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U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG-1958

Safety Evaluation Report

Related to the License Renewal of Kewaunee Power Station

Docket No. 50-305

Dominion Energy Kewaunee, Inc.

Office of Nuclear Reactor Regulation

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ABSTRACT

This safety evaluation report (SER) documents the technical review of the Kewaunee Power Station (KPS) license renewal application (LRA) by the U.S. Nuclear Regulatory Commission (NRC) staff (the staff). By letter dated August 12, 2008, Dominion Energy Kewaunee, Inc. (Dominion, DEK, or the applicant) submitted the LRA in accordance with Title 10, Part 54, of the *Code of Federal Regulations*, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." Dominion requests renewal of the KPS operating license (Facility Operating License Number DPR-43) for a period of 20 years beyond the current expiration at midnight on December 21, 2013.

KPS is located in the Town of Carlton, Wisconsin, in the southeast corner of Kewaunee County, Wisconsin, on the western shore of Lake Michigan. The staff issued the original construction permit for KPS on August 6, 1968, and the operating license on December 21, 1973. The plant's nuclear steam supply system consists of a 2-loop pressurized water reactor with a dry, ambient containment (PWR-DRYAMB). The nuclear steam supply system was supplied by Westinghouse. The balance of the plant was originally designed and constructed by Pioneer Service and Engineer Company. KPS operates at a licensed power output of 1,772 megawatt-thermal (MWt), with a gross electrical output of approximately 590 megawatt-electric (MWe).

Unless otherwise indicated, this SER presents the status of the staff's review of information submitted through October 20, 2010, the cutoff date for consideration in the SER. The four open items previously identified by the staff for the SER with open items have been closed (see SER Section 1.5); therefore, no open items remain to be resolved before the final determination is reached by the staff on the LRA.

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3.1.2.2.15 Changes in Dimensions Due to Void Swelling

The staff reviewed LRA Section 3.1.2.2.15 and Table 3.1.1, item 3.1.1-33 against the criteria in SRP-LR Section 3.1.2.2.15. LRA Section 3.1.2.2.15 addresses changes in dimensions due to void swelling that could occur in stainless steel and Ni-alloy PWR RVI components exposed to reactor coolant as an aging effect that the applicant will manage, consistent with the SRP-LR, by the ASME Section XI ISI, Subsections IWB, IWC, and IWD Program. This AMP is enhanced with Commitment No. 1, which is also identified in the USAR supplement description of the program.

SRP-LR Section 3.1.2.2.15 states that:

> [c]hanges in dimensions due to void swelling could occur in stainless steel and nickel alloy PWR reactor internal components exposed to reactor coolant. The GALL Report recommends no further [AMR] if the applicant provides a commitment in the FSAR Supplement to (1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval.

As described in LRA Sections 3.1.2.2.15, A.2.1.2, and B.2.1.2, the applicant made Commitment No. 1 to enhance its ASME Section XI ISI, Subsections IWB, IWC, and IWD Program to incorporate all three GALL Report requirements stated above regarding managing aging effects on RVIs. Therefore, the staff concludes that the applicant's program meets the SRP-LR Section 3.1.2.2.15 criteria because using the ASME Section XI ISI, Subsections IWB, IWC, and IWD Program with Commitment No. 1 to manage the aging effects due to SCC and IASCC is consistent with the SRP-LR guidance. The staff also confirmed that LRA Table 3.1.2-2 identified all GALL AMR Table IV.B2 items under this aging mechanism (IV.B2-1, IV.B2-4, IV.B2-7, IV.B2-11, IV.B2-15, IV.B2-19, IV.B2-23, IV.B2-27, IV.B2-29, IV.B2-35, IV.B2-39, and IV.B2-41). The staff concludes that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.16 Cracking Due to Stress-Corrosion Cracking and Primary Water Stress-Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.16 against the criteria in SRP-LR Section 3.1.2.2.16.

Item 1. The staff reviewed LRA Section 3.1.2.2.16.1 against the criteria in SRP-LR Section 3.1.2.2.16. LRA Table 3.1.1, item 3.1.1-34 describes the cracking due to SCC and PWSCC of austenitic stainless steel reactor vessel components that were exposed to reactor coolant. The AMR items corresponding to item 3.1.1-34 include the CRDM pressure housing and the stainless steel portion of the closure head instrument tubes and spare CRDM penetrations, bottom head instrument tube penetrations, and closure head CRDM penetrations (Table 3.1.2-1). The applicant stated that cracking due to SCC of these components is managed by the ASME Section XI ISI, Subsections IWB, IWC, and IWD Program and Primary Water Chemistry Program. The applicant further stated that the programs are consistent with the GALL Report.

