March 11, 2010

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 (TAC NO. MD9408)

Dear Mr. Heacock:

By letter dated August 12, 2008, Dominion Energy Kewaunee, Inc. (Dominion), submitted an application for renewal of operating license 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 Paul Aitken, of your staff, and a mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me by telephone at 301-415-3873 or by e-mail at John.Daily@nrc.gov.

Sincerely,

/RA/

John Daily, Sr. Project Manager
Project Operations Branch
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-305

Enclosure:
As stated

cc w/encl: See next page

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OFFICE	PM:RPOB:DLR	LA:RPOB:DLR	BC:RPOB:DLR	PM:RPB1:DLR
NAME	JDaily	SFigueroa	JRobinson	JDaily (Signature)
DATE	3/11/10	3/10/10	3/11/10	3/11/10

OFFICIAL RECORD COPY

Letter to David A. Heacock from John Daily dated March 11, 2010

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

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J. Daily
D. Doyle
P. Tam
S. Burton
K. Barclay
M. Kunowski
V. Mitlyng
I. Couret
S. Burton
P. Higgins
J. Medoff
J. Dozier

cc:

Resident Inspectors Office
U.S. Nuclear Regulatory Commission
N490 Hwy 42
Kewaunee, WI 54216-9510

Mr. Chris L. Funderburk
Director, Nuclear Licensing and
Operations Support
Dominion Resources Services, Inc.
Innsbrook Technical Center – 2SE
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

Mr. Thomas L. Breene
Dominon Energy Kewaunee, Inc.
Kewaunee Power Station
N490 Highway 42
Kewaunee, WI 54216

Mr. Michael J. Wilson, Director
Nuclear Safety & Licensing
Dominion Energy Kewaunee, Inc.
Kewaunee Power Station
N490 Highway 42
Kewaunee, WI 54216

Mr. Daniel G. Stoddard
Senior Vice President – Nuclear Operations
Innsbrook Technical Center – 2SE
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

Mr. Alan J. Price
Vice President – Nuclear Engineering
Innsbrook Technical Center – 2SE
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

Mr. William D. Corbin
Director – Nuclear Engineering
Innsbrook Technical Center - 3NE
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

Mr. Paul C. Aitken
Supervisor – License Renewal Project
Innsbrook Technical Center – 3NE
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

Mr. David A. Sommers
Supervisor – Nuclear Engineering
Innsbrook Technical Center - 2SE
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

Ms. Lillian M. Cuoco, Esq.
Senior Counsel
Dominion Resources Services, Inc.
120 Tredegar Street
Riverside 2
Richmond, VA 23219

Mr. Stephen E. Scace
Site Vice President
Dominion Energy Kewaunee, Inc.
Kewaunee Power Station
N490 Highway 42
Kewaunee, WI 54216

Mr. David R. Lewis
Pillsbury Winthrop Shaw Pittman, LLP
2300 N Street, N.W.
Washington, DC 20037-1122

Mr. Ken Paplham
E 4095 Sandy Bay Rd.
Kewaunee, WI 54216

Mr. Jeff Kitsembel, P.E.
Public Service Commission of Wisconsin
P. O. Box 7854
Madison, WI 53707-7854

KEWAUNEE POWER STATION
LICENSE RENEWAL APPLICATION
REQUEST FOR ADDITIONAL INFORMATION

RAI B.2.1.29-01 – Selective Leaching of Materials

Background

The applicant stated in LRA Section B2.1.29 that its new Selective Leaching of Materials Program is consistent with GALL AMP XI.M33, "Selective Leaching of Materials." The "scope of program," "preventive actions," "parameters monitored or inspected," and "detection of aging effects," elements of GALL AMP XI.M33 include a one-time visual inspection and hardness measurement of a selected set of sample components to determine whether loss of material due to selective leaching is not occurring for the period of extended operation. The "detection of aging effects" program element of GALL AMP XI.M33 furthers clarifies that Brinell Hardness Testing on the inside of a selected set of components is an acceptable method of determining if selective leaching has occurred. The LRA AMP also credits use of qualitative examination, such as resonance when struck by another object, scraping, or chipping, as appropriate, to determine if loss of material due to selective leaching has occurred; which is beyond the hardness measurement recommended by the GALL Report. The GALL AMP does not include a discussion regarding the use of qualitative examinations to determine whether the loss of material due to selective leaching has occurred.

