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NINE MILE POINT
NUCLEAR STATION
UNIT 2

UPDATED SAFETY
ANALYSIS REPORT

OCTOBER 2016

REVISION 22

APPENDIX C

LICENSE RENEWAL SUPPLEMENT -
AGING MANAGEMENT PROGRAMS AND TIME-LIMITED AGING ANALYSES

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LICENSE RENEWAL SUPPLEMENT - AGING MANAGEMENT PROGRAMS AND TIME-LIMITED AGING ANALYSES

C.0 INTRODUCTION

The original operating license for Nine Mile Point Nuclear Station - Unit 2 (Unit 2) was issued by the Nuclear Regulatory Commission (NRC) on October 31, 1986, and authorized operation for 40 yr. Per 10CFR54, licensees could apply for a renewed operating license that would authorize up to an additional 20 yr of operation. Unit 2 applied for a renewed license on May 26, 2004, and amended the application on July 14, 2005. The NRC granted approval of a renewed license on October 31, 2006. The environmental and safety reviews conducted by the NRC are documented in NUREG-1437 Supplement 24, and NUREG-1900, respectively.

This appendix to the Unit 2 Updated Safety Analysis Report (USAR) meets the requirements of 10CFR54.21(d) and describes the programs credited for managing the aging of applicable structures, systems and components (SSC), describes the time-limited aging analyses (TLAA) performed for license renewal, lists the commitments made to meet the regulations, and describes the generic quality assurance program requirements for license renewal.

The Aging Management Programs (AMP) described in this appendix have been credited with managing the aging of SSCs that have been determined to be within the scope of license renewal [per 10CFR54.4(a)] and subject to aging management [per 10CFR54.21(a)(1)]. There are 39 AMPs described in this appendix. Seven are new programs while the remaining 32 are existing (some have license renewal names but they include activities already performed at the station). For each AMP, a description of the program is provided along with the identification of any enhancements (i.e., commitments) and/or exceptions taken to the NRC guidance documents (NUREG-1800 Rev. 0 and NUREG-1801 Rev. 0).

This appendix also describes the TLAA dispositions performed for license renewal per 10CFR54.21(c). The dispositions address existing Unit 2 calculations and analyses that include, as one of the criteria, a time limit. The time limit is normally the duration of the original license, i.e., 40 yr, but can be any length of time. Each TLAA description includes the scope of the evaluation and a conclusion of how the evaluation is dispositioned for the period of extended operation (i.e., 41 to 60 yr).

A table documenting each of the commitments made as part of the license renewal application (LRA) is also provided. Each commitment is associated with a TLAA or AMP and is described in those sections. The table provides a single location for all the

commitments. The source document for the commitment is listed along with the due date. Where the source document is listed as "LRA Section...," it refers to the Amended License Renewal Application (ALRA) submitted on July 14, 2005, under letter number NMP1L 1962. A due date of "Prior to period of extended operation" means prior to October 31, 2026.

The final section of this appendix addresses the generic quality assurance program requirements for license renewal. Each AMP must meet three attributes that are the same for all AMPs. The attributes are corrective actions, confirmation process, and administrative controls. The final section describes how each attribute is addressed for the Unit 2 AMPs.

C.1 AGING MANAGEMENT PROGRAMS

C.1.1 10CFR50 Appendix J Program

The 10CFR50 Appendix J Program detects degradation of the containment structure and components that comprise the containment pressure boundary, including seals and gaskets. Containment leak rate tests are performed to assure that leakage through the primary containment and systems and components penetrating primary containment does not exceed allowable leakage limits specified in the Technical Specifications. This program complies with Option B requirements of 10CFR50 Appendix J, with plant-specific exceptions approved by the NRC as part of license amendments, and implements the guidelines provided in NEI 94-01, Revision 2-A.

C.1.2 ASME Section XI Inservice Inspection (Subsection IWE) Program

The American Society of Mechanical Engineers (ASME) Section XI Inservice Inspection (Subsection IWE) Program (referred to herein as the IWE ISI Program) manages aging effects due to 1) corrosion of carbon steel components comprising the containment pressure boundary; and 2) degradation of containment pressure-retaining polymers. Program activities include visual examination, with limited surface or volumetric examinations when augmented examination is required. The IWE ISI Program is based on the 1998 edition of the ASME Boiler and Pressure Vessel Code, Section XI (Subsection IWE), for containment inservice inspection with plant-specific exceptions approved by the NRC. This is an exception to the evaluation in NUREG-1801 (which covers ASME Section XI requirements from both the 1992 edition with the 1992 addenda, and the 1995 edition with the 1996 addenda).

The Unit 2 ASME Section XI Inservice Inspection (Subsection IWE) Program is being improved to add an augmented VT-1 visual examination of the Unit 2 containment penetration bellows. This inspection will be performed using enhanced techniques qualified for detecting SCC per NUREG-1611, Table 2, Item 12. This improvement is not required for consistency with NUREG-1801 but

is an activity being adopted to ensure consistency with industry practice.

C.1.3 ASME Section XI Inservice Inspection (Subsection IWF) Program

The ASME Section XI Inservice Inspection (Subsection IWF) Program (referred to herein as the IWF ISI Program) manages aging of carbon steel component and piping supports, including ASME Class MC supports, due to general corrosion and wear. Program activities include visual examination to determine the general mechanical and structural condition of components and their supports. The IWF ISI Program is based on the 1989 edition of the ASME Boiler and Pressure Vessel Code, Section XI (Subsection IWF), for inservice inspection of supports, and implements the alternate examination requirements of ASME Code Case N-491-1. This is an exception to the evaluation in NUREG-1801 (which covers ASME Section XI requirements from the 1989 edition through the 1995 edition, and addenda through the 1996 addenda).

C.1.4 ASME Section XI Inservice Inspection (Subsection IWL) Program

The ASME Section XI Inservice Inspection (Subsection IWL) Program (referred to herein as the IWL ISI Program) manages aging of concrete in the Unit 2 containment wall, base mat, and drywell floor. Program activities include general visual examination of all accessible concrete surface areas, with provisions for detailed visual examination when deterioration and distress of suspect areas is detected. The IWL ISI Program is based on the 1998 edition of the ASME Boiler and Pressure Vessel Code, Section XI (Subsection IWL), for containment inservice inspection with plant-specific exceptions approved by the NRC. This is an exception to the evaluation in NUREG-1801 (which covers ASME Section XI requirements from both the 1992 edition with the 1992 addenda, and the 1995 edition with the 1996 addenda).

C.1.5 ASME Section XI Inservice Inspection (Subsections IWB, IWC, IWD) Program

The ASME Section XI Inservice Inspection (Subsections IWB, IWC, IWD) Program manages aging of Class 1, 2, or 3 pressure-retaining components and their integral attachments. Program activities include periodic visual, surface, and/or volumetric examination and pressure tests of Class 1, 2, and 3 pressure-retaining components. The ASME Section XI Inservice Inspection (Subsections IWB, IWC, IWD) Program is based on ASME Section XI, 1989 edition with no addenda, and ASME Section XI, Appendix VIII, 1995 edition through 1996 addenda. Examination categories B-F, B-J, C-F-1, C-F-2, and intergranular stress corrosion cracking (IGSCC) Category A are inspected using NRC-approved risk-informed methodology. Prior to the period of extended operation, the ISI Program will be updated to the latest edition and addenda of ASME Section XI, as mandated by 10CFR50.55a and 10CFR54 requirements. This is an exception to the program described in NUREG-1801

(which cites ASME Section XI requirements covered in the 1995 edition through 1996 addenda).

C.1.6 Buried Piping and Tanks Inspection Program

The Buried Piping and Tanks Inspection Program is a new program that will manage the aging effects on the external surfaces of carbon steel, low-alloy steel, and cast iron components (e.g., tanks, piping) that are buried in soil. Program activities will include visual inspections of external coatings and wrappings to detect damage and degradation. Prior to entering the period of extended operation, Nine Mile Point will verify that there has been at least one opportunistic or focused inspection within the past 10 yr.

Upon entering the period of extended operation, Nine Mile Point will perform a focused inspection within 10 yr, unless an opportunistic inspection occurred within this 10-yr period. All credited inspections will be performed in areas with the highest likelihood of corrosion problems, and in areas with a history of corrosion problems. This program will be implemented prior to the period of extended operation.

C.1.7 BWR Feedwater Nozzle Program

The Unit 2 Feedwater Nozzle Program requires ultrasonic test (UT) examinations of the feedwater nozzles every 10 yr to verify the nozzles are acceptable for continued service.

The Feedwater Nozzle Program is implemented through the ISI Program which, at the time the LRA was submitted, conformed to the requirements in ASME Section XI, Subsection IWB, Table IWB 2500-1 (1989 edition, no addenda), and ASME Section XI, Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," 1995 edition with the 1996 addenda. NUREG-1801, Section XI.M5, identifies the 1995 edition (including the 1996 addenda) of ASME Section XI as the basis for the Generic Aging Lessons Learned (GALL) Feedwater Nozzle Program. The ISI Programs will not comply with the edition and addenda of ASME Section XI cited in the GALL report because the programs are updated to the latest edition and addenda of ASME Section XI, as mandated by 10CFR50.55a, prior to the start of each inspection interval.

UT and particle test inspections required by NUREG-0619 have been superseded because the inspections are now performed in accordance with ASME Section XI, Appendix VIII.

C.1.8 BWR Penetrations Program

The Boiling Water Reactor (BWR) Penetrations Program manages the effects of cracking in the various penetrations of the reactor pressure vessels (RPV) at Nine Mile Point. The BWR Penetrations Program is based on guidelines issued by the BWR Vessel and Internals Project and approved by the NRC. This program is

implemented by the BWR Vessel and Internals Program (BWRVIP) for managing specific aging effects. The attributes of the BWR Penetrations Program related to maintaining reactor coolant water chemistry are included in the Water Chemistry Control Program.

C.1.9 BWR Reactor Water Cleanup System Program

The BWR Reactor Water Cleanup (RWCU) System Program manages the effects of stress corrosion cracking or IGSCC on the intended function of austenitic stainless steel piping in the RWCU system. This program is based on the NRC criteria related to inspection guidelines for RWCU piping welds outboard of the containment isolation valve, as delineated in NUREG-0313, Revision 2, and Generic Letter (GL) 88-01. The design of the Unit 2 RWCU system is such that carbon steel piping welds are not required to be examined in accordance with GL 88-01. The attributes of the BWR RWCU System Program related to maintaining reactor coolant water chemistry are included in the Water Chemistry Control Program.

C.1.10 BWR Stress Corrosion Cracking Program

The BWR Stress Corrosion Cracking (SCC) Program manages IGSCC in reactor coolant pressure boundary (RCPB) piping made of stainless steel, as delineated in NUREG-0313, Revision 2, and GL 88-01 and its Supplement 1, as modified by BWRVIP-75. Augmented inspections are performed in accordance with these documents. An exception to the program described in NUREG-1801 is that the acceptance criteria for the BWR SCC Program are based upon the 1989 edition of the ASME Section XI Code versus the 1995 edition through the 1996 addenda, as described in NUREG-1801. The attributes of the BWR SCC Program related to maintaining reactor coolant water chemistry are included in the Water Chemistry Control Program.