The staff reviewed LRA item 3.1.1-34 in comparison with the GALL Report, Volume 1, Table 1, ID 34. In its review, the staff noted that for these components or portion of the components constructed of austenitic stainless steel, the GALL Report recommends a combination of ASME Section XI ISI and control of primary water chemistry to manage the effect of cracking due to SCC. The staff's reviews of the applicant's ASME Section XI ISI, Subsections IWB, IWC, and IWD Program and the Primary Water Chemistry Program are discussed in SER Sections 3.0.3.2.1 and 3.0.3.1.9, respectively. In its review, the staff found that the applicant's programs are consistent with the GALL Report and are, therefore, acceptable.

On the basis of its review, the staff determines that the applicant's proposed program is acceptable for managing the cracking due to SCC in austenitic stainless steel reactor vessel components corresponding to item 3.1.1-34. The staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Steam generator components associated with LRA Section 3.1.2.2.16.1. The components covered in GALL Report Table 3.1.1, item 3.1.1-35 are applicable to B&W model OTSGs. KPS has Westinghouse recirculating steam generators, so this item is not applicable to KPS, except for the case discussed in the following paragraphs.

SRP-LR Section 3.1.2.2.16.1 identifies that cracking due to PWSCC could occur on the primary coolant side of PWR steel steam generator tube-to-tubesheet welds made or clad with Ni-alloy. The GALL Report recommends controls of the ASME Code Section XI ISI, Subsections IWB, IWC, and IWD and Water Chemistry programs to manage this aging, and recommends no further AMR for PWSCC of Ni-alloy if the applicant complies with applicable NRC orders and provides a commitment in its USAR supplement to implement applicable NRC bulletins, GLs, and staff-accepted industry guidelines. GALL Report Revision 1, Volume 2 addresses this aging in item IV.D2-4, stating the item is applicable to OTSGs, but not to recirculating steam generators.

USAR Section 4.2.2.6 states that the applicant's steam generator tubes are fabricated from Alloy 690TT (Thermally Treated), that the side of the tubesheet in contact with the reactor coolant is clad with Inconel (Alloy 600 in USAR Table 4.2-1), and that the tube-to-tubesheet joints are welded.

The staff noted that the ASME Code Section XI does not require inspection of the tube-to-tubesheet welds. In addition, no specific NRC orders or bulletins address inspection requirements for these welds. The staff's concern is that, if the tubesheet cladding is Alloy 600, autogenous tube-to-tubesheet welds may not have sufficient chromium content to prevent initiation of PWSCC, even when the steam generator tubes are made from Alloy 690TT, which is the configuration of the applicant's steam generator tubes. Consequently, such a PWSCC crack initiated in this region, close to a tube, could propagate into or through the weld, causing a failure of the weld and of the RCPB, even for recirculating steam generators such as those of the applicant. Therefore, because the NRC has not approved a redefinition of the pressure boundary for these steam generators in which the autogenous tube-to-tubesheet weld is no longer included, the staff considers that the effectiveness of the primary water chemistry program should be verified to ensure PWSCC cracking is not occurring.

In a conference call on October 13, 2010, between the staff and the applicant, the staff questioned how cracking in the applicant's steam generator tube-to-tubesheet welds will be managed if that material is susceptible to PWSCC. The applicant agreed to provide information on its management of this issue.

In its response dated October 20, 2010, the applicant stated that it will commit to developing a plan to address potential failure of the steam generator primary-to-secondary pressure boundary due to PWSCC cracking of tube-to-tubesheet welds. The applicant further stated that the plan will consist of two resolution options:

- In the first option, the applicant stated that it would perform an analytical evaluation of the steam generator tube-to-tubesheet welds in order to establish a technical basis for concluding that the structural integrity of the steam generator tube-to-tubesheet interface is adequately maintained even with the presence of tube-to-tubesheet weld cracking, and that the steam generator tube-to-tubesheet weld is not required for the RCPB.

- In the second option, the applicant stated that it would perform a one-time inspection of a representative number of tube-to-tubesheet welds in each steam generator to determine if PWSCC cracking is present. The applicant also stated that if weld cracking is identified, the condition will be resolved through repair or engineering evaluation for continued service, as appropriate, and that an ongoing monitoring program will be established to perform routine inspections of tube-to-tubesheet welds for the remaining life of the steam generators.

