performed walkdowns of portions of plant systems, structures, and components (SSCs). These walkdowns were intended to determine the acceptability of the scope boundaries, to observe the current condition of the SSCs, and to assess the likelihood that a proposed Aging Management Program (AMP) would successfully manage the associated aging effects. Specifically, the team conducted walkdowns of accessible portions of:

- Unit 1 Residual Heat Removal (RHR) System Train-A (Auxiliary Building);
- Unit 2 RHR System Train-A (Auxiliary Building);
- Station Compressed Air System;
- Unit 1A Fuel Oil Diesel Storage Tank;
- 0B Essential Service Water Make-up Pump;
- Unit 1A Emergency Diesel Generator Fuel Oil System;
- River Screen House Carbon Dioxide Fire Suppression System;
- 345 kilo-volt (kV) Switchyard and Relay House;
- Unit 1 Emergency Diesel Generator (EDG) and Engineered Safety Features (ESF) Switchgear Room;

- Auxiliary Building Cable Spreading Rooms;
- Auxiliary Building fire protection headers and discharge nozzles, Halon tanks, and carbon dioxide tanks;
- River Screen House E5 Program Fuse Panel;
- Unit 1 ATWS panel;
- B Level Storage Building;
- Unit 2 Feedwater pumps and piping flange pressure retaining bolting;
- Unit 2 Turbine Building overhead crane;
- Unit 2: Three Chemical Volume and Control piping snubber component supports, verification of one snubber setting;
- Unit 2 Main Steam Isolation Valve Room;
- Unit 2 Auxiliary Building: bolting and fasteners in Zone 3 electrical penetration area and Elevation 426 general area for cable tray, conduit, and ventilation duct splices, component supports, baseplates, structural beam connections, and cable tray supports;
- Essential Service Water Cooling Tower (ESCT) structure;
- River Screen House structure and component support bolting;
- Unit 1 and Unit 2 safety-related service water piping system at the cooling towers;
- Unit 1 and Unit 2 non-safety-related raw water systems;
- Unit 1 and Unit 2 river water pumps;
- Unit 1 and Unit 2 safety-related service water components located at the service water pump room including strainers, pumps, and piping components;
- Unit 1 and Unit 2 air compressors and dryers;
- Unit 1 and Unit 2 fire water system; and
- Spent fuel pool.

3. REVIEW OF SCOPING AND SCREENING METHODOLOGY

In order to assess the applicant's scoping and screening methodology, the team reviewed a sample of non-safety-related SSCs that the applicant determined were not within the scope of LR in accordance with 10 CFR 54.4(a)(2). Specifically, the team reviewed applicable documents, interviewed applicant staff, and conducted walkdowns of the following sample of SSCs:

.1 Main Condenser and Air Removal System

The main condenser condenses the exhaust from the main turbine and feedwater pump turbines. The condenser is equipped with jet air ejectors that utilize condensate to liquefy entrained vapor. In addition, the condenser uses a mechanical vacuum pump for initial evacuation during startup. The applicant excluded the main condenser and air removal system from the scope of LR because it did not perform a safety-related function, was not required for a regulated event, and did not potentially impact the safety function of another system.

The team reviewed the LR boundary drawings, the application, scoping and screening reports, and the UFSAR. In addition, the team interviewed personnel responsible for the system and conducted a walkdown of accessible portions of the main condenser and air removal system. Based on the reviewed portions of the system, the team concluded the applicant had performed scoping and screening for the main condenser and air removal system in accordance with the methodology described in the LRA and the rule.

.2 Miscellaneous Instrumentation Systems

The team conducted a walkdown for portions of the Unit 1 miscellaneous instrumentation systems. Specifically, the team observed the control panels for the digital electro-hydraulic control system in the located in the control room and the auxiliary electrical equipment room.

The team concluded the applicant had performed scoping and screening for the miscellaneous instrumentation systems in accordance with the methodology described in the LRA and the rule.

.3 Miscellaneous Not In-Scope Structures

The miscellaneous not-in scope structures are non-safety-related and provide support, shelter, and protection for non-safety-related SSCs that do not perform an intended function for LR. These non-safety-related structures are also separated from safety-related SSCs such that their failure would not impact a safety-related function. The applicant excluded the miscellaneous not-in scope structures from the scope of LR because it did not perform a safety-related function, was not required for a regulated event, and did not potentially impact the safety function of another SSC.

The team reviewed the LR boundary drawings, the application, and the UFSAR and interviewed responsible applicant staff. In addition, the team walked down accessible portions of the B Level Storage Building to verify that a failure of the structures would not potentially impact the safety function of another SSC. Based on the portions of structures reviewed, the team concluded the applicant had performed scoping and screening for the miscellaneous not-in scope structures in accordance with the methodology described in the LRA and the rule.

.4 Radwaste Storage System

The Radwaste System is a normally operating, mechanical system designed to collect, process, and prepare radioactive liquid, gaseous, and solid wastes for disposal or release. Not included in the scope of license renewal are liquid and gas filled portions of the volume reduction system, the solid rad-waste disposal system, the acid feed and handling system, and the caustic handling system located within the Turbine Building Complex or the Radwaste and Service Building Complex, as these portions of the system are not located within an area in proximity of components performing a safety-related function. The applicant excluded these portions of the Radwaste System from the scope of LR because they did not perform a safety-related function, was not required for a regulated event, and did not potentially impact the safety function of another system.

The team reviewed scoping and screening documents, system drawings, and interviewed responsible applicant staff. The team reviewed documentation associated with the inspection of fire dampers for the U-1 remote shutdown room and Boron Recycle room. The team conducted a walkdown of the remote shut down panels and Radwaste control panel area for the Unit 1 and Unit 2 Radwaste Storage System. Based on the portions of systems reviewed, the team concluded the applicant had performed scoping and screening for the not-in scope portions of the Radwaste System in accordance with the methodology described in the LRA and the rule.

4. REVIEW OF AGING MANAGEMENT PROGRAMS

The team assessed the adequacy of current implementation of existing AMPs credited in the applicant's LRA. This included verification the current AMPs would ensure aging effects would be managed so that there was reasonable assurance an SSC's intended function would be maintained throughout the period of extended operation. For those programs indicated by the applicant as being consistent with NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," the team confirmed the applicant's program included the GALL attributes. For those programs which the applicant indicated were new or being enhanced, the team confirmed commitments existed and were sufficient to support future implementation. For those programs where the applicant indicated they intended to take exception to the GALL, the team reviewed the exceptions against the GALL recommendations and evaluated the acceptability of the applicant's proposal.

The team also conducted walkdowns of selected in-scope SSCs to assess how plant equipment was being maintained under the current operating license and to visually observe examples of non-safety-related equipment determined to be in-scope due to their proximity to safety-related equipment and their potential for failure due to aging effects.

.1 American Society of Mechanical Engineers (ASME) Section XI In-Service Inspection (ISI), Sub-Sections IWB, IWC, IWD Program (B.2.1.1)

The ASME Section XI ISI, Sub-Sections IWB, IWC, and IWD AMP is an existing program intended to manage the aging effects of cracking, loss of fracture toughness, and loss of material in Class 1, 2, and 3 piping and components exposed to air with borated water leakage, reactor coolant, reactor coolant and neutron flux, treated borated water, steam, and treated water environments. This program relies on periodic visual, surface, and volumetric examination, and leakage testing of Class 1, 2, and 3 pressure-retaining components

including welds, pump casings, valve bodies, integral attachments, and pressure-retaining bolting. These activities are implemented in accordance with the requirements identified in the ASME Code Section XI, Subsections IWB, IWC, and IWD.

This existing program will include an enhancement to perform a visual inspection of the accessible portions of the ASME Class 2 reactor vessel flange leakage monitoring tube every other refueling outage. This program, with the enhancement, is intended to be consistent with Revision 2 of NUREG 1801, Section XI.M1, "ASME Section XI ISI, Sub-Sections IWB, IWC, and IWD," without exceptions. In addition, the LRA Program description was revised to identify additional components subject to examination under this program in applicant's letter to the NRC titled "Responses to NRC Requests for Additional Information, Set 29, dated June 4, 2014, related to the Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2, License Renewal Application," dated June 18, 2014, (ADAMS Accession No. ML14169A026). Specifically, the applicant stated the control rod drive mechanism thermal sleeves are examined under an augmented Inservice Inspection (ISI) Program, which relies on ultrasonic testing five thermal sleeves with the worst visual wear found to date. The plan is to obtain measured wear data points at the five designated thermal sleeve locations during three different outages. The frequency for inspection of the reactor vessel head thermal sleeve for loss of material due to wear will be re-evaluated after the accumulation of the three data points on each of the five designated thermal sleeves. The three series of examinations will be performed prior to the period of extended operation. Subsequently, the required frequency for further inspections, if required, will be determined using the guidance provided in WCAP-16911-P, "Reactor Vessel Head Thermal Sleeve Wear Evaluation for Westinghouse Domestic Plants."

The team reviewed the LR program basis documentation, responses to NRC requests for additional information (RAIs), implementing procedures, ISI Program plans, NRC ISI baseline inspection reports, completed ISI records, LR boundary drawings for the residual heat removal system, ISI Program health reports, and the LRA. The team also interviewed the responsible applicant staff and performed walkdowns of the Units 1A and 2A residual heat removal piping system at the Auxiliary Building. As a result of this review, the team identified the following observations:

- The program description contained in Appendix A, "Updated Final Safety Analysis Report Supplement," and Appendix B, "Aging Management Programs," of the LRA was not bounding. Specifically, the AMP description did not include existing inspections of small bore lines subject to thermal fatigue as described in MRP-146 "Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines." The applicant captured this observation as License Renewal Change Request (LRCR) Region-11 to revise the program description in LRA Appendices A and B to include this additional inspection activity.

- The program description contained in Appendix B did not identify this AMP will use 10 CFR 50.55a to impose additional limitations, modifications, and augmentations of ISI requirements beyond those stated in ASME Code, Section XI. The applicant captured this observation as LRCR Region-3 to revise the LRA Program description.

The applicant incorporated these changes into the LRA in letter to the NRC titled "Response to NRC Request for Additional Information, Set 38, dated August 4, 2014; LRA changes from NRR Staff Feedback on July 30, 2014 telecon; and, LRA changes from NRC Region III IP 71002 Inspection, related to the Byron Station, Units 1 and 2, and Braidwood Station,

Units 1 and 2, License Renewal Application," dated August 29, 2014 (ADAMS Accession No. ML14241A527).

The team concluded the implementation of the ASME Section XI ISI, Sub-Sections IWB, IWC, and IWD AMP, as described in the LRA with the proposed enhancement and LRCR Region-11 and Region-3 changes should provide reasonable assurance the aging effects will be managed, consistent with the license basis, for the period of extended operation.

.2 Reactor Head Closure Stud Bolting Program (B2.1.3)

The Reactor Head Closure Stud Bolting Program is an existing program intended to manage the effects of material loss and cracking to the reactor head closure studs and associated reactor pressure vessel head flange threads, nuts, and washers exposed to air in a borated water leakage environment. This program is based on the examination and inspection requirements specified in ASME Code, Section XI, Subsection IWB, Table IWB 2500 1. In addition, it is based on the preventive measures described in NRC NUREG 1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure of Nuclear Power Plants," and NRC Regulatory Guide (RG) 1.65, “Materials and Inspection for Reactor Vessel Closure Studs.”

The team reviewed the LR Program basis documentation, aging management review documents, and responses to RAIs, implementing procedures, completed ISI records, certified material test reports, and the LRA. The team also interviewed the responsible applicant staff. The team confirmed through review of the Certified Material Test Reports that the recorded stud material yield strength was less than 170 ksi. Further, the team reviewed completed ISI records to confirm no indications of SCC had been identified in the closure studs. The team was unable to observe the condition of reactor head closure stud bolting because they were inaccessible at the time of this inspection.

This program will include an enhancement to be consistent with Revision 2 of NUREG 1801, Section XI.M3, “Reactor Head Closure Stud Bolting,” with one exception as described in the LRA. Specifically, the Preventive Action Element of Revision 2 of NUREG 1801, Section XI.M3, stated that using bolting material for closure studs with actual measured yield strength less than 150 kilo-pounds per square inch (ksi) can reduce the potential for stress corrosion cracking (SCC) and intergranular SCC. The LRA includes a justification for taking exception to this preventive measure since site documentation indicated that some reactor head closure studs installed prior to commercial operation or used as replacements may have actual measured yield strength slightly greater than 150 ksi. This program will also be enhanced to revise the procurement requirements for reactor head closure stud material to assure the maximum yield strength of replacement material is consistent with this preventive measure.

In addition, the LRA Program description was revised to address the out-of-service Unit 2 reactor vessel flange stud at location 11 in applicant’s letter to the NRC titled “Updated Response to two NRC Requests for Additional Information from Set 1, dated October 7, 2013, related to the Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2, License Renewal Application,” dated December 19, 2013, (ADAMS Accession No. ML13354B749). In this letter, the applicant committed to repair the stud no later than six months prior to the period of extended operation, so that all 54 reactor head closure studs will be tensioned during the period of extended operation.

The team concluded the implementation of the Reactor Head Closure Stud Bolting Program, as described in the LRA with the proposed enhancement, should provide reasonable assurance the aging effects will be managed for the period of extended operation, consistent with the license basis.

.3 Boric Acid Corrosion Program (B2.1.4)

The Boric Acid Corrosion Program is an existing program that manages the aging effects loss of material on piping, piping components, and piping elements, heat exchangers, ducting and components, containment liners, penetration bellows and sleeves, bolting, cabinets and enclosures, miscellaneous steel, and other structural components. The program also manages increased resistance of connection/corrosion of connector contact surfaces on connector contacts for electrical connectors. The program consists of visual examinations of external surfaces that are potentially exposed to borated water leakage and if leakage is identified, the source and the adjacent components in the leakage pathway are evaluated to assess the damage. The program is consistent with AMP XI.M10, "Boric Acid Corrosion," without exceptions, as described in Revision 2 of NUREG-1801.

The team's review of scope for this AMP included the AMP basis document, implementing procedures, UFSAR changes proposed for the AMP, NRC inspection reports, completed ISI records, Boric Acid Program Health Reports and discussions of the AMP with the responsible applicant and site staff.

The RHR system is a safety-related system with degradation that is managed by several AMPs including the Boric Acid Corrosion Program. The team conducted walkdowns of the exterior of the A-train RHR piping system components within the auxiliary building for both Units to visually observe the material condition. No boric acid leakage was identified and no abnormal or degraded conditions were noted on the external portions of the piping system components observed. Additionally, the team reviewed the results of corrective actions taken in response to boric acid accumulations identified on RHR system components during the periodic ASME Code Section XI pressure tests conducted on A-train of the RHR system for each unit. The corrective actions were consistent with the program requirements and no pressure boundary degradation occurred as a result of boric acid leakage. Based upon these reviews, the team concluded that the material condition of the RHR system was good and no issues were identified which would indicate the Boric Acid Corrosion Program was less than fully effective for managing the aging effects applicable to this system.

Based upon the reviews completed, the team concluded the implementation of the Boric Acid Corrosion Program should provide reasonable assurance the aging effects will be managed, consistent with the license basis for the period of extended operation.

.4 Pressurized Water Reactor Vessel Internals Program (B2.1.7)

The Pressurized Water Reactor (PWR) Vessel Internals Program is a new program that implements the guidance of Electric Power Research Institute (EPRI) 1022863 (MRP-227-A), "PWR Internals Inspection and Evaluation Guideline" and EPRI 1016609 (MRP-228), "Inspection Standard for PWR Internals" to manage the aging effects of reactor vessel internal (RVI) components. The program is designed to manage the degradation for aging effects applicable to PWR RVI components in a reactor coolant with neutron flux environment. The monitoring methods are intended to detect aging effects and the frequency of monitoring is intended to prevent significant age-related degradation prior to the loss of the intended function. These aging effects include (1) various forms of cracking;

(2) loss of material induced by wear; (3) loss of fracture toughness due to neutron irradiation embrittlement; (4) changes in dimension due to void swelling and irradiation growth; and (5) loss of preload due to thermal and irradiation enhanced stress relaxation or creep. The applicant identified the RVI components were not made of susceptible cast austenitic stainless steel, martensitic stainless steel, or precipitation-hardened stainless steel, therefore, the aging effect of loss of fracture toughness due to thermal aging did not apply. The applicant identified the PWR Vessel Internals Program will be consistent with AMP XI.M16A, "PWR Vessel Internals," as described in NUREG-1801 with one exception. The applicant took exception to the AMP XI.M16A AMP because the PWR Vessel Internals Program will be modified to be consistent with the March 20, 2012, draft of the NRC document LR-ISG-2011-04, "Updated Aging Management Criteria for RVI Components for PWRs." In LR-ISG-2011-04, the NRC provided updates to the NUREG-1801, Revision 2 to ensure consistency with MRP-227-A for the aging management of age-related degradation for PWR RVI components. The applicant's justification for this exception was that the PWR Vessel Internals Program is based on the latest guidance issued by the NRC.