C.1.11 BWR Vessel ID Attachment Welds Program

The BWR Vessel ID Attachment Welds Program manages the effects of cracking in RPV inside diameter (ID) attachment welds. This program is based on industry guidelines issued by the BWRVIP and approved by the NRC. The BWR Vessel ID Attachment Welds Program is implemented by the BWRVIP for managing specific aging effects. The attributes of the BWR Vessel ID Attachment Welds Program related to maintaining reactor coolant water chemistry are included in the Water Chemistry Control Program.

C.1.12 BWR Vessel Internals Program

The BWRVIP manages aging of materials inside the reactor vessel. Program activities include 1) inspections for the presence and effects of cracking; and 2) monitoring and control of water chemistry. This program is also used to manage loss of material for the carbon steel vessel instrumentation penetrations. This program is based on guidelines issued by the BWRVIP and approved (or pending approval) by the NRC. Inspections and evaluations of

reactor vessel components are consistent with the guidelines provided in the following BWRVIP reports:

- BWRVIP-18, BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines
- BWRVIP-25, BWR Core Plate Inspection and Flaw Evaluation Guidelines
- BWRVIP-26, BWR Top Guide Inspection and Flaw Evaluation Guidelines
- BWRVIP-27, BWR Standby Liquid Control System/Core Plate ΔP Inspection and Flaw Evaluation Guidelines
- BWRVIP-38, BWR Shroud Support Inspection and Flaw Evaluation Guidelines
- BWRVIP-41, BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines
- BWRVIP-42, LPCI Coupling Inspection and Flaw Evaluation Guidelines
- BWRVIP-47, BWR Lower Plenum Inspection and Flaw Evaluation Guidelines
- BWRVIP-48, Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines
- BWRVIP-49, Instrument Penetration Inspection and Flaw Evaluation Guidelines
- BWRVIP-74, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines
- BWRVIP-76, BWR Core Shroud Inspection and Flaw Evaluation Guidelines

Unit 2 has completed, or will complete, each of the license renewal applicant action items described in the NRC safety evaluations for these BWRVIP reports. In addition, Unit 2 will implement the NRC-approved inspection and flaw evaluation guidelines for the steam dryer, access hole cover, and inaccessible core spray, jet pump, and LPCI component welds when issued. The attributes of the BWRVIP related to maintaining reactor coolant water chemistry are included in the Water Chemistry Control Program.

Enhancements to the BWRVIP include the following revisions to existing activities that are credited for license renewal:

1. Unit 2 will perform inspections of the guide beams similar (in inspection methods, scope and frequency of inspection) to the inspections specified in BWRVIP-47, "BWR Lower Plenum Inspection and Flaw Evaluation Guidelines," for the control rod guide tube components. The extent of examination and its frequency will be based on a 10-percent sample of the total population, which includes all grid beam and beam-to-crevice slots, being inspected within 12 yr of entry into the period of extended operation with 5 percent of the population being inspected within the first 6 yr. The sample locations selected for examination will be in areas that are exposed to the highest neutron fluence. The

top guide grid beam reinspection requirements will depend on the inspection results; however, at a minimum, the BWRVIP will follow the same guidance for the subsequent 12-yr interval as defined for the initial 12-yr baseline.

2. Nine Mile Point will implement the resolution of the open items documented in BWRVIP-18, BWRVIP-41, and BWRVIP-42 regarding the inspection of inaccessible welds for core spray, jet pump, and low-pressure coolant injection (LPCI) components, respectively. It will be included in the BWRVIP response to be reviewed and accepted by the NRC.

3. Once the guidelines for inspection and evaluation for steam dryers currently under development by the BWRVIP committee are documented, reviewed and accepted by the NRC, the actions will be implemented in accordance with the BWRVIP.

4. Once the inspection and evaluation guidelines for access hole covers guidelines are documented, reviewed and accepted by the NRC, the actions will be implemented into the BWRVIP.

5. The baseline inspections recommended in BWRVIP-47 for the BWR lower plenum components will be incorporated into the program.

6. Unit 2 will evaluate component susceptibility to loss of fracture toughness. Assessments and inspections will be performed, as necessary, to ensure that intended functions are not impacted by the aging effect.

7. An EVT-1 examination of the Unit 2 feedwater sparger end bracket welds will be added to the BWRVIP. The inspection extent and frequency of the end bracket weld inspection will be the same as the ASME Section XI inspection of the feedwater sparger bracket vessel attachment welds. If the final fabrication review of the Unit 2 feedwater thermal sleeve concludes that the thermal sleeve hidden welds are not IGSCC susceptible, the Unit 2 inspections will be discontinued.

Enhancements will be completed prior to the period of extended operation.

C.1.13 Closed-Cycle Cooling Water System Program

The Closed-Cycle Cooling Water System (CCCWS) Program manages loss of material and fouling of components exposed to CCCW environments. The applicable piping systems include the reactor building closed loop cooling (RBCLC) system, which does not perform an intended cooling function, control building

ventilation chilled water system, the heat exchanger jacket water cooling portion of the standby diesel generator protection (generator) system. Also included are portions of non-safety related systems credited in the aging management review. Program activities include chemistry monitoring, surveillance testing, data trending, and component inspections. The CCCWS Program implements the guidelines for controlling system performance and aging effects described in Electric Power Research Institute (EPRI) Report TR-107396.

Enhancements to the CCCWS Program include the following revisions to existing activities that are credited for license renewal:

1. Direct periodic inspections to monitor for loss of material in the piping of the CCCW systems.

2. Establish periodic monitoring, trending, and evaluation of performance parameters for the RBCLC and control building ventilation chilled water systems.

3. Implement a program to use corrosion inhibitors in the RBCLC system and control building ventilation chilled water system in accordance with the guidelines given in EPRI TR-107396.

4. Establish the frequencies to inspect for degradation of components in CCCW systems, including heat exchanger tube wall thinning.

5. Expand periodic chemistry checks of CCCW systems consistent with the guidelines of EPRI TR-107396.

6. Specify chemistry sampling frequency for the control building ventilation chilled water system.

7. Provide the controls and sampling necessary to maintain water chemistry parameters in CCCW systems within the guidelines of EPRI Report TR-107396.

8. Ensure acceptance criteria are specified in the implementing procedures for the applicable indications of degradation.

The enhancements will be completed prior to the period of extended operation.

C.1.14 Environmental Qualification Program

The Environmental Qualification (EQ) Program manages thermal, radiation, and cyclical aging for electrical equipment important to safety and active safety-related mechanical equipment located in harsh plant environments at Unit 2. Program activities 1) identify applicable equipment and environmental requirements; 2) establish, demonstrate, and document the level of qualification (including configuration, maintenance,

surveillance, and replacement requirements); and 3) maintain (or preserve) qualification. The EQ Program employs aging evaluations based on 10CFR50.49(f) qualification methods. Components in the EQ Program must be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. Important attributes for the reanalysis of an aging evaluation include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met).

C.1.15 Fatigue Monitoring Program

The Fatigue Monitoring Program (FMP) manages the fatigue life of RCPB components by tracking and evaluating key plant events. The FMP monitors operating transients to date, calculates cumulative usage factors (CUF) to date, and directs performance of engineering evaluations to develop preventive and mitigative measures in order not to exceed the design limit on fatigue usage.

The FMP will be enhanced with guidance for the use of the FatiguePro software package and updated methodology for environmental fatigue factors in establishing updated fatigue life calculations for components. The enhancement will be completed prior to the period of extended operation.

C.1.16 Fire Protection Program

The Fire Protection Program provides guidance for performance of periodic visual inspections to manage aging of the various materials comprising rated fire barriers. These include 1) sealants in rated penetration seals (subject to shrinkage due to weathering); 2) concrete and steel in fire-rated walls, ceilings, and floors (subject to loss of material due to flaking and abrasion; separation and concrete damage due to relative motion, vibration, and shrinkage); and 3) steel in rated fire doors (subject to loss of material due to corrosion and wear or mechanical damage). In addition, this program requires testing of the diesel-driven fire pump to verify that it is performing its intended function. This activity manages aging of the fuel oil supply line to, and the exhaust system from, the diesel engine, both of which may experience loss of material due to corrosion. Inspection and testing is performed in accordance with the guidance of applicable standards. There are two exceptions to the Fire Protection Program as described in NUREG-1801. Inspections on hollow metal fire doors will be performed on a plant-specific schedule, and valve lineups will not be used for aging management of fire suppression systems. These exceptions are consistent with NRC Interim Staff Guidance (ISG) 04.

The Fire Protection Program will be enhanced to include the following: 1) periodic visual inspections of piping and fittings in a non-water environment in the Halon and carbon dioxide (CO_2)

fire suppression systems components to detect signs of degradation; 2) periodic functional tests of the diesel-driven fire pump will be enhanced to include inspection of engine exhaust system components to verify that loss of material is managed; 3) the fire door inspection frequency will be determined by a plant-specific analysis; and 4) Halon and CO_2 functional test frequencies will be revised to semi-annual. These enhancements will be implemented prior to the period of extended operation.

C.1.17 Fire Water System Program

The Fire Water System Program manages aging of water-based fire protection systems due to loss of material and biofouling. Program activities include periodic maintenance, testing, and inspection of system piping and components containing water (e.g., sprinklers, nozzles, fittings, valves, hydrants, hose stations, standpipes). Inspection and testing is performed in accordance with the guidance of applicable National Fire Protection Association (NFPA) Codes and Standards and the Nuclear Electric Insurance Limited (NEIL) Members' Manual. Enhancements to the Fire Water System Program include the following revisions to existing activities that are credited for license renewal:

1. Incorporate inspections to detect and manage loss of material due to corrosion into existing periodic test procedures.

2. Specify periodic component inspections to verify that loss of material is being managed.

3. Add procedural guidance for performing visual inspections to monitor internal corrosion and detect biofouling.

4. Add requirements to periodically check the water-based fire protection systems for microbiological contamination.

5. Develop new procedures and preventive maintenance tasks to implement sprinkler head replacement and/or inspections to meet NFPA 25, Section 5.3.1 (2003 edition) requirements.

6. Measure fire protection system piping wall thickness using non-intrusive techniques (e.g., volumetric testing) to detect loss of material due to corrosion.

7. Establish an appropriate means of recording, evaluating, reviewing, and trending the results of visual inspections and volumetric testing.

8. Define acceptance criteria for visual inspections and volumetric testing.

Enhancements will be completed prior to the period of extended operation.

C.1.18 Flow-Accelerated Corrosion Program

The Flow-Accelerated Corrosion (FAC) Program (also referred to as the Erosion/Corrosion Program) manages aging effects due to FAC in carbon steel and low-alloy steel piping containing single-phase and two-phase high-energy fluids. Program activities include 1) analysis using a predictive code (CHECWORKS) to determine critical locations; 2) baseline inspections to determine the extent of thinning at the selected locations; 3) follow-up inspections to confirm the predictions; and 4) repair or replacement of components, as necessary. The program considers the recommended actions in NRC Bulletin 87-01 and Information Notice 91-18, and implements the guidelines for an effective FAC Program presented in EPRI Report NSAC-202L-R2. The program also implements the recommendations provided in NRC Generic Letter (GL) 89-08, "Erosion/Corrosion Induced Pipe Wall Thinning."

