Calvert Cliffs Nuclear Power Plant
Constellation Generation Group, LLC

1650 Calvert Cliffs Parkway
Lusby, Maryland 20657

Constellation Energy

December 14, 2005

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;
License Nos. DPR 53 & DPR 69
Licensee Event Report 2005-003-01
Overpower Condition Resulting from Non-conservative Flow Correction Factors

The attached licensee event report supplement is being sent to you as required by 10 CFR 50.73. Should you have questions regarding this report, we will be pleased to discuss them with you.

Very truly yours,

Joseph E. Pollock
Plant General Manager

JEP/MJY/bjd

Attachment: As stated

cc: P. D. Milano, NRC
S. J. Collins, NRC
Resident Inspector, NRC
R. I. McLean, DNR

JE22

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Calvert Cliffs Nuclear Power Plant	05000 317	1 OF 004

4. TITLE

Overpower Condition Resulting from Non-conservative Flow Correction Factors

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									Calvert Cliffs	05000 318
09	12	2005	2005	- 003 -	01	12	14	2005	FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

1

10. POWER LEVEL

100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☒ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☐ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Michael J. Yox	410-495-6652

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

Tracer testing results received on September 12, 2005 indicated that main feedwater flow venturi correction factors calculated using ultrasonic flow meters (UFMs) had been set non-conservatively low. Immediate corrective actions included returning main feedwater flow correction factors on Unit 1 and Unit 2 to (1.000). This effectively removed the UFMs from service. The non-conservative correction factors were installed in July, 2003. Unit 1 and Unit 2 operated at rated thermal power levels of up to 100.4 and 100.74 percent, respectively during this period. The correction factor errors did not represent a failure of any installed components.

A root cause for this event was a failure to consider data, within the design basis document, indicating that piping/component configuration could distort flow farther downstream than analyzed. A contributing cause was weak oversight by the vendor in 2004 which prevented earlier detection of the condition. Corrective actions included additional evaluation requirements within the vendor Topical Report and vendor procedure revisions to require independent corroboration of performance prior to commissioning future installations. The maximum analyzed steady state reactor core power levels, of 102 percent of rated thermal power or 2754 MWth, were not exceeded during operation with the non-conservative correction factors installed.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
CALVERT CLIFFS, UNIT 1	05000 317	2005	- 003 -	01	02 OF 004

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

I. DESCRIPTION OF EVENT

Chemical tracer testing indicated that main feedwater flow venturi correction factors, calculated using ultrasonic flow meters (UFMs), may have been set non-conservatively low. Preliminary results from testing performed on August 18 – 19, 2005 were received from the vendor on September 12, 2005. Final vendor approved results and root cause were not received within 60 days of discovery of this condition, but are now complete. The initial testing results were corroborated by the vendor as part of their root cause analysis. Immediate corrective actions included returning main feedwater flow correction factors on Unit 1 and Unit 2 to (1). This action effectively removed the UFMs from service. The non-conservative correction factors were installed on July 22, 2003 (Unit 1) and July 8, 2003 (Unit 2).

The maximum authorized steady-state reactor core power levels, per Unit 1 and Unit 2 Operating License Conditions 2.C.(1), are not to exceed 2700 MWth. Unit 1 operated at a maximum power level of 2711 MWth [100.4 percent rated thermal power (RTP)] from July 22, 2003 until the time of discovery (September 12, 2005). Unit 2 operated at a maximum power level of 2720 MWth (100.74 percent RTP) from July 8, 2003 until the same time of discovery. The maximum analyzed steady-state reactor core power levels, including uncertainties, are 102 percent of RTP or 2754 MWth.

II. CAUSE OF EVENT

The non-conservative main feed flow correction factors were installed based on the use of a vendor supplied and approved methodology, in accordance with site procedures. The root cause for the event was a failure to consider data, within the design basis document (Topical Report), indicating that piping/component configuration could produce flow distortions farther downstream than analyzed. A contributing cause was weak oversight by the vendor in 2004, which would have allowed an earlier opportunity to analyze the piping configuration in accordance with vendor procedures and identify errant meter readings.

