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

Serial No. 06-578D
NL&OS/CDS: R4
Docket No. 50-305
License No. DPR-43

DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
RESPONSE TO NRC QUESTIONS REGARDING KEWAUNEE REQUEST FOR APPROVAL OF TOPICAL REPORT DOM-NAF-5, "APPLICATION OF DOMINION NUCLEAR CORE DESIGN AND SAFETY ANALYSIS METHODS TO THE KEWAUNEE POWER STATION (KPS)"

In a January 31, 2006, public meeting with Nuclear Regulatory Commission (NRC) staff, Dominion Energy Kewaunee, Inc. (DEK) presented a conceptual approach and implementation strategy for application of existing NRC-approved nuclear core design and safety analysis methods to Kewaunee Power Station (KPS) (reference 1). These design and analysis methods are already in use within the remainder of the Dominion fleet. Fundamental to the proposed approach was creation of a composite topical report (DOM-NAF-5) that would document the application of the relevant methodologies to KPS.

On August 16, 2006, DEK submitted Dominion Topical Report DOM-NAF-5 without attachments A and B (reference 2). Attachment A to DOM-NAF-5, containing Core Management Systems benchmark analysis results, was submitted on December 6, 2006 (reference 3). On April 16, 2007, DEK submitted Attachment B to DOM-NAF-5, containing RETRAN benchmark analysis results (reference 4). This submittal, in conjunction with References 2 and 3, provided the complete contents of DOM-NAF-5.

On May 4, 2007, DEK submitted the KPS plant specific application of the NRC approved Dominion Topical Report VEP-NE-2-A, "Statistical DNBR Evaluation Methodology," for KPS cores containing Westinghouse 422V+ fuel assemblies with the VIPRE-D/WRB-1 code correlation (reference 5).

Subsequently, the (NRC) staff communicated two questions regarding these submittals. These questions and DEKs responses are provided in Attachment 1.

Should you have any questions, please contact Mr. Craig D. Sly at 804-273-2784.

Very truly yours,

G. T. Bischof
Vice President - Nuclear Engineering

References:

1. Summary of Meeting on January 31, 2006, "To Discuss the Applicability of Dominion Safety and Core Design Methods to Kewaunee Power Station (TAC No. MC 9566)," (ADAMS Accession Number ML 060400098).
2. Letter from G. T. Bischof (DEK) to NRC, "Request for Approval of Topical Report DOM-NAF-5, 'Application of Dominion Nuclear Core Design and Safety Analysis Methods to the Kewaunee Power Station (KPS),'" dated August 16, 2006 (ADAMS Accession Number ML 062370351).
3. Letter from G. T. Bischof (DEK) to NRC, "Attachment A to Topical Report DOM-NAF-5, 'Application of Dominion Nuclear Core Design and Safety Analysis Methods to the Kewaunee Power Station (KPS),'" dated December 6, 2006 (ADAMS Accession Number ML 0063410177).
4. Letter from G. T. Bischof (DEK) to NRC, "Request for Approval of Topical Report DOM-NAF-5, 'Application of Dominion Nuclear Design and Safety Analysis Methods to the Kewaunee Power Station (KPS),'" dated April 16, 2007.
5. Letter from G. T. Bischof (DEK) to NRC, "Implementation of the Dominion Statistical DNBR Methodology with VIPRE–D/WRB–1 at Kewaunee Power Station," dated May 4, 2007.

Attachment:

1. Response to NRC Request for Additional Information Regarding Kewaunee Request for Approval of Topical Report DOM-NAF-5, "Application of Dominion Nuclear Core Design and Safety Analysis Methods to the Kewaunee Power Station (KPS)."

Commitments made in this letter: None

cc: Regional Administrator
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Mr. S. C. Burton
NRC Senior Resident Inspector
Kewaunee Power Station

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 12th day of June, 2007.

My Commission Expires: August 31, 2008.

Margaret B. Bennett
Notary Public

MARGARET B. BENNETT
Notary Public
Commonwealth of Virginia
My Commission Expires Aug 31, 2008

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ATTACHMENT 1

Response to NRC Questions Regarding Kewaunee Request for Approval of Topical Report DOM-NAF-5, "Application of Dominion Nuclear Core Design and Safety Analysis Methods to the Kewaunee Power Station (KPS)"

KEWAUNEE POWER STATION

DOMINION ENERGY KEWAUNEE, INC.