The team's review of scope for this AMP included the AMP basis document, applicable NRC RAIs, implementing procedures (included procedures with proposed evaluation and acceptance criteria), UFSAR changes proposed for the AMP, Reactor Internals Program Inspection Plans, and discussions of the AMP with the responsible applicant and site staff.

The Byron Units were operating during this inspection period which precluded observation of physical condition of RVI components. Instead, the team reviewed recent material improvements completed for RVI components. Specifically, the team reviewed a 2007 completed work order that replaced the Unit 2 control rod drive tube support pins with material less susceptible to SCC which had also been completed for the Unit 1 control rod drive support pins in 2005. The team did not identify any issues with completion of this work activity.

Based upon the reviews completed and the applicant's basis for the NUREG-1801 exception, the team concluded that, if the proposed PWR Vessel Internals Program is developed as planned, there should be reasonable assurance the aging effects will be adequately managed consistent with the licensing basis, for the period of extended operation.

.5 Flow-Accelerated Corrosion Program (B2.1.8)

The Flow-Accelerated Corrosion (FAC) Program is an existing program based on implementation of the EPRI guideline NSAC- 202L-R3, "Recommendations for an Effective Flow Accelerated Corrosion Program." The FAC Program provides guidance for prediction, detection, and monitoring wall thinning in piping, piping components, and piping elements, and heat exchangers due to FAC in closed cycle cooling water, treated water, and steam environments. Program activities include analyses to determine critical locations, baseline inspections to determine the extent of wall thinning at these critical locations, and follow-up inspections to confirm or quantify the predictions, and take long term corrective actions. Repairs and replacements are performed as necessary. FAC examinations are performed using ultrasonic, visual, or other approved testing techniques capable of detecting wall thinning. Where applicable, analysis to determine critical locations in piping and other components susceptible to FAC are performed utilizing CHECWORKS, which is a predictive computer program model based on the guidance identified in NSAC-202L-R3. In-field wall thickness measurement are used to confirm the predicted wear rate developed in the CHECWORKS model and this model is updated to reflect significant changes in plant

operating parameters such as power uprate. In response to RAI B.2.1.8-1 (documented in Letter RS-14-143, dated May 15, 2014; ADAMS No. ML14135A179), the applicant stated the FAC Program also manages wall thinning caused by mechanisms other than FAC, such as cavitation, flashing, droplet impingement, and solid particle impingement, in situations where periodic monitoring is used in lieu of eliminating the cause of various erosion mechanisms. The FAC Program will be consistent with the AMP XI.M17, "Flow-Accelerated Corrosion," as described in Revision 2 of NUREG-1801 with one enhancement. As documented in the response to RAI B.2.1.8-2 (reference letter RS-14-143, dated May 15, 2014; ADAMS No. ML 14135A179), the applicant stated the FAC Program implementing procedures will be enhanced to require the documentation of the validation and verification of updated vendor supplied FAC program software which calculates component wear, wear rates, remaining life, and next scheduled inspection. The validation and verification process will confirm the updated software performs calculations consistent with NSAC-202L-R3.

The team's review of scope for this AMP included the AMP basis document, applicable NRC RAIs, implementing procedures (included procedures with proposed evaluation and acceptance criteria), UFSAR changes proposed for the AMP, Reactor Internals Program Inspection Plans, and discussions of the AMP with the responsible applicant and site staff.

No FAC examinations were scheduled during the on-site inspection period so the team was unable to observe field activities conducted under this AMP. Instead, the team reviewed documentation from completed FAC examinations, and discussed the inspection results with the responsible site personnel and the applicant's corporate lead for FAC.

Based upon the reviews completed, the team concluded the implementation of the proposed FAC Program should provide reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

.6 Bolting Integrity Program (B2.1.9)

The Bolting Integrity AMP is an existing program intended to manage closure bolting on pressure retaining joints within the scope of LR for loss of preload, cracking, and loss of material due to corrosion. This program credits visual inspection of pressure retaining bolted joints in ASME Class 1, 2, and 3 systems for leakage and age-related degradation during system pressure tests performed in accordance with ASME Section XI. In addition, it credits volumetric, surface, and visual inspections of ASME Class 1, 2, and 3 bolts, nuts, washers, and associated bolting components performed in accordance with ASME Section XI, Subsections IWB, IWC, and IWD. The integrity of non-ASME (non-safety-related) pressure retaining bolted joints (in non-ASME Class 1, 2, 3 and MC systems) is monitored by detection of visible leakage, evidence of past leakage, or other age-related degradation during maintenance activities and walkdowns in plant areas that contain systems within scope of LR.

This existing program will include three enhancements as described in the LRA. These enhancements prohibit the use of lubricants containing molybdenum disulfide on pressure retaining bolted joints, prohibit the use of high strength bolting (actual measured yield strength equal to or greater than 150 ksi) for pressure retaining bolted joints in portions of systems within the scope of this AMP, and perform visual inspection of submerged bolting on fire protection system pumps and well water system deep well pumps when submerged portions of the pumps are overhauled or replaced during maintenance activities. This program, with the enhancements, is intended to be consistent with Revision 2 of NUREG-1801, Section XI.M18, "Bolting Integrity," without exceptions.

The team reviewed LR Program basis documentation, existing procedures, responses to RAIs, visual examination of a sample of in-plant pressure retaining bolting, and the LRA. The team also interviewed responsible applicant staff and walked down a sample of pressure retaining bolting at feedwater pumps and attached feedwater piping for evidence of visible or past leakage or other age-related degradation.

As a result of this review, the team identified the scope of this AMP, as described in the LRA, was incomplete. Specifically, the LRA scope description in Appendices A and B did not include non-pressure retaining bolting associated with the integral reactor vessel head assembly. The applicant captured this observation as LRCR Region-38 and revised the LRA Program description to include this additional component in letter RS-14-293 to the NRC titled "Response to NRC Request for Additional Information, Set 41, dated October 9, 2014; and, LRA changes resulting from NRC Region III IP-71002 Braidwood Inspection, both related to the Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2, License Renewal Application," dated October 16, 2014 (ADAMS Accession No. ML14289A423).

The team concluded the implementation of the Bolting Integrity AMP, as described in the LRA with the proposed enhancements and LRCR Region-38 changes, should provide reasonable assurance the aging effects will be managed, consistent with the license basis, for the period of extended operation.

.7 Steam Generators Program (B2.1.10)

The Steam Generators Program is an existing program that provides for managing aging of the steam generator tubes, plugs, and secondary side components that are contained within the steam generator (i.e., secondary side internals). The program implements Nuclear Energy Institute (NEI) 97-06, "Steam Generator Program Guidelines." Aging is managed through assessment of potential degradation mechanisms, inspections, tube integrity assessments, tube plugging and repairs, primary to secondary leakage monitoring, maintenance of secondary side internal component integrity, primary and secondary side water chemistry, and foreign material exclusion. Station procedural guidance implements the performance criteria for steam generator tube integrity, condition monitoring requirements, inspection scope and frequency, acceptance criteria for the plugging or repair of flawed tubes, acceptable tube repair methods, leakage monitoring requirements, operational leakage and accident induced leakage requirements specified in the Technical Specifications.

The Steam Generators Program is consistent with the AMP XI.M19, "Steam Generators," as described in NUREG-1801 and as modified by LR-ISG-2011-02, "AMP for Steam Generators," with one exception and two enhancements. The NUREG-1801 AMP XI.M19 is based on EPRI 1008219, "Steam Generator Primary-to-Secondary Leakage Guidelines," Revision 3 for monitoring primary-to-secondary leakage, in contrast to the applicant's Steam Generators Program which is based on Revision 4 of EPRI 1008219. Revision 4 of EPRI 1008219 included updates to the technical bases and clarified the monitoring and action-level requirements for implementation. The applicant justified use of Revision 4, as an exception to the XI.M19 AMP, because it provided the latest industry guidance for the monitoring of primary-to-secondary leakage and did not reduce the level of monitoring for leakage. The applicant also identified two program enhancements that will be implemented. For the first enhancement, the existing AMP will be enhanced to validate that primary water stress corrosion cracking (PWSCC) of the divider plate welds to the primary head and tube sheet cladding is not occurring. For the second enhancement applicable to the Byron Unit 1

steam generators, the existing AMP will be enhanced to validate that PWSCC of the tube-to-tube sheet welds is not occurring.

The team's review scope for this AMP included the AMP basis document, applicable NRC RAIs, implementing procedures, UFSAR changes proposed for the AMP, NRC ISI baseline inspection reports, Steam Generator Program Health Reports and discussions of the AMP with the responsible applicant and site staff.

The Byron Units were operating during this inspection which precluded observation of the applicant examinations of the steam generator components managed under this AMP. Instead, the team reviewed material condition of the Byron steam generator components monitored under this AMP as documented in the most recent Steam Generator Degradation Assessments and Steam Generator Condition Monitoring/Operational Assessments completed for each Unit. No issues were identified which would indicate the Steam Generator Program was less than fully effective for managing the aging effects applicable to the components managed within the steam generators.

Based upon the reviews completed, and the applicant's basis for the exception to AMP XI.M19 as described in Revision 2 of NUREG-1801, the team concluded the implementation of the Steam Generators Program with proposed enhancements, should provide reasonable assurance the aging effects will be managed, consistent with the license basis for the period of extended operation.

.8 Open–Cycle Cooling Water System (B2.1.11)

The Open-Cycle Cooling Water System AMP is an existing program intended to manage heat exchangers and piping components in safety-related and non-safety-related systems exposed to a raw water environment for loss of material and reduction of heat transfer. Program activities include tests, inspections, cleaning, and biocide and chemical treatment.

The existing program will include six enhancements as described in the applicant's letter to the NRC titled "Response to NRC Request for Additional Information, Set 28, dated May 29, 2014, related to the Byron Station, Units 1 and 2, and Braidwood Station, Units 1, and 2, License Renewal Application," dated June 30, 2014 (ADAMS Accession No. ML14181B145). These program enhancements are associated with inspections of coatings and non-safety-related service water system piping. This AMP with the enhancements is intended to be consistent with Revision 2 of NUREG-1801, Section XI.M20, "Open-Cycle Cooling Water System," without exceptions. The guidelines of Revision 2 of NUREG-1801, Section X1.M20, are based on the recommendations of the Generic Letter (GL) 89-13, "Service Water System Problems Affecting Safety-Related Equipment."

The team reviewed LR Program basis documentation, Aging Management Program documents, existing procedures, and surveillance results, Corrective Action Program documents, LR boundary drawings and the LRA. The team also interviewed responsible applicant staff and conducted walkdowns of accessible portions of the safety-related and non-safety-related service water system. As a result of this review, the team noted the following observations:

- The program description contained in Appendices A and B of the LRA was not bounding. Specifically, the AMP description was limited to safety-related components within the scope of GL 89-13 and non-safety-related service water piping. However, program basis document BB-PBD-AMP-XI.M20, "Open-Cycle Cooling Water System," and the

associated implementing procedures included existing additional non-safety-related components, such as the deep well pumps and non-safety-related service water heat exchangers. The applicant captured this observation as LRCR Region-20 to revise the program description in LRA Sections A.2.1.11 and B.2.1.11 to include these additional non-safety-related components.

- The leak test methodology of a buried portion of safety-related service water piping used to provide make-up to the cooling towers was non-conservative. Specifically, the team noted leak rate was determined by subtracting the measured flow rate value at the pipe outlet from the predicted flow rate value at the pipe inlet. However, the pipe inlet flow rate value was predicted by measuring the pipe inlet pressure and correlating it to flow rate using the 5 percent degraded pump curve. This method would underestimate the inlet flow rate if actual pump performance was better than 5 percent assumed degradation. Underestimating the inlet flow rate would underestimate the predicted leak rates and, in some cases, result in negative leak rate values. A review of test results found an instance where the leak rate was a negative value and the station determined the acceptance criteria was met because a negative leak rate value is less than the positive leak rate limit value. In addition, the team noted the leak test results significantly varied from test to test. The applicant initiated AR01694494 to evaluate this methodology and implement the necessary corrective actions. In addition, the applicant determined there is reasonable assurance the pipe structural integrity was maintained based on pump in-service test results, visual flow confirmations, and walkdowns of the ground above the buried piping.

- The current procedure guidance for wall loss extent of condition credited in the applicant's response to NRC RAI 3.0.3-2c was revised and the revision was inconsistent with this response. Specifically, the applicant stated an extent of condition is performed if wall loss is greater than 50 percent or if remaining life is less than two years in accordance with the Raw Water Corrosion Program in letter RS-14-003 dated January 13, 2014, (ADAMS Accession No. ML14013A293). This response was based on Revision 5 of Procedure ER-AA-5400-1001, "Raw Water Corrosion Program Guide." However, this procedure was revised twice since the RAI response resulting in the elimination of the remaining life criterion. In addition, Revision 7 of Procedure ER-AA-5400-1001 allowed two years or more to perform an extent of condition under certain circumstances. Thus, this procedure revision allowed extent of conditions to be completed during a time period that exceeded calculated remaining life. Specifically, the extent of condition may not have been performed in time to determine whether similar conditions exist in other trains or nearby areas to prevent failure if the calculated remaining life is less than two years. The applicant captured this observation as LRCR Region-95. At the time of this inspection, LRCR Region-95 planned to evaluate this procedure change and to revise Procedure ER-AA-5400-1001 as necessary.

The team concluded the implementation of the proposed Open-Cycle Cooling Water System AMP, as described in the LRA with the proposed enhancements and LRCR Region-20 changes should provide reasonable assurance the aging effects will be managed for the period of extended operation consistent with the licensing basis.

.9 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program (B2.1.13)

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP is an existing program intended to evaluate the effectiveness of maintenance

monitoring activities for cranes and hoists within the scope of LR. This existing program credits visual inspections for loss of material on the structural components of the bridge, trolley, girders, bolting, and rails in the rail system and also manages loss of preload of associated bolted connections. For those cranes or hoists with associated Time-Limited Aging Analyses, the effects of past and future usage, including the number and magnitude of lifts, are evaluated in Section 4.7.2 of the LRA.

The existing program will be modified by two enhancements as described in the LRA. Specifically, the program will include inspections of structural components and bolting for loss of material due to corrosion, rails for loss of material due to wear and corrosion, and bolted connections for evidence of loss of preload. In addition, the program will ensure periodic inspections are performed on all cranes, hoists, monorails, and rigging beams within the scope of LR, including those that are infrequently in use. This program, with the enhancements, is intended to be consistent with Revision 2 of NUREG 1801, Section XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems,” without exceptions.

The team reviewed LR program basis documentation, implementing procedures, documentation for a sample of crane periodic inspections, and the LRA. The team also interviewed responsible applicant staff and walked down a Turbine Building overhead crane for evidence of loss of material, cracking, or loose bolted connections. No significant concerns were identified during the walkdown.

The team concluded the implementation of the proposed Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP, as described in the LRA with the proposed enhancements, should provide reasonable assurance the aging effects will be managed for the period of extended operation consistent with the licensing basis.

.10 Compressed Air Monitoring Program (B2.1.14)

The Compressed Air Monitoring AMP is an existing program intended to manage material loss in compressed air system piping and piping components exposed to a condensation environment. Current program activities include monitoring of moisture content and contaminants. The existing program will be enhanced to inspect critical component internal surfaces for loss of material due to corrosion. This AMP with the enhancement is intended to be consistent with Revision 2 of NUREG-1801, Section XI.M24, “Compressed Air Monitoring," with an exception to continuously monitor dew point as opposed to recording and trending daily dew point readings. The guidelines of Revision 2 of NUREG-1801, Section X1.M24, are based, in part, on the relevant aspects to license renewal of GL 88-14, “Instrument Air Supply System Problems Affecting Safety-Related Equipment.”

The team reviewed LR Program basis documentation, Aging Management Program documents, existing procedures and surveillance results, Corrective Action Program documents, LR boundary drawings, and the LRA. The team also interviewed responsible applicant staff and conducted walkdowns of the Unit 1 and 2 air compressor and dryers.

