December 3, 2009

Mr. David A. Heacock
President and Chief Nuclear Officer
Dominion Energy Kewaunee, Inc.
Innsbrook Technical Center – 2SW
5000 Dominion Blvd.
Glen Allen, VA 23060-6711

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE KEWAUNEE POWER STATION LICENSE RENEWAL APPLICATION – AGING MANAGEMENT REVIEW/AGING MANAGEMENT PROGRAM (TAC NO. MD9408)

Dear Mr. Heacock:

By letter dated August 12, 2008, Dominion Energy Kewaunee, Inc., submitted an application for renewal of Operating License No. DPR-43 for the Kewaunee Power Station. The staff of the U.S. Nuclear Regulatory Commission (NRC or the staff) is reviewing this application in accordance with the guidance in NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants." During its review, the staff has identified areas where additional information is needed to complete the review. The staff's requests for additional information are included in the enclosure. Further requests for additional information may be issued in the future.

Items in the enclosure were discussed with Mr. Paul Aitken, of your staff, and a mutually agreeable date for the response is within 45 days from the date of this letter. If you have any questions, please contact me by telephone at 301-415-4049 or by e-mail at Samuel.Hernandez@nrc.gov.

Sincerely,

/RA/

Samuel Hernández, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-305

Enclosure:
As stated

cc w/encl: See next page

December 3, 2009

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Samuel Hernández, Project Manager
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DATE	11/27/09	11/23/09	12/02/09	12/03/09

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Letter to David A. Heacock from Samuel Hernandez dated December 3, 2009

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE KEWAUNEE POWER STATION LICENSE RENEWAL APPLICATION – AGING MANAGEMENT REVIEW/AGING MANAGEMENT PROGRAM (TAC NO. MD9408)

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Kewaunee Power Station

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KEWAUNEE POWER STATION
LICENSE RENEWAL APPLICATION
REQUEST FOR ADDITIONAL INFORMATION

Request for Additional Information (RAI) B2.1.8-4

Background

Exception 1 in license renewal application (LRA) Section B2.1.8 states that corrosion inhibitors are not used in the Control Room Air Conditioning System because this system interconnects with the Service Water System, which provides an alternate safety-related cooling mode. The applicant stated that periodic testing of this mode would release any inhibitors to the environment. The applicant also stated that, in lieu of the use of corrosion inhibitors, the system is periodically sampled to verify system integrity. The applicant further stated that periodic visual inspections of system components are performed under the plant-specific Work Control Process (WCP) Program.

Issue

Electric Power Research Institute (EPRI) TR-1007820 allows for the operation of closed cooling water systems without the addition of inhibitors, provided proper water chemistry is maintained. Specifically, EPRI TR-1007820 states that control of dissolved oxygen is particularly important for systems containing copper or copper alloys. The report recommends that dissolved oxygen either be maintained at <100 ppb to stabilize the cuprous oxide film on component surfaces or that it be maintained at >2000 ppb to stabilize the cupric oxide film. Operation at dissolved oxygen levels between these two limits is specifically warned against, since it results in alternate formation and breakdown of the two oxides and resulting loss of the protective film. The staff notes that the applicant does not state the limits on dissolved oxygen level in the Control Room Air Conditioning System or in which of the two EPRI-recommended dissolved oxygen level regimes this system operates.

Request

Please clarify the limits on dissolved oxygen level in the Control Room Air Conditioning System and specify in which of the two EPRI-recommended dissolved oxygen level regimes this system operates. If the limits on dissolved oxygen in the Control Room Air Conditioning System are not maintained within the levels that are recommended by EPRI TR-1007820, provide further details on how inspection procedures under the applicant's WCP are used to verify that corrosion of copper alloy components is not occurring. Include information on water sampling for the presence of dissolved and/or suspended copper indicative of copper alloy corrosion.

ENCLOSURE

RAI Aging Management Review (AMR) Table 3.3.2.1-1

Background

Steel tanks when in contact with soil and or concrete environments, at the inaccessible interface (between soil or concrete), can undergo corrosion and or loss of material. The Generic Aging Lessons Learned (GALL) Report for these aboveground steel tanks recommends such aging effects to be managed through aging management program (AMP) XI.M29, "Above Ground Steel Tanks." This AMP discusses how to manage loss of material, general corrosion of the tanks' external viewable surfaces, as well as those that are in inaccessible areas, e.g., at the interface between soil or concrete at the bottom of the tank. The GALL Report, in order to prevent moisture and water to accumulate under the steel tanks, emphasizes the installation and maintenance of pristine seals around the tanks' bottoms, assuring, thus, the existence and adequacy of a moisture barrier.

