June 16, 2005

Mr. George Vanderheyden, Vice President
Calvert Cliffs Nuclear Power Plant, Inc.
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 - REQUEST FOR ADDITIONAL INFORMATION RE: 1.38 PERCENT MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATE LICENSE AMENDMENT REQUEST (TAC NOS. MC6210 AND MC6211)

Dear Mr. Vanderheyden:

In reviewing your submittal of January 31, 2005, concerning the subject request to increase core power for Calvert Cliffs Nuclear Power Plant, Units 1 and 2, by 1.38 percent to 2737 megawatts thermal, the Nuclear Regulatory Commission (NRC) staff has determined that additional information contained in the enclosure to this letter is needed to complete its review. The NRC staff discussed the issue with your staff on June 13, 2005. As agreed to by your staff, we request you respond within 30 days of the date of this letter.

If you have any questions, please contact Mr. John Stang at 301-415-1345.

Sincerely,

/RA/

Richard V. Guzman, Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosure: As stated

cc w/encl: See next page

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DISTRIBUTION:

PUBLIC	PDI-1 R/F	RLaufer	RGuzman	SLittle
OGC	ACRS	JStang	JTrapp, RI	
DLPM DPR	DClarke			

ACCESSION NUMBER: *RAI provided. No major changes made.

OFFICE	PDI-1/PM	PDI-1/LA	PD3-1/PM*	PDI-1/SC
NAME	RGuzman	SLittle	JStang	RLaufer
DATE	6/6/05	6/16/05	6/16/05	6/16/05

OFFICIAL RECORD COPY

REQUEST FOR ADDITIONAL INFORMATION

1.38 PERCENT MEASUREMENT UNCERTAINTY RECAPTURE

POWER UPRATE LICENSE AMENDMENT REQUEST

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-317 AND 50-318

1. In Table II-1 of the January 31, 2005, submittal, the licensee for the Calvert Cliffs Nuclear Power Plant, Units 1 and 2 (CCNPP 1 and 2), indicated that the power uprate conditions are bounded by the Updated Final Safety Analysis Report (UFSAR) Chapter 14 loss-of-coolant accident (LOCA) and non-LOCA transient analyses. Please provide the following information:

   A. Confirm that all UFSAR Chapter 14 events will remain bounded for operation at the new MUR power uprate power level. As part of the confirmation provide a list of references which demonstrates that each UFSAR Chapter 14 event remains bounded. Provide the specific details for each reference (i.e., flowpath) justifying how the referenced analyses bound the event. If multiple references are used to bound a single event, provide a detailed explanation of the relationship between the references. For each UFSAR Chapter 14 event, provide a reference to the Nuclear Regulatory Commission (NRC) approval of the analysis. If there is not a specific reference to the NRC approval of the analysis, provide a detailed explanation and justification for operation at the measurement uncertainty recapture (MUR) power level.

   B. Provide justification that plant operation at the MUR power level will be acceptable for all UFSAR Chapter 14 events, as a minimus large and small break LOCAs that were not reviewed and approved by the NRC. The discussion should include:

      (a) a program that supports acceptability of the analyses in terms of input data used in the NRC-approved computer codes, compliance with safety evaluation (SE) restrictions on the NRC-approved methods, and quality assurance of the analyses and results; and

      (b) reference to licensing submittals that support adequacy of the analyses including effects of plant operating condition changes, the use of new correlations, and installation of the replacement steam generators (SGs) and new fuel design with mixing vane grids.

C. Provide information for the following items:

(a) List the NRC-approved values of the design safety departure from nucleate boiling ratio (DNBR) limits with the associated SEs approving the values for the CE-1, ABB-NV and ABB-turbine event critical heat flux correlations with use of the extended statistical combination of uncertainties.

(b) Confirm that the values of the DNBR limits used in UFSAR Chapters 3.5 and 14 analyses are consistent with the values specified in Section IV.5.2 of the January 31, 2005, submittal and are acceptable, or revise the UFSAR (such as the information for DNBRs in Table 14.9-2) as needed.

©) Provide a commitment to reference the correlations that were used for DNBR calculations applicable for current and future cycles in appropriate documents, such as UFSAR Chapters 3.5 and 14, and the core operating limits report.

(d) Specify the NRC-approved value of the DNBR penalty factor for the mixing core DNBR analysis with turbo and non-turbo fuel assemblies, or provide a justification for cases where the core mixing factor was not considered.

(e) Confirm that the references discussed in each section of Attachment 2 to the January 31, 2005, submittal are adequate and consistent with the references listed in Section IX, Reference Section of Attachment 2.