The team concluded the implementation of the proposed Compressed Air Monitoring AMP, as described in the LRA with the proposed enhancement, should provide reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

.11 Fire Protection Program (B2.1.15)

The Fire Protection, Aging Management Program is an existing condition and Performance Monitoring Program that will be enhanced to manage the aging of components performing a fire barrier-intended function and for the Halon and low-pressure carbon dioxide fire suppression systems and associated components. The program applies to the piping, piping components, piping elements, and tanks associated with the Halon and low-pressure carbon dioxide fire suppression systems. The program also applies to components that perform a fire barrier-intended function such as fire rated doors, dampers, penetration seals, walls, ceilings, floors, insulations and wraps, and combustible fluid retaining berms and curbs. This program manages the age-related degradation of these components caused by long term exposure to indoor air, air with borated water leakage, outdoor air, and condensation environments. The Fire Protection Program provides for visual inspections of fire barrier penetration seals for signs of degradation such as cracking, hardening, loss of bond (e.g., seal separation, separation of layers), loss of material, loss of strength, and physical damage (e.g., rupture or puncture of seals). The program requires the performance of visual inspections of not less than 10 percent of each type of penetration seal at least once per refueling cycle (18-month). The program specifies the visual examination of fire barrier walls, ceilings, and floors separating safety-related fire areas or separating portions of redundant systems important to safe shutdown within a fire area. Periodic visual inspections and functional tests are used to manage the aging effects of fire doors. Each fire door is visually inspected and the required closing mechanisms and latches are functionally tested on a frequency of at least once per six (6) months. The program provides for visual inspections of all fire dampers that penetrate fire barriers within the scope of this program at least once per 18 months.

The applicant identified the Fire Protection Program will be consistent with AMP XI.M26, “Fire Protection,” as described in Revision 2 of NUREG-1801 when enhanced. Prior to the period of extended operation, the following enhancements will be implemented:

- Include visual inspections of the earthen berm enclosing the outdoor fuel oil storage tanks for signs of age-related degradation such as loss of material and loss of form that could affect the intended function of the berm.

- Provide additional inspection guidance to identify age-related degradation of fire barrier walls, ceilings, and floors or aging effects such as cracking, spalling, and loss of material.

- Include visual inspection of halon and low-pressure carbon dioxide fire suppression system piping and component external surfaces for signs of corrosion or other age-related degradation.

The Fire Protection Aging Management Program Is under the direction of a fire protection qualified engineer. Personnel performing inspections are qualified and trained to perform the inspection activities. Unacceptable conditions are entered into the corrective action program (CAP) for disposition.

To evaluate the material condition of components managed by this AMP, the team conducted walk downs of the Halon tanks, carbon dioxide tanks, cable spreading rooms, fire protection headers and discharge nozzles and visual inspections of the earthen berm enclosing the outdoor fuel oil storage tanks. No concerns were noted

The team concluded the implementation of the proposed AMP should provide reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

.12 Fire Water System (B2.1.16)

The Fire Water System AMP is an existing program intended to manage the water-based fire protection system and associated components exposed to outdoor air and raw water for material loss aging effects. Program activities include system pressure monitoring, system header flushing, buried ring header flow testing, pump performance testing, hydrant full flow flushing and full flow verification, sprinkler and deluge system flushing and flow testing, and hydrostatic testing.

The team reviewed LR Program basis documentation, Aging Management Program documents, existing procedures and surveillance results, Corrective Action Program documents, LR boundary drawings, and the LRA. The team also interviewed responsible applicant staff and conducted walkdowns of accessible portions of the fire water system, including components such as pumps, sprinklers, hose stations, and piping. As a result of this review, the team noted the following observations:

- The station did not perform an extent of condition following the discovery of a leak. Specifically, the station identified a through wall leak on the fire water main header (i.e., piping 0FP07B) and captured this condition in the CAP as Action Request (AR)01520239. This AR concluded the piping was degraded and the fire water system remained capable of performing its function. However, AR01520239 did not include an extent of condition. The applicant captured this observation in their Corrective Action Program as AR01694947 to perform an extent of condition, evaluate the cause for not performing the extent of condition, and to review the applicable procedures to determine whether additional clarity is needed to prevent repeat occurrences.

- Procedure 0BOSR 10.b.10-1, "Annual Fire Protection System Flush," had not been verified to be effective for lifting and flushing accumulated sedimentation from the fire protection ring header. Specifically, the procedure did not specify a minimum flow rate value necessary for effective flushing nor require an evaluation if the configuration prescribed by the procedure did not achieve the minimum effective flushing flow rate. Furthermore, the team performed a walkdown of the small through-wall leak documented in AR01520239 and noted mud was leaking out. Specifically, the team observed a crust of mud of approximately four inches in diameter attached at the bottom of the pipe, which was moist in its center, and the floor beneath this crust was slightly wetted. The applicant captured this observation as LRCR Region-43 and determined there was reasonable expectation that adequate flow velocities would be available based on the latest full flow test results. At the time of the inspection, LRCR Region-43 planned to verify the effectiveness of the procedure and to revise it as necessary.

This AMP with the enhancements is intended to be consistent with Revision 2 of NUREG-1801, Section XI.M27, “Fire Water System," without exception. The existing program will include 14 enhancements as described in the applicant’s letter RS-14-235 to the NRC dated August 29, 2014 (ADAMS Accession No. ML14241A527). These program enhancements are associated with, in part, microbiologically influenced corrosion control, and inspections and tests of coatings, sprinklers, deluge systems, tanks, and fire water piping.

The team concluded the implementation of the proposed Fire Water System AMP, as described in the LRA with the proposed enhancements, should provide reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

.13 Aboveground Metallic Tanks Program (B2.1.17)

The aboveground metallic tanks AMP is a new program intended to manage material loss and cracking on the external surfaces of aboveground metallic tanks that are supported on concrete or a four inch sand cushion above compacted backfill in soil, and exposed to outdoor air environments. At the time of this inspection, the aluminum condensate storage tanks (CSTs) were the only tanks identified as being within the scope of this program. This AMP will credit the protection provided to the non-coated CSTs by the cathodic protection system, roof flashing, insulation, corrosion resistant properties of aluminum, sealants at the concrete/component interface, and insulation lagging with overlapping seams. This new program will also rely on periodic visual inspections to detect degradation of the external surface of the insulation lagging, flashing, caulking, roof, and accessible sealant. Sealant inspections will be augmented with physical manipulation to detect hardening and loss of strength. In addition, this AMP will require periodic visual inspections and liquid penetrant examinations of the tank external surfaces, and will include removal of selected tank lagging and insulation to allow for the inspection of external tank surfaces and exposed sealants.

This AMP is intended to be consistent with Revision 2 of NUREG 1801, Section XI.M29, "Aboveground Metallic Tanks," with an exception to perform visual inspections at selected locations of the aluminum tank external surfaces as oppose to the entire external tank surface. In addition, the applicant's letter to the NRC titled "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," dated January 13, 2014, (ADAMS Accession No. ML14013A293), revised this AMP, in part, to include one-time tank bottom ultrasonic inspections, to specify inspection sample and frequency, and to incorporate the cathodic protection availability and effectiveness criteria of License Renewal Interim Staff Guidance (ISG) LR ISG 2011 03, "Changes to the Generic Aging Lessons Learned (GALL) Report Revision 2 Aging Management Program XI.M4, 'Buried and Underground Piping and Tanks.'"

The team reviewed LR program basis documentation, drawings, tank photos, corrective action program documents, and cathodic protection system availability and effectiveness data. The team also interviewed responsible applicant staff and conducted walkdowns of the in scope CSTs and cathodic protection system rectifier and deep well probe locations. The team was unable to review the implementing documents associated with this new program because they were being developed at the time of this inspection.

The team concluded that, if the proposed Aboveground Tank AMP is developed as described in the LRA, there should be reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

.14 Fuel Oil Chemistry Program (B2.1.18)

The Fuel Oil Chemistry Program is an existing 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 program scope includes components of; emergency diesel generators, fuel oil system, essential service water system and auxiliary

feedwater system. The program relies on a combination of surveillance procedures and maintenance activities 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 within acceptable levels as identified in Technical Specifications, Technical Requirement Manual, and applicable American Society for Testing of Materials (ASTM) Standards. 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. Inspections of internal coatings will be performed by qualified coating team and evidence of unacceptable coating degradation is entered into the CAP. These activities manage the effects of aging by maintaining contaminants at acceptably low concentrations.

The applicant identified the Fuel Oil Chemistry Program will be consistent with AMP XI.M30, "Fuel Oil Chemistry," as described in Revision 2 of NUREG-1801 when enhanced. In response to RAI 3.0.3-2a (reference letter RS-14-124, dated May 5, 2014, ADAMS No. ML14125A325) and RAI 3.0.3-2b (reference letter RS-14-175, dated June 30, 2014, ADAMS No. ML14181B145), the applicant identified several enhancements. These enhancements included periodic draining, cleaning, internal inspection and coating inspections (where applicable) of fuel oil tanks within the scope of the AMP. The applicant identified specific sampling and analysis to be conducted which included water, sediment, particulate concentration and content levels of microbiological organisms for the fuel oil tanks under this program.

The team's review of scope for this AMP included the AMP basis document, applicable NRC RAIs, implementing procedures, UFSAR changes proposed for the AMP, plant specific operating history documents, license renewal boundary drawings for the Fuel Oil System, scoping and screening reports, previously performed surveillance results, and discussions of the AMP with the responsible applicant and site staff.

The team observed the applicant simulate drawing of a fuel oil sample from the Unit 1A Diesel Oil Storage Tank (DOST) in accordance with the site procedure. Additionally, the team performed a walkdown of the 1A DOST room, the fuel oil system associated with the 0B essential service water make-up pump located in the river screen house, and the fuel oil system associated with the 1A EDG. The team identified minor material condition issues such as a minor fuel oil leak on the 1A EDG supply line and external corrosion on the essential service water make-up pump diesel exhaust line which were documented by the applicant in the CAP. The team concluded the material condition of the systems observed was good, and no issues were identified that would indicate the Fuel Oil Chemistry Program was less than fully effective for managing the aging effects applicable to this system.

Based upon the reviews completed, the team concluded the implementation of the Fuel Oil Chemistry Program should provide reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

.15 <u>One-Time Inspection Program (B2.1.20)</u>

The One-Time Inspection AMP is a new program intended to verify the effectiveness of mitigation AMPs to confirm age-related degradation is not occurring, is insignificant, or is occurring slowly such that component function will be maintained through the period of extended operation. Specifically, the AMP will require one-time inspections of representative component samples to verify the effectiveness of the Water Chemistry, Fuel

Oil Chemistry, and Lubricating Oil Analysis AMPs. In addition, the program may trigger additional actions, depending on the one-time inspection results, to ensure the intended functions of affected components will be maintained during the period of extended operation. This program is intended to be consistent with Revision 2 of NUREG-1801, Section XI.M32, “One-Time Inspection," without exceptions.

The team reviewed LR Program basis, Aging Management Program documents, and the LRA. In addition, the team interviewed responsible applicant staff. The team was unable to review the implementing documents associated with this new program because they were being developed at the time of this inspection. However, in response to the team's questions, the applicant indicated that Byron will not take credit for Braidwood's one-time inspection sample population. Specifically, the applicant stated in LRCR Region-23 that each site will develop separate one-time inspection sample basis documents which will include site specific sample populations.

The team concluded that, if the proposed One Time Inspection AMP is developed as planned, there should be reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

.16 <u>One-Time Inspection of ASME Code Class 1 Small Bore Piping Program (B2.1.22)</u>

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program is a new program that will manage cracking of piping exposed to a reactor coolant environment. The program will perform one-time inspections of a sample of ASME Code Class 1 piping less than a nominal pipe size (NPS) of four inches and greater than or equal to one inch. The program includes piping, fittings, branch connections, and full penetration (butt) welds and partial penetration (socket) welds. The monitoring methods are intended to be effective in detecting cracking due to intergranular SCC or fatigue cracking due to cyclical loading. Welds within the scope of the program that are greater than NPS 1 have been ranked relative to "consequence risk" as high, medium, or low risk per the Byron Risk Informed ISI Evaluation Reports. The program inspections augment the existing ASME Code, Section XI ISI requirements and will include a sample of piping components equal to NPS 1. Specifically, the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program will include volumetric examination of socket welds with techniques capable of detecting cracking. If demonstrated volumetric techniques are not available by the time of the scheduled inspections, the applicant will perform destructive testing. If destructive testing is necessary, each examination location will be credited as equivalent to two volumetrically examined welds. The inspection sample size will include 10 percent of the socket weld population up to a maximum of 25 socket welds for each unit and 10 percent of the butt weld population up to a maximum of 25 butt welds for each unit. The applicant will select sample locations based on susceptibility for intergranular SCC and fatigue cracking due to cyclical loading, consequence of failure, inspectability, dose considerations, operating experience, and the limiting locations for the total population of Class 1 small-bore piping. Further, in the response to RAI B.2.1.22-1 (reference letter RS-14-002 to NRC, dated January 13, 2014; ADAMS No. ML14013A148) the applicant stated the sample weld population for Byron Unit 1 will include a socket weld on the “D” safety injection system cold leg injection line which was replaced on 1998 due to a crack. The One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program will be consistent with AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping," as described in Revision 2 of NUREG-1801.

The team's review scope for this AMP included the AMP basis document, implementing procedures, UFSAR changes proposed for the AMP, plant specific operating history documents, and discussions of the AMP with the responsible applicant and site staff.

Because the One-Time Inspection of ASME Code Class 1 Small Bore Piping Program is a new program, and no associated inspections have taken place, no field activities were available for observation by the team.

Based upon the reviews completed, the team concluded that, if the proposed One-Time Inspection of ASME Code Class 1 Small Bore Piping AMP is developed as planned, there should be reasonable assurance the aging effects will be adequately managed consistent with the licensing basis, for the period of extended operation.

.17 External Surfaces Monitoring of Mechanical Components Program (B2.1.23)

The External Surfaces Monitoring of Mechanical Components Program is a new program that implements visual inspections of external surfaces of components. Examples of systems with components managed under the scope of this AMP include: (1) the main steam system, (2) main condensate and feedwater system, (3) safety injection system, (4) RHR system, and (5) the service water system. The program consists of periodic visual inspection of components such as piping, piping components, ducts, insulation jacketing and elastomeric components. Periodic representative inspections to detect corrosion under insulation will be conducted on both indoor and outdoor insulated components, where the process fluid temperature is below the dew point for a period of time sufficient to accumulate condensation. The program manages aging effects of metallic and elastomeric components through visual inspection of external surfaces for evidence of loss of material in air-indoor, air-outdoor, and air with borated water leakage environments. The visual inspections are augmented by physical manipulation as necessary for evidence of hardening and loss of strength. Materials inspected under this program include aluminum alloy, carbon steel, copper alloy, ductile cast iron, galvanized steel, gray cast iron, low alloy steel, and stainless steel. Any visible evidence of degradation will be evaluated for acceptability of continued service. Acceptance criteria will be based upon component, material, and environment combinations. Deficiencies will be documented and evaluated within the CAP. The External Surfaces Monitoring of Mechanical Components Program will be consistent with the AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," as described in Revision 2 of NUREG-1801, as modified by applicable guidance provided by the NRC in LR-ISG-2011-03 "Changes to the Generic Aging Lessons Learned (GALL) Report Revision 2 Aging Management Program XI.M41, Buried and Underground Piping and Tanks."

The team's review scope for this AMP included the AMP basis document, applicable NRC RAIs, NRC ISG documents, implementing procedures, UFSAR changes proposed for the AMP, plant specific operating history documents, and discussions of the AMP with the responsible applicant and site staff.

Because the External Surfaces Monitoring of Mechanical Components Program is a new program, no inspections have been implemented by the applicant. To assess the current condition of components that will be managed under this program, the team performed a walkdown of components within the river screen house including the 0B essential service water makeup pump and associated fuel oil system and the carbon dioxide fire suppression system. The team observed minor corrosion and external coating degradation on components that were subsequently recorded by the applicant in the CAP. Based on these

walkdowns, the team concluded the material conditions of the observed system portions were good and no significant issues were identified.

The team noted the program scope as described in the applicant's basis document lacked details for the reactor vessel head lifting lugs. This observation prompted the applicant to implement a change to the basis document to clarify that the scope of the program would include the integrated reactor vessel head assembly and reactor vessel head lifting lugs. The applicant documented the concern as LRCR Region-17, dated August 6, 2014.

Based upon the reviews completed, the team concluded that, if the proposed External Surfaces Monitoring of Mechanical Components Program is developed as planned, there should be reasonable assurance the aging effects will be adequately managed consistent with the licensing basis, for the period of extended operation.

.18 Lubricating Oil Analysis Program (B2.1.26)

The Lubricating Oil Analysis Program is an existing program that ensures the oil environment in mechanical systems subject to aging management review is maintained to the required quality to prevent or mitigate age-related degradation of components within the scope of this program. The program scope includes components within the auxiliary feedwater system, chemical, volume control system, and the EDGs. The Lubricating Oil Analysis Program maintains oil systems contaminants within acceptable limits through periodic sampling and analysis, and comparing the analytical results to pre-determined limits that are associated with corrective actions such as filtering or oil replacement in order to manage the aging effects of loss of material due to corrosion or reduction of heat transfer due to fouling. The program implements scheduled activities that include routine sampling, analyses, and trending. The lubricating oil testing (sampling and analysis) and condition monitoring activities identify detrimental contaminants such as water, sediments, specific wear elements, and elements from an outside source. The oil contaminant levels are trended. Any result that is outside of the acceptance criteria is entered into the CAP to evaluate the condition, which could include in-leakage or corrosion product buildup, and implement corrective actions such as component repairs, filtering, or oil replacement to maintain the lubricating oil contaminants within acceptable limits. In addition to the previously described, in order to verify the effectiveness of the Lubricating Oil Analysis program, selected components will be inspected as described in the One-Time Inspection Program, to ensure age-related degradation is not occurring and component intended functions are maintained during the period of extended operation. The Lubricating Oil Analysis Program is consistent with the AMP XI.M39, "Lubricating Oil Analysis," as described in Revision 2 of NUREG-1801.