Moreover, the applicant stated that it will develop its plan prior to the period of extended operation. As described in its response to RAI 3.1.2.2.13-1a dated September 23, 2010, the applicant explained that the lower portions of its steam generators, including the tubes and tubesheets, have accumulated less than 10 years of service time since having been replaced in 2001. Considering this limited service time of the replaced portions of the steam generators, the applicant further stated that the implementation of its plan, including weld inspections for the presence of PWSCC cracking if necessary, will be completed prior to 50 years of plant operation (i.e., prior to 2023). Finally, the applicant stated that Commitment No. 53, covering the above plan to manage the aging effect due to PWSCC of steam generator tube-to-tubesheet welds, will be added to LRA Appendix A, USAR Table A6.0-1.

Based on its review, the staff finds the applicant's plan and associated Commitment No. 53 acceptable because the applicant stated that it will manage the aging effect of cracking due to PWSCC in the steam generator tube-to-tubesheet welds either by demonstrating that those welds do not have a structural integrity or pressure boundary function, or by implementing a one-time inspection capable of detecting PWSCC cracking on a representative number of tube-to-tubesheet welds of each steam generator, in a time period consistent with the detection of potential PWSCC cracks and the period of extended operation. The staff finds that the timing of this inspection prior to 50 years of plant operation is acceptable because at that time, the replaced lower portion of the steam generator will have been in operation for less than 22 years, and it is unlikely that significant PWSCC cracking will have initiated. The staff also notes that, in case the aging effect is revealed, this one-time inspection program is accompanied by an appropriate corrective action process, including an evaluation of the degradation and the implementation of routine inspections for the remaining life of the steam generators. The staff concludes that the applicant has demonstrated that the effects of aging for these components

will be adequately managed so that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 2. The components covered by Table 3.1.1, item 3.1.1-36 are not applicable to KPS. See SER Section 3.1.2.1.1.

3.1.2.2.17 Cracking Due to Stress-Corrosion Cracking, Primary Water Stress-Corrosion Cracking, and Irradiated-Assisted Stress-Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.17 and Table 3.1.1, item 3.1.1-37 against the criteria in SRP-LR Section 3.1.2.2.17. LRA Section 3.1.2.2.17 addresses cracking due to SCC, PWSCC, and IASCC that could occur in stainless steel and Ni-alloy PWR reactor internal components exposed to reactor coolant as an aging effect that the applicant will manage, consistent with the SRP-LR, with the Primary Water Chemistry Program and the ASME Section XI ISI, Subsections IWB, IWC, and IWD Program. The ASME Section XI ISI, Subsections IWB, IWC, and IWD Program is enhanced with Commitment No. 1, which is also identified in the USAR supplement description of the ASME Section XI ISI, Subsections IWB, IWC, and IWD Program.

SRP-LR Section 3.1.2.2.17 states that:

> [c]racking due to [SCC, PWSCC, and IASCC] could occur in PWR stainless steel and nickel alloy reactor vessel internals components. The existing program relies on control of water chemistry to mitigate these effects. However, the existing program should be augmented to manage these aging effects for reactor vessel internals components. The GALL Report recommends no further AMR if the applicant provides a commitment in the USAR Supplement to (1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval.

As indicated in SER Section 3.0.3.1.9, the staff accepts the Primary Water Chemistry Control Program for mitigating the aging effects due to SCC, PWSCC, and IASCC, meeting one of the requirements mentioned in SRP-LR Section 3.1.2.2.17. Furthermore, the applicant made Commitment No. 1 in LRA Sections 3.1.2.2.17, A.2.1.2, and B.2.1.2 to enhance its ASME Section XI ISI, Subsections IWB, IWC, and IWD Program to incorporate all three GALL Report requirements stated above regarding managing aging effects on reactor internals. Therefore, the staff concludes that the applicant's program meets the SRP-LR Section 3.1.2.2.17 criteria because, in addition to the required Water Chemistry Control Program, using the ASME Section XI ISI, Subsections IWB, IWC, and IWD Program with Commitment No. 1 to manage the aging effects due to SCC, PWSCC, and IASCC is consistent with the SRP-LR guidance. The staff also confirmed that LRA Table 3.1.2-2 identified all GALL AMR Table IV.B2 items under this aging mechanism (IV.B2-16, IV.B2-20, IV.B2-28, and IV.B2-40). The staff concludes that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

APPENDIX A

COMMITMENTS FOR LICENSE RENEWAL OF KEWAUNEE POWER STATION

During the review of the Kewaunee Power Station (KPS) license renewal application (LRA) by the staff of the U.S. Nuclear Regulatory Commission (the staff), Dominion Energy Kewaunee, Inc. (Dominion, DEK, or the applicant), made commitments related to aging management programs (AMPs) to manage aging effects of structures and components (SCs) prior to the period of extended operation. The following table lists these commitments, along with the implementation schedules and the sources of the commitment.