Issue

The LRA AMP credits performance of a one-time visual inspection and a hardness test or qualitative examination, such as resonance when struck by another object, scraping, or chipping, as appropriate, to determine whether the aging effect of loss of material due to selective leaching has occurred, while the GALL AMP recommends performance of a one-time visual inspection and a hardness measurement.

Request

Please provide justification for why the qualitative examination methodologies credited in the LRA AMP are acceptable alternative to performing a hardness measurement as recommended by the GALL Report.

Please also revise the LRA AMP to reflect that inclusion of a qualitative examination, such as resonance when struck by another object, scraping, or chipping, is an exception to the GALL AMP.

RAI B.2.1.16-01 – Inspection of Overhead Heavy Load and Refueling Handling Systems

Background

The applicant stated in LRA Section B2.1.16 that its existing Inspection of Overhead Heavy Load and Refueling Handling Systems Program is consistent with GALL AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems." The "scope of program" program element description for GALL AMP XI.M23 states that the program manages the effects of general corrosion on the crane and trolley structural components and the effects of wear on the rails in the rail system. However, the applicant's

Overhead Heavy Load and Refueling Handling Systems Program includes visual inspection of the structural bolting associated with structural members for general corrosion and tightness.

Issue
The applicant included visual examination of structural bolting associated with structural members for tightness within the scope of the Overhead Heavy Load and Refueling Handling Systems Program. The GALL Report recommends use of GALL AMP XI.M18, "Bolting Integrity," to manage the effects of aging on structural bolting. GALL AMP XI.M18 recommends volumetric examination for structural bolting larger than one inch with a yield strength greater than 150 ksi, in addition to visual examination.

Request
Please justify how a visual inspection will verify tightness of bolting. Additionally, the staff requests that the applicant verify if this bolting is also managed by its Bolting Integrity Program, and if not, verify whether it conducts volumetric examinations on bolting larger than one inch with a yield strength greater than or equal to 150 ksi.

RAI B.2.1.5-07 – Bolting Integrity Program

Background
The applicant stated in LRA Section B2.1.5 that its existing Bolting Integrity Program is consistent, with an enhancement, with GALL AMP XI.M18, "Bolting Integrity." In its response to RAI B2.1.5-5 on September 28, 2009, the applicant stated that it would take an exception to the B2.1.5 Bolting Integrity Program to use only visual inspections to detect the effects of aging on high strength bolting with a diameter greater than one inch whereas GALL AMP XI.M18 recommends volumetric and visual examinations. The applicant justified the exception by stating that the bolting in question is used to provide a connection between the top of the reactor coolant pump support columns and the pump support brackets. The applicant stated that these bolts are hand tightened at each end and are not torqued. The applicant also stated that visual examinations will detect corrosion and conditions indicative of a corrosive environment which is a requirement of SCC in high strength bolting.

Issue
In its response to RAI B2.1.5-5 the applicant took an exception to the recommendation to perform volumetric testing on high strength bolting, noting that SCC is an aging effect requiring management for the reactor coolant pump connecting bolts because of the possibility of residual stresses from the manufacturer for these high strength bolts.

In LRA Table 3.5.2-15, footnote 4, the steam generator footbolts are noted as not being susceptible to SCC and therefore not included in the Bolting Integrity Program. In its response to RAI B2.1.5-5, the applicant did not include justification for why the steam generator footbolts are not susceptible to SCC. The applicant did not include specific information regarding why the footbolts are not subject to a corrosive environment, and have low residual and tensile stresses.

Request
Please provide justification for why the steam generator footbolts are noted in LRA Table 3.5.2-15, footnote 4, as not subject to SCC and why no aging management program is credited to manage the effects of aging on the footbolts.