C.1.19 Fuel Oil Chemistry Program

The Fuel Oil Chemistry Program manages loss of material due to corrosion that may result from introduction of contaminants into the plant's fuel oil tanks. Program activities include 1) sampling and chemical analysis of the fuel oil inventory at the plant; 2) sampling, testing, and analysis of new fuel oil as it is unloaded at the plant; and 3) cleaning and inspection of fuel oil tanks. The Fuel Oil Chemistry Program is based on maintaining fuel oil quality in accordance with the guidelines of American Society for Testing Materials (ASTM) Standards D975, D1796, D2276, and D4057.

The Fuel Oil Chemistry Program takes exceptions to the following NUREG-1801, Section XI.M30 (Fuel Oil Chemistry Program) evaluation elements:

1. Unit 2 takes exception to using both ASTM D1796 and ASTM D2709 to determine the concentration of water and sediment in the diesel fuel oil tanks. Unit 2 uses only the guidance given in ASTM D1796.

2. Unit 2 takes exception to using the modified ASTM D2276, Method A, which specifies a pore size of 3.0 µm. Unit 2 uses a filter with a pore size of 0.8 µm as specified in ASTM D2276.

3. Unit 2 takes exception to multilevel sampling in the diesel fuel oil tanks. The physical configuration of the fuel oil tanks does not allow a representative fuel oil sample to be taken at multiple levels.

4. Unit 2 takes exception to periodically sampling the emergency diesel fuel oil day tanks. These small tanks do not have a provision for sampling.

5. Unit 2 takes exception to periodic internal inspection of any fuel oil day tank. The physical size and configuration are not suitable for such inspections and, after enhancement, all such tanks will be routinely drained, thereby removing any contaminants from the tank that would provide an aging mechanism.

6. Unit 2 takes exception to the addition of biocides, stabilizers, and corrosion inhibitors to the diesel fuel oil storage tanks.

Enhancements to the Fuel Oil Chemistry Program include the following revisions to existing activities that are credited for license renewal:

1. Add a requirement for quarterly trending of water, sediment, and particulate contamination analysis results.

2. Add requirements to periodically inspect the fuel oil tanks for evidence of significant degradation, including a requirement that the tank thickness be determined. Bottom thickness measurements will be performed using UT or other industry-recognized methods.

3. Provide guidelines for the appropriate use of biocides, corrosion inhibitors, and fuel stabilizers to maintain fuel oil quality.

4. Add a requirement to sample the diesel fuel oil storage tanks for water and sediment at least quarterly per the ASTM standard.

5. Ensure acceptance criteria are specified in the implementing procedures for the applicable indications of potential degradation.

6. Add steps for removal of water, if found.

Enhancements will be completed prior to the period of extended operation.

C.1.20 Fuse Holder Inspection Program

The Fuse Holder Inspection Program is a new plant-specific program that applies to fuse holders located outside of active devices that have aging effects requiring management. This program requires testing to detect deterioration of metallic clamps that would affect the ability of in-scope fuse holders to perform their intended function. The Fuse Holder Inspection

Program includes the following aging stressors: moisture, fatigue, ohmic heating, mechanical stress, vibration, thermal cycling, electrical transients, chemical contamination, oxidation, and corrosion.

Analytical trending will not be included in this activity because the parameters monitored may vary depending upon the test method selected. This is an exception to the "Monitoring and Trending" element in Appendix A.1.2.3.5 to NUREG-1800, but is consistent with the latest regulatory and industry license renewal precedence. This program will be implemented prior to the period of extended operation.

C.1.21 Inspection of Overhead Heavy Load and Light Load Handling Systems Program

The Inspection of Overhead Heavy Load and Light Load Handling Systems Program (referred to herein as the Crane Inspection Program) manages loss of material due to corrosion of cranes within scope of license renewal (WSLR). Program activities include 1) performance of various maintenance activities on a specified frequency; and 2) preoperational inspections of equipment prior to lifting activities. Crane inspection activities are based on the mandatory requirements of applicable industry standards and implement the guidance of NUREG-0612.

The Crane Inspection Program will be enhanced to add specific direction for performance of corrosion inspections of certain hoist lifting assembly components. The enhancement will be completed prior to the period of extended operation.

C.1.22 Masonry Wall Program

The Masonry Wall Program manages aging effects so that the evaluation basis established for each masonry wall WSLR remains valid through the period of extended operation. The Masonry Wall Program is based on the structures monitoring requirements of 10CFR50.65. The Masonry Wall Program is implemented by the Structures Monitoring Program for managing specific aging effects.

C.1.23 Non-EQ Electrical Cables and Connections Program

The Non-EQ Electrical Cables and Connections Program is a new program that manages aging of cables and connectors WSLR exposed to adverse localized temperature, moisture, or radiation environments. Program activities include periodic visual inspection of susceptible cables for evidence of cable and connection jacket surface anomalies. This program will be implemented prior to the period of extended operation.

C.1.24 Non-EQ Electrical Cables and Connections Used in Instrumentation Circuits Program

The Non-EQ Electrical Cables and Connections Used in Instrumentation Circuits Program manages aging of cables and connections exposed to adverse localized temperature and radiation environments that could result in loss of insulation resistance. It applies to accessible and inaccessible electrical cables that are not in the EQ Program and are used in circuits with sensitive, high-voltage, low-level signals such as radiation monitoring, nuclear instrumentation, and other such cables subject to aging management review that are sensitive to a reduction in insulation resistance. Activities include routine calibration tests of instrumentation loops, or direct testing of the cable system in those cases where cable testing is conducted as an alternate to surveillance testing, and in either case are implemented through the Surveillance Testing and Preventive Maintenance Programs. Testing is based on requirements of the particular calibrations, surveillances, or testing performed on the specific instrumentation circuit or cable and is implemented through the work control system. Where cable testing is conducted as an alternate to surveillance testing, the acceptance criteria for each test will be defined by the specific type of test performed and the specific cable tested.

Enhancements to the Non-EQ Electrical Cables and Connections Used in Instrumentation Circuits Program include the following revisions to existing activities that are credited for license renewal:

1. Implement reviews of calibration or surveillance data for indications of aging degradation affecting instrument circuit performance. The first reviews will be completed prior to the period of extended operation and every 10 yr thereafter.

2. In cases where a calibration or surveillance program does not include the cabling system in the testing circuit, or as an alternative to the review of calibration results described above, provide requirements and procedures to perform cable testing to detect deterioration of the insulation system, such as insulation resistance tests or other testing judged to be effective in determining cable insulation condition. The first test will be completed prior to the period of extended operation. The test frequency of these cables shall be determined based on engineering evaluation, but the test frequency shall be at least once every 10 yr.

Enhancements will be completed prior to the period of extended operation.

C.1.25 Non-EQ Inaccessible Medium-Voltage Cables Program

The Non-EQ Inaccessible Medium-Voltage Cables Program provides reasonable assurance that the intended functions of inaccessible medium-voltage cables that are not subject to the EQ requirements

of 10CFR50.49, and are exposed to adverse localized environments caused by moisture while energized, will be maintained consistent with the current licensing basis through the period of extended operation. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified service environment for the cable. An adverse variation in environment is significant if it could appreciably increase the rate of aging of a component or have an immediate adverse effect on operability. In this AMP, periodic actions are taken to prevent cables from being exposed to significant moisture, such as inspecting for water collection in cable manholes, and draining water as needed. Additionally, in-scope medium-voltage cables exposed to significant moisture and significant voltage are tested to provide an indication of the condition of the conductor insulation. The specific type of test performed will be determined prior to the initial test, and will be a proven test for detecting deterioration of the insulation system due to wetting, such as power factor or partial discharge, as described in EPRI TR-103834-P1-2, or other testing that is state-of-the-art at the time the test is performed, and consistent with the latest industry guidance at the time the test is performed. The program considers the technical information and guidance provided in applicable industry publications.

Enhancements to the Non-EQ Inaccessible Medium-Voltage Cables Program include:

1. Expand the scope of the existing procedures to provide for manhole inspection and water removal,

2. Develop new testing procedure specific to those cables requiring aging management under this Program. The specific type of test performed will be determined prior to the initial test, will be a proven test for detecting deterioration of the insulation system due to wetting, as described in EPRI TR-103834-P1-2, such as power factor, partial discharge, or other testing that is both state-of-the-art and consistent with the latest industry guidance at the time the test is performed,
3. Establish maintenance requirement to test cables subject to aging management prior to, and every 10 yr during, the period of extended operation, and

4. Establish maintenance requirement to inspect and remove water, as necessary, from manholes serving cables subject to aging management. The inspection frequency will be based on actual plant experience with water accumulation in the manhole, but in any event, will be at least once every 2 yr. The first inspection will be completed prior to the period of extended operation.

Enhancements will be implemented prior to the period of extended operation.

C.1.26 Non-Segregated Bus Inspection Program

The Non-Segregated Bus Inspection Program manages aging effects for components and materials internal to the non-segregated bus ducts that connect the reserve auxiliary transformers to the 4160V buses required for the recovery of offsite power following a station blackout (SBO) event. Based upon the most recent industry and regulatory license renewal precedence, this program also includes normally energized bus ducts associated with boards feeding components WSLR. These normally-energized components are not subject to the EQ requirements of 10CFR50.49, but can be affected by elevated temperatures prior to the end of the period of extended operation. Program activities include 1) visual inspections of internal portions of the bus ducts to detect cracks, corrosion, debris, dust, and moisture; 2) visual inspections of the bus insulating system to detect embrittlement, cracking, melting, swelling, and discoloration; 3) visual inspections of bus supports (insulators) to detect cracking and lack of structural integrity; and 4) as an alternative to thermography or measuring connection resistance of bolted connections, a visual inspection for the accessible bolted connections that are covered with heat shrink tape, sleeving, insulating boots, etc. The program considers the technical information and guidance provided in applicable industry publications.

Analytical trending will not be included in this activity because the ability to trend inspection results is limited. This is an exception to the "Monitoring and Trending" element in Appendix A.1.2.3.5 to NUREG-1800. Enhancements to the Non-Segregated Bus Inspection Program include expanded visual inspections of the bus ducts, their supports and insulation systems. Enhance program documents to develop acceptance criteria for visual inspection of the bus ducts, their supports and insulation systems, and the low-range ohmic checks of connections.

Enhancements will be implemented prior to the period of extended operation.

C.1.27 One-Time Inspection Program

The One-Time Inspection Program is a new program that manages aging effects with potentially long incubation periods for susceptible components WSLR. Program activities include visual, volumetric, and other established inspection techniques consistent with industry practice to provide a means of verifying that an aging effect is either 1) not occurring, or 2) progressing so slowly that it has a negligible effect on the intended function of the structure or component. The program also provides measures for verifying the effectiveness of existing AMPs. This program will be implemented prior to the period of extended operation.