D. Discuss the impact of the proposed power uprate on the analyses of record for:

(a) natural circulation cooldown.

(b) station blackout (SBO).

©) capacity of the relief valves for the high temperature overpressure protection (UFSAR 4.2.1).

(d) the relief valve capacity for low-temperature overpressure protection (UFSAR 4.2.2).

2. Provide information for the following items:

A. Identify the nature and quantity of megavolt ampere reactive (MVAR) support necessary to maintain post-trip loads and minimum voltage levels as a result of the power uprate.

B. Identify what MVAR contributions CCNPP 1 and 2 are credited for providing to the grid following implementation of the power uprate.

C. After the power uprate, identify any changes in MVAR associated with Items A and B above.

D. Address the compensatory measures that the licensee would take to compensate for the depletion of the nuclear unit MVAR capability on a grid-wide basis following implementation of the power uprate.

E. Evaluate the impact of any MVAR shortfall listed in Item D above on the ability of the offsite power system to maintain minimum post-trip voltage levels and to supply power to safety buses during peak electrical demand periods. The subject evaluation should document information exchanges with the transmission system operator.

3. Provide in detail the effect of the power uprate on the SBO coping capability in accordance with Title 10 of the *Code of Federal Regulations* Section 50.63, "Loss of all alternating current power." The SBO coping analysis should address the condensate inventory for decay heat removal, Class 1E battery capacity, compressed air, effect of loss of ventilation, containment isolation, etc.

4. Provide in detail the uprated ratings and the effect of the power uprate on the following equipment:

   A. Main generator

   B. Isophase bus

   C. Main power transformer

   D. Start-up transformer

   E. Station power transformer

5. Provide a list of loads affected by the power uprate.

6. The proposed 1.38 percent power uprate (2737 MWt) is based on the assumed power measurement uncertainty of 0.62 percent. Response to Criterion 1 shows an uncertainty of 0.56 percent with an operable Crossflow whereas Table I-1 shows a calculated uncertainty of 0.41 percent for CCNPP 1 and 0.46 percent for CCNPP 2. Explain these values.

7. Response to Criterion 1 and 3 refers to a plant-specific feedwater mass flow measurement uncertainty calculation performed by Westinghouse for each CCNPP unit (References 6.3.1 and 6.3.2). Please submit a calculation for NRC staff review.

8. The table in Section 4.4.1.6 of Enclosure 1 (Calculation CA06494) lists the Crossflow ultrasonic flow meter (UFM) uncertainties for each of the four headers. These values are different from those listed in Table I-1 of Attachment 2 for CCNPP 1 and 2. Please explain how the contents of Table I-1 were calculated and how the random and bias components were used to calculate total calorimetric uncertainty. Section 3 of

Enclosure 1 states that this calculation uses methodology established in ES-028. Was ES-028, “Instrument Loop Uncertainty and Setpoint Methodology” (Reference 6.1) reviewed and approved by the NRC staff?

9. A flow profile “fully developed” term is used in the 1^{st}, 3^{rd}, and 4^{th} paragraphs of response to Criterion 4, while a flow profile “stable” term is used in the 3^{rd} paragraphs of response to Criterion 2 and 4. Crossflow Topical Report CENPD-397-P-A used a “fully developed” term for locating the UFM. Westinghouse has subsequently replaced this term with a “stable flow in an isothermal and subcooled” liquid condition. Replacement of this new terminology and the Crossflow in-situ calibration is explained in the X-Beam Topical Report WCAP-16163-P, Revision1 (Supplement 1-P to CENPD-397-P, Revision 1), which is not yet approved by the NRC staff. Explain and justify using the new terminology and maintain consistency.

10. It is proposed to install a new X-Beam UFM farther down-stream from the flow straightener to address the observed increase in the venturi correction factor on three of the four Crossflow meter locations at steady state power levels between 85 percent and 100 percent rated thermal power. Is this exercise to confirm the upstream installed, in-situ calibrated, loops 11, 21,and 22 Crossflow UFM readings by comparing it with a higher accuracy X-Beam UFM? Will the X-Beam UFMs be removed after the proposed testing on both units? Please note that X-Beam topical report is not yet approved by the NRC staff.

11. Section 1.4 of Attachment 2 addresses various aspects of calibration and maintenance procedures only for Crossflow UFM. Section I-F of RIS 2002-03 guidance discusses addressing various aspects of calibration and maintenance of “all instruments that affect the power calorimetric.” Please submit complete information.