The team observed the applicant simulate the performance of the lubricating oil sampling for the 1A EDG and performed a walkdown of the 1A EDG Room. The team questioned the lack of time requirements or limitations between sampling and analysis within the governing procedure (BOP DG-300-1, Revision 7) which prompted the applicant to initiate a procedure revision to incorporate guidance for timely sample analysis. Based upon these simulation and walkdowns, the team did not identify any issues that would indicate the Lubricating Oil Analysis Program was less than effective for managing the aging effects applicable to this system.

Based upon the reviews completed, the team concluded the implementation of the proposed Lubricating Oil Analysis Program should provide reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

.19 Monitoring of Neutron-Absorbing Materials Other than Boraflex Program (B2.1.27)

The Monitoring of Neutron-Absorbing Materials Other than Boraflex AMP is an existing program intended to monitor the neutron-absorbing capability of the boral material in the spent fuel storage racks to ensure the spent fuel pool maintains a 5 percent sub-criticality margin during the period of extended operation. Program activities include monitoring for loss of material, dimension changes, and loss of neutron-absorption capacity of the boral material.

The existing program will be enhanced to surround boral coupons with a greater number of freshly discharged fuel assemblies than that of any other cell location to ensure coupon exposure bounds the boral material in all spent fuel racks prior to coupons being examined. This program with the enhancement is intended to be consistent with Revision 2 of NUREG-1801, Section XI.M40, “Monitoring of Neutron-Absorbing Materials Other than Boraflex," without exception.

The team reviewed LR Program basis documentation, Aging Management Program documents, existing procedures and surveillance results, Corrective Action Program documents, LR boundary drawings, and the LRA. The team also interviewed responsible applicant staff and conducted a walkdown of the spent fuel pool.

The team concluded the implementation of the proposed Monitoring of Neutron-Absorbing Materials other than Boraflex AMP, as described in the LRA with the proposed enhancements, should provide reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

.20 Buried and Underground Piping and Tanks Program (B2.1.28)

The Buried and Underground Piping Program is an existing program that manages the external surface aging effects for buried and underground piping. Components within the scope of this program include (but not limited to) portions of the main condensate system, service water system and circulating water system. The program manages aging effects of loss of material through preventive, mitigative, and inspection activities for piping and components within the scope of license renewal. The scope of the program also includes monitoring of external coatings relied on for external corrosion control, the application of cathodic protection, and the quality of backfill utilized. The program implements periodic and opportunistic inspection activities, including visual examination of buried and underground piping, and electrochemical verification of the effectiveness of the cathodic protection system. The directed inspections of buried and underground piping are planned based on categorization criteria contained in NRC guidance as described in LR-ISG-2011-03, “Changes to the Generic Aging Lessons Learned (GALL) Report Revision 2 Aging Management Program XI.M41, Buried and Underground Piping and Tanks.” Byron Station does not have any buried or underground tanks within the scope of license renewal.

The Buried and Underground Piping Program will be consistent AMP XI.M41, “Buried and Underground Piping and Tanks,” as described in Revision 2 of NUREG-1801 and as modified by NRC Guidance in LR-ISG-2011-03 with two exceptions and a number of enhancements. The exceptions and enhancements are described in the LRA and applicant responses to RAI-B.2.1.28-2, RAI-B.2.1.28-3, RAI-B.2.1.28-4 and RAI-B.2.1.28-3a (Reference Letters RS-14-003 and RS-14-143, dated January 13, 2014, and May 15, 2014, respectively; ADAMS No. ML14013A293 and ML14135A179, respectively). One exception to the X1.M41 AMP is that carbon steel pipe embedded within concrete is not coated and

the justification for this exception included the applicant's assessment that reinforced concrete provides superior corrosion protection for the embedded piping such that coatings are not necessary. The second exception to the X1.M41 AMP is that the aging management of the buried fire protection system piping which will be accomplished through annual fire protection system leakage testing in place of direct examinations. The applicant stated this method and frequency is consistent with the intent of crediting flow tests performed in accordance with Section 7.3 of National Fire Protection Association (NFPA) 25, as allowed in NUREG-1801, Chapter XI.M41 and LR-ISG-2011-03 and the annual system leakage testing is capable of detecting significant leakage prior to a loss of system intended function, thus ensuring delivery of sufficient flow at sufficient pressure for fire suppression requirements. The applicant identified seven enhancements to the existing program which included: (1) application of coating to carbon steel essential service water system piping within the scope of license renewal in accordance with National Association of Corrosion Engineers Publication SP0169-2007 prior to the period of extended operation; (2) enhanced training and qualifications for staff performing inspections under this program; (3) acceptance criteria for cathodic protection systems; (4) criteria for expanding inspection scope; and (5) details of the planned inspection locations and sample sizes.

The team's review scope for this AMP included the AMP basis document, applicable NRC RAIs, NRC ISG documents, implementing procedures, UFSAR changes proposed for the AMP, plant specific operating history documents, previously performed surveillance results, and discussions of the AMP with the responsible applicant and site staff.

No opportunities to observe activities conducted under the Buried and Underground Piping Program occurred during the on-site inspection period. Instead, the team reviewed completed records of cathodic inspection surveys, and discussed the survey results with site personnel and the applicant's program lead. No issues were identified that would indicate this program was less than fully effective.

Based upon the reviews completed, the team concluded the implementation of the proposed Buried and Underground Piping Program should provide reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

.21 <u>ASME Section XI, Subsection IWE Program (B2.1.29)</u>

The ASME Section XI, Subsection IWE Aging Management Program is an existing program, credited in the LRA, which provides for periodic examination of the Containment Structure surfaces and components, including 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, personnel airlock and equipment hatch, and the moisture barrier between the bottom of the containment liner and the base mat for cracking, loss of leak-tightness, loss of material, loss of preload, and loss of sealing.

The team's review scope for this AMP included the AMP basis document, applicable NRC RAIs, implementing procedures and results of current liner inspections; license renewal drawings, and corrective action documents. The team also interviewed the program owner and the responsible site engineer. The Byron Units were inservice during this inspection period which precluded observation of physical condition of containment surfaces and components. Instead, the team reviewed recent outage related inspections and work orders where the condition of containment surfaces and components were assessed. Specifically,

the team reviewed Visual IWE examinations conducted in accordance with Procedure ER-AA-335-018, "Visual Examination of ASME IWE Class MC and Metallic Liners of IWL Class CC Components," Revision 9. The team did not identify any issues with completion of these work activities.

The program is consistent with the ten elements of an Aging Management Program described in Revision 2 of NUREG-1801, Section XI.S1, “ASME Section XI, Subsection IWE,” with two enhancements, which include:

- provide guidance for use of bolting material, lubricant and sealants, and installation torque or tension to prevent or mitigate degradation and failure of structural bolting; and the use of the condition of 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.

- provide guidance to 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 whether 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.

Additional details of enhancement No. 2 were provided in letter titled “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,” dated April 17, 2014, (ADAMS Accession No. ML12107A027)

Based upon the reviews completed and the applicant’s proposed enhancements, the team concluded the implementation of the ASME Section XI, Subsection IWE Program should provide reasonable assurance aging effects will be managed, consistent with the license basis.

.22 <u>ASME Section XI, Subsection IWL Program (B2.1.30)</u>

The ASME Section XI, Subsection IWL AMP is an existing program intended to implement examination requirements of the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWL for Class CC Concrete Components of Light-Water Cooled Plants, as mandated by 10 CFR 50.55a. Its scope includes reinforced concrete and the unbonded post tensioning system. The program relies on visual examinations and supplementary testing. These inspection methods along with the associated parameters and acceptance criteria are in accordance with ASME Section XI, Subsection IWL as approved by 10 CFR 50.55a. In addition, accessible concrete surfaces are visually examined to detect deterioration and distress such as defined in American Concrete Institute (ACI) 201.1R and ACI 349.3R, including loss of material, cracking, increase in porosity and permeability, and loss of bond in the air-outdoor and air-indoor (uncontrolled) environments. Concrete surfaces that exhibit deterioration and distress are subject to detailed visual examinations to determine the magnitude and extent of deterioration and distress. Concrete surfaces at the bearing plates for tendon anchorages are also subject to detailed visual examination. In

addition, one tendon wire of each type, hoop dome and vertical, is examined for loss of material and subject to physical testing to determine yield strength, ultimate tensile strength, and elongation. Tendon corrosion protection medium is analyzed for alkalinity, water content, and soluble ion concentrations. Any free water contained in the anchorage end cap and free water, which drains from tendons during the examination, is documented and samples are analyzed for pH.

The team's review scope for this AMP included the applicable program basis document, applicant responses to applicable NRC RAIs, implementing procedures and results of the concrete surfaces inspections and tendons inspections, license renewal drawings, and Corrective Action Program documents. The inspectors walked down accessible portions of Units 1 and 2 containment structure and post tensioning systems to assess degradation that may challenge containment integrity. The inspectors visually inspected exterior surfaces of the Unit 1 and 2 containment concrete surfaces; the Unit 1 upper and lower tendon grease cans and surrounding concrete surfaces; and the dome tendon grease cans and surrounding concrete surfaces. The inspectors performed a general surfaces inspection of the tendon tunnel for cracks and grease leakage. The inspectors interviewed site engineers and program owners regarding the condition of the Unit 1 containment building concrete and periodic inspection results. No loose components, excessive grease leakage, or cracks were observed that were not captured in the applicant's Corrective Action Program. The team noted cracking in the steam generator replacement patch concrete and requested additional information on the inspection methods utilized to capture and quantify the degree of degradation.

As described in the LRA, the applicant indicated that this existing program, with three enhancements, is intended to be consistent with Revision 2 of NUREG 1801, Revision 2 of NUREG 1801, Section XI.S2, "ASME Section XI, Subsection IWL," without exceptions. The program enhancements include: (1) additional augmented examination requirements after post-tensioning system repair/replacement activities in accordance with Table IWL-2521-2; (2) explicitly require that areas of concrete deterioration and distress be recorded in accordance with the guidance provided in ACI 349.3R; and (3) 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.

As a result of this review, the team questioned if visual inspections of concrete surfaces will be conducted during the period of extended operation with methods and equipment that provide sufficient quantitative measurements to evaluate against the quantitative criteria in ACI 349.3R. Specifically, the visual inspections of concrete surfaces at the time of this inspection were taken at a distance with the use of a binoculars, which is consistent with ASME Code Section XI, Subsection IWL. Specifically, sub-article IWL-2310 required that general visual examinations of concrete surfaces shall be performed, directly or remotely, in sufficient detail to identify areas of concrete deterioration and distress, such as described in ACI 201.1R and ACI 349.3R. However, this visual examination will be modified during the period of extended operation by Enhancement 5 of this AMP to "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." The team questioned if the described remote visual observation will be capable of providing quantitative measurements to evaluate against this quantitative criteria. The team discussed this observation with NRR staff who intends to issue RAI B.2.1.30-6 to verify sufficient visual resolution capability will be used during visual examinations of concrete surfaces of containment structures to detect and quantify forms of degradation for comparison against quantitative acceptance criteria based on Chapter 5 of ACI 349.3R.

The team concluded that, subject to satisfactory resolution of RAI B.2.1.30-6, implementation of the proposed ASME Section XI, Subsection IWL AMP, as described in the LRA with the proposed enhancements, should provide reasonable assurance the aging effects will be managed for the period of extended operation consistent with the licensing basis.

.23 ASME Section XI, Subsection IWF Program (B2.1.31)

The ASME Section XI, Subsection IWF AMP is an existing program intended to manage ASME Section XI Class 1, 2, 3, and MC piping and component support members exposed to air-indoor uncontrolled, air-outdoor, air with borated water leakage, and treated borated water environments for signs of degradation such as loss of material, loss of mechanical function, and loss of pre-load. Bolting is also included with these component supports and inspected for loss of material and for loss of preload by inspecting for missing, detached, or loosened bolts and nuts. This program relies on periodic visual examinations.

As described in the LRA and related correspondence, the applicant indicated that this existing program, with six enhancements, is intended to be consistent with Revision 2 of NUREG 1801, Section AMP XI.S3, "ASME Section XI, Subsection IWF," with two exceptions. The AMP as described in the LRA is enhanced to: (1) add metallic containment supports for the transfer tube in the refueling cavity in the containment structure and the refueling canal in the fuel handling building to the scope of the program; (2) provide guidance for proper specification of bolting material, lubricant and sealants, and installation torque or tension to prevent or mitigate degradation and failure of structural bolting; and (3) provide procedural guidance regarding the selection of supports to be inspected on subsequent inspections, when a support is repaired in accordance with the Corrective Action Program. The two exceptions to NUREG-1801 are related to age management of bolting with actual yield strength equal to or greater than 150 ksi. As noted in the LRA, the originally installed reactor coolant pump and pressurizer hold-down bolts have actual measured yield strength that is greater than 150 ksi. NUREG-1801 recommends using bolting with actual yield strength less than 150 ksi to mitigate the potential for SCC. The applicant provided justification for this exception in the LRA. In addition, the applicant concluded the current ASME Section XI, Subsection IWF Program examination techniques, which include performing VT3 visual examinations, are appropriate for identifying SCC degradation of these bolts in the LRA. NUREG-1801 recommends volumetric examination comparable to that of ASME Code Section XI, Table IWB-2500-1, Examination Category BG-1 should be performed to detect cracking in addition to the VT-3 examination. The applicant provided justification for this exception to not perform volumetric examination in the LRA.

The NRC requested additional information from the applicant related to age management of bolting with actual measured yield strength that is greater than 150 ksi in RAIs B.2.1.31-1, B.2.1.31-2, B.2.1.31-3, and RAI B.2.1.31-1a. The applicant responded to RAIs B.2.1.31-1, B.2.1.31-2, and B.2.1.31-3 in Letter RS-14-052 to the NRC titled "Response to NRC Requests for Additional Information, Set 13, dated February 7, 2014, related to the Braidwood Station, Units 1 and 2 and Byron Station, Units 1 and 2 License Renewal Application," dated March 4, 2014, (ADAM Accession No. ML14063A495), and to RAI B.2.1.31-1a in Letter RS-140170 to the NRC titled "Responses to NRC Requests for Additional Information, Set 30, dated May 22, 2014, related to the Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2, License Renewal Application," dated June 16, 2014, (ADAM Accession No. ML14167A297). In these responses, the applicant (1) modified Enhancement 2 in LRA Section B.2.1.31 to revise the AMP implementing documents to

include guidance for bolting storage, require an engineering evaluation to use bolting material with a yield strength of 150 ksi or greater, and to prohibit use of lubricants that contain molybdenum on high strength bolting; (2) added new Enhancement 4 to specify requirements for one-time volumetric examination on a sample high strength bolting; and (3) added new Enhancement 5 to revise implementing documents to specify requirements for periodic visual examinations to detect a corrosive environment that supports SSC potential. In addition, the applicant added Enhancement 6 to add the control rod drive mechanism seismic support assembly to the scope of the program to implement additional examinations in letter to the NRC titled “Response to NRC Request for Additional Information, Set 38, dated August 4, 2014, LRA changes from NRR Staff Feedback on July 30, 2014, telecom; and, LRA changes from NRC Region III IP 71002 Inspection, related to the Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2, License Renewal Application," dated August 29, 2014 (ADAMS Accession No. ML14241A527).

The team reviewed LR Program basis documentation, applicable RAI responses, implementing procedures, and the LRA. In addition, the team interviewed the responsible applicant staff and walked down three Chemical Volume & Control piping system snubber component supports for evidence of loss of material or physical deformation and verified one snubber setting was in conformance with the associated design drawing.

As a result of this review, the team identified the scope of this AMP, as described in the LRA, was incomplete. Specifically, the control rod drive mechanism lateral supports were not included within the program scope. The applicant captured this observation as LRCR Region-30 and revised the LRA Program description to include these additional components as AMP Enhancement 6 in Letter RS-14-235 to the NRC titled “Response to NRC Request for Additional Information, Set 38, dated August 4, 2014; LRA changes from NRR Staff Feedback on July 30, 2014, telecon; and, LRA changes from NRC Region III IP 71002 Inspection, related to the Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2, License Renewal Application," dated August 29, 2014, (ADAMS Accession No. ML14241A527).