APPENDIX A: LONG TERM COMMITMENTS FOR LICENSE RENEWAL OF KPS			
No.	**Commitment**	**Implementation Schedule**	**Source**
1	The ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program will be enhanced to: (1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the staff for review and approval to augment the current inspections.	At least 2 years prior to entering the period of extended operation.	ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
2	The ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program will be enhanced to include identification of the limiting susceptible cast austenitic stainless (CASS) steel reactor vessel internal components from the standpoint of thermal aging susceptibility, neutron fluence, and cracking. For each identified component, a plan will be developed that accomplishes aging management through either a supplemental examination or a component-specific evaluation. The plan will be submitted for staff review and approval, not less than 24 months before entering the period of extended operation.	At least 2 years prior to entering the period of extended operation.	ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
3	The Bolting Integrity Program will be enhanced to further incorporate applicable Electric Power Research Institute (EPRI) and industry bolting guidance. Topic enhancements will include proper joint assembly, torque values, gasket types, use of lubricants, and other bolting fundamentals.	Prior to the Period of Extended Operation	Bolting Integrity
4	The Buried Piping and Tanks Inspection program will be enhanced to perform visual inspections of a representative sample of material/protective measure combinations for in-scope buried piping and tanks. The following materials are utilized in buried applications with the associated protective measures: • Steel (including cast iron)/coated, • Steel/coated and wrapped, • Steel/uncoated, and • Stainless steel/coated and wrapped Visual inspections of the external surfaces of the components will be performed to identify damaged wrapping (if present), degraded or damaged coating (if present), and evidence of loss of material. Each piping inspection will include a minimum of 10 linear feet of piping. The following inspections will be performed: The circulating water system 30 inch diameter recirculation line, which is coated and wrapped carbon steel, will receive one inspection prior to the period of extended operation, and additional inspections within the first 10 years and second 10 years of the period of extended operation. (Continued next page)	Prior to the Period of Extended Operation And During the first 10 years of the period of extended operation And During the second 10 years of the period of extended operation	Letter 10-548, Response to RAI B2.1.7-3a.

APPENDIX A: LONG TERM COMMITMENTS FOR LICENSE RENEWAL OF KPS			
No.	**Commitment**	**Implementation Schedule**	**Source**
	The circulating water system recirculation line vent piping, which is coated and wrapped stainless steel, will receive one inspection prior to the period of extended operation and additional inspections within the first 10 years and second 10 years of the period of extended operation. The diesel generator system fuel oil piping, which includes coated and wrapped carbon steel fuel oil supply and return piping, storage tank vent piping, and day tank vent piping, will receive one inspection prior to the period of extended operation and additional inspections within the first 10 years and second 10 years of the period of extended operation. The inspections will be performed in the non-cathodically protected portion of the piping. The diesel generator system fuel oil storage tanks, which are coated carbon steel, will receive one inspection of one tank prior to the period of extended operation. An additional tank inspection will be performed within each of the first and second 10 years of the period of extended operation. The diesel generator system fuel oil storage tanks hold down straps, which are uncoated carbon steel, will be inspected in conjunction with the associated fuel oil storage tank inspection. One set will be inspected prior to the period of extended operation, and one set will be inspected within each of the first and second 10 years of the period of extended operation. The fire protection system piping, which is coated ductile iron, will receive three inspections prior to the period of extended operation, and three additional inspections within each of the first and second 10 years of the period of extended operation.		
5	The Compressed Air Monitoring Program will be enhanced to incorporate the compressed air system testing and maintenance recommendations from the ASME OM-S/G-1998, Part 17 and the EPRI TR-108147 and to identify these documents as part of the program basis.	Prior to the Period of Extended Operation	Compressed Air Monitoring
6	The External Surfaces Monitoring Program will be enhanced to inspect the accessible external surfaces of in-scope components, piping, supports, structural members, and structural commodities, in the infrequently accessed areas, consistent with the criteria used in other plant areas.	Prior to the Period of Extended Operation	External Surfaces Monitoring
7	The External Surfaces Monitoring Program will be enhanced to provide training for operations, engineering, and health physics personnel performing the program inspections and walkdowns. The training will address: (1) the requirements of the External Surfaces Monitoring Program for license renewal, (2) the need to document the identified conditions with sufficient detail to support monitoring and trending the aging effects, and (3) the aging effects monitored by the program and how to identify them.	Prior to the Period of Extended Operation	External Surfaces Monitoring
8	The Fire Protection Program will be enhanced to test a representative sample of sprinkler heads or to replace all affected sprinkler heads in accordance with the requirements of National Fire Protection Association (NFPA) 25.	Prior to the sprinkler heads achieving 50 years of service life.	Fire Protection