C.1.28 Open-Cycle Cooling Water System Program

The Open-Cycle Cooling Water System (OCCWS) Program manages aging of components exposed to raw, untreated (e.g., service) water. This includes a portion of the alternate decay heat (ADH) system, safety-related portions of the service water (SWP) system, the residual heat removal (RHS) heat exchangers, diesel generator (EGS) jacket water coolers, and control room chillers (HVK).

The program also manages internal portions of non-safety related segments of the circulating water (CWS) and SWP systems which are WSLR per 10CFR54.4(a)(2). It also manages all aging effects for components subject to the scope of recommendations for GL 89-13.

Program activities include 1) surveillance and control of biofouling (including biocide injection); 2) verification of heat transfer capabilities for components cooled by the SWP system; 3) inspection and maintenance; 4) walkdown inspections; and 5) review of maintenance, operating, and training practices and procedures. Inspections may include visual, UT, and eddy current testing (ECT) methods. This program is based on the recommendations of GL 89-13.

Enhancements to the OCCWS Program include the following activities that are credited for license renewal:

1. Ensure that the applicable Unit 2 commitments made for GL 89-13, and the requirements in NUREG-1801, Section XI.M20, are captured in Unit 2 procedure N2-TDP-REL-0104, "GL 89-13, Service Water System Problems Affecting Safety Related Equipment Program Plan."

2. Where the requirements of the NUREG-1801, Section XI.M20, are more conservative than the GL 89-13 commitments, they will be incorporated into the OCCWS Program.

3. Revise Unit 2 preventive maintenance and heat transfer performance test procedures to incorporate specific inspection criteria, corrective actions, and frequencies.

Enhancements will be completed prior to the period of extended operation.

C.1.29 Preventive Maintenance Program

The scope of the Preventive Maintenance (PM) Program includes, but is not limited to, valve bodies, heat exchangers, expansion joints, tanks, ductwork, fan/blower housings, dampers, and pump casings. This program provides for performance of various maintenance activities on a specified frequency based on vendor recommendations and operating experience. These activities provide opportunities for component condition monitoring to manage the effects of aging for many SSCs that are WSLR.

Enhancements to the PM Program include the following revisions to existing activities that are credited for license renewal:

1. Expand the PM Program to encompass activities for certain additional components identified as requiring aging management.

2. Explicitly define the aging management attributes, including the systems and the component types/commodities included in the program.

3. Specifically list activities credited for aging management, parameters monitored, and the aging effects detected.

4. Establish a requirement that inspection data be monitored and trended.

5. Establish detailed parameter-specific acceptance criteria.

Enhancements will be completed prior to the period of extended operation.

C.1.30 Reactor Head Closure Studs Program

The Reactor Head Closure Studs Program manages cracking and loss of material from the RPV closure studs. This program implements the preventive measures of RG 1.65. Inservice examinations are performed in accordance with the 1989 edition of the ASME Boiler and Pressure Vessel Code with no addenda, and ASME Section XI, Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," 1995 edition through 1996 addenda as approved by the NRC in plant-specific exemptions. This is an exception to the program described in NUREG-1801 (which cites ASME Section XI requirements covered in the 1995 edition through 1996 addenda).

C.1.31 Reactor Vessel Surveillance Program

The Reactor Vessel Surveillance Program manages loss of fracture toughness due to neutron irradiation embrittlement in the RPV beltline material. Program activities include 1) periodic withdrawal and testing of surveillance capsules from the RPV; 2) use of test results and allowable stress loadings for the ferritic RPV materials to determine operating limits; and 3) comparison with a large industry data set to confirm validity of test results. Analysis and testing are based on the requirements of 10CFR50 Appendix H, and ASTM Standard E-185. Nine Mile Point commits to implement the Integrated Surveillance Program (ISP) described in BWRVIP-116 (if approved by the NRC staff). When the NRC issues a final safety evaluation report (SER) for BWRVIP-116, Nine Mile Point will address any open items and complete the SER action items. Should BWRVIP-116 not be approved by the NRC, a plant-specific Reactor Vessel Surveillance Program will be

submitted to the NRC 2 yr prior to commencement of the period of extended operation.

Enhancements to the Reactor Vessel Surveillance Program include the following revisions to existing activities that are credited for license renewal:

1. Incorporate the requirements and elements of the ISP, as documented in BWRVIP-116 and approved by the NRC or an NRC-approved plant-specific program, into the Reactor Vessel Surveillance Program, and include a requirement that if Unit 2 surveillance capsules are tested, the tested specimens will be stored in lieu of optional disposal.

2. Project analyses of upper-shelf energy (USE) and pressure-temperature (P-T) limits to 60 yr using methods prescribed by RG 1.99, Revision 2, and include the applicable bounds of the data, such as operating temperature and neutron fluence.

Enhancements will be completed prior to the period of extended operation.

C.1.32 Selective Leaching of Materials Program

The Selective Leaching of Materials Program is a new program that manages aging of components susceptible to selective leaching. The potentially susceptible components include valve bodies, valve bonnets, pump casings, and heat exchanger components in various systems. This program will be implemented through the One-Time Inspection Program prior to the period of extended operation.

C.1.33 Structures Monitoring Program

The Structures Monitoring Program manages aging of structures, structural components, and structural supports that are WSLR. The program provides for periodic visual inspections, surveys, and examination of all safety-related buildings (including the containment buildings and substructures within the primary containment), and various other buildings that are WSLR. Program activities identify degradation of materials of construction, which include structural steel, concrete, masonry block, and sealing materials. While not credited for mitigation of aging, protective coatings are also inspected under this program. The Structures Monitoring Program, which was initially developed to meet the regulatory requirements of 10CFR50.65, implements guidance provided in RG 1.160, NUMARC 93-01, and NEI 96-03.

Enhancements to the Structures Monitoring Program include the following revisions to existing activities that are credited for license renewal:

1. Expand the program to include the following activities or components that are WSLR, but not within the current scope of 10CFR50.65: 1) fire-rated assemblies and watertight penetration visual inspection; 2) masonry walls in the turbine building and service water tunnel serving a fire barrier function, and 3) steel electrical transmission towers required for the SBO recovery path.

2. Expand the parameters monitored during structural inspections to include those relevant to aging effects requiring management identified for structural bolting.

3. Implement regularly scheduled groundwater monitoring to ensure that a benign environment is maintained.

Enhancements will be completed prior to the period of extended operation.

C.1.34 Systems Walkdown Program

The Systems Walkdown Program manages aging effects for accessible external surfaces of pumps, valves, piping, bolts, heat exchangers, tanks, heating, ventilation and air conditioning (HVAC) components, and other components. Visual inspections identify corrosion, changes in material properties, signs of material degradation, and leakage. The program also identifies adverse conditions that can lead to aggressive environments for systems and components within the scope of license renewal. Program activities include system engineer walkdowns (i.e., field evaluations of system components to assess material condition), documentation and evaluation of inspection results, and appropriate corrective actions.

Enhancements to the Systems Walkdown Program include the following revisions to existing activities that are credited for license renewal:

1. Train all personnel performing inspections in the Systems Walkdown Program to ensure that age-related degradation is properly identified, and incorporate this training into the site training program.

2. Specify acceptance criteria for visual inspections to ensure aging-related degradation is properly identified and corrected.

Enhancements will be completed prior to the period of extended operation.

C.1.35 Water Chemistry Control Program

The Water Chemistry Control Program manages aging effects by controlling the internal environment of the reactor water, feedwater, condensate, and control rod drive systems, and related

auxiliaries (such as the suppression pool, condensate storage tank, and spent fuel pool). The aging effects of concern are 1) loss of material; and 2) crack initiation and growth. Program activities include monitoring and controlling concentrations of known detrimental chemical species below the levels known to cause degradation. The Water Chemistry Control Program implements the guidelines for BWR water chemistry presented in EPRI Report TR-103515-R2. This is an exception to the program described in NUREG-1801 (which identifies EPRI TR-103515-R0 as the basis for BWR water chemistry programs).

C.1.36 Bolting Integrity Program

The Bolting Integrity Program manages aging effects due to loss of preload, cracking, and loss of material of bolting within the scope of license renewal, including safety-related bolting, bolting for nuclear steam supply system (NSSS) component supports, bolting for other pressure-retaining components, and structural bolting. Program activities include periodic inspections of bolting for indication of loss of preload, cracking, and loss of material due to corrosion, rust, etc. This program is based on the guidelines delineated in NUREG-1339 and EPRI NP-5769, with exceptions noted in NUREG-1339, for safety-related bolting and EPRI TR-104213 for other bolting. The Bolting Integrity Program is implemented through the ASME Section XI Inservice Inspection (Subsections IWB, IWC, IWD) Program, ASME Section XI Inservice Inspection (Subsection IWE) Program, ASME Section XI Inservice Inspection (Subsection IWF) Program, Structures Monitoring Program, PM Program, and Systems Walkdown Program. An exception is taken to the GALL in that Unit 2 utilizes the 1989 edition with no addenda of the ASME Section XI Code versus the 1995 edition through the 1996 addenda.

Enhancements to the Bolting Integrity Program include the following:

1. Establish an augmented inspection program for high-strength (actual yield strength ≥150 ksi) bolts. This augmented program will prescribe the examination requirements of Tables IWB-2500-1 and IWC-2500-1 of ASME Section XI for high-strength bolts in the Class 1 and Class 2 component supports, respectively.

2. The Structures Monitoring, PM and Systems Walkdown Programs will be enhanced to include requirements to inspect bolting for indication of loss of preload, cracking, and loss of material, as applicable.

3. Include in administrative and implementing program documents references to the Bolting Integrity Program and industry guidance.

Enhancements will be completed prior to the period of extended operation.

C.1.37 Protective Coating Monitoring and Maintenance Program

The Protective Coating Monitoring and Maintenance Program is described in the Unit 2 response to GL 98-04, "Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System after a Loss-Of-Coolant Accident because of Construction and Protective Coating Deficiencies and Foreign Material in Containment." The program applies to Service Level 1 protective coatings inside the primary containment. The Unit 2 suppression pool (wetwell) is not included because it is primarily stainless steel and does not have Service Level 1 coatings. The condition assessments and resulting repair, replacement, or removal activities ensure that the amount of coatings subject to detachment from the substrate during a loss-of-coolant accident (LOCA) is minimized to ensure post-accident operability of the emergency core cooling system (ECCS) suction strainers. The Protective Coating Monitoring and Maintenance Program takes exception to certain NUREG-1801, Section XI.S8 (Protective Coating Monitoring and Maintenance Program) evaluation elements, in that it is not credited for prevention of corrosion of carbon steel. The program will be enhanced following the guidance within ASTM D5163-05a, and measurements of cracks, peeling, or delaminated coatings will be estimated via visual methods.

Planned program enhancements include the following:

1. Specifying the visual examination of coated surfaces for any visible defects including blistering, cracking, flaking, peeling, and physical or mechanical damage.

2. Performance of periodic inspection of coatings every refueling outage versus every 24 months.

3. Setting minimum qualifications for inspection personnel, the inspection coordinator, and the inspection results evaluator.

