Kevin J. Nietmann
Plant General Manager
Calvert Cliffs Nuclear Power Plant
Constellation Generation Group, LLC

1650 Calvert Cliffs Parkway
Lusby, Maryland 20657
410 495-4101
410 495-4787 Fax

Constellation Energy Group

October 28, 2002

U.S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 and 2; Docket Nos. 50-317 and 50-318;
License Nos. DPR 53 and DPR 69
Licensee Event Report 2002-004
Post-Accident Monitoring Instrumentation Not Seismically Connected

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

Very truly yours,

KJN/ALS/bjd

Attachment

cc: J. Petro, Esquire
J. E. Silberg, Esquire
Director, Project Directorate I-1, NRC
D. M. Skay, NRC
H. J. Miller, NRC
Resident Inspector, NRC
R. I. McLean, DNR

IE22

NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

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, Unit 1	05000 317	1 OF 06

4. TITLE

Post-Accident Monitoring Instrumentation Not Seismically Connected

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									Calvert Cliffs, U2	05000 318
08	27	02	2002	- 04 -	00	10	28	2002	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 2203(a)(3)(ii)	X 50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
20 2201(d)	20.2203(a)(4)	50.73(a)(2)(iii)	50 73(a)(2)(x)
20 2203(a)(1)	50.36(c)(1)(i)(A)	50.73(a)(2)(iv)(A)	73.71(a)(4)
20 2203(a)(2)(i)	50.36(c)(1)(ii)(A)	50.73(a)(2)(v)(A)	73 71(a)(5)
20.2203(a)(2)(ii)	50.36(c)(2)	50.73(a)(2)(v)(B)	OTHER Specify in Abstract below or in NRC Form 366A
20.2203(a)(2)(iii)	50.46(a)(3)(ii)	50.73(a)(2)(v)(C)	
20.2203(a)(2)(iv)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(D)	
20.2203(a)(2)(v)	50.73(a)(2)(i)(B)	50.73(a)(2)(vii)	
20.2203(a)(2)(vi)	50.73(a)(2)(i)(C)	50.73(a)(2)(viii)(A)	
20.2203(a)(3)(i)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(B)	

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
A. L. Simpson, Senior Engineer	410-495-6913

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
B	IP	RI	6063	Y					

14. SUPPLEMENTAL REPORT EXPECTED			15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO				

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

On August 27, 2002 while reviewing a causal analysis, a condition was identified at Calvert Cliffs that could have prevented the Post-Accident Monitoring System from fulfilling its safety function. Specifically, the review identified that loose pins on the cable connectors for the containment area radiation high range indicators could cause the channels to fail during a seismic event. This could result in the loss of Control Room indication of containment area radiation levels, required by Control Room Operators during accident situations, and could also have prevented the hydrogen purge isolation valves from shutting on a containment radiation signal. Evidence suggests that the condition existed during the time period from April 14, 2000 through May 20, 2002 when the connector pins were replaced and equipment tested satisfactorily. Failure of the connectors was attributed to inconsistent use of a connector extraction tool and approximately 20 years of unmonitored mechanical wear. Issue reports were initiated to periodically inspect the connectors for wear, and to ensure connectors are installed and maintained properly in the future. Several sets of connector extraction tools were purchased and made available for use. All instrumentation with this style connector was identified and repaired. Corrective Actions were established to address human performance errors.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
CALVERT CLIFFS, UNIT 1	05000 317	2002	- 004 -	00	02 OF 06

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

I. DESCRIPTION OF EVENT

On August 27, 2002 while reviewing a causal analysis, it was identified that a condition had existed at Calvert Cliffs that could have prevented the Post-Accident Monitoring (PAM) System from fulfilling its safety function. Specifically, the review identified that loose pins on the cable connectors for the containment area radiation high range indicators could cause the channels to fail during a seismic event. The review determined that the condition existed during the time period from April 14, 2000 through May 20, 2002 for Unit 1 and April 14, 2000 through April 11, 2002 for Unit 2. This condition existing during all plant modes for Units 1 and 2, however the affected components have Technical Specification applicability in Modes 1, 2, and 3 only.

