Dominion Energy Kewaunee, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060

Dominion®

January 23, 2007

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Serial No. 05-750A
KPS/LIC: R3
Docket No. 50-305
License No. DPR-43

DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST – 211 "RADIOLOGICAL ACCIDENT ANALYSIS AND ASSOCIATED TECHNICAL SPECIFICATIONS CHANGE"

Pursuant to 10 CFR 50.90, Dominion Energy Kewaunee, Inc. (DEK) submitted a request for approval of a proposed license amendment for the Kewaunee Power Station (KPS) (reference 1). The license amendment request would modify the currently approved radiological accident analyses and associated technical specifications (TS) to account for greater than expected control room emergency zone unfiltered inleakage.

Subsequently, the Nuclear Regulatory Commission (NRC) transmitted a request for additional information (RAI) regarding this license amendment request. The RAI and the DEK response are provided in the attachment to this letter.

This RAI response does not change the significant hazards determination or the requested approval date for the proposed amendment discussed in reference 1.

If you have any questions or require additional information, please contact Mr. Craig Sly at (804) 273-2784. A complete copy of this submittal has been transmitted to the State of Wisconsin as required by 10 CFR 50.91(b)(1).

Very truly yours,

Gerald T. Bischof
Vice President - Nuclear Engineering

Commitments made by this letter: None.

Reference:

1. Letter from Leslie Hartz (DEK) to Document Control Desk, "License Amendment Request 211 - Radiological Accident Analyses and Associated Technical Specification Changes," dated January 30, 2006 (ADAMS Accession No. ML060540217).

Attachment:

1. Response to Request for Additional Information Regarding Kewaunee License Amendment Request 211.

cc: Regional Administrator, Region III
U.S. Nuclear Regulatory Commission
2443 Warrenville Road
Suite 210
Lisle, IL 60532-4352

Mr. R. F. Kuntz
U.S. Nuclear Regulatory Commission
Mail Stop O 7D1A
Washington, D. C. 20555

Mr. S. C. Burton
NRC Senior Resident Inspector
Kewaunee Power Station

Public Service Commission of Wisconsin
Electric Division
P. O. Box 7854
Madison, WI 53707

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Gerald T. Bischof, who is Vice President – Nuclear Engineering of Dominion Energy Kewaunee, Inc. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 23rd day of January, 2007.

My Commission Expires: August 31, 2008.

Margaret B. Bennett
Notary Public

(SEAL)

ATTACHMENT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING KEWAUNEE LICENSE AMENDMENT REQUEST 211

KEWAUNEE POWER STATION

DOMINION ENERGY KEWAUNEE, INC.

Response to Request for Additional Information Regarding Kewaunee License Amendment Request 211

Pursuant to 10 CFR 50.90, Dominion Energy Kewaunee, Inc. (DEK) submitted a request for approval of a proposed license amendment for the Kewaunee Power Station (KPS) (reference 1). The license amendment request would modify the currently approved radiological accident analyses and associated technical specifications (TS) to account for greater than expected control room emergency zone unfiltered in-leakage.

Subsequently, the Nuclear Regulatory Commission (NRC) transmitted a request for additional information (RAI). The RAI states the following:

> *"In their letter of January 30th, Kewaunee stated that they wished to reduce the assumed fraction of rods-in-DNB from 100% to 50% when performing the radiological dose assessment for the locked rotor event.*
>
> *The licensing basis locked rotor event analysis results, reported in Chapter 14.1.8 of the Kewaunee USAR, indicates that the calculated fraction of rods-in-DNB is less than 50%. Therefore, Kewaunee's proposed change is acceptable, since the assumed fraction of rods-in-DNB, used in the radiological dose assessment, exceeds the calculated fraction of rods-in-DNB.*
>
> *Kewaunee should verify that the fission product gap inventory, assumed in the radiological dose assessment, is consistent with Table 3 of RG 1.183."*

Response:

Dominion Energy Kewaunee (DEK) has reviewed the fission product releases assumed in the radiological dose assessment for non-LOCA events for consistency with Table 3, "Non-LOCA Fraction of Fission Product Inventory in Gap," of Regulatory Guide (RG) 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," July 2000. The KPS non-LOCA events that use RG 1.183, Table 3 gap fractions are the locked rotor (LR) and the fuel handling (FHA) events. Based on the discussions below, DEK concludes that the fission product releases assumed in the radiological dose assessment for non-LOCA events are consistent with Regulatory Guide 1.183, Table 3.