12. Section 3.3.6 of Topical Report CENPD-397-P-A states that each rejected data point is highlighted and if the build up of rejected data point is higher than normal (plant-specific), the operator shuts down the Crossflow meter. Please identify CCNPP 1 and 2's normal number of rejected data points. Additionally, Section 3.2.4.6 of the topical report indicates that the standard design recommends averaging 4 seconds of data in one time delay. The operator of a power plant has a choice to use multiple time delays for averaging data. Please identify if CCNPP Units 1 and 2 are using multiple time delays for Crossflow data averaging, and also provide reasons for this choice.

13. Surveillance Requirement 3.3.1.2 in the CCNPP 1 and 2 technical specifications (TSs) requires adjusting excore power range and ΔT power channels to agree with calorimetric calculation if the absolute difference is $ 1.5 percent. The TSs Bases do not explain reason for choosing 1.5 percent value. Was this value chosen to remain within the required Appendix K margin of 2.0 percent to allow for instrumentation error? Please explain and justify retaining the same value of the absolute difference with the proposed 1.38 percent MUR power uprate.

14. The last sentence in the first paragraph in Section 1.5 of Attachment 2 states that the random component of uncertainty could be substantially reduced permitting an even greater (-0.24 percent) variation in correction factor over the 72-hour interval. Please explain this statement.

15. How many effective full power years (EFPYs) of operation is the projected end of license neutron fluence based on for both CCNPP units?

16. What is the core thermal power level for the projected end of license neutron fluence for both CCNPP units?

17. For the evaluation of the upper shelf energy (USE), the beltline of the CCNPP 1 and 2 reactor vessels is limited by the USE drop that is projected to occur in what material heat no in the CCNPP 1 and 2 reactor vessels? What is the projected end of life USE value for these materials based on for the uprated number of EFPYs and 1/4 T neutron fluence. Please indicate what the 1/4 T neutron fluence is for both units.

18. The licensee stated in its application that the blowdown system will continue to operate normally with no change at a continuous rate of up to 200 gallons per minute per SG.

    A. Since the MUR power uprate will require the blowdown system to operate beyond its current design time, explain whether the additional operating time will make any components in the system more susceptible to flow accelerated corrosion (FAC).

    B. Does the licensee's current evaluation of the blowdown system under uprate conditions consider the effect of a potential increase of impurities in the SG water?

    C. Provide a technical justification as to why the blowdown system is to operate normally without any changes during uprate conditions.

19. Since the inlet pressure to the SG blowdown system varies proportionally with operating steam pressure, the blowdown flow control valves must be designed to handle a corresponding range of inlet pressures. Confirm that any change to the inlet pressure of the SG blowdown system is still inside the revised range of operating parameters for the uprate.

20. The licensee stated that the evaluation resulted in long-term FAC program impacts and no short-term impacts. Describe what the long-term FAC program impacts identified in your evaluation are and explain how these will be addressed under your corrective action program implementation.

21. The licensee stated that the MUR power uprate will result in a slight increase in inspection scope for some specific systems and possibly some additional replacement scope prior to the end-of-plant life expectancy.

    A. Describe the criteria used in the FAC program for selecting components for inspection after the MUR power uprate.

    B. Describe the criteria for repair or replacement of components that become damaged as a result of FAC.

22. What are the significant changes in FAC rates anticipated as a result of the MUR power uprate conditions>

23. Identify the systems that are expected to experience the greatest increase in wear as a result of the uprate. In addition, for the five components most susceptible to FAC, provide numerical data that show changes in (1) velocity, (2) temperature, and (3) predictive wear rate result from the uprate. For the same components, provide numerical data comparing the measured FAC rate with the as found condition.

24. Confirm that the coating qualification temperature and pressure profile used to qualify the original maintenance Service Level I coatings continues to bound the design basis accident temperature and pressure profile under power uprate conditions.

25. Under the power uprate conditions, the differential pressure across the tubes, the temperature of the primary and secondary water, and the flow through the SG will change. Confirm that the SG will still satisfy all original design criteria (e.g., American Society of Mechanical Engineers *Boiler and Vessel Pressure Code*) under these conditions. In addition, confirm that your analysis addresses the current condition of the CCNPP 1&2 SGs (e.g., the plugs, any repairs the as-built configuration, loose parts, etc.) and addressed flow-induced vibration.

26. Confirm that CCNPP 1 and 2's plugging limit is still appropriate for power uprate conditions, given the guidance in Regulatory Guide 1.121, “Bases for Plugging Degraded PWR [Power Water Reactor] Steam Generator Tubes.”

cc:

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