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February 18, 2009

U. S. Nuclear Regulatory Commission  
Washington, DC 20555

**ATTENTION:** Document Control Desk

**SUBJECT:** Calvert Cliffs Nuclear Power Plant  
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318  
Response to Request for Additional Information – License Amendment for  
Measurement Uncertainty Recapture Power Uprate - Calvert Cliffs Nuclear  
Power Plant, Unit Nos. 1 and 2

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**REFERENCES:**

- (a) Letter from Mr. D. R. Bauder (CCNPP) to Document Control Desk (NRC), dated August 29, 2008, License Amendment Request: Appendix K Measurement Uncertainty Recapture – Power Uprate Request
- (b) Letter from Mr. D. V. Pickett (NRC) to Mr. J. A. Spina (CCNPP), dated October 3, 2008, Request for Additional Information Re: License Amendment for Measurement Uncertainty Recapture Power Uprate – Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2
- (c) Letter from Mr. D. V. Pickett (NRC) to Mr. J. A. Spina (CCNPP), dated November 17, 2008, Request for Additional Information Re: License Amendment for Measurement Uncertainty Recapture Power Uprate - Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2

In Reference (a), Calvert Cliffs Nuclear Power Plant, Inc. submitted a license amendment request to the Nuclear Regulatory Commission for a measurement uncertainty recapture power uprate for Calvert Cliffs Nuclear Power Plant, Units 1 and 2. In References (b) and (c) the Nuclear Regulatory Commission requested additional information to be submitted to support their review of the submittal. The responses to the Request for Additional Information #1.2, 2.a, 2.b, and 2.c listed in Reference (b) are provided in Attachment (1). The responses to the Reactor Systems Branch Request for Additional Information listed in Reference (c) are provided in Attachment (2). Submittal of these responses completes the responses to all Requests for Additional Information requested in References (b) and (c).

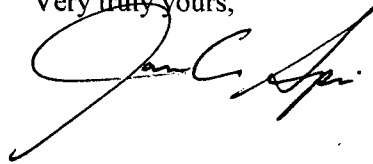
Enclosures (1), (3), and (4) to Attachment (1) and Enclosures (1) and (2) to Attachment (2) contain information proprietary to Cameron International. Therefore the enclosures are marked as such and are accompanied by affidavits signed by Cameron International (Enclosure 6 to Attachment (1) and Enclosure (3) to Attachment (2)). The affidavits set forth the basis on which the information may be withheld from public disclosure by the Commission, and addresses with specificity the considerations

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listed in 10 CFR 2.390(b)(4). Accordingly, it is respectfully requested that the information that is proprietary to Cameron International be withheld from public disclosures. Please note there are no non-proprietary versions of these documents.

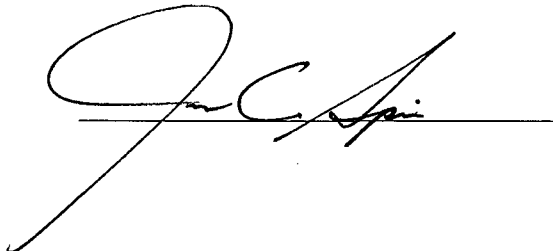
Should you have any questions regarding this matter, please contact Mr. Jay S. Gaines at (410) 495-5219.

Very truly yours,

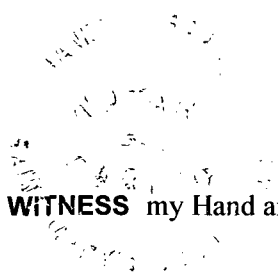


STATE OF MARYLAND :  
  : TO WIT:  
COUNTY OF CALVERT :

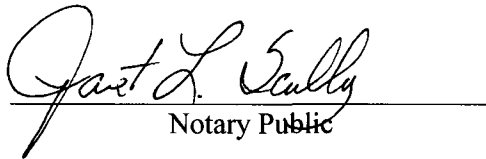
I, James A. Spina, being duly sworn, state that I am Vice President - Calvert Cliffs Nuclear Power Plant, Inc. (CCNPP), and that I am duly authorized to execute and file this License Amendment Request on behalf of CCNPP. To the best of my knowledge and belief, the statements contained in this document are true and correct. To the extent that these statements are not based on my personal knowledge, they are based upon information provided by other CCNPP employees and/or consultants. Such information has been reviewed in accordance with company practice and I believe it to be reliable.