Response to NRC Questions Regarding Kewaunee Request for Approval of Topical Report DOM-NAF-5, "Application of Dominion Nuclear Core Design and Safety Analysis Methods to the Kewaunee Power Station (KPS)"

On August 16, 2006, Dominion Energy Kewaunee (DEK) submitted Dominion Topical Report DOM-NAF-5 without attachments A and B (reference 2) to the NRC. On December 6, 2006, Attachment A to DOM-NAF-5, containing Core Management Systems benchmark analysis results, was submitted (reference 3). On April 16, 2007, DEK submitted Attachment B to DOM-NAF-5, containing RETRAN benchmark analysis results (reference 4). This submittal, in conjunction with references 2 and 3, provided the complete contents of DOM-NAF-5.

On May 4, 2007, DEK submitted the KPS plant specific application of the NRC approved Dominion Topical Report VEP-NE-2-A, "Statistical DNBR Evaluation Methodology," for KPS cores containing Westinghouse 422V+ fuel assemblies with the VIPRE-D/WRB-1 code correlation (reference 5).

Subsequently, the (NRC) staff communicated two questions regarding these submittals. These questions and DEKs responses are provided below.

NRC Question 1

In the August 16, 2006, submittal, a brief explanation (on page 12 of 34), and a summary (on page 14 of 34) is provided for the relaxed power distribution control methodology. However, no analysis results are provided. Please provide "before" and "after" results of the bounding analyses conducted with the VEP-FRD-42 methodology, demonstrating continued adherence to the respective limits.

Dominion Response

The question above was clarified during a teleconference with NRC staff members on May 15, 2007. During the teleconference it was determined that before and after analysis results are not currently available and providing them was not practicable. Dominion agreed to provide a comparative analysis showing the Dominion relaxed power distribution (RPDC) methodology, when applied to Kewaunee Power Station, will produce similar results to those provided by the Westinghouse relaxed axial offset control (RAOC) methodology currently in use (WCAP-10216-P, Revision 1A (reference 7)).

Dominion expects that the cycle-specific RPDC analysis to be performed for KPS will support similar delta-I limits to those that are calculated using the Westinghouse RAOC methodology. Delta-I is defined as the difference in power generated in the top and

bottom halves of the core (in percent of rated thermal power). The two methodologies are very similar to each other and the physics codes (ANC (Westinghouse) and CMS (Dominion)) used in the main calculations should generate a similar set of axial power shapes. This expectation is based on Dominion's experience with RPDC implementation for the North Anna units and informal comparisons to generic RAOC analysis results.

To further illustrate the similarity of the two methods, Table 1 presents a side-by-side comparison of key elements for both methodologies. This table provides greater detail about items a) through h) listed on page 14 of 34 of the August 16, 2006 submittal (reference 2). Since Table 1 illustrates that the key elements of the RPDC methodology are directly comparable to the elements of the RAOC methodology, it may be concluded that the RPDC results obtained during the KPS reload analysis will be essentially the same.

Table 1
Comparison of Key Elements of Dominion Relaxed RPDC and Westinghouse ROAC Methodology

Category	Element	Westinghouse RAOC	Dominion RPDC	Comparison
Technical Specification / COLR Limits				
	Operating Limits	Axial Flux Difference (AFD) limits versus reactor power	Axial Flux Difference (AFD) limits versus reactor power	Same
FQ Surveillance				
	Non-equilibrium conditions	RAOC applies a cycle specific W(z) factor to the measured FQ to account for non-equilibrium operation.	RPDC applies a cycle specific N(z) factor to the FQ limit to account for non-equilibrium operation.	Essentially the same
Condition I Analysis				
	Xenon Distributions	RAOC methodology populates a xenon shape library using a xenon reconstruction model. The reconstruction model is dependent on several parameters whose ranges are determined by xenon transient analysis. Parameters for a given xenon shape are retained only if Delta-I control can be maintained for those shapes within a tentative limit.	The RPDC xenon shape library is built by reducing Doppler feedback in the base neutronics model and allowing a divergent xenon oscillation to occur. Actual xenon distributions are sampled and saved from this transient. No consideration is given during the transient calculation to whether or not the shapes are obtainable during normal operation	Both methodologies generate axial xenon distributions that cover essentially the same delta-I space.