The determination of consistency involves evaluation of the reload core considering the criteria of RG 1.183, Table 3, footnote 11. Footnote 11 states the following:

> "The release fractions listed here have been determined to be acceptable for use with currently approved LWR fuel with a peak burnup up to 62,000 MWD/MTU

provided that the maximum linear heat generation rate does not exceed 6.3 kw/ft peak rod average power for burnups exceeding 54 GWD/MTU. As an alternative, fission gas release calculations performed using NRC approved methodologies may be considered on a case-by-case basis. To be acceptable, these calculations must use a projected power history that will bound the limiting projected plant-specific power history for the specified fuel load. For the BWR rod drop accident and the PWR rod ejection accident, the gap fractions are assumed to be 10% for iodines and noble gases."

The number of fuel rods at KPS that do not meet the footnote 11 criteria, which permits application of RG 1.183, Table 3 gap fractions, is determined for each reload core. The peak fuel rod power (FDH) in the fuel rods that do not meet the criteria is calculated (including applicable uncertainties). The fraction of fuel rods (in the fuel assembly) that have burnup greater than 54 GWD/MTU and a linear power greater than 6.3 kw/ft is also determined. If the reload core has fuel rods that exceed the criteria of footnote 11, then the impact of these fuel rods on applicable non-LOCA event dose consequences will be evaluated as discussed below.

Locked Rotor Event

The RG 1.183, Table 3 gap fractions are appropriate and are consistently applied in the LR dose analysis. The LR accident analysis supporting calculation determines the FDH for departure from nucleate boiling (DNB). Fuel rods at or above this LR FDH are predicted to be in DNB as a result of the LR event. The peak FDH of the fuel rods that do not meet the footnote 11 criteria is compared to the LR FDH. For KPS reloads this comparison has shown that the peak FDH of the fuel rods that exceed the footnote 11 criteria is less than the LR FDH for DNB. Thus, the fuel rods that exceed the footnote 11 criteria would not fail as a result of the LR event since the FDH of these fuel rods is less than the LR FDH for DNB.

Fuel Handling Accident

KPS has re-evaluated its method of analysis for the FHA. Because Kewaunee reload cores contain fuel rods that do not meet the criteria of RG 1.183 Table 3, footnote 11, the FHA was re-analyzed assuming a higher fission product inventory in the gap. The revised FHA assumptions and results provided below replace the FHA assumptions and results that were provided in reference 1.

In the KPS FHA, a fuel assembly is assumed dropped and damaged during refueling. Analysis of the FHA is performed with assumptions selected so that the results are bounding for the accident occurring either inside containment or in the auxiliary building. Activity from the damaged assembly is released to the outside atmosphere with no

credit for isolation of the release pathway or filtration of the release. The FHA dose consequence analysis considers the complete release of activity assumed to be in the gap in conjunction with the peak fuel rod power (i.e., the design limit FDH (1.7)).

The assumptions and inputs used for the revised fuel handling accident (FHA) radiological accident analysis are the same as the assumptions and inputs of the currently approved accident analysis, as described in reference 2, except as described below.

The gap fractions applied were modified from those listed in RG 1.183, Table 3 because the Table 3, footnote 11 criteria are exceeded for the KPS reload cores. The new bounding FHA analysis conservatively assumes 50% of the rods in a fuel assembly exceed the guidance of footnote 11. The gap fractions listed in RG 1.25 (as modified by the direction of NUREG/CR-5009) are used for the fraction of rods in a fuel assembly that are assumed to exceed the guidance in footnote 11. The remaining 50% of the rods that meet the guidance of footnote 11 use the gap fractions from RG 1.183, Table 3. The determination of the activity released from the limiting fuel assembly is based on the combination of these gap fractions using the design limit FDH. Use of the design limit FDH in this application is conservative due to the fact that any fuel rod experiencing high burnup that would cause the criteria of footnote 11 not to be met would have a lower analyzed power (FDH). The methodology described above has previously been approved for Indian Point 3 (reference 5).

The fraction of fuel rods in a fuel assembly that do not meet the footnote 11 criteria has been shown to be bounded by the value of 0.50 for the past several KPS reload cores (cycles 26, 27, and 28). This value will be verified for each future reload.

The fission product gap fractions used for the FHA re-analysis are shown in Table 1. The fission product release fractions are derived using the design limit FDH of 1.7. Gap fractions from RG 1.183, Table 3 are used for 50% of fuel rods in the dropped assembly and gap fraction values from RG 1.25 and NUREG/CR-5009 are used for the remaining 50% of fuel rods.