4. Performing the thorough visual inspection and areas noted as deficient along with the general visual inspection.

5. Specifying the types of instruments and equipment that may be used for the inspection.

6. Requiring pre-inspection reviews of the previous two monitoring reports before performing the condition assessment.

7. Establishing guidelines for prioritization of repair areas and monitoring these areas until they are repaired.

8. Requiring that the inspection results evaluator determine which areas are not acceptable and initiates corrective action.

Enhancements will be completed prior to the period of extended operation.

C.1.38 Non-EQ Electrical Cable Metallic Connections Inspection Program

The Non-EQ Electrical Cable Metallic Connections Inspection Program is a new plant-specific program that manages the aging effects of the metallic portion of electrical cable connections that are not subject to the qualification requirements of 10CFR50.49, but are still subject to aging effects caused by various stressors. These aging stressors include: thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. All connections associated with cables that are in scope for license renewal are part of this program. This program is a one-time inspection program, on a representative sample basis, of the non-EQ electrical cable metallic connection population subject to aging management to ensure that aging that would affect the ability of the non-EQ electrical cable metallic connections to perform their intended function is not occurring. The one-time inspections will be completed at least once prior to the period of extended operation to verify that loosening and/or high resistance of the non-EQ electrical cable connections due to the identified potential aging stressors is not occurring and, therefore, periodic inspections are not required during the period of extended operation.

Trending actions are not included as part of this program because it is a one-time inspection program.

C.1.39 Wooden Power Pole Inspection Program

The Unit 2 Wooden Power Pole Inspection Program manages the aging of wooden electrical poles that are within the scope for license renewal for recovery from SBO. Qualified personnel perform inspections to manage material loss and degradation and physical damage of wooden poles prior to the period of extended operation and every 10 yr thereafter. Activities include visual inspections of the entire structure, including cross members and hardware, pole sounding and circumference measurements, below-grade inspections, any necessary core boring, preservative application, and pesticide treatments. Corrective actions may include pole reinforcement or replacement. The program inspection activities ensure that in-scope electrical support structures retain their intended functions between inspection cycles. The Wooden Power Pole Inspection Program is implemented by the Structures Monitoring Program for managing specific aging effects.

The Wooden Power Pole Inspection Program is a new program that will be implemented prior to the period of extended operation.

C.2 TIME-LIMITED AGING ANALYSES SUMMARIES

As part of the application for a renewed license, 10CFR54.21(c) requires that an evaluation of TLAAs for the period of extended operation be provided. The following TLAAs have been identified and evaluated to meet this requirement.

C.2.1 Reactor Vessel Neutron Embrittlement Analysis

The ferritic materials of the reactor vessel are subject to embrittlement due to high-energy neutron exposure. The evaluation of reactor vessel neutron embrittlement is a TLAA. The following TLAA discussions are related to the issue of neutron embrittlement.

- Upper-shelf energy
- Pressure-temperature limits
- Axial weld failure probability

C.2.1.1 Upper-Shelf Energy

Ferritic RPV materials undergo a transition in fracture behavior from brittle to ductile as the temperature of the material is increased. Charpy V-notch tests are conducted in the nuclear industry to monitor changes in the fracture behavior during irradiation. Neutron irradiation to fluences above approximately $1x10^{17}$ n/cm^2 causes an upward shift in the ductile-to-brittle transition temperature and a drop in USE. To satisfy the acceptance criteria for USE contained in 10CFR50 Appendix G, the RPV beltline materials must have a Charpy USE of no less than 50 ft-lbs throughout the life of the RPV unless it can be demonstrated that lower values of Charpy USE will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code.

The USE for the limiting beltline weld materials and for the limiting beltline plate materials for Unit 2 are predicted to remain above 50 ft-lbs throughout the period of extended operation based on projected fluence values. Therefore, the USE for the Unit 2 RPV beltline materials has been projected (reevaluated) for the period of extended operation in accordance with 10CFR54.21(c)(1)(ii).

C.2.1.2 Pressure-Temperature Limits

10CFR50 Appendix G requires that the RPV be operated within established P-T limits during heatup and cooldown. These limits specify the maximum allowable pressure as a function of reactor coolant temperature. Unit 2 Technical Specifications contain P-T limit curves for heatup, cooldown, inservice leakage testing, and

hydrostatic testing, and limit the maximum rate of change of reactor coolant temperature.

The P-T limit curves are periodically revised to account for changes in fracture toughness of the RPV components due to anticipated neutron embrittlement effects for higher accumulated fluences. Calculation of P-T limit curves using the projected fluence at the end of the period of extended operation would result in unnecessarily restrictive operating curves. However, projection of the adjusted reference temperature (ART), which is used in development of the curves, to the end of the period of extended operation provides assurance that development of P-T limit curves will be feasible up to the maximum predicted effective full power year (EFPY).

Projections of the ART values for the beltline materials have been made for the period of extended operation, providing reasonable assurance that it will be possible to prepare P-T curves that will permit continued plant operation. The P-T curves (and the related Technical Specifications) will continue to be updated, either as required by 10CFR50 Appendix G to assure the operational limits remain valid at the current cumulative neutron fluence levels, or on an as-needed basis to provide appropriate operational flexibility.

C.2.1.3 Axial Weld Failure Probability

In the safety evaluation presented in "Supplement to Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report" (Reference 5), the NRC staff indicates that the RPV failure frequency due to failure of the limiting axial welds in the BWR fleet at the end of 40 yr of operation is less than $5x10^{-6}$ per reactor year, given the assumptions on flaw density, distribution, and location described in the SER. Projected values of mean reference temperature nil ductility transition temperature (RT_{NDT}) and upper bound RT_{NDT} for the limiting axial welds at Unit 2 are below the bounding mean RT_{NDT} value determined by the NRC staff in the SER for BWRVIP-74-A (Reference 1). Thus, there is reasonable assurance that the RPV failure frequency due to failure of the limiting axial weld is expected to remain less than $5x10^{-6}$ per reactor year for Unit 2.

Inspection of the axial welds in accordance with the ASME XI Code requirements will continue at Unit 2 during the period of extended operation. Supporting analyses will be completed prior to the period of extended operation to confirm that the RPV axial weld failure probability for the limiting Unit 2 axial weld remains bounded for the period of extended operation. Based on the scoping evaluation discussed above, there is reasonable assurance the failure probability will remain acceptable for the period of extended operation.

C.2.2 Metal Fatigue Analysis

ASME Section III requires calculation of CUFs to demonstrate fatigue-tolerant design for reactor vessels, vessel internals, Class 1 piping and components, metal containments, and penetrations. These values are indexed to the number of transients anticipated over the design life of the component (usually 40 yr).

Designated plant events have been counted and categorized to ensure that the number of actual operational transient cycles does not exceed the number of transients assumed in the plant design for fatigue. For certain events that affect fatigue usage, linear projections of the actual data to the end of the period of extended operation will exceed the analyzed number of design basis transients. For those locations where additional fatigue analysis is required to take advantage of the implicit margin (and to more accurately determine CUFs), the EPRI FatiguePro fatigue monitoring software will be implemented.

The following thermal and mechanical fatigue analyses of mechanical components have been identified as TLAAs:

1. Reactor Vessel Fatigue Analysis
2. ASME Section III Class 1 Piping and Components Fatigue Analysis
3. Feedwater (FWS) Nozzle and Control Rod Drive Return Line (CRDRL) Nozzle Fatigue and Cracking Analyses
4. Non-ASME Section III Class 1 Piping and Components Fatigue Analysis
5. Reactor Vessel Internals Fatigue Analysis
6. Environmentally Assisted Fatigue

C.2.2.1 Reactor Vessel Fatigue Analysis

The original design of RPV pressure boundary components included analyses of fatigue resistance. Components were evaluated by calculating the alternating stresses associated with applicable design transients and determining a CUF based on the number of anticipated transients for the original 40-yr life of the plant. Fatigue-tolerant design is demonstrated for those locations with CUFs less than 1.0.

For the critical RPV component locations, transients contributing to fatigue usage will be tracked by the FMP (Section C.1.15) with additional usage added to the baseline CUF. The FMP provides an analytical basis for confirming that the number of cycles established by the analysis of record will not be exceeded before the end of the period of extended operation.

C.2.2.2 ASME Section III Class 1 Piping and Components Fatigue Analysis

The RCPB piping at Unit 2 was designed to meet ASME Section III Class 1 requirements for fatigue loading. The subject piping and components were evaluated by calculating the alternating stresses associated with applicable design transients and determining a CUF based on the number of anticipated transients for the original 40-yr life of the plant. Fatigue-tolerant design is demonstrated for components with CUFs less than 1.0 (or less than 0.1 for components in break exclusion zones). Additional pipe break postulation criteria are applied to high-energy ASME Class 1 piping with a CUF greater than 0.1.

For the bounding locations for ASME Class 1 systems, transients contributing to fatigue usage will be tracked by the FMP (Section C.1.15) with additional usage added to the baseline CUF.

C.2.2.3 Feedwater Nozzle and Control Rod Drive Return Line Nozzle Fatigue and Cracking Analyses

BWRs have experienced fatigue crack initiation and growth in FWS and CRDRL nozzles. Rapid thermal cycling (occurring as a result of bypass leakage past loose-fitting thermal sleeves, or in nozzles lacking thermal sleeves) initiated fatigue cracks that propagated due to larger (in terms of the magnitude of temperature and pressure change) thermal cycles resulting from plant transients. NUREG-0619, "BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking," identifies interim and long-term procedural and design changes to minimize thermal fatigue cracking, as well as inspection requirements.

Various calculations were prepared in response to NUREG-0619 (e.g., to support enhanced inspection intervals, to incorporate updated fatigue crack growth curves, etc.), and CUFs were determined on the basis of anticipated transients for the original 40-yr life of the plant. Fatigue-tolerant design is demonstrated for those locations with CUFs less than 1.0.

The Unit 2 FWS nozzles require continued monitoring (including analysis using FatiguePro) to demonstrate compliance over the period of extended operation. Transients contributing to fatigue usage of the FWS nozzles will be tracked by the FMP (Section C.1.15) with additional usage added to the baseline CUF. In NUREG-0619, the NRC evaluated a number of options proposed by General Electric Company (GE) to resolve the problem of cracking in the CRDRL nozzle, and identified acceptable methods for performing the modifications. Unit 2 implemented the recommendation to cut and cap the CRDRL nozzle without rerouting the CRDRL. Therefore, there are no fatigue concerns associated with the CRDRL nozzle at Unit 2.

C.2.2.4 Non-ASME Section III Class 1 Piping and Components Fatigue Analysis

With the exception of the RCPB piping, piping and components WSLR were designed to codes other than ASME Section III Class 1.

Applicable codes include ASME Section III Class 2 or 3. These codes do not require explicit fatigue analysis. Instead, the effects of cyclic loading are accounted for through application of stress range reduction factors based on the anticipated number of equivalent full temperature thermal expansion cycles over the original 40-yr life of the plant.

No locations in the Non-ASME Class 1 piping at Unit 2 are expected to require development of fatigue analyses. ASME Section III Class 2 and 3 piping generally experiences less severe thermal transients and does not include any of the locations identified in NUREG/CR-6260 (Reference 2). Therefore, the existing fatigue design basis for Unit 2 is considered valid for the period of extended operation. If fatigue monitoring of ASME Class 1 piping indicates higher fatigue usage than expected, non-ASME Class 1 piping will be evaluated for possible fatigue concerns.