Subscribed and sworn before me, a Notary Public in and for the State of Maryland and County of St. Mary's, this 18<sup>th</sup> day of February, 2009.



WITNESS my Hand and Notarial Seal:



Notary Public

My Commission Expires:

March 1, 2011  
Date

JAS/KLG/bjd

Attachments: (1) Response to Request for Additional Information dated October 03, 2008-  
Measurement Uncertainty Recapture Power Uprate

- Enclosures: (1) Proprietary - ER-507 Revision 2, Bounding Uncertainty Analysis  
for Thermal Power Determination at Calvert Cliffs Using the  
LEFM CheckPlus System
- (2) CA06945 Revision 1, Calorimetric Uncertainty Using the LEFM  
CheckPlus Flow Measurement System
  - (3) Proprietary - ER-724 Revision 1, Meter Factor Calculation and  
Accuracy Assessment for Calvert Cliffs Nuclear Plant Unit 2
  - (4) Proprietary - ER-727 Revision 2, Meter Factor Calculation and  
Accuracy Assessment for Calvert Cliffs Nuclear Plant Unit 1"
  - (5) CA07018 Revision 0, Main Feedwater Pressure Input  
Uncertainty to the Caldon CheckPlus LEFM
  - (6) Letter from C. R. Hastings (Cameron) to Document Control  
Desk (NRC), dated February 6, 2009, Application for  
Withholding Proprietary Information from Public Disclosure

(2) Response to Request for Additional Information dated November 17, 2008-  
Measurement Uncertainty Recapture Power Uprate

- Enclosures: (1) Proprietary – ALD-1115 Revision 0, “Hydraulic Calibration Plan  
for Calvert Cliffs NPP Unit 2 Loops A and B, LEFM CheckPlus  
16” Chordal Spool Pieces”
- (2) Proprietary – ALD-1116 Revision 0, “Hydraulic Calibration Plan  
for Calvert Cliffs NPP Unit 1 Loops A and B, LEFM CheckPlus  
16” Chordal Spool Pieces”
  - (3) Letter from C. R. Hastings (Cameron) to Document Control  
Desk (NRC), dated January 29, 2009, Application for  
Withholding Proprietary Information from Public Disclosure

cc: D. V. Pickett, NRC  
S. J. Collins, NRC  
Resident Inspector, NRC

**(Without Enclosures)**  
S. Gray, DNR

**ATTACHMENT (1)**

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**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION  
DATED OCTOBER 3, 2008 - MEASUREMENT UNCERTAINTY  
RECAPTURE POWER UPRATE**

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## ATTACHMENT (1)

### RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION DATED OCTOBER 03, 2008 - MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATE

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*Responses to NRC Request for Additional Information (RAI) dated October 03, 2008*

RAI 1.2:

*Please clearly explain the nature and impact of the degraded condition of the LEFM measurement uncertainty to support continued operation at the proposed power uprate for 30 days.*

**CCNPP Response:**

The nature of the degraded conditions for LEFM measurement uncertainty applicable to the 30 day allowed outage time (AOT) was previously provided in Reference 1 within our response to RAI #1.1. The 30 day AOT is applied to those conditions resulting in an "Alert" status of operation, which is also referred to as the "Maintenance Mode" of operation. The system is in the "Maintenance Mode" when any of the following conditions exist:

- Failure of one or more transducer paths in one plane of transducers. The remaining plane of transducers is fully operational.
- Failure of both resistance temperature detector (RTD) inputs with temperature above approximately 250°F. Above 250°F the RTD inputs are not necessary to resolve the ultrasonic temperature measurement algorithm.
- Failure of one pressure input or RTD input in a header. The second input remains available for calculation of flow and temperature.
- Both pressure inputs are working but do not compare within alarm limits or both temperature inputs are working but do not compare within alarm limits. The more conservative value (lower pressure or lower temperature) is used in the calculation of feedwater flow.

With the system in the "Maintenance Mode" of operation, the system flow uncertainty is +/- 0.52% of flow as documented in Enclosure 1. The resultant calorimetric uncertainty, as determined in Enclosure 2, in the direction of interest is -0.574% Reference Thermal Power (RTP) (2737 MWth). This means that at an indicated power of 100% RTP, actual power may in fact be as high as 100.574% RTP.