APPENDIX A: LONG TERM COMMITMENTS FOR LICENSE RENEWAL OF KPS			
No.	**Commitment**	**Implementation Schedule**	**Source**
9	The Fire Protection Program fire barrier penetration seal inspections will be revised to include the elastomer shield building fire boots.	Prior to the Period of Extended Operation	Fire Protection
10.	The Fire Protection Program inspections of the reactor coolant pump oil collection system will be revised to include additional inspection criteria for the visual inspection of the system and to perform a one-time inspection of the internal surfaces of the reactor coolant pump oil collection tank.	Prior to the Period of Extended Operation	Fire Protection
11.	The Fuel Oil Tank Inspections Program will be enhanced to provide guidance for the periodic draining, cleaning, and inspection activities.	Prior to the Period of Extended Operation	Fuel Oil Tanks Inspection
12.	The Inspection of Overhead Heavy Load and Refueling Handling Systems Program will be enhanced to clarify the requirements of visual inspection of structural members, including structural bolting, of the in-scope heavy load and refueling handling cranes and associated equipment.	Prior to the Period of Extended Operation	Inspection of Overhead Heavy Load and Refueling Handling Systems
13.	The Metal-Enclosed Bus (MEB) Program will be enhanced to include augmented periodical visual inspections of the MEB internal surfaces, bus supports, bus insulation, taped joints, and boots for signs of degradation or aging.	Prior to the Period of Extended Operation. Thereafter, the inspection of all MEB will not exceed a 10-year interval and the inspection of the sample of bolted connections will not exceed a 5-year interval.	Letter 09-469, Response to RAI B2.1.18-1
14.	The Non-EQ Electrical Cables and Connections Program will be established. The program will periodically visually inspect for accessible electrical cables and connections installed in an adverse localized equipment environment. Should an adverse localized environment be observed, a representative sample of electrical cables and connections installed within that environment will be visually inspected for jacket surface anomalies.	Prior to the Period of Extended Operation. Thereafter, the inspections will not exceed a 10-year interval.	Non-EQ Electrical Cables and Connections
15.	The Non-EQ Electrical Cable Connections Program will be established. The program will perform a one-time inspection, on a sampling basis, to confirm the absence of loosening of bolted connections.	Prior to the Period of Extended Operation	Non-EQ Electrical Cables and Connections

APPENDIX A: LONG TERM COMMITMENTS FOR LICENSE RENEWAL OF KPS			
No.	**Commitment**	**Implementation Schedule**	**Source**
16.	The Non-EQ Inaccessible Medium-Voltage Cables Program will be established. The program will periodically inspect the in-scope manholes and pulling pit for water collection and will remove water, if required. The program will periodically perform a test on the in-scope cables to provide an indication of the condition of the conductor insulation.	Prior to the Period of Extended Operation. Thereafter, the manholes and pulling pit inspections will be performed at least every 2 years. And Thereafter, the cable testing will be performed at least every 10 years.	Non-EQ Inaccessible Medium-Voltage Cables, and Letter 10-548, RAI response to RAI B2.1.21-1a.
17.	The Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals Program will be established. The program will periodically perform a proven cable system test for detecting deterioration of the insulation system for those electrical cables and connections disconnected during calibration, or will periodically review the results and findings of calibrations for those electrical cables that remain connected during the calibration process.	Prior to the Period of Extended Operation. Thereafter, the cable testing and calibration reviews will not exceed a 10-year interval.	Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals
18.	The Open-Cycle Cooling Water System Program will be enhanced to add the applicable aging effects as inspection criteria for the circulating water system underwater visual inspections.	Prior to the Period of Extended Operation	Open-Cycle Cooling Water System
19.	The Reactor Vessel Surveillance Program will be enhanced to include the applicable limitations on operating conditions to which the surveillance capsules were exposed (e.g., neutron flux, spectrum, irradiation temperature, etc.).	Prior to the Period of Extended Operation	Reactor Vessel Surveillance
20.	The Reactor Vessel Surveillance Program will be enhanced to include requirements for storing, and possible recovery, of tested and untested capsules (removed from the reactor vessel after August 31, 2000).	Prior to the Period of Extended Operation	Reactor Vessel Surveillance
21.	The Selective Leaching of Materials Program will be established. The program will perform a one-time visual inspection and hardness measurement or qualitative examination of selected components, within the scope of license renewal for selective leaching.	Prior to the Period of Extended Operation	Selective Leaching of Materials
22.	The Structures Monitoring Program will be enhanced to clearly define structures, structural elements, and miscellaneous structural commodities that are in-scope. Defined scope to include the MEB enclosure assemblies, structural supports, and enclosure seals.	Prior to the Period of Extended Operation	Letter 09-469, Response to RAI B2.1.18-2
23.	The Structures Monitoring Program will be enhanced to monitor groundwater quality and verify that it remains non-aggressive to below-grade concrete.	Prior to the Period of Extended Operation	Structures Monitoring Program
24.	The Structures Monitoring Program will be enhanced to improve criteria for the detection of aging effects for the underwater visual inspections of the in-scope structures.	Prior to the Period of Extended Operation	Structures Monitoring Program