C.2.2.5 Reactor Vessel Internals Fatigue Analysis

Determination of CUFs was not a design requirement for reactor vessel internals at Unit 2. However, certain locations were evaluated for fatigue using ASME Section III methods to calculate alternating stresses and determine CUF values based on a number of anticipated transients (generally for the original 40-yr life of the plant). Fatigue-tolerant design is demonstrated for those locations with CUFs less than 1.0.

While all CUFs determined for components comprising the reactor vessel internals are less than 1.0, the calculated values for certain locations exceed 0.4 (considered a general threshold of significance). Thus, the CUFs for these locations (i.e., the shroud, core support plate and studs, and jet pumps) will be revised or reevaluated to remove conservatism and/or encompass the period of extended operation. In particular, a more extensive fatigue analysis of the jet pumps (whose original design analyses are proprietary to GE) will be performed prior to the period of extended operation.

The potential for cracking of components comprising the reactor vessel internals, both due to fatigue and (more significantly) IGSCC, is managed by the BWRVIP (Section C.1.12), which incorporates comprehensive inspection and evaluation guidelines issued by the BWRVIP and approved by the NRC. These activities provide assurance that any unexpected degradation resulting from fatigue in the reactor vessel internals for the current license period and the period of extended operation will be identified and corrected. Therefore, the effects of fatigue on the intended function(s) of the reactor vessel internals will be adequately managed for the period of extended operation.

C.2.2.6 Environmentally-Assisted Fatigue

Generic Safety Issue (GSI) 190, "Fatigue Evaluation of Metal Components for 60-Year Plant Life," was established to address

NRC concerns regarding environmental effects on fatigue of pressure boundary components for 60 yr of plant operation. The NRC staff studied the probability of fatigue failure for selected metal components based on the increased CUFs determined in NUREG/CR-6260 (Reference 2) and a 60-yr plant life. The NRC closed this GSI and concluded that environmental effects did not substantially affect core damage frequency. However, since the nature of age-related degradation indicated the potential for an increase in the frequency of pipe leaks as plants continue to operate, licensees are required to address the effects of coolant environment on component fatigue life as AMPs are formulated in support of license renewal.

Unit 2 will assess the impact of the reactor coolant environment on a sample of critical component locations, including locations equivalent to those identified in NUREG/CR-6260 as part of the FMP (Section C.1.15). These locations will be evaluated by applying environmental correction factors (F_{en}) to existing and future fatigue analyses. Evaluation of the sample of critical components will be completed prior to the period of extended operation.

C.2.3 Environmental Qualification

The following EQ analyses have been identified as TLAAs:

- Electrical Equipment EQ
- Mechanical Equipment EQ

C.2.3.1 Electrical Equipment EQ

10CFR50.49 requires that certain safety-related and non-safety related electrical equipment remain functional during and after identified design basis events. To establish reasonable assurance that this equipment can function when exposed to postulated harsh environmental conditions, licensees are required to determine the equipment's qualified life and to develop a program that maintains the qualification of that equipment.

For components within the scope of the EQ Program (Section C.1.14), analyses of thermal exposure, radiation exposure, and mechanical cycle aging that cannot be shown to remain valid for the period of extended operation will be projected to extend the qualification of components before reaching the aging limits established in the applicable evaluation, or the components will be refurbished or replaced.

C.2.3.2 Mechanical Equipment EQ

To demonstrate compliance with General Design Criterion (GDC) 4 of Appendix A to 10CFR50, the NRC staff required that Unit 2 submit evaluations of the environmental effects on nonmetallic subcomponents comprising safety-related mechanical equipment that must remain functional in harsh environments during and after

identified design basis events (Reference 3). Threshold radiation values and maximum service temperatures for these materials were compared with the maximum postulated environmental conditions to establish qualification. If necessary, a material replacement life limit was calculated.

For components within the scope of the EQ Program (Section C.1.14), analyses of thermal exposure, radiation exposure, and mechanical cycle aging that cannot be shown to remain valid for the period of extended operation will be projected to extend the qualification of the components before reaching the aging limits established in the applicable evaluation, or the components will be refurbished or replaced.

C.2.4 Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis

The following containment analyses have been identified as TLAAs:

- Containment Liner Analysis
- Fatigue of Primary Containment Penetrations
- Downcomer and Safety/Relief Valve Discharge Line (SRVDL) Fatigue Evaluation

C.2.4.1 Containment Liner Analysis

The Unit 2 Mark II containment is a reinforced concrete structure consisting of a drywell chamber located above a suppression pool, with a drywell floor separating the two. Except at various penetrations and access openings through the walls, the primary containment liner is a continuous steel membrane (attached to the inside face of the wall) that functions as a leak-tight barrier to the release of fission products. The containment wall is designed to withstand anticipated loads without participation of the liner as a structural component. The portion of the liner functioning as the suppression pool floor is welded to the wall liner through a corner junction embedment. The fatigue analysis for the containment liner, in accordance with requirements specified in ASME Section III, was conducted assuming a 40-yr life.

Fatigue-tolerant design is demonstrated for those locations with CUFs less than 1.0.

A linear projection has been performed of the maximum CUF from the original containment liner fatigue analysis, demonstrating that the CUF remains acceptable for 60 yr. The projection is conservative because the main contributor to fatigue usage of the liner is safety/relief valve (SRV) actuation, and SRV actuations are occurring at a rate far less than the rate assumed in the original design.

C.2.4.2 Fatigue of Primary Containment Penetrations

The Unit 2 penetrations were designed in accordance with ASME Section III; therefore, fatigue analyses exist for all penetrations for the Class 1 and Class MC portions of the penetrations. Fatigue usage calculations for the process pipe, when required, and the associated penetration sleeve (Class MC portion) were performed together. Fatigue-tolerant design is demonstrated for components with CUFs less than 1.0 (or less than 0.1 in break exclusion zones). For the Class 1 portion of the penetration, additional pipe break postulation criteria are applied to high-energy piping with a CUF greater than 0.1. While the CUFs for all penetrations were shown to be less than the allowable values of 1.0 (or 0.1 in the break exclusion zone), limiting locations are subject to change; thus, ASME Class 1 piping and components require continued monitoring (including analysis using FatiguePro) to demonstrate compliance over the period of extended operation.

C.2.4.3 Downcomer and Safety/Relief Valve Discharge Line Fatigue Evaluation

The downcomers consist of 121 pipes open to the drywell and submerged 9.5 ft below the low water level (operating minimum) of the suppression pool, providing a flow path for uncondensed steam into the pool. The load combinations considered in the fatigue analysis of the downcomers include normal operating load conditions and accident conditions, including a small break accident (SBA), intermediate break accident (IBA), or design basis accident (DBA). An SBA, IBA, or DBA was assumed to occur one time during the life of the plant, combined with the fatigue usage resulting from upset conditions plus one residual heat removal (RHR) system blowdown. The largest contributor to the usage factor was from the upset loads. Since the upset loads were assumed to occur more than once over the 40-yr life of the plant, it is appropriate to project the usage resulting from these loads for an additional 20 yr of operation by multiplying the usage by 1.5. Adding this to the contribution from DBA and RHR, the total projected fatigue usage is below the ASME Section III allowable of 1.0. Therefore, the downcomer fatigue CUF has been projected for the period of extended operation.

There are eighteen 12-in diameter SRV lines that penetrate the drywell floor via flued-head-type penetrations. For these penetrations, a fatigue analysis using ASME Section III Class 1 rules was performed for the SRV piping penetrations through the drywell floor. Although the SRV piping system is Safety Class 3, these additional requirements are considered for additional assurance that steam bypass across the drywell floor will not occur. Additionally, since the highest loads occur at the penetration, this serves to increase the confidence in the overall system. For the SRV penetration fatigue analysis, the analysis considered operating basis earthquake (OBE), SRV actuations, condensation oscillation, chugging, and thermal loads occurring during SRV discharge. The SRV penetration fatigue analysis was reevaluated as a result of power uprate utilizing

significant conservatism. The projected CUF for the balance of plant life, including the period of extended operation, was close to the ASME Section III allowable of 1.0; therefore, prior to entry into the period of extended operation, the SRV penetration fatigue analysis will be revised to remove the excessive conservatism, or the fatigue usage of the SRV penetrations will be monitored by the FMP.

C.2.5 Other Plant-Specific TLAAs

The following plant-specific TLAAs have been identified for Unit 2:

- Main Steam Isolation Valve (MSIV) Corrosion Allowance
- Stress Relaxation of Core Plate Hold-Down Bolts

C.2.5.1 Main Steam Isolation Valve Corrosion Allowance

The MSIV bodies were fabricated from carbon steel and are exposed to a dry steam environment during plant operation. During a refueling outage, the MSIVs are exposed to treated water and air. To provide for 40-yr service in these environments, USAR Section 5.4.5 indicates a 0.120-in corrosion allowance was added to the MSIV wall thickness in addition to the minimum required by applicable codes.

To ensure the 40-yr corrosion allowance remains valid, ultrasonic wall thickness readings from representative components in the main steam system (MSS) will be used to predict the wall thinning of the MSIVs, thus ensuring the thickness lost is bounded by the corrosion allowance. Therefore, the aging of the MSIV bodies will be adequately managed for the period of extended operation.

C.2.5.2 Stress Relaxation of Core Plate Hold-Down Bolts

Hold-down bolts located around the rim of the core plate are subcomponents of the core plate assembly that ensure the core plate safety function. Preload in these bolts could be reduced over time by the effects of IGSCC and fluence; thus, Reference 4 determined that loss of preload should be evaluated as a potential TLAA.

The potential for cracking of components comprising the reactor vessel internals due to IGSCC is managed by the BWRVIP (Section C.1.12). Prior to the period of extended operation, Unit 2 will either:

1. Install core plate wedges (as part of a proposed core shroud tie-rod repair) to eliminate the need for the enhanced inspections of the core plate hold-down bolts recommended by BWRVIP-25; or

2. Perform an analysis (incorporating detailed flux/fluence analyses and improved stress relaxation

correlations) to demonstrate that the core plate hold-down bolts can withstand all normal, emergency, and faulted loads, considering the effects of stress relaxation until the end of the period of extended operation, and submit it for staff review and approval 2 yr prior to entering the license renewal period.

These activities provide assurance that stress relaxation of the Unit 2 core plate hold-down bolts will be adequately managed for the period of extended operation.

C.3 GENERIC QUALITY ASSURANCE PROGRAM REQUIREMENTS FOR LICENSE RENEWAL

The Nine Mile Point Quality Assurance Program implements the requirements of 10CFR50 Appendix B, and is consistent with the summary in Appendix A.2 of NUREG-1800, "Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants," published July 2001. The elements of corrective action, confirmation process, and administrative controls in the Quality Assurance Program are applicable to both safety-related and non-safety related SSCs that are subject to an aging management review. Generically, these three elements are applicable as follows:

1. Corrective Actions

   Corrective actions are implemented in accordance with the requirements of 10CFR50 Appendix B, as committed to in the Quality Assurance Topical Report (QATR). The Corrective Action Program provides for the identification, evaluation, and resolution of nonconforming conditions.