The causal analysis was performed to address a concern identified during review of an issue report (IR3-062-052) initiated to address a recent failure of the subject instrumentation. The failure occurred in April 2002 when Unit 1 was shutdown in a scheduled refueling outage and Unit 2 was operating in Mode 1. Specifically, during performance of maintenance on 1RI5317B (Unit 1 Containment Area Radiation High Range Indicator, Channel B), a cable was inadvertently dislodged on 2RI5317B rendering the Unit 2 instrument out-of-service. Technical Specification 3.3.10 "Post-Accident Monitoring (PAM) Instrumentation" Limiting Condition for Operation Condition A "One or more functions with one required indication channel inoperable," was immediately entered for 2RI5317B. The cable was subsequently reconnected, the channel returned to service, a Channel Check performed satisfactorily and the limiting condition for operation was exited. However, during subsequent review of IR3-062-052 by the issue review group, the operability of 2RI5317B was questioned when seismic conditions are considered. As a result of the subsequent review, IR3-081-622 was initiated to document the operability concern regarding 2RI5317B under seismic conditions. The instrument was considered inoperable and Technical Specification Action Statement 3.3.10A was immediately entered. It was identified that this style connector is only installed on cables for the containment area radiation high range indicators. Maintenance orders were planned to repair the degraded connectors. The Unit 2 connectors were repaired and returned to service April 11, 2002. The Unit 1 connectors were repaired and returned to service May 20, 2002. New retention springs were installed on all connectors.

The subject causal analysis identified that the loose connector problem was identified in October 2001. On October 22, 2001, IR3-081-320 was initiated to document an unexpected Control Room alarm for 2RI5317B. The appropriate Technical Specification action statement (3.3.10A) was entered and a maintenance order generated. Maintenance was performed to clear the alarm, however, the connectors were not replaced at that time. Subsequent post-maintenance and operational testing was performed satisfactorily on October 26, 2001 and the Technical Specification action statement was exited. However, based on the failure experienced in April 2002, it appears that the maintenance performed in October 2001 may not have been adequate to satisfy the connector's seismic requirements. Therefore, an engineering evaluation was performed to ascertain the seismic capability of the degraded connectors. To support the engineering evaluation, several documents, including the repair maintenance order for 2RI5317A and 2RI5317B were reviewed. The maintenance order documents in the "As-found" condition

that the retention springs were missing. The associated vendor technical manual indicates that retention springs are to be used. Since the connector retention springs were missing, the engineering evaluation concluded that the connector for 2RI5317A/B would most likely become dislodged and the signal would be lost during a seismic event. The engineering evaluation only addressed Unit 2 since the issue with Unit 1 had not been identified at the time. Review of the Unit 1 repair maintenance order indicates that 1RI5317A was not damaged and 1RI5317B had a damaged retention spring. Since the retention spring for 1RI5317B was damaged, most likely the connector would become dislodged and the signal would be lost during a seismic event.

During review of the maintenance history for the subject instruments, evidence was discovered that suggests the condition existed as early as April 14, 2000. Specifically, on April 14, 2000 while Unit 1 was in a scheduled refueling outage, an issue was identified with unexpected Control Room alarms on 1RI5317B. During performance of troubleshooting on April 18, 2000, the associated maintenance order documents that the signal cable for 1RI5317B was loose, thus causing the alarms to come in. The maintenance order further states that the Unit 2 cable came out, causing Unit 2 alarms to come in. Unit 2 was operating in Mode 1 at the time.

Based on the above, the condition most likely existed from April 14, 2000 until May 2002 for Unit 1 and from April 14, 2000 until April 11, 2002 for Unit 2.

II. CAUSE OF EVENT

The problem with the connectors was originally noted and documented on an issue report in April 2000. The causal analysis identified that the cables had become loose in their connectors due to approximately 20 years of unmonitored mechanical wear. The mechanical wear resulted from repeated disengagement/engagement operations performed to support maintenance and performance of periodic surveillance tests. The causal analysis also identified that the proper extraction tool, which is used to remove the connector pins, was not always used, increasing the wear on the connectors. Based on a review of the repair maintenance orders, the connectors became loose due to damage to and/or loss of the connector retention springs. The vendor's design qualification test for the instrumentation includes a discussion regarding aging of various components including the connectors. It notes that mechanical wear is the failure mechanism for connectors that will experience a large number of engagement/disengagement operations. Therefore, the cause for failure of the connectors can be attributed to inconsistent use of a connector extraction tool and approximately 20 years of unmonitored mechanical wear.