Category	Element	Westinghouse RAOC	Dominion RPDC	Comparison
	Power Levels	Minimum of three power levels, 100%, 50%, and an intermediate power are required.	A range of power levels between 50% and 100% power with small enough increments to ensure an adequate number of power distributions are being analyzed (typically 10% power intervals).	Essentially the same
	Control Rod Positions	Range of control rod positions from ARO to power dependent Rod Insertion Limits (RILs).	Range of control rod positions from ARO to power dependent Rod Insertion Limits (RILs).	Same
	Burnups	BOL, MOL, EOL	BOL, MOL, EOL	Same
FQ Analysis				
	Loss of Coolant Accident (LOCA)	Each power shape generated for Condition I is analyzed to determine if LOCA constraints are met or exceeded. For each power level the results of this analysis will indicate a tentative range of delta-I in which there are no violations of the LOCA limits.	The FQ x Power for each shape is compared to the LOCA FQ x Power x K(z) limit at each power level to determine which axial shapes approach the LOCA limit, thereby establishing a preliminary allowable delta-I versus power band.	Essentially the same
	Loss of Flow Accident (LOFA)	Normal operation power distributions are evaluated relative to the assumed limiting normal operation power distribution, typically the 1.55 cosine, used in the accident analysis	The entire set of axial power distributions from the normal operation analysis are evaluated against the 1.55 cosine design axial power distribution for the LOFA analysis with the applicable thermal-hydraulic code(s) and correlation(s).	Essentially the same

Category	Element	Westinghouse RAOC	Dominion RPDC	Comparison
Condition II Analysis				
	Analyzed Accidents	Cooldown Accident, Control Rod Withdrawal, Boration / Dilution	Cooldown Accident, Control Rod Withdrawal, Boration / Dilution	Same
	Shape Selection	Initial statepoints for Condition II analysis are limited to the Condition I axial power distributions that fit within tentative delta-I bands.	Initial statepoints for Condition II analysis are limited to the Condition I axial power distributions that fit within tentative delta-I bands.	Same

NRC Question 2

On page 26 of 34, Section 3.6.1 addresses the conditions and limitations associated with VIPRE-D. In section 3.6.2, parts 1.C and 1.D allude to various models being used without stating when and how these models are used. Please provide additional information regarding the model selection process, e.g., when one particular model is chosen, how that choice is made, and who makes the decision.

Dominion Response

The model selection process is controlled by NRC approved Dominion Fleet Report DOM-NAF-2-A, "Reactor Core Thermal-Hydraulics Using the VIPRE-D Computer Code" (reference 6). Dominion will develop and use VIPRE-D models for Kewaunee cores that strictly follow the modeling guidelines and usage requirements specified in DOM-NAF-2-A. DOM-NAF-2-A prescribes the specific constitutive models to be selected for use in the VIPRE-D models for two-phase flow models and correlations, heat transfer correlations, and turbulent mixing models. DOM-NAF-2-A allows no flexibility to select different options for these constitutive models. These VIPRE-D models are used to analyze the non-LOCA, DNB-related transients and accidents as listed in DOM-NAF-2-A.

References:

1. Summary of Meeting on January 31, 2006, "To Discuss the Applicability of Dominion Safety and Core Design Methods to Kewaunee Power Station," (TAC No. MC 9566), (ADAMS Accession Number ML 060400098).
2. Letter from G. T. Bischof (DEK) to NRC, "Request for Approval of Topical Report DOM-NAF-5, 'Application of Dominion Nuclear Core Design and Safety Analysis Methods to the Kewaunee Power Station (KPS),'" dated August 16, 2006 (ADAMS Accession Number ML 062370351).
3. Letter from G. T. Bischof (DEK) to NRC, "Attachment A to Topical Report DOM-NAF-5, 'Application of Dominion Nuclear Core Design and Safety Analysis Methods to the Kewaunee Power Station (KPS),'" dated December 6, 2006 (ADAMS Accession Number ML 0063410177).
4. Letter from G. T. Bischof (DEK) to NRC, "Request for Approval of Topical Report DOM-NAF-5, "Application of Dominion Nuclear Design and Safety Analysis Methods to the Kewaunee Power Station (KPS)," dated April 16, 2007.
5. Letter from G. T. Bischof (DEK) to NRC, "Implementation of the Dominion Statistical DNBR Methodology with VIPRE–D/WRB–1 at Kewaunee Power Station," dated May 4, 2007.
6. Dominion Fleet Report DOM-NAF-2-A, "Reactor Core Thermal-Hydraulics Using the VIPRE-D Computer Code," August 2006.
7. WCAP-10216-P-A, Revision 1A, "Relaxation of Constant Axial Offset Control FQ Surveillance Technical Specification," February 1994.