2. Confirmation Process

   The confirmation process is part of the Corrective Action Program, which is implemented in accordance with the requirements of 10CFR50 Appendix B, as committed to in the QATR. The focus of the confirmation process is on the verification that corrective actions are effective. The measure of effectiveness is in terms of correcting the adverse condition and precluding repetition of significant conditions adverse to quality.

3. Administrative Controls

   AMPs are implemented through various plant documents. These implementing documents are subject to administrative controls, including a formal review and approval process, in accordance with the requirements of 10CFR50 Appendix B, as committed to in the QATR.

C.4 REFERENCES

1. Letter from U.S. Nuclear Regulatory Commission to BWRVIP Chairman, dated October 18, 2001, Subject: Acceptance for Referencing of EPRI Proprietary Report TR-113596, "BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines (BWRVIP-74-A)," and Appendix A, "Demonstration of Compliance with the Technical Information Requirements of the License Renewal Rule (10CFR54.21)."

2. NUREG/CR-6260, INEL-95/0045, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," February 1995.

3. Letter from U.S. Nuclear Regulatory Commission to Niagara Mohawk Power Corporation, dated October 25, 1983, Subject: Summary of Meeting with Niagara Mohawk Power Corporation on Deviations from the Standard Review Plan (NUREG-0800) for Nine Mile Point Nuclear Station, Unit 2.

4. Letter from U.S. Nuclear Regulatory Commission to BWRVIP Chairman, dated December 7, 2000, Subject: Safety Evaluation for Referencing of BWR Vessel and Internals Project, BWR Core Plate Inspection and Flaw Evaluation Guidelines (BWRVIP-25) Report for Compliance with the License Renewal Rule (10CFR54) and Appendix B, BWR Core Plate Demonstration of Compliance with the Technical Information Requirements of the License Renewal Rule (10CFR54.21).

5. Letter from U.S. Nuclear Regulatory Commission to BWRVIP Chairman, dated March 7, 2000, Subject: Supplement to Final Safety Evaluation of the BWR Vessel and Internal Project BWRVIP-05 Report (TAC No. MA3395).

TABLE C-1

COMMITMENTS

Item	Commitment	Source	Schedule
1	Incorporate Appendix A2 into the USAR.	· LRA Section A.0	Following issuance of the Renewed Operating License
2	In accordance with 10CFR54.21(b), during NRC review of this application, provide an annual update to the application to reflect any change to the current licensing basis that materially affects the contents of the license renewal application (LRA).	· LRA Section 1.2.1	Completed - Letters dated December 20, 2005, and March 23, 2006.
3	Supporting analyses will be completed prior to the period of extended operation to confirm that the failure probabilities for the limiting RPV axial welds remain bounded for the period of extended operation.	· LRA Section 4.2.4 · LRA Appendix A.2.2.1.3	Prior to period of extended operation
4	For those locations where additional fatigue analysis is required to take advantage of the implicit margin, and to more accurately determine CUF, the EPRI FatiguePro fatigue monitoring software will be implemented.	· LRA Section 4.3 · LRA Appendix A.2.2.2 · LRA Appendix B.3.2	Prior to period of extended operation
5	For the critical reactor vessel components locations shown in Table 4.3-4 of the LRA, additional usage will be added to the baseline CUF using one of the methods described in Section 4.3 of the LRA.	· LRA Section 4.3.1 · LRA Appendix A.2.2.2.1	Prior to period of extended operation
6	For the bounding locations for ASME Class 1 systems, transients contributing to fatigue usage will be tracked by the FMP with additional usage added to the baseline CUF using the design cycle-based fatigue (CBF) method described in Section 4.3 of the LRA. If a bounding location with a current CUF value less than or equal to 0.1 could have its CUF value exceed 0.1 before the end of the period of extended operation, then the impact on the original break postulation calculations will be assessed.	· LRA Section 4.3.2 · LRA Appendix A.2.2.2.2	Prior to period of extended operation
7	Transients contributing to fatigue usage of the FWS nozzles will be tracked by the FMP, with additional usage added to the baseline CUF using the stress-based fatigue method described in Section 4.3 of the LRA.	· LRA Section 4.3.3 · LRA Appendix A.2.2.2.3	Prior to period of extended operation
8	If fatigue monitoring of ASME Class 1 piping (described in LRA Section 4.3.2) indicates higher fatigue usage than expected, non-ASME Class 1 piping will be evaluated for possible fatigue concerns.	· LRA Section 4.3.4 · LRA Appendix A.2.2.2.4	Prior to period of extended operation
9	Revise or evaluate the CUF evaluations for the shroud, core support plate and studs, and jet pumps to removed conservatism and/or encompass	· LRA Section 4.3.5 · LRA Appendix A.2.2.2.5	Prior to period of extended operation

TABLE C-1 (Cont'd.)

Item	Commitment	Source	Schedule
	the period of extended operation (e.g., a more extensive fatigue analysis of the jet pumps will be performed).		
10	Assess the impact of the reactor coolant environment on a sample of critical component locations, including locations equivalent to those identified in NUREG/CR-6260, as part of the FMP. These locations will be evaluated by applying environmental correction factors (F_{en}) to existing and future fatigue analyses.	· LRA Section 4.3.6 · LRA Appendix A.2.2.2.6 · LRA Appendix B.3.2	Prior to period of extended operation
11	For penetrations listed in Table 4.6-4 of the LRA, transients contributing to fatigue usage will be tracked by the FMP with additional usage added to the baseline CUF using the design CBF method described in Section 4.3 of the LRA.	· LRA Section 4.6.5	Prior to period of extended operation
12	Nine Mile Point will either: 1. Install core plate wedges (as part of a proposed core shroud tie-rod repair) to eliminate the need for the enhanced inspections of the core plate hold-down bolts recommended by BWRVIP-25; or 2. Perform an analysis (incorporating detailed flux/fluence analyses and improved stress relaxation correlations) in accordance with BWRVIP-25 to demonstrate that the core plate hold-down bolts can withstand all normal, emergency, and faulted loads considering the effects of stress relaxation until the end of the period of extended operation, and submit it for staff review and approval 2 yr prior to entering the period of extended operation.	· LRA Section 4.7.3 · LRA Appendix A.2.2.5.3	October 31, 2024
13	Enhance the BWRVIP to address: 1. BWRVIP-18, 41 and 42 open items regarding the inspection of inaccessible welds for core spray, jet pump and LPCI components, respectively. As such, Nine Mile Point will implement the resolution of these open items as documented in the BWRVIP response and reviewed and accepted by the NRC; 2. The inspection and evaluation guidelines for steam dryers and access hole covers are currently under development by the BWRVIP committee. Once these guidelines are documented and reviewed and accepted by the NRC, the actions will be implemented in accordance with the BWRVIP program; 3. The baseline inspections recommended in BWRVIP-47 for the BWR lower plenum components will be incorporated into the appropriate program and implementing documents; and 4. Nine Mile Point will perform inspections of the guide beams similar (in inspection methods, scope and frequency of inspection) to the inspections specified in BWRVIP-47, "BWR Lower Plenum Inspection and	· LRA Appendix B.2.1.8	Prior to period of extended operation

TABLE C-1 (Cont'd.)

Item	Commitment	Source	Schedule
	Flaw Evaluation Guidelines," for the control rod guide tube components. The extent of examination and its frequency will be based on a 10-percent sample of the total population, which includes all grid beam and beam-to-crevice slots, being inspected within 12 yr of entry into the period of extended operation, with 5 percent of the population being inspected within the first 6 yr. The sample locations selected for examination will be in areas that are exposed to the highest neutron fluence. The top guide grid beam reinspection requirements will depend on the inspection results; however, at a minimum, the BWRVIP program will follow the same guidance for the subsequent 12-yr interval as defined for the initial 12-yr baseline.		
14	Enhance the OCCWS Program to: 1. Ensure that the applicable commitments made for GL 89-13, and the requirements in NUREG-1801, Section XI.M20, are captured in N2-TDP-REL-0104, "GL 89-13, Service Water System Problems Affecting Safety Related Equipment Program Plan;" 2. Incorporate into the OCCWS Program the requirements of NUREG-1801, Section XI.M20, that are more conservative than the GL 89-13 commitments; and 3. Revise the preventive maintenance and heat transfer performance test procedures to incorporate specific inspection criteria, corrective actions, and frequencies.	· LRA Appendix B.2.1.10	Prior to period of extended operation
15	Enhance the CCCWS Program to: 1. Expand periodic chemistry checks of the system consistent with the guidelines of EPRI TR-107396; 2. Implement a program to use corrosion inhibitors in the RBCLC and control building ventilation chilled water system (CBVCWS) in accordance with the guidelines given in EPRI TR-107396; 3. Direct periodic inspections to monitor for loss of material in the piping of the CCCWS; 4. Establish the frequencies to inspect for degradation of components in CCCWS, including heat exchanger tube wall thinning; 5. Establish periodic monitoring, trending, and evaluation of performance parameters for the RBCLC and CBVCWS; 6. Specify chemistry sampling frequency for the CBVCWS; 7. Provide the controls and sampling necessary to maintain water chemistry parameters in CCCWS within the guidelines of EPRI Report TR-107396; and 8. Ensure acceptance criteria are specified in the implementing procedures for the applicable indications of degradation.	· LRA Appendix B.2.1.11	Prior to period of extended operation

TABLE C-1 (Cont'd.)

Item	Commitment	Source	Schedule
16	Revise applicable procedures related to the Crane Inspection Program to add specific direction for performance of corrosion inspections, with acceptance criteria, for certain hoist-lifting assembly components.	· LRA Appendix B.2.1.13	Prior to period of extended operation
17	Enhance the Fire Protection Program to: 1. Incorporate periodic visual inspections of piping and fittings located in a non-water environment, such as Halon and CO_2 fire suppression systems components, to detect evidence of corrosion and any system mechanical damage that could affect its intended function; 2. Expand the scope of periodic functional tests of the diesel-driven fire pump to include inspection of engine exhaust system components to verify that loss of material is managed; 3. Perform an engineering evaluation to determine the plant-specific inspection periodicity of fire doors; and 4. Revise Halon and CO_2 functional test frequencies to semi-annual.	· LRA Appendix B.2.1.16	Prior to period of extended operation
18	Enhance the Fire Water System Program by revising applicable existing procedures to: 1. Incorporate inspections to detect and manage loss of material due to corrosion into existing periodic test procedures; 2. Specify periodic component inspections to verify that loss of material is being managed; 3. Add procedural guidance for performing visual inspections to monitor internal corrosion and detect biofouling; 4. Add requirements to periodically check the water-based fire protection systems for microbiological contamination; 5. Measure fire protection system piping wall thickness using non-intrusive techniques (e.g., volumetric testing) to detect loss of material due to corrosion; 6. Establish an appropriate means of recording, evaluating, reviewing, and trending the results of visual inspections and volumetric testing; 7. Define acceptance criteria for visual inspections and volumetric testing; and 8. Develop new procedures and PM tasks to implement sprinkler head replacements and/or inspections to meet National Fire Protection Association (NFPA) 25, "Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," Section 5.3.1 (2003 edition) requirements.	· LRA Appendix B.2.1.17	Prior to period of extended operation

TABLE C-1 (Cont'd.)