APPENDIX A: LONG TERM COMMITMENTS FOR LICENSE RENEWAL OF KPS			
No.	**Commitment**	**Implementation Schedule**	**Source**
25.	The Work Control Process Program will be established. The program will perform one-time inspections as a verification of the effectiveness of chemistry control programs. The program will also perform visual inspections of component internal surfaces and external surfaces of selected components to manage the effects of aging when the surfaces are made available for examination through surveillance and maintenance activities.	Prior to the Period of Extended Operation	Letter 09-597, Changes to the WCP Program
26.	Deleted	N/A	Letter 09-597
27.	Deleted	N/A	Letter 09-597
28.	The Metal Fatigue of Reactor Coolant Pressure Boundary Program will be enhanced to include a routine assessment of the transient cycle count totals and fatigue usage status for monitored locations, including an action limit for the initiation of corrective action.	Prior to the Period of Extended Operation	Metal Fatigue of Reactor Coolant Pressure Boundary
29.	The following will be further evaluated as part of the applicant's ongoing performance improvement programs: ● SAMA 160: Install Emergency Diesel Generator (EDG) exhaust duct insulation. ● Concurrent implementation of SAMAs 81,160,166, and 167. ● Implementation of temporary screenhouse ventilation.	Prior to the Period of Extended Operation	Environmental Report – SAMA Analysis, Letters 09-028 and 09-291
30.	Quarterly laboratory testing of fuel oil samples for water, sediment, and particulates will be performed on the EDG day tanks and on the technical support center diesel generator (TSC DG) day tank. The testing acceptance criteria will be consistent with the requirements specified in American Society for Testing and Materials (ASTM) D975-06b for water and sediment and ASTM D6217 for particulates.	Prior to the Period of Extended Operation	Letter 09-680, RAI response to B2.1.14-3
31.	The Work Control Process Program will be enhanced to provide for a one-time-inspection of the EDG day tanks and the TSC DG day tank. An exterior surfaces ultrasonic test (UT) inspection will be performed to verify wall thickness of the bottom of each day tank. Based upon the UT inspections, the most limiting EDG day tank will also be drained, cleaned, and visually inspected as a leading indicator for the remaining tanks.	Prior to the Period of Extended Operation	Letter 09-469, Response to RAI B2.1.15-1
32.	The 14 potentially cost beneficial SAMAs identified in LRA Appendix E, Attachment F, will be further evaluated as part of the applicant's ongoing performance improvement programs.	Prior to the Period of Extended Operation	Environmental Report – SAMA Analysis
33.	Develop a plan for identification and remediation of reactor refueling cavity liner leakage to be implemented during the period of extended operation.	Prior to the Period of Extended Operation	Letter 09-760, Response to RAI B2.1.31-4a
34.	At least one core bore sample will be taken from the waste drumming room reinforced concrete ceiling below the spent fuel pool. The core sample location and depth will be sufficient to validate the strength of the concrete and the extent of any degradation. The core sample will be tested for compressive strength and will be subject to petrographic examination. Reinforcing steel in the core sample area will be exposed and inspected for material condition.	Prior to the end of 2011	Letter 10-093, Response to RAI B2.1.31-5a