The revised FHA analysis is modeled consistent with the current licensing basis. The maximum unfiltered makeup flow during normal ventilation operation is used to maximize the activity entering the control room prior to isolation. The activity level in the air supply duct causes a high-radiation signal within seconds. Isolation of the control room and alignment of the accident ventilation is conservatively delayed until 1 minute after event initiation to provide operational flexibility and to maximize dose.

A summary of the revised assumptions and input parameters used in the FHA re-analysis is shown in Table 2.

Re-analysis of the FHA was performed with a controlled version of the computer code RADTRAD-NAI 1.1 (QA) (reference 3). The Numerical Applications, Inc. (NAI) version of RADTRAD was originally derived from NRC/ITS RADTRAD, version 3.01 documented in NUREG/CR-6604 (reference 4). Subsequently, RADTRAD-NAI was changed to conform to NRC/ITS RADTRAD, version 3.02 with additional modifications to improve usability. The RADTRAD-NAI code is maintained under NAI's QA program, which conforms to the requirements of 10 CFR 50, Appendix B.

The re-analyzed FHA doses are shown in Table 3. The resulting dose consequences for the EAB, LPZ, and control room remain below regulatory limits as defined in 10 CFR 50.67 and RG 1.183.

Conclusions

Based on the discussions above, DEK concludes that the fission product releases assumed in the radiological dose assessment for non-LOCA events are consistent with Regulatory Guide 1.183, Table 3. The LR was analyzed consistent with RG 1.183, Table 3 and was shown to satisfy the required dose acceptance criteria. The FHA re-analysis is consistent with RG 1.183, Table 3 using a revised assumption for fission product inventory in the gap for those fuel rods in the fuel assembly that do not meet the RG 1.183, Table 3, footnote 11 criteria. The results from the revised FHA were shown to satisfy the required dose acceptance criteria.

Table 1

Revised FHA Fission Product Release Fraction

Group	Radiological FHA Analysis Fraction of Fission Product Release
I-131	1.70 x [(0.08 x 0.50) + (0.12 x 0.50)] = 0.17
Kr-85	1.70 x [(0.10 x 0.50) + (0.30 x 0.50)] = 0.34
Other Halogens and Noble Gases	1.70 x [(0.05 x 0.50) + (0.10 x 0.50)] = 0.13

Table 2

Revised Assumptions for FHA

Parameter	Revised Assumption	Current Assumption
Normal Control Room Ventilation Flow Unfiltered Makeup Flow	1620 – 2750 scfm	2250 – 2750 scfm
Emergency Control Room Ventilation Flow Unfiltered In-leakage	1500 scfm	200 scfm
Fission product inventory in the gap	Design limit FDH Fuel assembly with 50% fuel rods that use RG 1.83 and 50% fuel rods that use RG 1.25 (NUREG CR 5009) fission product inventory in the gap. *	Design limit FDH Fuel Assembly with 100% fuel rods that use RG 1.83 fission product inventory in the gap.
Control Room Isolation Damper Closure Time	20 seconds	10 seconds

* The 50% value is a design limit that will be verified for each reload.

Table 3

Revised FHA Doses

Case	FHA dose with adjusted gap fraction (rem TEDE)	Acceptance Criteria (rem TEDE)
EAB	0.9*	6.3
LPZ	0.15	6.3
Control Room	4.0**	5.0

* The EAB dose reported is for the worst 2-hour period.

** The 4.0 rem TEDE control room dose listed is based on the licensing basis operation of the control room with 1500 cfm unfiltered inleakage, 20 second damper closure time and 1-minute control room isolation.

References:

1. Letter from Leslie Hartz (DEK) to Document Control Desk, "License Amendment Request 211 - Radiological Accident Analyses and Associated Technical Specification Changes," dated January 30, 2006.
2. Letter from John G. Lamb (NRC) to Thomas Coutu (Nuclear Management Company), "Issuance of Amendment Regarding Stretch Power Uprate (TAC No. MB9031)," dated February 27, 2004 (ADAMS Accession No. ML04030633).
3. RADTRAD-NAI 1.1(QA), Numerical Applications Inc.
4. NUREG/CR-6604, "RADTRAD: A Simplified Model for Radionuclide Transport and Removal and Dose Estimation," USNRC, June 1997, S.L. Humphreys, et al.
5. Letter from P. D. Milano (NRC) to M. Kansler (Entergy), "Indian Point Nuclear Generating Unit No. 3 – Issuance of Amendment RE: Selective Adoption of Alternate Source Term (TAC No. MB 5382)," dated March 17, 2003 (ADAMS Accession No. ML 030760135).