Issue

In the LRA, Kewaunee Power Station (KPS) indicates aging effects for the Diesel Generator Expansion Tanks will be managed with the GALL Report AMP XI.M36, "External Surfaces Monitoring." This AMP manages loss of material for steel and related corrosion aging effects. The GALL Report, however, recommends for aboveground steel tanks aging effects to be managed with AMP XI.M29. There are significant differences between the two AMPs. The AMP XI.M36 is a condition monitoring program, while AMP XI.M29 is a preventive measures program. XI.M36 is based on visual inspections, periodic walkdowns, with sampling allowed. AMP XI.M29 consists of the same approach for walkdowns and visual inspections. It differs from AMP XI.M36 in the protection mode of surfaces from corrosion (program element, scope of program). AMP XI.M29 recommends paint to be applied at exposed tank surfaces and caulking or sealant at the interface of the tank when supported by a slab or foundation (program element, preventive actions). AMP XI.M36 ascribes to qualification of personnel performing the inspections. Caulking, sealant, and paint are inspected by AMP XI.M29 vs paint as designated in the AMP XI.M36 (program element, parameters monitored/inspected). In addition to these visually observed quantities, AMP XI.M29 also recommends inspecting personnel to track via ultrasonic testing (UT) the thickness of tank bottoms, when in contact with the ground to assure significant degradation is not occurring (program element, detection of aging effects).

Request

- Are the elevated expansion tanks detached or attached to the ground (concrete slab/foundation)? State their location, elevation, and accessibility for performance of full visual inspections.
- State the frequency of inspections.

RAI 3.3.2.2.3.3-1 Diesel Exhaust Piping

Background

Section 3.3.2.2.3.3, "Cracking due to Stress Corrosion Cracking" and Section 3.3.2.2.7.3, "Loss of Material due to General, Pitting, and Crevice Corrosion" of the Standard Review Plan for License Renewal Applications of Nuclear Power Plants (SRP-LR) identify cracking due to stress corrosion cracking (SCC) and loss of material as aging effects requiring management for steel and stainless steel diesel exhaust piping, piping components, and piping elements exposed to diesel exhaust. The applicant has credited the plant-specific AMP B2.1.32 WCP Program with managing this aging effect for the diesel engine exhaust piping, piping components, and piping elements.

Issue

Section A.1.2.3.4 Detection of Aging Effects of the SRP-LR describes the attributes of an acceptable plant-specific AMP which should be used to manage this aging effect. The SRP-LR states that aspects such as method or technique, frequency, sample size, etc should be appropriate in order to ensure timely detection of aging effects. LRA Sections 3.3.2.2.3.3 and 3.3.2.2.7.3 describe the inspection frequency to be on an ongoing basis, dependent upon the preventive and corrective maintenance activities required for the components. The staff notes that preventive maintenance activities are typically done based on a schedule set in advance of the maintenance activity being performed. However, the LRA is not clear in defining the preventive maintenance activity schedule for diesel exhaust gas components. The lack of a schedule would bring into question the adequacy of preventive maintenance, as well as the frequency of the accompanying visual examinations to manage the loss of material and cracking aging effects.

Request

Please clarify whether or not preventive maintenance will be done and whether or not actual inspections of the diesel exhaust gas components will be done during the scheduled preventive maintenance to manage the loss of material and cracking aging effects.

RAI 3.3.2.3-1 - Secondary Water Chemistry AMP

Background

LRA Tables 3.4.2-5, 3.4.2-6, 3.4.2-7, 3.4.2-8, 3.4.2-9, 3.4.2-10, 3.4.2-12, and 3.4.2-14 address the SCC of copper-alloy valves, auxiliary feedwater components, and heating steam components exposed to treated secondary water and/or steam. The applicant proposes to manage this aging effect through the use of its AMPs "Secondary Water Chemistry" and "Work Control Process" (LRA B2.1.28 and B2.1.32). The applicant also states that for the component, material and environment combination listed, the aging effect being considered is not included in the GALL Report (Generic Note H).