The team concluded the implementation of the ASME Section XI, Subsection IWF AMP, as described in the LRA with the proposed enhancement and LRCR Region-30 changes should provide reasonable assurance the aging effects will be managed, consistent with the license basis, for the period of extended operation.

.24 Title 10 CFR Part 50, Appendix J Program (B2.1.32)

The 10 CFR Part 50, Appendix J Aging Management Program is an existing performance monitoring program that monitors leakage rates through the containment pressure boundary, including the containment liner, associated welds, penetrations, fittings, and other access openings, in order to detect age related degradation of the containment pressure boundary. Corrective actions are taken if leakage rates exceed acceptance criteria. The Primary Containment Leakage Rate Testing Program provides for aging management of pressure boundary degradation for electrical penetration assemblies, mechanical penetrations, penetration bellows and sleeves, the containment liner, bolting, personnel airlock, equipment hatch, and seals, gaskets, and moisture barriers, due to aging effects from the loss of material, loss of sealing, loss of leak-tightness, loss of preload, or cracking in systems penetrating containment in air-outdoor, air with borated water leakage, condensation, and waste water environments.

The team's review scope for this AMP included (1) the AMP basis document; (2) applicable NRC RAIs, implementing procedures and results of the penetration inspections and leak rate tests; (3) license renewal drawings; and (4) corrective action documents. The team walked down penetration bellows; and mechanical, electrical, and instrument line containment penetrations. The team also interviewed the program owner and site staff regarding the status of the program and condition of the containment penetrations.

The 10 CFR Part 50, Appendix J Aging Management Program is consistent with the ten elements of Aging Management Program XI.S4, "10 CFR Part 50, Appendix J," as specified in Revision 2 of NUREG-1801, without exceptions or enhancement.

Based upon the reviews completed, the team concluded the implementation of the proposed Appendix J Program should provide reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

.25 Structures Monitoring Program (B2.1.34)

The Structures Monitoring AMP is an existing program intended to implement the requirements of 10 CFR 50.65. This program is based on Revision 2 of Nuclear Management and Resources Council (NUMARC) 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and Revision 2 of RG 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." This program relies on periodic visual inspections and condition monitoring of concrete structures, steel components, elastomers, and masonry block walls. This program also includes elements of the Masonry Walls AMP (i.e., LRA Section B.2.1.33).

This existing program will include 17 enhancements as described in the LRA and as revised in the applicant's letters to the NRC: RS-13-274 titled "Response to NRC Requests for Additional Information, Set 5, dated November 22, 2013, related to the Braidwood Station, Units 1 and 2 and Byron Station, Units 1 and 2 License Renewal Application," dated December 19, 2013 (ADAMS Accession No. ML13353A627); RS-14-097 titled "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," dated April 17, 2014 (ADAMS Accession No. ML12107A027); and RS-14-169 titled "Responses to NRC Requests for Additional Information, Set 27, dated May 21, 2014, and Correction of Previously Submitted Information related to the Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2, License Renewal Application," dated June 16, 2014, (ADAMS Accession No. ML14168A084). This existing program, with the enhancements, is intended to be consistent with Revision 2 of NUREG 1801, Section AMP XI.S6, "Structures Monitoring," without exceptions.

The team reviewed LR Program basis documentation, applicable RAI responses, implementing procedures, and the LRA. In addition, the team interviewed the responsible applicant staff and performed walkdowns for evidence of material loss or loose bolting for a sample of cable tray, conduit, and ventilation duct bolting, component supports, structural steel components, and structural bolting. No significant concerns were identified during the walkdown.

The team concluded the implementation of the Structures Monitoring AMP, as described in the LRA with the proposed enhancements, should provide reasonable assurance the aging effects will be managed, consistent with the license basis, for the period of extended operation.

.26 Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.35)

The Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP is an existing program that consists of inspection and surveillance programs to provide management of aging effects for the River Screen House and ESCT structure associated with emergency cooling water systems based on RG 1.127, Revision 1. There are no dams or canals within the scope of the program. The program monitors the condition of the River Screen House and ESCT. In addition to reinforced concrete, the program also includes structural steel, structural bolting, miscellaneous steel components (trash rack bars) associated with the water control structures, and cooling tower fill and drift eliminators associated with the ESCT. Elements of the program are designed to detect degradation and unacceptable conditions, when found, are evaluated or corrected in accordance with the Corrective Action Program.

This existing program will include 16 enhancements, which are described in the LRA. This AMP, with the enhancements, is intended to be consistent with Revision 2 of NUREG 1801, Section XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants," without exception.

The team reviewed LR Program basis documentation, implementing procedures, an inspection report for the ESCT, corrective actions resulting from inspection of the ESCT, and the LRA. The team also interviewed responsible applicant staff and performed a walkdown of accessible portions of the ESCT and River Screen House for evidence of concrete degradation, structural steel loss of material, and loose structural bolting. No significant concerns were identified during the walkdown.

The team concluded the implementation of the proposed RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP, as described in the LRA with the proposed enhancements, should provide reasonable assurance the aging effects will be managed for the period of extended operation consistent with the licensing basis.

.27 Protective Coating Monitoring and Maintenance Program (B2.1.36)

The Protective Coating Monitoring Program is an existing program that manages the aging effects of loss of coating integrity/blistering, cracking, flaking, peeling, and physical damage in Service Level 1 coatings inside containment exposed to air with borated water leakage. This periodic monitoring program includes selection, application, inspection, and maintenance. The program is comparable to RG 1.54, "Service Level I, II and III Protective Coatings Applied to Nuclear Power Plants," Revision 2. The failure of the Service Level I coatings could adversely affect the operation of the Emergency Core Cooling Systems (ECCS) by clogging the ECCS suction strainers. Proper maintenance of the Service Level I coating ensures that coating degradation will not impact the operability of the ECCS systems. The program includes visual examination of all reasonably accessible Service Level 1 coatings inside containment during every refueling outage and includes assessment and repair for any condition that adversely affects the intended function of Service Level I coatings.

The team's review scope for this AMP included the AMP basis document, applicable NRC RAIs, implementing procedures and results of current coatings inspections, license renewal drawings, and corrective action documents. The team also interviewed the program owner and the responsible site engineer. The Byron Units were operating during this inspection

period which precluded observation of physical condition of containment coatings. Instead, the team reviewed recent outage related inspections and work orders where the condition of containment coatings was assessed. Specifically, the team reviewed 2014 Primary Containment Coatings Inspection Report and other containment liner plate and coatings inspections. The team did not identify any issues with completion of these work activities.

The program is consistent with the ten elements of an Aging Management Program described in Revision 2 of NUREG-1801, Section XI.S8, "Protective Coating Monitoring and Maintenance Program" with six enhancements, which include: (1) adding recurring work orders requiring Service Level I coating inspections every refuel outage; (2) requiring qualification of coating team to ASTM Standard D 5498; (3) requiring qualification of personnel in accordance with ASTM Standard D 7108; (4) incorporate guidance for inspection and maintenance of Service Level I coatings per RG 1.54 and imposing ASTM Standard D 5163-08 requirements for Service Level I coatings condition assessment, reporting, evaluation, and documentation; (5) require thorough visual inspections of all coatings near sumps or screens associated with the ECCS by the coatings inspector(s); (6) and specifying instruments and equipment that may be needed for Service Level I coatings inspections.

Based upon the reviews completed and the applicant's proposed enhancements, the team concluded the implementation of the Protective Coating Monitoring Program should provide reasonable assurance the aging effects will be managed, consistent with the license basis.

.28 Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program (B2.1.37)

The Non-Environmentally Qualified (Non-EQ) Insulated Cables and Connections Program is a new program that the applicant will implement prior to the period of extended operation. This new aging management program applies to the insulation materials used for non-EQ cables and connections within the scope of license renewal. By definition, non-EQ cables and connections are either not exposed to harsh accident conditions or are not required to remain functional during or following an accident to which they are exposed. Adverse localized environments will be identified through an integrated approach, considering EQ of the Electric Components program temperatures, radiation and moisture data, consultations with plant operations, maintenance and engineering staff, current temperature measurements, and industry and plant specific operating experience. Accessible electrical cables and connections installed in adverse localized environments will be visually inspected at least every 10 years for cable jacket and connection insulation surface anomalies such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination, that could indicate incipient conductor insulation aging degradation from temperature, radiation, or moisture. If an unacceptable condition or situation is identified for a cable or connection, then by way of the Corrective Action Program, a determination will be made as to whether the same condition or situation is applicable to inaccessible cables or connections. Repair, replacement, or extent of condition inspections will be initiated as appropriate. This program will be consistent with the program described in Revision 2 of NUREG-1801, Section XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." The Non-EQ insulated cables and connections program will apply to accessible insulated cables and connections installed in structures within the scope of license renewal and prone to adverse localized environments.

The team reviewed license renewal program basis documents and confirmed the applicant had a commitment in place to implement the program prior to the start of the period of

extended operation. The team also interviewed the Non-EQ insulated cables and connections program owner to determine how and when the testing and monitoring requirements for this Aging Management Program will be developed and implemented.

To evaluate the material condition of components that will be managed by this AMP, for this system, the team conducted walk downs in the Cable spreading rooms. No abnormal conditions were observed.

The team concluded that, if the proposed AMP is developed as planned, there should be reasonable assurance the aging effects will be adequately managed consistent with the licensing basis, for the period of extended operation.

.29 Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program (B2.1.38)

The Non-Environmentally Qualified (Non-EQ) Electrical Cables and Connections used in Instrumentation Circuits Program is a new program that the applicant will implement prior to the period of extended operation. This new Aging Management Program applies to the non-EQ cables and connections insulation within the scope of the Radiation Monitoring system. Radiation monitoring and neutron monitoring circuits are sensitive instrumentation circuits with high voltage, low-level current signals and are located in areas where the cables and connections could be exposed to adverse localized environments caused by temperature, radiation, or moisture. These adverse localized environments can result in reduced insulation resistance causing increases in leakage currents. Calibration testing will be performed for the in-scope process radiation monitoring circuits because the cables are included as part of the calibration circuit. A proven cable test will be performed for the in-scope neutron monitoring circuits. These calibration and cable tests will be performed prior to the period of extended operation. The first review of the results will be assessed for reduced insulation resistance prior to the period of extended operation and at least once every 10 years during the period of extended operation. Potential degradation of cable or connection insulation is evaluated in accordance with the corrective action program. This program will be consistent with the program described in NUREG-1801, Section XI.E2, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits." This program will manage the aging of the sensitive, high voltage, low-level current instrumentation cables, and connections that are not required to be environmentally qualified but are within the license renewal scope.

The team reviewed license renewal program basis documents and confirmed the applicant had a commitment in place to implement the program prior to the start of the period of extended operation. The team also interviewed the staff responsible for non-EQ instrumentation circuits subject to sensitive, high-voltage, and low-level signals, to determine current practice and test procedures to be developed under the program. The Byron Units were in-service during this inspection which precluded a physical examination of instrumentation cables.

The team concluded that, if the proposed AMP is developed as planned, there should be reasonable assurance the aging effects will be adequately managed consistent with the licensing basis, for the period of extended operation.

.30 Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program (B2.1.39)

The Non-Environmentally Qualified (Non-EQ) Inaccessible Power Cables Program is a new program that the applicant will implement prior to the period of extended operation. This new Aging Management Program applies to non-EQ, inaccessible or underground (e.g., in conduit, duct bank, or direct buried) power cables that are exposed to adverse environments, primarily significant moisture. For this program, power is define as greater than or equal to 400 volts. Significant moisture is defined as periodic exposures to moisture that last more than a few days (e.g., cable wetting or submergence in water). Periodic exposures that last less than a few days (e.g., normal rain and drain) are not significant. Power cable exposure to significant moisture may cause reduced insulation resistance that can potentially lead to failure of the cable's insulation system. The cables in the scope of this Aging Management Program will be tested using one or more proven test for detecting reduced insulation resistance of the cable's insulation system due to wetting or submergence, such as Dielectric Loss (Dissipation Factor/Power Factor), Alternating Current Voltage Withstand, Partial Discharge, Step Voltage, Time Domain Reflectometry, Insulation Resistance and Polarization Index, Line Resonance Analysis, or other testing that is state- of-the-art at the time the tests are performed. The cables will be tested at least once every 6 years. The first test will be completed prior to the period of extended operation. Periodic actions will be taken to prevent inaccessible cables significant moisture. Manholes associated with the cables included in this Aging Management Program will be inspected to assure cables are not wetted or submerged, cables and connections are intact without observable surface damage, cable support structures are intact, and that drainage systems or dewatering devices, if installed are operating properly. Corrective actions such as draining manholes, installation of permanent drainage systems, or installation of sump pumps are implemented when inspection results do not meet acceptance criteria. This will include an assessment of cable degradation when inaccessible power cables are exposed to significant moisture. This program will be consistent with the program described in Revision 2 of NUREG-1801, Section XI.E3,"Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." This program applies to all inaccessible or underground (e.g., in conduit, duck bank, or direct-buried) power cables within the scope of license renewal that are exposed to adverse environments, primarily significant moisture.

The team reviewed license renewal program basis documents, condition reports and confirmed the applicant had a commitment in place to implement the program prior to the start of the period of extended operation. The team also interviewed the Non-EQ Inaccessible Power Cables program owner to determine current practice and expected test procedures to be developed under the program.

To evaluate the material condition of components that will be managed by this AMP, for this system, the team conducted a walk downs of three manholes containing safety-related 4.16 kV cables, insulators and splices and observed them to be free of water cable support structures are intact. No significant concerns were identified during the walkdown.

The team concluded that, if the proposed AMP is developed as planned, there should be reasonable assurance the aging effects will be adequately managed consistent with the licensing basis, for the period of extended operation.

.31 Metal Enclosed Bus Program (B2.1.40)

The Metal Enclosed Bus (MEB) Aging Management Program is an existing condition monitoring program that will be enhanced to manage aging of in scope metal enclosed buses during the period of extended operation. This Aging Management Program provides for the inspection of the internal and external portions of the MEB. The internal portions of the bus enclosure assemblies are inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. The bus insulation is visually inspected for signs of reduced insulation resistance, such as embrittlement, cracking, chipping, melting, swelling, discoloration, or surface contamination, which may indicate overheating or aging degradation. The internal bus insulating supports are visually inspected for structural integrity and signs of cracks. External surfaces are visually inspected for loss of material due to general, pitting, and crevice corrosion. Enclosure assembly elastomers are visually inspected for surface cracking, crazing, scuffing, dimensional change, shrinkage, discoloration, hardening, and loss of strength. A sample of accessible bolted connections will be inspected for increased resistance of connection using resistance measurements. The sample will be 20 percent of the accessible MEB bolted connection population with a maximum sample size of 25. The selected sample of bolted connections inspected by resistance measurements will be confirmed to be within the acceptance criteria established in program implementing procedures. Unacceptable results are subject to an evaluation under the CAP. The inspections and resistance measurements are performed at least once every 10 years for indications of aging degradation. The MEB Aging Management Program will be enhanced prior to the period of extended operation. The MEB Aging Management Program with the three enhancements specified in the LRA will be consistent with the ten elements of Aging Management Program XI.E4, “Metal-Enclosed Bus,” specified in Revision 2 of NUREG-1801 without exception. The Metal Enclosed Bus Program is a condition monitoring program that inspects representative samples of the non-segregated 4160 volt phase bus between station offsite source auxiliary transformers and plant buses in scope of LR.

The team reviewed License Renewal Program basis documents, program health report, self-assessment report, condition reports, aging management review documents and existing procedures and confirmed the applicant had a commitment in place to implement the program prior to the start of the period of extended operation. The team also interviewed the MEB Program owner to determine current practice and expected test procedures to be developed under the program. To evaluate the material condition of components that will be managed by this AMP, for this system, the team conducted walk downs of the non-segregated 4160 volt phase bus between station offsite source auxiliary transformers and plant ESF buses. No significant concerns were identified during the walkdown.

The team concluded the implementation of the proposed AMP should provide reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

.32 Fuse Holders Program (B2.1.41)

The Fuse Holders Aging Management Program is a new program that the applicant will implement prior to the period of extended operation. This new Aging Management Program applies to fuse holders within the scope of license renewal located outside of active devices that are susceptible to increased resistance of connection due to chemical contamination, corrosion, and oxidation or fatigue caused by ohmic heating, thermal cycling, electrical transients, frequent manipulation, or vibration. Fuse holders located inside an active device

are not within the scope of this program. This program will be used to manage aging of the metallic portions of fuse holders. Fuse holders subject to increased resistance of connection or fatigue, will be tested, by a proven test methodology, such as thermography, contact resistance testing, or other appropriate testing method, at least once every 10 years for indications of aging degradation. Unacceptable results will be subject to an evaluation under the CAP. Visual inspection is not part of this program. AMP XI.E1, "Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," manages the aging of insulating material of the fuse holders. This program will be consistent with the program described in Revision 2 of NUREG-1801, Section XI.E5, “Fuse Holders,” without exception.