The vendor root cause analysis concluded that design input contained in the Topical Report was inadequate. The vendor's design review of the Calvert Cliffs Nuclear Power Plant (CCNPP) feedwater piping/component configuration was based solely on the specified criteria for meter installation contained in the Topical Report. The report failed to consider other data showing that the piping/component configuration could produce flow distortions farther downstream than analyzed, and failed to clarify an aspect of the >15 L/D (length/diameter) criteria that flow entering the 90-degree elbow must itself be stable. As a result, the design review did not adequately address placement of the upstream meter.

Engineering personnel did not realize that the piping/component configuration upstream of the Loop 12 upstream UFM was influencing the meter and leading to an erroneous correction factor. Flow at this meter did not meet stable flow criteria cited by the Topical Report as a requirement for meter mounting location.

The root cause and contributing cause were both related to human performance. The failure to consider critical data within the design basis document can be attributed to work practices that did not focus sufficient attention on all areas of the evaluation. Weak oversight by the vendor allowing an earlier opportunity to identify the problem to be missed can be attributed to insufficient self-evaluation and command and control.

III. ANALYSIS OF EVENT

This event is reportable in accordance with the following:

10 CFR 50.73(a)(2)(i)(B); "Any operation or condition which was prohibited by the plant's Technical Specifications."

Calvert Cliffs Nuclear Power Plant (CCNPP) Technical Specifications, Limiting Condition for Operation (LCO) 3.2.5 for Axial Shape Index (ASI) requires that ASI shall be maintained within the limits specified in the Core Operating Limits Report (COLR). This Technical Specification is applicable when in Mode 1 with thermal power greater than 20 percent. Axial Shape Index shall be restored to within COLR limits within two hours if this LCO is not met. The corresponding COLR Section 3.2.5, requires ASI to be maintained within the limits of COLR Figure 3.2.5 when the Better Axial Shape Selection System (BASSS) is inoperable.

Operability of the BASSS is typically only challenged when the plant computer fails. Two periods were identified for Unit 2 where the non-conservative main feedwater flow correction factors were installed and the plant computer was down longer than two hours while the ASI LCO was applicable. The Unit 2 BASSS was inoperable for greater than 2 hours on July 24, 2003 (one occurrence of 4 hours 30 minutes, and one additional occurrence of 2 hours 2 minutes) and February 14, 2005 (14 hours 17 minutes).

During periods of BASSS inoperability, COLR Figure 3.2.5 establishes acceptable and unacceptable regions for operation within limits of Peripheral ASI (x-coordinates) and Fraction of Maximum Allowable Thermal Power (y-coordinates). The maximum value on COLR Figure 3.2.5 within the acceptable operation region has a corresponding maximum allowable thermal power value (y-coordinate) of 1.000. Operation in excess of 100 percent RTP is, therefore, in the unacceptable operation region of the curve and prohibited by Technical Specification 3.2.5 with BASSS inoperable. Although the non-conservative main feedwater flow correction factors were installed for over two years, the total amount of time in excess of the LCO Required Action Completion Time for the ASI Technical Specification (3.2.5) was less than 24 hours for each Unit. Engineering evaluation has determined that operation during the period when BASSS was inoperable in excess of the Technical Specification LCO Required Action Completion Time did not result in exceeding any design limits.

An evaluation of the impact on core damage frequency was performed for an extended period of operation at 101.1 percent RTP. This evaluation is bounding for both Unit 1 and Unit 2. The assessment determined an increase in annual core damage frequency of less than 1.0E-6/year.

IV. CORRECTIVE ACTIONS

A. All main feedwater flow correction factor inputs to the plant computer were restored to a value of 1.000 to effectively remove the UFMs from service.

B. The vendor has initiated measures to further evaluate and revise, as necessary, design basis documentation to further clarify flow stability requirements based on lessons learned at CCNPP.

C. Calvert Cliffs Nuclear Power Plant will verify the UFM's are installed in an area of suitable flow and in-situ calibration correction factors are accurate prior to returning the UFM's to service.

D. The vendor has initiated measures to ensure that oversight of future installations of their UFM system is sufficient to prevent recurrence of the conditions identified in this report.

V. ADDITIONAL INFORMATION

A. Component Identification

Component	IEEE 803 EIIS Function	IEEE 805 System ID
Feedwater Flow Venturi	FI	SJ
Plant Computer	CPU	ID

B. Previous Occurrences

No other previous similar events have occurred within the past three years at CCNPP.