Issue

In its review of LRA Tables 3.4.2-5, 3.4.2-6, 3.4.2-7, 3.4.2-8, 3.4.2-9, 3.4.2-10, 3.4.2-12, and 3.4.2-14, the staff confirmed that the GALL Report does not address this aging process for the specific components identified by the applicant. The staff also noted that aging management of SCC of specific copper-alloy components in contact with treated secondary water and/or steam is not addressed anywhere as a line item in the GALL Report tables. The staff further noted that the GALL Report states in Table IX.C that "copper-zinc alloys >15% zinc are susceptible to stress corrosion cracking, selective leaching (except for inhibited brass), and pitting and crevice corrosion. Additional copper alloys may be susceptible, such as aluminum bronze >8% aluminum."

Request

State whether the copper alloy components discussed in this section of the LRA are or may be susceptible to SCC. If susceptible components are present or are believed to be present, identify the limits on those chemical impurity species controlled by the applicant's Secondary Water Chemistry AMP that might promote SCC in these components.

RAI 3.1.2.2.7-1 - Vessel Flange Leakage Monitor Lines

Background

In LRA Table 3.1.2-1, the applicant proposes to manage cracking/SCC in the stainless steel vessel flange leakage monitor lines exposed to primary reactor coolant water through the use of its AMPs, "Primary Water Chemistry" and "Work Control Process (WCP)" (LRA B2.1.24 and B2.1.32). The vessel flange leak monitor lines require management so leakage from them, if it occurred, has no adverse impact on other components inside containment. SRP-LR Section 3.1.2.2.7 requires that a plant-specific AMP be evaluated to ensure this aging effect is adequately managed, since existing programs may not be capable of mitigating or detecting crack initiation and growth due to SCC in the vessel flange leak monitor line.

Issue

The applicant states that the service environment for this austenitic stainless steel component is primary water. However, the staff noted in its review that the normal internal environment for the flange leakage monitor line is air, and the line would see reactor coolant only when there is a leak at the inner reactor vessel closure flange O-ring. The staff determined that the applicant's Primary Water Chemistry program is of little value in mitigating SCC in a line that is intermittently exposed to stagnant reactor coolant, particularly when that coolant is subject to the absorption of oxygen and possible concentration of other impurities from the environment in the line. The staff also noted that control of the water chemistry in the stagnant coolant intermittently present in the line is extremely difficult under any water chemistry program. The staff therefore concluded that effective management of degradation due to SCC for this component must be accomplished primarily through periodic inspection rather than through water chemistry control. The staff questions the efficacy the applicant's WCP Program, which it

proposes to be an alternative to XI.M32, to detect crack initiation in the components under consideration.

Request

LRA Section 3.1.2.2.7.1 utilizes the Primary Water Chemistry and the WCP AMPs. Hence, leakage occurring after a one-time inspection will not be discovered and its impact on other components will not be assessed. Provide additional justification to demonstrate that the applicant's WCP AMP is effective on an ongoing basis in detecting cracks in the vessel flange leakage monitor lines exposed to treated primary coolant water. The justification should include a summary of industry experience with flawed vessel flange leak detection lines to demonstrate that failure of these lines is unlikely to occur.

RAI 3.2.2.2.2 - Loss of Material Due to Cladding Breach

Background

SRP-LR Section 3.2.2.2.2 notes that loss of material due to cladding breach could occur for pressurized-water reactor steel pump casings with stainless steel cladding exposed to treated borated water, and recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed. The corresponding section of the KPS LRA notes that the failures in the referenced U.S. Nuclear Regulatory Commission Information Notice pertained to manufacturing at the Pacific Pump Division of Dresser Industries and were not related to aging. The KPS LRA continued by stating that the safety injection pumps at the KPS were manufactured by Sulzer Bingham, and since there was no operating experience related to loss of material due to cladding breach in Sulzer Bingham pumps, this item was not applicable.

Issue

According to the KPS USAR Table 6.2-6, the safety injection pumps are carbon steel forgings with stainless steel cladding. The lack of operating experience related to loss of material due to cladding breach in Sulzer Bingham pumps is an insufficient basis to ensure that this aging effect is being managed.