Additionally, the staff requests that the applicant verify whether it has any high strength structural bolting with a diameter greater than one inch other than those associated with the reactor coolant pump connecting bolts and steam generator footbolts.

RAI B2.1.30-17 – Kewaunee Steam Generator Tube Integrity

Background
By letter dated July 13, 2009, the staff issued several RAIs (B2.1.30-1 through B2.1.30-13) about the steam generator tube integrity aging management program requesting the applicant to solve numerous inconsistencies the staff identified between the applicant's program and its implementing documents and industry guidance documents.

The applicant responded to these RAIs in its letter dated August 17, 2009. The staff reviewed the applicant's answers.

Issue
However, for some of these RAIs (B2.1.30-2, B2.1.30-3, B2.1.30-5, B2.1.30-7, B2.1.30-11, and B2.1.30-12), the staff finds the applicant's response inadequate, mainly because the staff could not verify that the modifications to be made to the procedure and/or implementing documents will be consistent with the GALL AMP XI.M19.

Request
Confirm that the modifications you will implement through your Corrective Action Program in your different documents in a way that elements one through six of your Steam Generator Tube Integrity Program will be consistent with the corresponding program elements of GALL AMP XI.M19 before entering in the period of extended operation for RAIs B2.1.30-2, B2.1.30-3, B2.1.30-5, B2.1.30-7, B2.1.30-11, and B2.1.30-12.

RAI 3.1.2.2.2.4-02a – Kewaunee - Follow up to RAI 3.1.2.2.2.4-2

Background
By letter dated November 20, 2009, the staff issued RAI 3.1.2.2.2.4-2 requesting the applicant to describe the inspections that will be performed on the "transition weld" during the renewed license period. The transition weld is the new field weld generated by the cut made in the transition cone at the time of steam generator replacement.

In its response dated December 28, 2009, the applicant stated that a radiography examination (in accordance with the requirements of ASME Code, Section III) was performed on this weld at the time of SG replacement, with no indications identified that exceed the acceptance criteria of ASME Code, Section III. The applicant further stated that the transition weld does not require volumetric examination in accordance with ASME, Section XI inservice inspection requirements, because it is not located at a gross structural discontinuity, as defined in the ASME Code, and is located a sufficient distance from the structural discontinuity at the transition cone-to-upper shell junction such that the resulting elevated stresses at that junction do not affect the transition weld area. The applicant identified that the transition weld does receive a VT-2 visual examination as part of the system pressure test in accordance with ASME Code, Section XI IWC 2500-1, Examination Category C-H requirements.

SRP-LR Section 3.1.2.2.2.4 and GALL AMR Item 3.1.1-16 identify that the loss of material due to general, pitting, and crevice corrosion can occur in steel PWR steam generator SG upper shell-to and lower shell-to transition cone welds that are exposed to a secondary feedwater or steam environment, and that the existing program relies on control of chemistry to mitigate corrosion and Inservice Inspection (ISI) to detect loss of material. SRP-LR Section 3.1.2.2.2.4 further states that the extent and schedule of the existing steam generator inspections are designed to ensure that flaws cannot attain a depth sufficient to threaten the integrity of the welds.

Issue
The staff has observed that AMR Item 3.1.1-16 was included in the GALL Report to ensure that volumetric examinations performed in accordance with the requirements of ASME Code Section XI IWC-2500-1, Examination Category C-A, Inspection Item C1.10 for upper shell-to and lower shell-to transition cones with gross structural discontinuities would be capable of managing loss of material due to general, pitting, and crevice corrosion in the welds. The staff has observed that the new continuous circumferential weld in the Kewaunee SG transition cone design should not be aligned to the intent of GALL AMR Item 3.1.1-16 because the intent of this GALL item was to address problems in the SG transition cone welds containing geometric discontinuities, and the new SG transition cone weld does not meet this design description. However, the new transition area weld is a field-weld as opposed to having been made in a controlled manufacturing facility, and the surface conditions of the transition weld may result in flow conditions more conducive to initiation of general, pitting, and crevice corrosion than those of the upper and lower transition cone welds.