Item	Commitment	Source	Schedule
19	Enhance the Fuel Oil Chemistry Program to: 1. Provide guidelines for the appropriate use of biocides, corrosion inhibitors, and/or fuel stabilizers to maintain fuel oil quality; 2. Add a requirement to sample the diesel fuel oil storage tanks for water and sediment at least quarterly per the ASTM standard; 3. Add requirements to periodically inspect the interior surfaces of the fuel oil storage tanks for evidence of significant degradation, including a specific requirement that the tank bottom thickness be determined by UT or other industry-recognized methods; 4. Add a requirement for quarterly trending of particulate contamination analysis results; 5. Ensure acceptance criteria are specified in the implementing procedures for the applicable indications of potential degradation; 6. Establish a requirement to perform quarterly trending of water and sediment; and 7. Establish a requirement to remove water, if found.	· LRA Appendix B.2.1.18	Prior to period of extended operation
20	Enhance the Reactor Vessel Surveillance Program to: 1. Incorporate the requirements and elements of the ISP, as documented in BWRVIP-116 and approved by NRC, or an NRC-approved plant-specific program, into the Reactor Vessel Surveillance Program, and include a requirement that if Nine Mile Point surveillance capsules are tested, the tested specimens will be stored in lieu of optional disposal. When the NRC issues a final SER for BWRVIP-116, Nine Mile Point will address any open items and complete the SER action items. Should BWRVIP-116 not be approved by the NRC, a plant-specific Reactor Vessel Surveillance Program will be submitted to the NRC 2 yr prior to commencement of the period of extended operation; and 2. Project analyses of USE and P-T limits to 60 yr using methods prescribed by RG 1.99, Revision 2, and include the applicable bounds of the data, such as operating temperature and neutron fluence.	· LRA Appendix B.2.1.19	Prior to period of extended operation
21	Develop and implement a One-Time Inspection Program, which also includes the attributes for a Selective Leaching of Materials Program.	· LRA Appendix B.2.1.20 · LRA Appendix B.2.1.21	Prior to period of extended operation
22	Develop and implement a Buried Piping and Tank Inspection Program which includes a requirement that before entry into the period of extended operation, if an opportunistic inspection has not occurred, Nine Mile Point will excavate Unit 2 degradation susceptible areas to perform focused inspections. Upon entering the period of extended operation, Nine Mile Point will perform a focused inspection within 10 yr, unless an opportunistic inspection occurred within this 10-yr period.	· LRA Appendix B.2.1.22	Prior to period of extended operation

TABLE C-1 (Cont'd.)

Item	Commitment	Source	Schedule
23	An augmented VT-1 visual examination of the containment penetration bellows will be performed using enhanced techniques qualified for detecting SCC, per NUREG-1611, Table 2, Item 12.	· LRA Appendix B.2.1.23	Prior to period of extended operation
24	Enhance the Structures Monitoring Program to: 1. Expand the program to include the following activities or components in the scope of license renewal but not within the current scope of 10CFR50.65: a. Fire-rated assemblies and watertight penetration visual inspections, b. Masonry walls in the turbine building and service water tunnel serving a fire barrier function, c. The steel electrical transmission towers required for the SBO and recovery paths; 2. Expand the parameters monitored during structural inspections to include those relevant to aging effects identified for structural bolting; and 3. Implement regularly scheduled groundwater monitoring to ensure that a benign environment is maintained.	· LRA Appendix B.2.2.27 · LRA Appendix B.2.1.28	Prior to period of extended operation
25	Develop and implement a Non-EQ Electrical Cables and Connection Program.	· LRA Appendix B.2.1.29	Prior to period of extended operation
26	Enhance the Non-EQ Electrical Cable and Connections Used in Instrumentation Circuit Program to: 1. Implement reviews of calibration or surveillance data for indications of aging degradation affecting instrument circuit performance. The first reviews will be completed prior to the period of extended operation and every 10 yr thereafter; and 2. In cases where a calibration or surveillance program does not include the cabling system in the testing circuit, or as an alternative to the review of calibration results described above, provide requirements and procedures to perform cable testing to detect deterioration of the insulation system, such as insulation resistance tests or other testing judged to be effective in determining cable insulation condition. The first test will be completed prior to the period of extended operation. The test frequency of these cables shall be determined based on engineering evaluation, but the test frequency shall be at least once every 10 yr.	· LRA Appendix B.2.1.30	Prior to period of extended operation
27	Enhance the Preventive Maintenance Program to: 1. Expand the PM Program to encompass activities for certain additional components identified as requiring aging management. Explicitly	· LRA Appendix B.2.1.32	Prior to period of extended operation

TABLE C-1 (Cont'd.)

Item	Commitment	Source	Schedule
	define the aging management attributes, including the systems and the component types/commodities included in the program; 2. Specifically list those activities credited for aging management; 3. Specifically list parameters monitored; 4. Specifically list the aging effects detected; 5. Establish a requirement that inspection data be monitored and trended; and 6. Establish detailed parameter-specific acceptance criteria.		
28	Enhance the System Walkdown Program to: 1. Train all personnel performing inspections in the Systems Walkdown Program to ensure that age-related degradation is properly identified and incorporate this training into the site Training Program; and 2. Specify acceptance criteria for visual inspections to ensure aging-related degradation is properly identified and corrected.	· LRA Appendix B.2.1.33	Prior to period of extended operation
29	Enhance the Non-Segregated Bus Inspection Program to: 1. Expand visual inspections of the bus ducts, their supports and insulation systems; 2. Create new provisions to perform as an alternative to either thermography or periodic low-range resistance checks of a statistical sample of the bus ducts accessible bolted connections, a visual inspection for the connections that are covered with heat shrink tape, sleeving, insulating boots, etc., and 3. Define acceptance criteria for inspection of the bus ducts, their support and insulation systems, and the low-range ohmic checks of connections.	· LRA Appendix B.2.1.34	Prior to period of extended operation
30	Develop and implement a Fuse Holder Inspection Program.	· LRA Appendix B.2.1.35	Prior to period of extended operation
31	Enhance the Bolting Integrity Program to: 1. The Structures Monitoring, PM, and Systems Walkdown Programs will be enhanced to include requirements to inspect bolting for indication of loss of preload, cracking, and loss of material, as applicable; 2. Include in administrative and implementing program documents references to the Bolting Integrity Program and industry guidance; and 3. Establish an augmented inspection program for high-strength (actual yield strength $\geq$150 ksi) bolts. This augmented program will prescribe the examination requirements of Tables IWB-2500-1 and IWC-2500-1 of ASME Section XI for high-strength bolts in the Class 1 and Class 2 component supports, respectively.	· LRA Appendix B.2.1.36	Prior to period of extended operation

TABLE C-1 (Cont'd.)

Item	Commitment	Source	Schedule
32	Enhance the Protective Coating Monitoring and Maintenance Program to: 1. Specify the visual examination of coated surfaces for any visible defects includes blistering, cracking, flaking, peeling, and physical or mechanical damage; 2. Perform periodic inspection of coatings every refueling outage versus every 24 months; 3. Set minimum qualifications for inspection personnel, the inspection coordinator, and the inspection results evaluator; 4. Perform thorough visual inspections in areas noted as deficient concurrently with the general visual inspection; 5. Specify the types of instruments and equipment that may be used for the inspection; 6. Pre-inspection reviews of the previous two monitoring reports before performing the condition assessment; 7. Establishment of guidelines for prioritization of repair areas and monitoring these areas until they are repaired; and 8. Require that the inspection results evaluator determine which areas are unacceptable and initiate corrective action.	· LRA Appendix B.2.1.38	Prior to period of extended operation
33	Develop and implement a Non-EQ Electrical Cable Metallic Connections Inspection Program.	· LRA Appendix B.2.1.39	Prior to period of extended operation
34	Develop and implement a Wooden Power Pole Inspection Program.	· LRA Appendix B.2.1.40	Prior to period of extended operation
35	Enhance the program to evaluate component susceptibility to loss of fracture toughness. Assessments and inspections will be performed, as necessary, to ensure that intended functions are not impacted by the aging effect.	· LRA Appendix B.2.1.8	Prior to period of extended operation
36	Prior to the period of extended operation, the spent fuel rack design that currently utilizes Boraflex for reactivity control in the spent fuel pool will be replaced by a design that utilizes Boral for this function.	· Amended LRA Table 3.3.1.B, Item 3.3.1.B-12 · Amended LRA Table 3.5.2.B-7	Prior to period of extended operation
37	An EVT-1 examination of the Unit 2 feedwater sparger end bracket welds will be added to the BWRVIP as a program enhancement. The inspection extent and frequency of the end bracket weld inspection will be the same as the ASME Section XI inspection of the feedwater sparger bracket vessel attachment welds. If the final fabrication review of the Unit 2 feedwater thermal sleeve concludes that the thermal sleeve hidden welds are not IGSCC susceptible, the Unit 2 inspections will be discontinued.	· NMP Letter NMP1L 2005, December 1, 2005	Prior to period of extended operation

TABLE C-1 (Cont'd.)

Item	Commitment	Source	Schedule
38	Enhance the Inaccessible Medium-Voltage Cables not Subject to 10CFR50.49 Environmental Qualification Requirements Program as follows: 1. Expand the scope of the existing procedures to provide for manhole inspections and water removal; 2. Develop a new testing procedure specific to those cables requiring aging management under this Program. The specific type of test performed will be a proven test for detecting deterioration of the insulation system due to wetting as described in EPRI TR-103834-P1-2, such as power factor, partial discharge, or other testing that is both state-of-the-art and consistent with the latest industry guidance at the time the test is performed; 3. Establish requirement to test cables subject to aging management prior to, and every 10 yr during, the period of extended operation; and 4. Establish maintenance requirement to inspect and remove water, as necessary, from manholes serving cables subject to aging management. The inspection frequency will be based upon actual plant experience with water accumulation in the manhole, but in any event, will be at least once every two years. The first inspection will be completed prior to the period of extended operation.	· NMP Letter NMP1L 2005, December 1, 2005	Prior to period of extended operation
39	No later than 2 yr prior to entering the period of extended operation, Nine Mile Point will submit, for NRC review and approval, the summary of the RG 1.190 based analysis that determines the maximum neutron fluence at the Unit 2 biological shield wall (BSW) or at the shield wall flaw locations that are the basis for the ALRA Section 4.7.1 TLAA. The submittal will include revised ALRA Sections 4.7.1 and A.2.2.5.1, and any other supporting analysis, as applicable.	· LRA Section 4.7.1 · LRA Appendix A.2.2.5.1	October 31, 2024
40	The NRC review of BWRVIP-76 is not yet complete. When the NRC review of BWRVIP-76 is complete, Nine Mile Point will evaluate the NRC SER and complete the SER action item(s), as appropriate.	· LRA Appendix B.2.1.8	Prior to period of extended operation