The team reviewed license renewal program basis documents, program health report, self-assessment report, condition reports and confirmed the applicant had a commitment in place to implement the program prior to the start of the period of extended operation. The team also interviewed the Fuse Holder program owner to determine how and when the testing and monitoring requirements for this aging management program will be developed and implemented.

To evaluate the material condition of components that will be managed by this AMP, the team conducted walk downs in the River Screen House fuse panel. No significant concerns were identified during the walkdown.

The team concluded that, if the proposed AMP is developed as planned, there should be reasonable assurance the aging effects will be adequately managed consistent with the licensing basis, for the period of extended operation.

.33 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.42)

The Non-Environmentally Qualified (Non-EQ) Electrical Cables Connections Program is a new program that the applicant will implement prior to the period of extended operation. This new Aging Management Program focuses on the metallic parts of the connection. Cable connections associated with cables within the scope of license renewal that are cable connections terminating within an active or passive device/enclosure from external sources are in scope of this program. Cable/wiring connections terminating within an active or passive device/enclosure from internal sources are not in scope of this program. The one-time testing verifies that increased resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation is not an aging effect that requires periodic testing. The program consists of a representative sample of electrical connections within the scope of license renewal, which is tested at least once prior to the period of extended operation to confirm that there are no aging effects requiring management during that period. Testing may include thermography, contact resistance testing, or other appropriate testing methods without removing the connection insulation, such as heat shrink tape, sleeving, insulating boots, etc. A representative sample of non-EQ electrical cable connections will be selected for one-time testing considering application (medium and low voltage), circuit loading (high loading), connection type, and location (high temperature, high humidity and vibration). The sample tested will be 20 percent of the population with a maximum sample size of 25 connections. The technical basis for the sample selected will be documented per station procedures. This program is intended to be consistent with the program described in Revision 2 of NUREG-1801, Section XI.E6, “Electrical Cables Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements,” without enhancement or exceptions. The Non-EQ insulated

cables and connections program will apply to accessible insulated cables and connections installed in structures within the scope of license renewal and prone to adverse localized environments.

The team reviewed License Renewal Program basis documents, condition reports and confirmed the applicant had a commitment in place to implement the program prior to the start of the period of extended operation. The team also interviewed the Non-EQ Electrical cables connections program owner to determine how and when the testing and monitoring requirements for this Aging Management Program will be developed and implemented. The Byron Units were operating during this inspection which precluded a physical examination of the Electrical cables Connections.

The team concluded that, if the proposed AMP is developed as planned, there should be reasonable assurance the aging effects will be adequately managed consistent with the licensing basis, for the period of extended operation.

.34 Fatigue Monitoring Program (B3.1.1)

The Fatigue Monitoring AMP is an existing program intended to manage fatigue of the reactor coolant pressure boundary piping components, reactor vessel components, and other components exposed to air-indoor uncontrolled, air with borated water, condensation, diesel exhaust, neutron flux, reactor coolant, treated water, treated borated water, and steam. Program activities include monitoring and tracking the actual number of operational transients to ensure the number of cycles used in design analysis is not exceeded and component cumulative usage factor is maintained below the allowable limit. The existing program will include four enhancements as described in the applicant's letter to the NRC titled "Braidwood, Units 1 and 2, and Byron, Units 1 and 2, Response to NRC Requests for Additional Information, Set 4, dated December 12, 2013, Related to the License Renewal Application," dated January 13, 2014, (ADAMS Accession No. ML14013A148). These program enhancements are associated, in part, with cumulative fatigue damage effects of the reactor coolant environments on component life, monitoring and tracking of additional plant transients that are significant contributors to component fatigue usage, and increasing the program scope. This program with the enhancements is intended to be consistent with Revision 2 of NUREG-1801, Section X.M1, "Fatigue Monitoring," without exceptions.

The team reviewed LR program basis documentation, Aging Management Program documents, existing procedures and surveillance results, Corrective Action Program documents, LR boundary drawings, and the LRA. The team also interviewed responsible applicant staff and conducted a walkdown of the accessible portions of Unit 1A and 2A RHR suction lines. No significant concerns were identified during the walkdown.

The team concluded the implementation of the proposed Fatigue Monitoring AMP, as described in the LRA with the proposed enhancements, should provide reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

.35 Concrete Containment Tendon Prestress Program (B3.1.2)

The Concrete Containment Tendon Prestress AMP is an existing program intended to monitor and manage the loss of tendon prestress in the concrete containment prestressing system during the current term and will continue through the period of extended operation. This existing program is predicated 2001 Edition, through the 2003 Addenda, of the ASME

Boiler and Pressure Vessel Code, Subsection IWL criteria as supplemented by the requirements of 10 CFR 50.55a(b)(2)(viii). The program requires periodic inspection of a sample of tendons during each inspection interval to confirm that individual and group tendon meets ASME Section IWL, acceptance criteria.

The program is consistent with the ten elements of Aging Management Program X.S1, "Concrete Containment Tendon Prestress," specified in NUREG-1801 with one enhancement to ensure that for each surveillance interval, the predicted lower-limit, minimum required value, and trending lines will be developed for the period of extended operation as part of the regression analysis for each tendon group.

The team reviewed LR Program basis documentation, existing procedures and surveillance results, Corrective Action Program documents, LR boundary drawings, and the LRA. The team also interviewed responsible applicant staff and conducted walkdowns of the Unit 1 concrete containment tendon anchorage systems that were exposed due to ongoing pull testing during this inspection. No significant concerns were identified during the walkdown.

The team concluded the implementation of the proposed Concrete Containment Tendon Prestress AMP, as described in the LRA with the proposed enhancement, should provide reasonable assurance the aging effects will be managed through period of extended operation consistent with the licensing basis.

.36 Environmental Qualification of Electrical Components Program (B3.1.3)

The Environmental Qualification (EQ)of Electric Components is an existing program that will be enhanced to manage the aging of mechanical environmental qualification (MEQ) components. Qualified lives for MEQ components are established based on aging concerns in accordance with the provisions of Criterion 4 of Appendix A to 10CFR Part 50. As part of the qualification, replacement intervals were identified as required either on the basis of aging performed during an institute of Electrical and Electronics Engineers (IEEE) 323-1974 Qualification Test Program or on the basis of published material aging data. The program establishes, demonstrates, and documents the level of qualification, qualified configurations, maintenance, surveillance, and replacements necessary to meet UFSAR Section 3.11. The EQ of Electric Components program manages the aging of electrical equipment within the scope of 10 CFR 50.49, "Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants." The program includes electric equipment important to safety, which are composed of various polymeric and metallic materials. This electric equipment is subject to adverse environments caused by heat, radiation, oxygen, moisture, or voltage. The program establishes, demonstrates, and documents the level of qualification, qualified configurations, maintenance, surveillance, and replacements necessary to meet10 CFR 50.49. A qualified life is determined for equipment within the scope of the program and appropriate mitigative actions such as replacement or refurbishment are taken prior to or at the end of the qualified life of the equipment so that the aging limit is not exceeded. The various aging effects addressed by this program are adequately managed so that the intended functions of components within the scope of 10 CFR 50.49 are maintained consistent with the current licensing basis during the period of extended operation. This program with the enhancement is intended to be consistent with Revision 2 of NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electric Components," without exceptions

The team reviewed license renewal program basis documents, program health report, self-assessment report, condition reports, aging management review documents and existing

procedures and confirmed the applicant had a commitment in place to implement the program prior to the start of the period of extended operation. The team also interviewed the program owner to determine current practice and expected test procedures to be developed under the program. To evaluate the material condition of components that will be managed by this AMP, for this system, the team conducted a walk down of the Unit 1 EDG and Unit 1 ESF switchgear rooms. No concerns were identified.

The team concluded the implementation of the proposed AMP should provide reasonable assurance the aging effects will be managed, consistent with the licensing basis, for the period of extended operation.

5. EXIT MEETING SUMMARY

On November 5, 2014, the team presented the inspection results to Mr. Thomas Chalmers and other members of the licensee staff. The applicant acknowledged the issues presented. The inspectors confirmed none of the potential report input discussed was considered proprietary.

The team noted that proprietary documents were reviewed during the course of the inspection. The applicant confirmed all such proprietary documents were returned or the copies destroyed and the likely content of the report would not involve the proprietary material.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Applicants

R. Kearney, Site Vice President
@# D. Brindle, Byron License Renewal
@ T. Cain, Acting Nuclear Oversight Manager
@# T. Chalmers, Plant Manager
@ A. Corrigan, Chemistry, Environmental and Radwaste Manager
# D. Drees, Byron Clerical
# C. Keller, Engineering Director
# C. Kinkead, PM License Renewal
@ R. Lawlor, Acting Operations Director
# D. Merkle, Acting Engineering Programs Manager
# P. Shier, Byron Design Engineer
# D. Spitzer, Regulatory Assurance Manager
# L. Wehner, Nuclear Oversight Manager
# R. Wolen, Braidwood License Renewal
@ M. Yousuf, Acting Engineering Director
@# L. Zurawski, NRC Coordinator

NRC Attendees

@ J. Draper, NRC
@T. Chalmers, Plant Manager

Attended an interim exit meeting at the site on August 22, 2014
@ Participated in a telephonic exit meeting on November 5, 2014

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened, Closed, and Discussed

None

LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC team reviewed the documents in their entirety, but rather, that selected sections or portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

LICENSE RENEWAL DOCUMENTS

License Renewal Application

Letter from Michael P. Gallagher, Exelon Generation Company LLC (Exelon) to NRC Document Control Desk; Application for Renewed Operating Licenses- Byron and Braidwood Stations, Units 1 and 2; dated May 29, 2013

License Renewal Action Items (Written as a Result of the Inspection)

LRCR No. Region-3; 10 CFR 50.55a Added to AMP Description; dated August 19, 2014
LRCR No. Region-11; MRP-146 Added to AMP Description; dated August 21, 2014
LRCR No. Region-17; AMP for Reactor Vessel Head Lifting Lugs; dated August 6, 2014
LRCR No. Region-20; Open-Cycle Cooling Water System Aging Management Program Scope; dated September 15, 2014
LRCR No. Region-23; Byron and Braidwood One-Time Inspection Credit; dated August 12, 2014
LRCR No. Region-30; CRDM Lateral Supports Added to IWF AMP to Description; dated August 19, 2014
LRCR No. Region-38; IHA Bolting Added to AMP Description; dated August 21, 2014
LRCR No. Region-41; MRP-192 Added to AMP Description; dated August 21, 2014
LRCR No. Region-43; Fire System Flush Velocity; dated September 22, 2014
LRCR No. Region-75; Visual Acuity Requirements for IWL AMP; dated September 19, 2014
LRCR No. Region-95; Procedure Allowed Time for Extent of Condition Inspection; dated September 24, 2014

License Renewal Basis Documents

BB-PBD-AMP-X.E1; Environmental Qualification (EQ) of Electrical Components; Revision 1
BB-PBD-AMP-X.M1; Fatigue Monitoring; Revision 1
BB-PBD-AMP-X.S1; Concrete Containment Tendon Prestress; Revision 1
BB-PBD-AMP-X1.M1; ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD; Revision 1
BB-PBD-AMP-X1.M3; Reactor Head Closure Head Stud Bolting; Revision 1
BB-PBD-AMP-X1.M10; Boric Acid Corrosion; Revision 1
BB-PBD-AMP-X1.M16a; PWR Internals; Revision 1
BB-PBD-AMP-XI.M17; Flow-Accelerated Corrosion Program; Revision 1
BB-PBD-AMP-XI.M18; Bolting Integrity; Revision 1
BB-PBD-AMP-X1.M19; Steam Generators; Revision 1
BB-PBD-AMP-XI.M20; Open-Cycle Cooling Water System; Revision 1
BB-PBD-AMP-XI.M23; Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems; Revision 1
BB-PBD-AMP-XI.M24; Compressed Air Monitoring; Revision 1
BB-PBD-AMP-XI.M26; Fire Protection; Revision; Revision 1
BB-PBD-AMP-XI.M27; Fire Water System; Revision 1

BB-PBD-AMP-XI.M29; Aboveground Metallic Tanks, Revision 1
BB-PBD-AMP-XI.M30; Fuel Oil Chemistry Program; Revision 1
BB-PBD-AMP-XI.M32; One-Time Inspection; Revision 1
BB-PBD-AMP-XI.M35; One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program; Revision 1
BB-PBD-AMP-XI.M36; External Surfaces Monitoring of Mechanical Components Program; Revision 2
BB-PBD-AMP XI.M39; Lubricating Oil Analysis Program; Revision 1
BB-PBD-AMP-XI.M40; Monitoring of Neutron-Absorbing Materials; Revision 1
BB-PBD-AMP-XI.M41; Buried and Underground Piping Program; Revision 1
BB-PBD-AMP-XI.S1; ASME Section XI, Subsection IWE; Revision 1
BB-PBD-AMP-XI.S2; ASME Section XI, Subsection IWL; Revision1
BB-PBD-AMP-XI.S3; ASME Section XI, Subsection IWF; Revision 1
BB-PBD-AMP-XI.S4; 10 CFR Part 50, Appendix J; Revision 1
BB-PBD-AMP-XI.S6; Structures Monitoring; Revision 1
BB-PBD-AMP-XI.S7; RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants; Revision 1
BB-PBD-AMP-XI.S8; Protective Coating Monitoring and Maintenance Program; Revision 1
BB-PBD-PTS; Scoping and Screening Basis Document: Pressurized Thermal Shock; Revision 1
BB-SSBD-ATWS; Scoping and Screening Basis Document: Anticipated Transient Without Scram; Revision 1
BB-TLAABD; Time-Limited Aging Analysis Basis Document; Revision 0

<u>License Renewal Drawings</u>

LR-BYR-M-37; License Renewal Boundary Drawing Diagram of Auxiliary Feedwater Unit 1; Revision 0
LR-BYR-M-39; License Renewal Boundary Drawing Diagram of Condensate (Sheet 1); Revision 0
LR-BYR-M-42; License Renewal Boundary Drawing Diagram of Essential Water Service; Revision 0
LR-BY-M-48 Sheet 16; License Renewal Boundary Drawing Diagram of Waste Disposal, Turbine Building Floor Drains, Units 1 and 2; Revision 0
LR-BYR-M-50 Sheet: 1A; License Renewal Boundary Drawing Diagram of Diesel Fuel Oil Unit 1; Revision 0
LR-BYR-M-50 Sheet: 1B; License Renewal Boundary Drawing Diagram of Diesel Fuel Oil Unit 1; Revision 0
LR-BYR-M-50 Sheet: 1C; License Renewal Boundary Drawing Diagram of Diesel Fuel Oil Unit 1; Revision 0
LR-BYR-M-50 Sheet: 1D; License Renewal Boundary Drawing Diagram of Diesel Fuel Oil Unit 1; Revision 0
LR-BYR-M-50 Sheet: 3; License Renewal Boundary Drawing Diagram of Diesel Fuel Oil Unit 1; Revision 0
LR-BYR-M-52; License Renewal Boundary Drawing Diagram of Fire Protection (Category I) Units 1 and 2; Revision 0
LR-BYR-M-52, Sheet 5; License Renewal Boundary Drawing Diagram of Fire Protection at Circulating Water Pump House Units 1 and 2; Revision 0
LR-BYR-M-54; License Renewal Boundary Drawing Diagram of Service Air Units 1 and 2; Revision 0
LR-BYR-M-55; License Renewal Boundary Drawing Diagram of Instrument Air; Revision 0

LR-BYR-M-61, Sheets 1A, 1B, 2, 3, 4, 5, 6; License Renewal Boundary Diagram of Safety Injection Unit 1; Revision 0
LR-BYR-M-62; License Renewal Boundary Drawing Diagram of RHR; Revision 0
LR-BYR-M-62, Sheet 1; License Renewal Boundary Diagram of Residual Heat Removal Unit 1; Revision 0
LR-BYR-M-83; License Renewal Boundary Drawing Diagram of Well Water Units 1 and 2; Revision 0
LR-BYR-M-137, Sheet 1; License Renewal Boundary Diagram of Residual Heat Removal Unit 2; Revision 0
LR-BYR-M-138, Sheets 1, 2, 3, 4, 5, 6; License Renewal Boundary Diagram of Safety Injection Unit 2; Revision 0
LR-BYR-S-01A; License Renewal Boundary Drawing Composite Site Plan; Revision 0
LR-BYR-S-01A; License Renewal Boundary Drawing Composite Site Plan; Revision 1