APPENDIX A: LONG TERM COMMITMENTS FOR LICENSE RENEWAL OF KPS			
No.	**Commitment**	**Implementation Schedule**	**Source**
35.	Develop an action plan for identification and remediation of spent fuel pool (SFP) liner leakage to be implemented during the period of extended operation.	Prior to the Period of Extended Operation	Letter 09-760, Response to RAI B2.1.31-5a
36.	If SFP liner leakage persists during the period of extended operation, an additional concrete core sample will be taken from the waste drumming room reinforced concrete ceiling below the spent fuel pool. The core sample location and depth will be sufficient to validate the strength of the concrete and the extent of any degradation. The core sample will be tested for compressive strength and will be subject to petrographic examination. Reinforcing steel in the core sample area will be exposed and inspected for material condition.	Prior to the end of the first 10 years of the Period of Extended Operation	Letter 09-760, Response to RAI B2.1.31-5a
37.	Perform a VT-1 visual examination of the stainless steel cladding of a safety injection pump for indications of cracking or corrosion due to cladding breach.	Prior to the Period of Extended Operation	Letter 09-777, Response to RAI 3.2.2.2.2
38.	The Boron Carbide Surveillance Program, which includes neutron attenuation testing, will continue to be performed during the period of extended operation every 3 years.	During the Period of Extended Operation	Letter 09-777, Supplemental Response to RAI 3.3.2.2.6-1
39.	A surveillance program will be implemented to perform verification that the Boral spent fuel storage rack neutron absorber B-10 areal density is maintained within the bounds of the spent fuel pool criticality analysis. Alternatively, the criticality analysis for the spent fuel pool will be revised to eliminate credit for the Boral neutron absorber material.	Prior to 2017. Surveillance program will be performed every 10 years thereafter	Letter 09-777, Supplemental Response to RAI 3.3.2.2.6-2
40.	Implement nitrate monitoring for the component cooling system on a frequency consistent with the existing monitoring for ammonia.	Prior to the Period of Extended Operation	Letter 10-008, Response to RAI B2.1.8-3a
41.	Perform a fatigue analysis of the surge line hot leg nozzle and the charging line nozzle in accordance with ASME Boiler and Pressure Vessel (B&PV) Code Section III, Subsection NB-3200 guidance and determine the cumulative usage factor (CUF), considering the effects of the reactor coolant environment. Confirm that CUF is less than 1.0 at the end of 60 years of plant operation.	Completed	Letter 10-033, Final Response to RAI B3.2-2, Letter 10-324, Completion of Kewaunee Power Station License Renewal Commitment 41.
42.	For Examination Category B-J, item No. B9.21, eight ASME Class 1 small-bore circumferential welds will receive volumetric and surface examinations during each 10-year ISI inspection interval during the period of extended operation.	During each 10-year ISI inspection interval during the period of extended operation	Letter 10-033, Supplemental Response to RAI B2.1.2-1

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No.	**Commitment**	**Implementation Schedule**	**Source**
43.	Ten volumetric examinations of ASME Class 1 small-bore socket welds will be performed using a demonstrated, nuclear-industry endorsed, inspection methodology that can detect cracking within the specified examination volume, if a methodology becomes available. In the event that a demonstrated, nuclear-industry endorsed, inspection methodology is not available, destructive examinations of socket welds will be substituted for volumetric nondestructive examinations. Each destructive weld examination will be considered equivalent to performing two volumetric weld examinations, such that a maximum of five destructive examinations will be performed.	Four volumetric examinations or two destructive examinations (or an equivalent combination of examinations) prior to the period of extended operation. Remaining examinations within three years of entering the period of extended operation.	Letter 10-665, Supplemental Response to RAI B2.1.2-2
44.	Core samples will be obtained from the inside surface of a concrete wall (below the groundwater table elevation) or from the foundation basemat in the vicinity of the groundwater wells for which average sampling results have exceeded the chloride concentration limit of 500 ppm. The concrete core samples will be tested to determine if the chloride content within the concrete could cause degradation due to corrosion of reinforcing steel.	Prior to the Period of Extended Operation	Letter 10-093, Response to RAI B2.1.31-3a
45.	In the event that the chloride content in the groundwater does not decrease to below 500 ppm within the first ten years of the period of extended operation, core samples will be obtained from the inside surface of a concrete wall (below the groundwater table elevation) or from the foundation basemat in the vicinity of a groundwater well for which average sampling results have exceeded the chloride concentration limit of 500 ppm. The concrete core samples will be tested to determine if the chloride content within the concrete could cause degradation due to corrosion of reinforcing steel.	Prior to the end of the first 10 years of extended operation.	Letter 10-093, Response to RAI B2.1.31-3a
46.	If the results of the core sample testing of the waste drumming room reinforced concrete ceiling leakage site (related to potential SFP liner leakage - Commitment 34) indicate degradation of the structural integrity of the concrete, at least one core bore sample will be taken near at least one of the refueling cavity liner leakage indication sites. The core sample location and depth will be sufficient to validate the strength of the concrete and the extent of any degradation. The core sample will be tested for compressive strength and will be subject to petrographic examination. Reinforcing steel in the core sample area will be exposed and inspected for material condition.	Prior to the Period of Extended Operation	Letter 10-093, Response to RAI B2.1.31-4a
47.	Submit three examples of operating experience associated with the Work Control Process – Internal Surfaces Monitoring Program for NRC staff review in determining the effectiveness of the program to detect and correct the effects of aging prior to the loss of function.	Within 2 years following implementation of the WCP aging management program	Letter 10-286; Response to RAI B2.1.32-5