Although the information notice in question may have specifically cited the Pacific Pump Division of Dresser Industries, information notices are used to inform the nuclear industry of recently-identified, significant operating experience that may have generic applicability. In doing so, specific examples of the phenomenon in question are included; however, these examples should not be viewed as a limitation on applicability. The conditions which resulted in the corrosion of the listed pumps could exist for other carbon steel pumps with stainless steel cladding, and therefore, they could similarly corrode unless an aging management program is implemented. The GALL Report recommends further evaluation of a plant-specific Aging Management Program, which meets the acceptance criteria described in Branch Technical Position RLSB-1.

Request

Provide a plant-specific AMP, which meets the acceptance criteria described in Branch Technical Position RLSB-1, to ensure that this aging effect, the loss of material due to cladding breach, for the pumps in question, is adequately managed.

RAI B2.1.32-1

Background

In Dominion Energy Kewaunee, Inc. (DEK) Letter No. 09-597, dated September 25, 2009, the applicant amended its LRA to change the WCP from a plant-specific AMP to an AMP that is consistent with GALL Report AMP XI.M32, "One-Time Inspection" (with an enhancement). For those AMR line items in the LRA in which the Primary Water Chemistry Program (LRA AMP B2.1.24), Secondary Water Chemistry Program (LRA AMP B2.1.28), Closed-Cycle Cooling Water Program (LRA AMP B2.1.8), Fuel Oil Chemistry Program (LRA AMP B2.1.14), or Lubricating Oil Analysis Program (LRA AMP B2.1.17) the applicant identifies that the WCP will be used to verify these program's effectiveness and that the sample size of the one-time inspections will be based on an assessment of material, environment, plausible aging effects and operating experience.

Issue

Although the applicant's sampling basis is consistent with the sampling basis statement in GALL Report AMP XI.M32, the staff notes that it does not clearly establish what the applicant's sampling basis would be because (1) the AMP that is credited in the AMR line items manage multiple material-environment-aging effect combinations and (2) the applicant did not clearly establish whether the representative sample will be chosen from each "unique" material-environment- aging effect combination or will the representative sample be chosen from the collection of all material-environment-aging effect combination. In addition, the staff felt that additional explanations were needed on the type of factors that would be used to select component or structure locations for the one-time examinations. In addition, KLR-1336 indicates that methodology in EPRI Report No. 107514 may be used to select the sample of components that are inspected on a periodic basis under the WCP.

Request

For those AMR line items in the LRA that credit the Primary Water Chemistry Program, Secondary Water Chemistry Program, Closed-Cycle Cooling Water Program, Fuel Oil Chemistry Program, or Lubricating Oil Analysis Program, clarify whether the WCP will inspect a representative sample of the component or structure populations for each "unique" material-environment-aging effect combination that is managed or whether some other type of sampling basis will be used. If another sampling basis is used, please justify its use.

Clarify which type of engineering, design, operational or operating experience considerations (e.g. stagnant areas for evidence of corrosion, high velocity flow areas for evidence of erosion or wear, etc.) will be used to select the representative sample of components for the one-time inspections.

Explain why these considerations are considered sufficient to justify the sample of components that are selected, particularly if a given sample is used to represent more than one material-environment-aging effect combination in the AMR tables of the LRA.

In addition, justify how the methodology in EPRI Report No. 107514 can be applied to the selection of components at Kewaunee Station, when the methodology in the report is only limited to component inspections in a limited number of systems of the Calvert Cliffs nuclear power station and when the report may only be relevant to PWR facilities that are part of the Combustion Engineering Owners Group.

RAI B2.1.32-2

Background

In DEK Letter No. 09-597, dated September 25, 2009, the applicant amended its LRA to change the WCP from a plant-specific AMP to an AMP that is consistent with GALL Report AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components” (with noted exceptions and an enhancement).

Issue

The “detection of aging effects” element in GALL Report AMP XI.M38 states that locations for inspection should be chosen to include conditions likely to exhibit the aging effects and that the inspection intervals should be established such that they provide for timely detection of degradation. The staff has noted that the Dominion Technical Report KLR-1336 does not specifically establish or justify what the sample populations, sample sizes, and inspection frequencies would be for the periodic examinations that are performed in accordance with the WCP because the program is defined as a new, GALL-based program for the LRA.

Request

Clarify why the visual examinations of those components that are actually scheduled for periodic maintenance are considered to be representative of those components that may not be inspected during the period of extended operation. Clarify how the results of the inspections will be applied to the population of components that may not be inspected under the program if aging is detected in the inspected components and how potential aging in the non-inspected will be addressed.