License Renewal Miscellaneous Documents

Fuel Oil System, System and Structure Scoping Report; Revision 1
Fuel Oil System, System and Structure Screening Report; Revision 1
LR-AA-1213; Plant Design and Licensing Basis Change Review; Revision 0
Residual Heat Removal System, System and Structure Scoping Report; Revision 2
RS-13-274; Response to NRC Requests for Additional Information, Set 5; December 19, 2013
RS-14-002; Response to NRC Requests for Additional Information, Set 4; dated January 13, 2014
RS-14-003; Response to NRC Requests for Additional Information, Set 2; dated January 13, 2014
RS-14-051; Response to NRC Requests for Additional Information, Set 8; dated February 27, 2014
RS-14-052; Response to NRC Requests for Additional Information, Set 13; dated March 4, 2014
RS-14-097; Responses to NRC Requests for Additional Information, Set 14; dated April 1, 2014
RS-14-124; Response to NRC Requests for Additional Information, Set 16; dated April 3, 2014
RS-14-126; Response to NRC Request for Additional Information, Set 20, dated April 7, 2014, related to the Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2, License Renewal Application; dated May 6 2014
RS-14-143; Response to NRC Requests for Additional Information, Set 21; dated April 17, 2014
RS-14-150; Response to NRC Requests for Additional Information, Set 23; dated May 23, 2014
RS-14-165; Responses to NRC Requests for Additional Information, Set 24; dated June 9, 2014
RS-14-169; Response to NRC Requests for Additional Information, Set 27; dated June 16, 2014
RS-14-170; Responses to NRC Requests for Additional Information, Set 30; dated June 16, 2014
RS-14-175; Response to NRC Requests for Additional Information, Set 28; dated May 29, 2014
RS-14-176; Responses to NRC Requests for Additional Information, Set 29; dated June 18, 2014
RS-14-218; Responses to NRC Requests for Additional Information, Sets 33 and 34; dated July 18, 2014
RS-14-235; Response to NRC Request for Additional Information, Set 38, dated August 29, 2014
Service Water System, System and Structure Scoping Report; Revision 1
WCAP-17096-NP; Reactor Internals Acceptance Criteria Methodology and Data Requirements; Revision 2

CURRENT PLANT DOCUMENTS

Calculations

5.2.2-BYR01-008; Tendons Stressing and In-Service Inspection Data; Revision 1
3C8-0781-002; Transient Temperatures in River Screen House – NRC Q010.48; Revision 0
BYR12-093; Regression Analysis to Predict Lift-Off Forces for the Containment Tendons (Byron Unit 1 - 60 Years); January 10, 2013
BYR12-094; Regression Analysis to Predict Lift-Off Forces for the Containment Tendons (Byron Unit 1 - 60 Years); January 10, 2013
HI-982094; Criticality Evaluation for the Byron/Braidwood Rack Installation Project; Revision 5

Corrective Action Documents

AR 00180292; Loose Bolts on 1HC22G Main Steel Girder Rail; dated October 10, 2003
AR 00180469; U2 RWST Heater Has a Leak; dated October 11, 2003
AR 00757349; Boric Acid Accumulation/Corrosion, NSSS 1RC01BA Steam Generator Supports; dated March 31, 2008
AR 00757579; Variable Spring Support 1AF06040V (Adjust Load Setting) dated April 1, 2008
AR 00872452; RIS 2008-30 Fatigue Analysis of Nuclear Plant Components; dated January 27, 2009
AR 00966380; Containment Liner Metal Reduction Exceeding 10%; dated September 17, 2009
AR 00967993; Follow-up to IR 966380, Liner Plate Degradation; dated September 21, 2009
AR 01183482; 1VP01AD SX Leakage Identified; dated March 4, 2011
AR 01308932; RIS 2011-14 Metal Fatigue Analysis Performed by Computer Software; dated January 3, 2012
AR01432045; Results of SX Cooling Tower Concrete Inspection; dated October 26, 2012
AR01432045-03; Engineering to Provide Attributes to Enhance 0BMSRz.7.a.5; dated January 18, 2013
AR01432045-04; Engineering to Revise ER-BY-450-1001 to Include WJE Report Recommendations; dated January 18, 2013
AR01432045-07; Revise 0BMSRz.7.a.5 Per Assignment -03; dated February 28, 2013
AR 01455851; Leakage on 0A WW PP Head; dated December 26, 2012
AR 01520239; Through Wall Leak on 0FP07B at CWPH; dated June 1, 2013
AR 00610890; SFP Boral Coupon Exceeds Areal Density Acceptance Criterion; dated March 30, 2007
AR 01542347; Spent Fuel Pool Boral Coupon Testing Results; dated August 1, 2013
AR 01682779; Higher Corrosion Rates in CW and WS; dated July 17, 2014
AR 01625989; Elevated Yellow Metal Corrosion Rate; dated February 25, 2014
AR 01184976; Reapply Sealant to U2 CST; dated March 8, 2011
AR 01529489; 5-Yr Inspection of U-1 Condensate Storage Tank; dated June 27, 2013
AR 01529492; 5-Yr Inspection of U-2 Condensate Storage Tank; dated June 27, 2013
AR 01600419; B1R19 T3 Strength-FAC Scoping; dated December 23, 2013
AR 01459124; As Found Buried Pipe Condition Assessment for Excavation 1; dated January 5, 2013
AR 01254938; Byron Station Five-Year ISI Program FASA; dated January 25, 2012
AR 01279228; Check in for B1R18 NRC Inspection; dated July 10, 2012
AR 01279228; Check in for B1R18 NRC Inspection; dated July 10, 2012
AR 01374664; Service Water Make-Up Pump Restraints Can Not Be Examined; dated June 5, 2012

AR 01396003; Localized Pipe Wall Thinning Found on 0WW07AB-8 During NDE; dated August 8, 2012
AR 01396003; Localized Pipe Wall Thinning Found On 0WW07AB-8 During NDE; dated August 1, 2012
AR 01434346; Dry Boric Acid Leak on Vent Cap; dated October 31, 2012
AR 01434364; Dry Boric Acid on ¾ Inch Flange Connection; dated October 31, 2012
AR 01434539; Dry Boric Acid on Bonnet; dated October 31, 2012
AR 01185736; Dry Boron on Pump Flange Bolting; dated March 10, 2011
AR 01193577; FME in 1RC01R Reactor Vessel; dated March 28, 2011
AR-01208120; NDE Indication Observed during MRP-192 Exam; dated April 26, 2011
AR 00885314; 0A SX M/U Pump Fuel Sample Results Acceptable; dated February 25, 2009
AR 00884504; 0A SX M/U PP Fuel Oil Sample Unsat; dated February 24, 2009
AR 00885314; 0A SX M/U PP Fuel Oil Sample Acceptable; dated February 25, 2009
AR 00581024; Fuel Sample From 0DO05T Tank Fails Clear and Bright Test; dated January 27, 2007
AR 00614914; R1-B2R13 FAC Scope Expansion Required; dated April 9, 2007
AR 00615496; R1-FAC Component 2RV110 Failed UT Examination; dated April 10, 2007
AR 00619516; 1DO02TA - Unsat Results From The 1A DG Oil Day Tank Sample; dated April 20, 2007
AR 00381707; 2B AF Diesel Day Tank Found Dirty during 10 Year Inspection; dated October 4, 2005
AR 00157911; 1D Diesel Oil Storage Tank Coating Degradation; dated May 8, 2003

Drawings

M-2CV08006S; Component Support, Chemical Feed and Volume Control-CV; Revision F
M-2CV08010S; Component Support, Chemical Feed and Volume Control-CV; Revision D
M-2CV08021S; Component Support, Chemical Volume & Control; Revision F
M-50 Sheet 1C; Diagram of Diesel Fuel Oil; Revision AN
M-50 Sheet 1A; Diagram of Diesel Fuel Oil; Revision AS
M-99; Diagram of River Screen House & Circulating Water Pump House Ventilation Systems; Revision M
M-117; P&ID of Radwaste and Remote Shutdown Control Room HVAC System (VI); Revision H
M-1312 Sheet 6; Auxiliary Building Radwaste and Remote Shutdown Cont. Rm. – HVAC; Revision AP
M-1312 Sheet 8; Auxiliary Building Radwaste and Remote Shutdown Control Room – HVAC System Sheet 8; Revision T
M-2099; HVAC/I&C Diagram Pump House Ventilation System; Revision N
S-313; Condensate Storage Tank Foundation Plan and Sections; Revision M
1-CISI-2000 Sheet 1, IWL.IWE Component Rollout Outside Containment 0 to 180 Azimuth Unit 1; Revision 0
1-CISI-2000 Sheet 2, IWL.IWE Component Rollout Outside Containment 180 to 360 Azimuth Unit 1; Revision 0

1-CISI-2000 Sheet 3, IWL Component Drawing Containment Dome Exterior Plan View Unit 1; Revision 0

1-CISI-2000 Sheet 4, IWL Component Drawing Tendon Gallery Plan View Unit 1; Revision 0

Miscellaneous

BACC FASA; dated June 23, 2010
Byron Station 2nd Interval ISI Program Plan; dated September 9, 2006
Certified Material Test Report - Heat No 153412 Bolt 62 (spare); dated February 12, 1976
Certified Material Test Report - Heat No 214444 16 Bolts (Byron 2); dated November 21, 1975.
Certified Material Test Report - Heat No 214444 16 Bolts (Byron 2); dated December 2, 1975
Certified Material Test Report - Heat No 214444 15 Bolts (Byron 2); dated December 9, 1975
Certified Material Test Report - Heat No 214444 12 Bolts (Byron 2); dated December 9, 1975
Corrosion Coupon Analytical Report 1153728; dated May 22, 2014
DTS Log ID EX0008800; CHECKWORKS Navigator/SFA DTSQA Classification Checklist; dated January 23, 2013
DTS Log ID EX0007900; CHECKWORKS Navigator/SFA DTSQA Classification Checklist; dated May 5, 2009
EXE-13-003; Evaluation or Analysis Using Higher Allowable Stresses in Later Editions and Addenda of Construction Codes; dated October 21, 2013
EC 349592; Replace Control Rode Drive Tube Support Pins with Material Resistant to Primary Water Stress Corrosion Cracking; Revision 1
EC 353115; Document and Evaluate the Acceptability the Free water Presence in Tendons Found during the 20th-Yr Tendon Surveillance; dated August 12, 2005
EC 383810; Byron Unit 1 B1R17 Steam Generator Condition Monitoring/Operational Assessment; Revision 0
EC 385032; B2R16 Steam Generator Degradation Assessment; Revision 1
EC 385482; Byron Unit 2 B2R16 Steam Generator Condition Monitoring/Operational Assessment; Revision 0
EC 389391; Regression Analysis to Predict Post-Tensioning Forces for Byron Unit 1 Containment Tendons in Support of License Renewal; Revision 0
EC 391931; Byron Unit 2 B2R17 Steam Generator Condition Monitoring/Operational Assessment; Revision 0
EC 395576; Higher Stresses in Section VIII HX & Class IID Piping; Revision 1
EC 395747; B1R19 Steam Generator Degradation Assessment; Revision 0
EPRI 1019038; Steam Generator Integrity Assessment Guidelines; Revision 3
ISI Program Plan - Third Ten-Year Inspection Interval; Revision 0
ISI Summary Report-IWF for RFO B2R14; May 3, 2007 to October 24, 2008
ISI Summary Report-IWF for RFO B2R15; August 21, 2011 to January 4, 2012
LER 2009-001-01; Byron Station Unit 2 - Late Entry into TS Condition Associated with Reactor Coolant System Leakage Characterization; Revision 1
LER 2012-004-00; Byron Station Unit 1 - Reactor Pressure Vessel Head Control Rod Drive Mechanism Penetration Nozzle Weld Repair; Revision 0
LER 2014-002-00: - Byron Station Unit 1 - Non-Compliance with Technical Specification 3.4.3 - RCS Pressure and Temperature Limits; Revision 0
Letter - Byron 2006-018, 90 Day ISI Report (1BR13); dated January 31, 2006
Letter - LTR-SGDA-07-90; WE Engineering Assessment of the Degradation to the Upper Internals of the Steam Generators 2A and 2B at Byron Unit 2 during the B2R16 Outage; dated October 3, 2011
Letter - LTR-SGDA-11-212; WE Engineering Assessment of the Degradation to the Upper Internals of the Steam Generators at Byron Unit 2; dated April 16, 2007
Letter- Byron 20060009; Submittal of Analytical Evaluation of Pressurizer Seismic Restraint Lug Indications; dated January 11, 2006
MRP 2013-025; MRP-227A Applicability Template Guidance; dated October 14, 2013

NRC Inspection Report 05000454/2014002; 05000455/2014002 for Byron Station, Units 1 and 2; dated May 7, 2014
NRC Inspection Report 05000454/2014003; 05000455/2014003 for Byron Station, Units 1 and 2; dated August 1, 2013
NSAC-202L-R3; Recommendations for an Effective Flow-Accelerated Corrosion Program; Revision 33
Program Health Report - Boric Acid Corrosion Control Program; 4rth Quarter 2013
Program Health Report - Boric Acid Corrosion Control Program; 1st Trimester 2014
Program Health Report - ISI Program; 4rth Quarter 2013
Program Health Report - ISI Program; 1st Trimester 2014
Program Health Report - SG Program; 4rth Quarter 2013
Program Health Report - SG Program; 1st Trimester 2014
Purchase Catalog ID 720444; Nitrogen Bottle Procurement Specifications
Root Cause Report – 0C Essential Service Water Riser Piping Leak; dated October 19, 2007
Surface Examination Data Sheet B2R12PT006; Unit 2 Pressurizer Lugs PSL-1,3 & 4; dated September 30, 2005
Ultrasonic Calibration Data Sheet; Unit 2 Pressurizer Lug PSL-1; dated October 5, 2005
Ultrasonic Calibration Data Sheet; Unit 1 Head Studs Nos. 19-35; dated March 19, 2011
Ultrasonic Calibration Data Sheet; Unit 1 Head Studs Nos. 1-18; dated March 28, 2008
Ultrasonic Calibration Data Sheet; Unit 1 Head Studs Nos. 19-54; dated March 8, 2005
Ultrasonic Examination Data Sheet; Unit 1 Head Studs Hole Flange Ligaments Nos. 1-54; dated March 31, 1999
WJE Final Report: Byron Generating Station, Inspection of Essential Service Water Cooling Tower; Revision 1

Procedures

0BMSR HC-21; River Screen House Underhung Traveling Bridge Crane Monthly/Yearly Inspection; Revision 4
0BMSR SX-5; Inspection of River Screen House and Essential Service Water Cooling Tower Basins; Revision 7
0BMSR z.7.a.5; Essential Service Water Cooling Tower (SXCT) Inspection; Revision 1
0BMSR 3.10.g.7 TRM Fire Damper 18-Month Visual; Revision 14
0BOSR IA-W1; Instrument Air Dryer Weekly Surveillance; Revision 5
0BOSR IA-2; Unit 0 Quarterly Instrument Air Testing; Revision 0
0BOSR 5.5.8.SX.5-1c; Unit Zero Comprehensive Inservice Testing (IST) Requirements for Essential Service Water Makeup Pump 0A; Revision 7
0BOSR 10.b.10-1; Annual Fire Protection System Flush; Revision 11
0BOSR 10.b.12-1; Fire Protection Pump Flow and Pressure Test; Revision 4
0BOSR 10.b.18-1; Unit 0 Fire Suppression Water System Fire Hydrant Flow Test; Revision 0
0BOSR 10.c.3-1; Annual Sprinkler and Deluge System Visual Inspection and Main Drain Test Surveillance; Revision 6
0BVSR FH-1; Unit 0 Spent Fuel Rack Boral Specimen Surveillance; Revision 5
0BVSR z.7.a.3; Deep Well Pump Make-Up Flow Verification; Revision 3
1BMSR HC-2; Turbine Building Overhead Traveling Bridge Crane Monthly/Yearly Inspection; Revision 9
1BOSR IA-R1; Instrument Air Surveillance for Refueling Outages; Revision 3
1BOSR IA-3; Unit One Instrument Air Dryer Testing; Revision 1
1BOSR 7.5.8-1; Unit One Quarterly Sampling Diesel Oil Day Tank for Auxiliary Feedwater System; Revision 4