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No.	**Commitment**	**Implementation Schedule**	**Source**
48.	The cathodic protection system associated with the diesel generator fuel oil storage tanks and protected portions of the fuel oil lines, and the circulating water system recirculation piping, will each be maintained available a minimum of 90% of the time during the period of extended operation. In addition, NACE cathodic protection system surveys will be performed at least annually during the period of extended operation.	During the Period of Extended Operation	Letter 10-548 Response to RAI-B2.1.7-3a
49	Recognizing that the EPRI Steam Generator Maintenance Program (SGMP) resolution is still under development, Kewaunee will perform an inspection of each steam generator to assess the condition of the divider plate assembly. The examination technique(s) will be capable of detecting PWSCC in the divider plate assembly and associated welds. The steam generator divider plate inspections will be completed prior to exceeding 10 years into the period of extended operation. In addition, Dominion Energy Kewaunee, Inc., (Dominion, DEK, or the applicant) will continue to actively participate in the EPRI SGMP studies.	Prior to 2023	Letter 10-548 Response to RAI-3.1.2.2.13-1a
50	Perform an audit of the Internal Surfaces Monitoring portion of the Work Control Process Program inspections to confirm that the components representing the leading indicators of aging for each of the material/environment combinations have been inspected at least once during the audit period. If any scheduled surveillance and maintenance activities which were intended to encompass components as leading indicators of aging in each of the material/environment combinations have not been performed, then perform deliberate focused inspections of these components.	Prior to the Period of Extended Operation and every 10 years thereafter. Deliberate focused inspections will be performed within 5 years of completion of the audits.	Letter 10-595 (Supplemental Response to RAI B2.1.32-5a)
51	DEK will perform a fatigue evaluation of the pressurizer lower head and surge line that is consistent with the requirements of ASME B&PV Code, Section III, NB-3200 and will determine the cumulative fatigue usage through the period of extended operation.	Prior to the Period of Extended Operation	Letter 10-595 Supplemental Response to RAI B3.2-2a
52	DEK will perform a review of design basis ASME Code Class 1 component fatigue evaluations to determine whether the NUREG/CR-6260-based components that have been evaluated for the effects of the reactor coolant environment on fatigue usage are the limiting components for the Kewaunee plant configuration. If more limiting components are identified, the most limiting component will be evaluated for the effects of the reactor coolant environment on fatigue usage.	Prior to the Period of Extended Operation	Letter 10-595 Supplemental Response to RAI B3.2-2a

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No.	**Commitment**	**Implementation Schedule**	**Source**
53	DEK will develop a plan to address the potential for failure of the primary-to-secondary pressure boundary due to PWSCC cracking of tube-to-tubesheet welds. The plan will consist of two resolution options: 1. Perform an analytical evaluation of the steam generator tube-to-tubesheet welds in order to: a) Establish a technical basis which concludes that the structural integrity of the steam generator tube-to-tubesheet interface is adequately maintained with the presence of tube-to-tubesheet weld cracking, and b) Establish a technical basis which concludes that the steam generator tube-to-tubesheet welds are not required to perform a reactor coolant pressure boundary function. -or- 2. Perform a one-time inspection of a representative number of tube-to-tubesheet welds in each steam generator to determine if PWSCC cracking is present. If weld cracking is identified: a) The condition will be resolved through repair or engineering evaluation to justify continued service, as appropriate, and b) An ongoing monitoring program will be established to perform routine tube-to-tubesheet inspections for the remaining life of the steam generators.	Develop a plan prior to the Period of Extended Operation Implement the requirements of the plan prior to 2023	Letter 10-595
54	The Structures Monitoring Program will be revised to include the evaluation criteria of ACI 349.3R-96, Chapter 5, as the criteria to be used when evaluating conditions or findings identified during concrete structure inspections. This will be done prior to the performance of the next scheduled inspection, which will occur prior to the period of extended operation.	Prior to the Period of Extended Operation	Letter 10-707, Response to RAI B2.1.31-9.