According to SRP-LR Section A.1.2.3.4, a program based solely on detecting structure and component failure should not be considered as an effective aging management program for license renewal, as would be the case using detection of leakage as the aging management for the transition weld. Thus, the staff considers the crediting of the ISI program for the new SG transition cone weld to be an ineffective basis for managing loss of material in this weld, as the ISI criteria would only perform a VT-2 visual leakage examination of the weld as part of the system leakage test performed pursuant to ASME Section XI, Table IWC 2500-1, Examination Category C-H requirements and because this type of examination would allow leakage to occur before appropriate corrective actions would be initiated on the weld. In addition, ASME Section XI IWA-5242 does not require licensees to remove insulation when performing visual examination on non-borated treated water systems. As a result, the staff finds the applicant’s response to RAI 3.1.2.2.2.4-2 does not currently resolve the request in the RAI.

Request
Since the surface conditions of the transition weld may result in flow conditions more conducive to initiation of general, pitting, and crevice corrosion than those of the upper and lower transition cone welds, describe the surface condition and the resultant flow near the transition weld (e.g., weld crown, ground flush, etc.) and how these parameters could affect the susceptibility of this weld to these aging mechanisms, relative to that of the upper and lower transition welds. Based on this information, justify if any additional aging management of the transition weld is necessary. If additional aging management is necessary, describe an aging management

program of the SG transition weld (including examination frequency and technique) that will be effective in managing an aging effect such as the loss of material due to general, pitting, and crevice corrosion during the period of extended operation.

Kewaunee - RAI 3.1.2.2.13-01, Cracking due to PWSCC
Background
SRP-LR Section 3.1.2.2.13 identifies that cracking due to primary water stress corrosion cracking (PWSCC) could occur in PWR components made of nickel alloy and steel with nickel alloy cladding, including reactor coolant pressure boundary components and penetrations inside the RCS such as pressurizer heater sheathes and sleeves, nozzles, and other internal components. GALL Report Volume 2 Item IV.D1-06 recommends Chapter XI.M2, "Water Chemistry," for PWR primary water for managing the aging effect of cracking in the nickel alloy steam generator divider plate exposed to reactor coolant.

In LRA Table 3.1.1, Item 81, the applicant credits its Primary Water Chemistry Program to manage the aging effect of cracking due to primary water stress corrosion cracking in nickel alloy or nickel-alloy clad steam generator (SG) divider plate exposed to reactor coolant, and indicates in Item 82 of this same table that Kewaunee's installed steam generator divider plate is fabricated from nickel alloy.

Issue
From recent foreign operating experience in steam generators with a similar design to that of Kewaunee, extensive cracking due to PWSCC has been identified in SG divider plates, even with proper primary water chemistry. Specifically, cracks have been detected in the stub runner, very close to the tubesheet/stub runner weld and with depths of almost a third of the divider plate thickness (OECD/NEA/CSNI/IAGE April 2007 EDF presentation). Therefore, the staff notes that the water chemistry program alone does not appear to be effective in managing the aging effect of cracking due to PWSCC in SG divider plate.

Although these SG divider plate cracks may not have a significant safety impact in of themselves, such cracks could impact adjacent items, such as the tubesheet and the channel head, if they propagate to the boundary with these items. For the tubesheet, PWSCC cracks in the divider plate could propagate to the tubesheet cladding with possible consequences to the integrity of the tube/tubesheet welds. For the channel head, the PWSCC cracks in the divider plate could propagate to the SG triple point and potentially affect the pressure boundary of the SG channel head.

Request
Please discuss the materials of construction of your SG divider plate assembly. If these materials are susceptible to cracking (e.g., Alloy 600 or the associated Alloy 600 weld materials), please discuss the potential for cracking in the divider plate to propagate into other components (e.g., .tubesheet cladding).

If propagation into these other components cannot be ruled out, please describe an inspection program (examination technique and frequency) for ensuring that there are no cracks propagating into other items (e.g., tube sheet and channel head) that could challenge the integrity of these other items.