RAI B2.1.32-3

Background

In DEK Letter No. 09-597, dated September 25, 2009, the applicant amended its LRA to change the WCP from a plant-specific AMP to an AMP that is consistent with GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" (with noted exceptions and an enhancement).

Issue

The staff noted that the "detection of aging effects" element in GALL Report AMP XI.M38 states that the applicant should identify and justify the inspection technique used for detecting the aging effects of concern. The staff has noted that, although the applicant's basis document appropriately identifies that enhanced VT-1 techniques will be used to monitor for cracking by SCC, the applicant does not identify which type of specific visual inspection techniques would be used to monitor for loss of material or for reduction of heat transfer capability by fouling.

Request

Clarify whether the visual inspection techniques that have been specified to detect for loss of material (corrosion, wear, erosion, etc.) and for reduction of heat transfer capability (fouling) during implementation of the one-time inspections of the program (i.e., the inspections that will be performed in accordance with GALL Report AMP XI.M32) also apply to the monitoring of these aging effects/mechanisms for the periodic inspections of the program (i.e., the inspections that will be performed in accordance with GALL Report AMP XI.M38). In addition, confirm that visual inspection techniques would be coupled with physical manipulation methods on applicable elastomeric components to monitor for cracking, crazing, discoloration, swelling, tackiness, or other aging effect parameters.

RAI B2.1.32-4

Background

In DEK Letter No. 09-597, dated September 25, 2009, the applicant amended its LRA to change the WCP from a plant-specific AMP to an AMP that is consistent with GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" (with noted exceptions and an enhancement).

Issue

The "acceptance criteria" element in GALL Report AMP XI.M38 states that acceptance criteria are established in the maintenance and surveillance procedures or other established plant procedures, and that, if the results are not acceptable, the corrective action program is implemented to assess the material condition and determine whether the component intended function is affected. The applicant states that the acceptance criterion is "no unacceptable wear, corrosion, cracking, change in material properties (for materials and non-metallics) or significant fouling."

Request

Clarify the intent (meaning) of the phrase "no unacceptable wear, corrosion, cracking, change in material properties (for materials and non-metallics) or significant fouling." Specifically clarify whether the intent is to establish acceptance criterion in which no evidence of wear, corrosion, cracking, change in material properties, or significant fouling is acceptable, or whether the intent is to establish an acceptance criterion in which a certain amount of wear, corrosion, cracking, change in material properties, or significant fouling may be permitted as long as it is within the bounds that are established in implementing procedures.

RAI B3.2-4a

Background/Issue

The applicant responded to RAI B3.2-4 in a letter dated August 17, 2009. The last paragraph of the response to RAI B3.2-4 states, "The differential temperature (ΔT) between the pressurizer and the reactor coolant loop is determined through a calculated plant computer data point that subtracts the greater of reactor coolant loop A or loop B wide range temperature from the pressurizer water temperature."

However, in subtraction, the larger the deduction, the smaller the net will be. It follows that the ΔT (i.e., the net) calculated in accordance with the formula stated above is smaller than what you would get if you were subtracting the smaller of T_A or T_B from the pressurizer water temperature. Therefore, the ΔT values you obtained are non-conservative, considering that, ΔT represents potential of stress due to stratification and insurge/outsurge.

Request

- Demonstrate that the formula as described for the ΔT calculation is conservative.
- The need of correction of the ΔT data was identified in August 2006 but Westinghouse Commercial Atomic Power (WCAP)-12841 and WCAP-12842 that helped to close the Bulletin 88-11 request concerning the issue on the surge line stratification and insurge/outsurge for KPS were prepared in 1991. Justify that the WCAP analyses remain valid since the ΔT data, which the WCAP analyses based upon, are changed due to the corrections demanded by the 2006 incident.

RAI 4.3-2a

Background/Issue

The applicant responded to RAI 4.3-2 in a letter dated August 17, 2009. The response to RAI 4.3-2 does not provide the historical dissolved oxygen data for the first 10 years of the plant history (1974 – 1984), although it covered the most recent 25 years.

Request

- Provide justification that, for the first 10 years of the plant operation (1974 through 1984), the KPS dissolved oxygen concentration in the reactor coolant system coolant was maintained at or below 0.05 ppm level.