100.574% RTP (2737 MWth x 1.00574) equates to approximately 2753 MWth, which is less than 2754 MWth (102% of the original power limit of 2700 MWth). Since operation at the proposed RTP (2737 MWth) with uncertainty remains bounded by the existing analyzed condition (2754 MWth), the units could operate indefinitely at the proposed RTP with the system in "Maintenance Mode." However, since "Maintenance Mode" represents operation at low margin in an undesirable degraded condition, the 30 day AOT is proposed as the maximum time allowed to correct and restore the LEFM CheckPlus system to normal operation mode.

RAI 2:

*Please submit the following reports in order to verify the assumptions used in the calorimetric uncertainty calculation:*

- a) Hydraulic modeling and testing results by Cameron International*

**CCNPP Response:**

The hydraulic modeling reports are provided in Enclosures 1 and 2 of Attachment (2). The test results from the laboratory modeling are included in Enclosures 3 and 4 of Attachment (1).

ATTACHMENT (1)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION DATED OCTOBER 03, 2008 -  
MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATE

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b) *Selection and evaluation of the pressure instrumentation.*

**CCNPP Response:**

As documented in Reference 1, Rosemount 3051CG5 series transmitters will be used for pressure input to the Caldon LEFM CheckPlus system. The uncertainty calculation for the transmitters determined in Enclosure 5 is +/- 5.902 psi. This value, which is well below the +/- 15 psi allowance assumed by the vendor, does not include the contribution to uncertainty from the analog to digital converter, which is considered to have minimal impact to total uncertainty. To exceed the +/- 15% allowance, the contribution to uncertainty from the analog to digital converter would have to be in excess of

$$U_{\frac{A}{D}} = \sqrt{(15\text{ psi})^2 - (5.902\text{ psi})^2} = 13.79\text{ psi.}$$

In Reference 1, a value of +/- 5.85 psi was reported based on a calculation performed for a similar transmitter. Enclosure 5 is the calculation performed specifically for the new transmitters.

c) *Feedwater flow uncertainty calculation.*

**CCNPP Response:**

The vendor's feedwater flow uncertainty calculation performed by Cameron International is included as Enclosure 1. For a fully functional LEFM CheckPlus system, the flow measurement uncertainty is +/- 0.30% of total flow.

The results of the vendor's flow uncertainty calculation were used to revise the calorimetric uncertainty calculation and remove conservative assumptions for feedwater flow uncertainty and feedwater temperature uncertainty used in the calorimetric assessment performed for Reference 2. The resultant calorimetric uncertainty in the direction of interest for a fully functional LEFM CheckPlus system is -0.384% RTP. Uncertainty is applied to actual power and the sign convention is reversed when applying uncertainty to indicated power. Therefore, at an indicated power of 100% RTP (2737 MWth), actual power could be as high as 100.384% (~2748 MWth); below the analyzed condition of 2754 MWth. Therefore operation at the proposed 100% RTP remains bounded by all existing analyses.

**References**

1. Letter from Mr. J. A. Spina (CCNPP) to Document Control Desk (NRC) dated December 3, 2008, Response to Request for Additional Information – License Amendment for Measurement Uncertainty Recapture Power Uprate- Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2
2. Letter from Mr. D. R. Bauder (CCNPP) to Document Control Desk (NRC), dated August 29, 2008, License Amendment Request: Appendix K Measurement Uncertainty Recapture – Power Uprate Request

ATTACHMENT (1)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION DATED OCTOBER 03, 2008 -  
MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATE

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**Enclosures**

- (1) Proprietary – ER-507 Revision 2, Bounding Uncertainty Analysis for Thermal Power Determination at Calvert Cliffs Using the LEFM CheckPlus System
- (2) CA06945 Revision 1, Calorimetric Uncertainty Using the LEFM CheckPlus Flow Measurement System
- (3) Proprietary - ER-724 Revision 1, Meter Factor Calculation and Accuracy Assessment for Calvert Cliffs Nuclear Plant Unit 2
- (4) Proprietary - ER-727 Revision 2, Meter Factor Calculation and Accuracy Assessment for Calvert Cliffs Nuclear Plant Unit 1
- (5) CA07018 Revision 0, Main Feedwater Pressure Input Uncertainty to the Caldon CheckPlus LEFM
- (6) Letter from C. R. Hastings (Cameron) to Document Control Desk (NRC), dated February 6, 2009, Application for Withholding Proprietary Information from Public Disclosure