1BOSR 8.3.3-1; Unit One 1A Diesel Generator Fuel Oil Storage Tanks Accumulated Water Sampling Monthly Surveillance; Revision 9
1BVSR-4.f.2-2; Nondestructive Examination of the Reactor Pressure Vessel; Revision 4
1BVSR-4.f.2-4; Unit 1 Scheduled 10 Year Visual Examination (VT-2) of Class 1 Components at Nominal Operating Pressures; Revision 6
1BVSR 4.f.2-7; Unit 1 Visual Examination of the Reactor Pressure Vessel Interior; Revision 5
1BVSR-4.f.2-8; Unit 1 Nondestructive Examination of ISI Program Components; Revision 5
2BMSR HC-2; Turbine Building Overhead Traveling Bridge Crane Monthly/Yearly Inspection; Revision 8
2BVSR 4.f.2-7; Unit 2 Visual Examination of the Reactor Pressure Vessel Interior; Revision 5
BAR 1-20-B12; River Screen House Alarm 1-20-B12 Response Procedure; Revision 3
BMP 3122-4; Essential Service Water Make-Up Repair; Revision 16
BMP 3208-3; Diesel Generator Governor Oil Change and Sampling; Revision 1
BOP DG-300-1; Sampling Standby Diesel Generators Lubricating Oil (DG01Ka, B); Revision 7
BVP 200-20; Spent Fuel Rack Boral Specimen Program; Revision 9
BVP 800-30; Essential Service Water Fouling Monitoring Program (GL 89-13 Program Basis Document); Revision 14
BVP 900-3; Documentation of Operating Plant/Component Cyclic or Transient Events; Revision 8
CC-AA-102; Design Input and Configuration Change Impact Screening; Revision 27
CC-AA-205; Control of Undocumented/Unqualified Coatings Inside the Containment; Revision 7
CY-AA-120-410; Circulating/Service Water Chemistry; Revision 4
CY-AA-120-4110; Raw Water Chemistry Strategic Plan; Revision 7
ER-AA-330; Conduct of Inservice Inspection Activities; Revision 10
ER-AA-330-001; Section XI Pressure Testing; Revision 11
ER-AA-330-002; Inservice Inspection of Section XI Welds and Components; Revision 10
ER- AA-330-002; Inservice Inspection of Section XI Welds and Components; Revision 10
ER-AA-330-003; Inservice Inspection of Section XI Component Supports; Revision 8
ER-AA-330-004; Visual Examination of Snubbers; Revision 7
ER-AA-330-005; Visual Examination of Section XI Class CC Concrete Containment Structures; Revision 10
ER-AA-300-006; Inservice Inspection and Testing of the Pre-Stressed Concrete Containment Post Tensioning Systems; Revision 6
ER-AA-330-006; Inservice Inspection and Testing of the Pre-Stressed Concrete Containment Post Tensioning Systems; Revision 007
ER-AA-330-007; Visual Examination of Section XI Class MC Surfaces and Class CC Liners; Revision 9
ER-AA-330-008; Exelon Service Level 1, and Safety Related (Service Level III) Protective Coatings; Revision 9
ER-AA-330-009; ASME Section XI Repair/Replacement Program; Revision 008
ER-AA-330-019; Visual Examination of ASME IWL Class CC Containment Components; Revision 0
ER-AA-335-016; VT-3 Visual Examination of Component Supports, Attachments and Interiors of Reactor Vessels; Revision 9
ER-AA-335-018; Visual Examination of ASME IWE Class MC and Metallic Liners of IWL Class CC Components; Revision 9
ER-AA-340; GL 89-13 Program Implementing Procedure; Revision 7
ER-AA-340-1001; GL 89-13 Program Implementing Instructional Guide; Revision 9
ER-AA-380; Primary Containment Leak Rate Testing Program; Revision 9
ER-AA-430; Conduct of Flow Accelerated Corrosion Activities; Revision 5
ER-AA-430-1001; Guidelines for Flow Accelerated Corrosion Activities; Revision 7

ER-AA-450; Structures Monitoring; Revision 3
ER-AA-470; Fatigue and Transient Monitoring Program; Revision 6
ER-AA-700-301; License Renewal One-Time Inspection Program; Revision 0
ER-AA-700-402; External Surface Monitoring Of Mechanical Components Aging Management Program; Revision 0
ER-AA-700-405; Compressed Air Monitoring Aging Management Program; Revision 0
ER-AA-700-1002; 10CFR 54.37(b) Review Process; Revision 2
ER-AA-2030; Conduct of Plant Engineering Manual; Revision 12
ER-AA-5400; Buried Piping and Raw Water Corrosion Program (BPRWCP) Guide; Revision 5
ER-AA-5400-1001; Raw Water Corrosion Program Guide; Revision 6
ER-AA-5400-1001; Raw Water Corrosion Program Guide; Revision 7
ER-AA-5400-1002; Buried Piping Examination Guide; Revision 4
ER-AP-331-1001; Boric Acid Corrosion Control Inspection Locations, Implement and Inspection Guidelines; Revision 7
ER-AP-331-1002; Boric Acid Corrosion Control Program Identification Screening and Evaluation; Revision 8
ER-AP-333; Pressurized Water Reactor Internals Management Program; Revision 0
ER-AP-333-1001; Pressurized Water Reactor Internals Program; Revision 0
ER- BY-450-1001; Byron Structures Monitoring Instructions; Revision 0
IT-AA-101-1001-F-01; DTSQA Classification Checklist; Revision 0
IT-AA-101; Digital Technology Software Quality Assurance Procedure; Revision 10
IT-AA-101-1001; DTSQA Level Classification; Revision 8
IT-AA-101-1001; DTS Quality Assurance Level Classifications; Revision 3
MA-AA-716-021; Lifting and Rigging Program; Revision 21
MA-AA-716-230; Predictive Maintenance Program; Revision 8
MA-AA-716-230-1001; Oil Analysis Interpretation Guideline; Revision 13
MA-AA-716-230-1004; Lubricant Sampling Guideline; Revision 3
MA-AA-733-1001; Guidance for Check Valve General Visual Inspection; Revision 7
MA-AP-733-381; Polar Crane Monthly/Yearly Inspection; Revision 7
MA-MW-736-600; Torquing and Tightening of Bolted Connections; Revision 4
NF-AA-610; On-Site Wet Storage of Spent Nuclear Fuel; Revision 13
NSWP-M-04; Pipe Support Installation and Inspection; Revision 2
PES-S-010; Fasteners; Revision 0

Surveillances

Byron Station 20th Year Unit 1 Physical and Unit 2 Visual Containment Tendon Surveillance Report; dated November 22, 2004
BY-N1044-N501; Final Report for 25th Year Containment IWL Inspection –Tendon Surveillance; dated November 16, 2009
PM122831; Unit 1 – Containment Vessel Tendon Test (5Y)
PMID 100159-03; SXCT A Cell Inspection per TRM, 1 Year Frequency; due April 14, 2015
PMID 100162-03; SXCT B Cell Inspection per TRM, 1 Year Frequency; due May 5, 2015
PMID 100165-03; SXCT C Cell Inspection per TRM, 1 Year Frequency; due May 12, 2015
PMID 100168-03; SXCT D Cell Inspection per TRM, 1 Year Frequency; due September 11, 2014
PMID 100171-03; SXCT E Cell Inspection per TRM, 1 Year Frequency; due September 24, 2014
PMID 100174-03; SXCT F Cell Inspection per TRM, 1 Year Frequency; due August 25, 2015
PMID 100177-03; SXCT G Cell Inspection per TRM, 1 Year Frequency; due October 1, 2014
PMID 100180-03; SXCT H Cell Inspection per TRM, 1 Year Frequency; due October 22, 2014

PMID 139682-17; Units 1 and 2, Areas 5, 6, and 7, Auxiliary Building 451; dated October 13, 2011
Report: VT-3 Component Support Examination; M-2CV08021S (Snubber); dated December 4, 2003
Report 2011-2314; VT-3 Component Support Examination; M-2CV08021S (Snubber); dated October 2, 2011

Work Orders and Work Requests

WO 00498121; Inspect CNMT Liner at Previously UT'ed LOC for Signs of Degradation; dated May 18, 2004
WO 00698993; Inspect CNMT Liner At Previously UT'ed Loc for Signs of Degradation; dated May 18, 2004
WO 00698993; Inspect CNMT Liner at Previously UT'ed LOC for Signs of Degradation; dated October 19, 2005
WO 00713045; IWL Exam of Class CC Concrete Structures; dated September 1 2006
WO 00713045; IWL, Visual Exam of Concrete (Class CC) Containment Structures; dated September 5, 2006
WO 00745524; 0SX04AB – HX Inspection per GL 89-13; dated January 22, 2009
WO 00857257; Install Unit 2 Control Rod Drive Support Pin; dated April 21, 2007
WO 00907699; Spent Fuel Rack Boral Specimen Surveillance; dated March 30, 2007
WO 00975572; MM-Clean 0DO05T Internals; dated March 5, 2007
WO 01072533; Replace Thinned Wall Pipe at SX Tower; dated October 27, 2007
WO 01100057; U/1 Visual Exam of Class CC Components and Surfaces; dated March 30, 2009
WO01164151; U1 (SX-3-5) VT XI (1A Pump Running); dated June 4, 2010
WO 01188586; Biennial Deep Well Pump Structure Inspection; dated July 2, 2010
WO 01195942; FP System Leakage; dated July 14, 2009
WO 01195942; Fire System Leakage Trace; dated July 14, 2009
WO 01216960; UT SX Riser; dated April 10, 2010
WO 01231741; Perform Containment Liner Plate Inspection; dated September 28, 2009
WO 01249080; IWL Exam of Class CC Concrete Structures; dated July 12, 2011
WO 01284581; Fire Protection Pump Flow and Pressure Test; dated August 15, 2011
WO 01291990; Limited Liner Plate Inspection Behind U2 Moisture Barrier; dated April 29, 2010
WO 01297602; OP (Sample) D/G Fuel Oil Day Tank Sample; dated March 27, 2010
WO 01302154; U1 VT XI SX-3-8 (1A/1B Pump Running); dated September 28, 2010
WO 01323965; Unit 1 VT-2 RHR System; dated September 29, 2011
WO 01323987; LLRT P-98 Fuel Transfer Tube Bellows; dated September 25, 2011
WO 01323987; LLRT for P-98 Fuel Transfer Tube Bellows; October 5, 2011
WO 01324570; LLRT For P-98 Fuel Transfer Tube Bellows; dated February 19, 2011
WO 01361699; FP System Leakage; dated July 11, 2011
WO 01377321; FP System Fire Hydrants Flow Test; dated December 12, 2012
WO 01400847; Biennial Deep Well Pump Structure Inspection; dated December 28, 2012
WO 01406366; U1 (SX-3-5) VT XI (1A Pump Running); dated November 14, 2012
WO 01419618; Remove LP Turbine for Inspection; dated October 5, 2012
WO 01420266; Unit 1 VT-2 RHR System; dated September 12, 2012
WO 01432448; Perform Polar Crane Inspection Surveillance MA-AP-733-381; dated September 10, 2012
WO 01440005; FP System Annual Flush; dated August 16, 2012
WO 01441592; Offload LP Rotor from Railcar to 451 Deck; dated September 6, 2012
WO 01445756; Perform Fuel Handling Building Crane Annual Surveillance for 0H03G; dated August 14, 2012

WO 01450638; Unit 2 VT-2 RHR System; dated December 19, 2012
WO 01453679; Perform Turbine Building Crane Inspection per BMS HC-2; dated September 7, 2012
WO 01455473; FP System Leakage; dated July 9, 2012
WO 01464221; Unit 2 VT-2 RHR System; dated October 31, 2012
WO 01487708; Monorail Annual Inspection; dated January 16, 2013
WO 01498278; LLRT for P-98 – Fuel Transfer Tube Bellows; April 25, 2013
WO 01564392; Monthly Cycle Counting; dated September 13, 2012
WO 01572126; R3 Moisture Barrier Degraded at 4 Separate Locations; dated September 28, 2012
WO 01578923; Support ECT Concurrent with GL 89-13; dated May 28, 2014
WO 01585386; Spent Fuel Rack Boral Specimen Surveillance; dated November 6, 2013
WO 01599078; Sprinkler System Visual Inspection and Main Drain Test; dated February 14, 2013
WO 01602496; LLRT for P-95 – 2VQ002A and 2VQ002B; June 22, 2013
WO 01649514; 0BOSR SX-SA1 SX-FP XTIE Surveillance; dated April 18, 2014
WO 01649514; SW Water – Fire Protection System Semiannual Flush; dated April 18, 2014
WO 01731369; 1A AF Pump SX Suction Line Flushing Surveillance; dated May 14, 2014
WO 01747690; Cycle Counting; dated July 19, 2014
WO 99238606; IWL, Visual Exam of Concrete (Class CC) CNMT Structures; dated September 6, 2001
WR 990193858; Repairs to Reactor Cavity Hoist; dated October 10, 2003

Corrective Action Documents (Written as a Result of the Inspection)

AR 01689311; Increased Noise from 0CW100B; dated August 5, 2014
AR 01689473; NRC Identified - Diesel FP Pmp/Mtr Rm Lights Not Functioning; dated August 18, 2014
AR 01694494; LR – SX Make-Up Line Change-In-Flow Testing Accuracy; dated August 20, 2014
AR 01689473; NRC Identified - Diesel FP Pmp/Mtr Rm Lights Not Functioning; dated August 18, 2014
AR 01689807; Reactor Surveillance Program; dated August 6, 2014
AR 01690222; NRC ID'D: Degrading Paint Identified on FP Lines at RSH; dated August 7, 2014
AR 01690391; NRC ID – SX Make-Up Pump Diesel Exhaust Corrosion; dated August 7, 2014
AR 01690390; NRC ID – SX Make-Up Pump Diesel Exhaust Corrosion; dated August 7, 2014
AR 01690547; LR Coating Degradation on Top of RSH CO2 Tank; dated August 8, 2014
AR 01690641; NRC ID: Fuel Oil Leak on 1A Diesel Generator; dated August 8, 2014.
AR 01694245; LR- Seal on Regulator Valve 0GW5010A May Be Degraded; dated August 19, 2014
AR 01694494; LR – SX Make-Up Line Change-In-Flow Testing Accuracy; dated August 20, 2014
AR 01695059; NRC Identified Discrepancies in Concrete Examination Records; dated August 21, 2014

LIST OF ACRONYMS USED

ACI	American concrete Institute
AMP	Aging Management Program
AR	Action Request
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing of Materials
ATWS	Anticipated Transient Without Scram
CAP	Corrective Action Program
CFR	Code of Federal Regulations
CRDM	Control Rod Drive Mechanism
CST	Condensate Storage Tank
DOST	Diesel Oil Storage Tank
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EPRI	Electric Power Research Institute
EQ	Environmental Qualification
ESCT	Essential Service Water Cooling Tower
ESF	Engineered Safety Feature
FAC	Flow Accelerated Corrosion
GALL	Generic Aging Lessons Learned
GL	Generic Letter
IEB	Inspection and Enforcement Bulletin
IEEE	Institute of Electrical & Electronic Engineers
IN	Information Notice
ISG	Interim Staff Guidance
ISI	Inservice Inspection
LR	License Renewal
LRCR	License Renewal Change Request
LRA	License Renewal Application
MEB	Metal Enclosed Bus
MEQ	Mechanical Equipment Qualification
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NRC	U.S. Nuclear Regulatory Commission
NPS	Nominal Pipe Size
NUMARC	Nuclear Management and Resources Council
PBD	Program Basis Document
PTS	Pressurized Thermal Shock
PWR	Pressurized Water Reactor
PWSCC	Primary Water Stress Corrosion Cracking
RAI	Request for Additional Information
RG	Regulatory Guide
RHR	Residual Heat Removal
RVI	Reactor Vessel Internal
SBO	Station Blackout
SCC	Stress Corrosion Cracking
SSC	System, Structure, and Component
UFSAR	Updated Final Safety Analysis Report
ksi	Kilo-pounds Per Square Inch (1000 Pounds Per Square Inch)
kV	Kilo-volt (1000 Volts)

In accordance with Title 10, *Code of Federal Regulations* (CFR), Section 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any), will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records System (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Ann Marie Stone, Chief
Engineering Branch 2
Division of Reactor Safety

Docket No. 50-454; 50-455
License No. NPF-37; NPF-66

Enclosure:
Inspection Report 05000454/2014008;
05000455/2014008
w/Attachments: Supplemental Information
and Exit Meeting Presentation Slides

cc w/encl: Distribution via LISTSERV®

DISTRIBUTION w/encl:
John Jandovitz
RidsNrrDorlLpl3-2 Resource
RidsNrrPMByron Resource
RidsNrrDirsIrib Resource
Cynthia Pederson
Darrell Roberts
Steven Orth
Allan Barker
Carole Ariano
Linda Linn
DRPIII
DRSIII
Carmen Olteanu
ROPreports.Resource@nrc.gov

DOCUMENT NAME: G:\DRSIII\DRS\Work in Progress 2\BYR 2014 008 LR MSH.docx
□ Publicly Available □ Non-Publicly Available □ Sensitive □ Non-Sensitive
To receive a copy of this document, indicate in the concurrence box "C" = Copy without attach/encl "E" = Copy with attach/encl "N" = No copy

OFFICE	RIII		RIII					
NAME	AMStone for MHolmberg:ls		AMStone					
DATE	11/07/14		11/07/14					

OFFICIAL RECORD COPY