Human performance errors also contributed to this event. Specifically, personnel did not understand the importance of ensuring proper installation of the connectors with regards to satisfying full design requirements, e.g., seismic design requirements. As a result, the equipment was returned to service in a functional, but not operable condition.

During the 2001-01 audit period, assessors identified that human performance errors introduced during the performance of maintenance challenge the reliability and operability of plant systems and equipment. A root cause analysis was performed to address the issue. The root cause

analysis identified several causes including the fact that specific information has not been provided to maintenance craft concerning the impact on equipment reliability (and operability) if maintenance is not performed correctly. Corrective actions have been established to address these human performance issues. Implementation of these corrective actions should prevent recurrence of similar events.

III. ANALYSIS OF EVENT

The primary purpose of the PAM instrumentation is to display plant variables that provide information required by the Control Room Operators during accident situations. This information provides the necessary support for the operator to take the manual actions, for which no automatic control is provided, that are required for safety systems to accomplish their safety functions for design basis accidents. The operability of the PAM instrumentation ensures that there is sufficient information available on selected plant parameters to monitor and assess plant status and behavior following an accident.

The primary purpose of the containment area radiation high range indicators is to alert the Operator to a possible Reactor Coolant System rupture or gross fuel failure. Automatic action for these indicators includes shutting the hydrogen purge isolation valves. If a malfunction had occurred with the subject instrumentation, the hydrogen purge isolation valves would not have shut on a containment radiation signal (CRS), had these normally "Locked Shut" valves been open for any reason. The hydrogen purge isolation valves also receive a shut signal when a safety injection actuation signal (SIAS) occurs. It is highly unlikely that an at-power CRS would occur without a SIAS present as well.

The hydrogen purge system is designed to limit the hydrogen concentration in the event that both hydrogen recombiners fail to function properly after a loss-of-coolant accident. The isolation valves are normally "Locked Shut" valves, but are periodically opened at power for surveillance testing and to keep containment pressure within Technical Specification limits.

During the "at risk" time frame, Operations performed negative pressure vents of the Unit 1 and 2 Containment per the Hydrogen Purge System Operating Instruction, ranging from one to three and one-half hours each. This evolution required both hydrogen purge isolation valves (per unit) to be open simultaneously. During the time in question, there were a total of 105 hours of negative pressure vents time for Unit 1 and 198 hours for Unit 2.

The event is not significant from a core damage or large early release perspective for two reasons. First, the hydrogen purge valves were open for a relatively short period of time (105/198 hours). Therefore, there was a relatively small probability that a seismic event would occur during this time frame. Second, the CRS is redundant to the SIAS to the hydrogen purge valves. The probability of a seismic event that includes a loss-of-coolant accident during the time in question, multiplied by the failure probability of both SIAS channels, is insignificant. The increase in core damage frequency for Unit 1 or 2 is less than 1E-06 and the increase in large early release frequency for Unit 1 or 2 is less than 1E-07. For this reason, the significance of this

issue is "low" or "green" in accordance with Calvert Cliffs Nuclear Power Plant's Issue Reporting and Assessment procedure.

During the time period from April 14, 2000 through May 20, 2002 Channel B of the Unit 1 containment area radiation high range instrumentation should have been declared out-of-service and the associated Technical Specification action statement should have been entered, when the Unit was in the applicable modes.

During the time period from April 14, 2000 through April 11, 2002, Channels A and B of the Unit 2 containment area radiation high range instrumentation should have been declared out-of-service and the associated Technical Specification action statement should have been entered, when the Unit was in the applicable modes.

The subject event describes a condition prohibited by the plant's Technical Specifications. The condition existed for a time longer than permitted by the Technical Specifications required action completion time. Therefore, this event is reportable pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition, which was prohibited by the plant's Technical Specifications.

IV. CORRECTIVE ACTIONS

A. All instrumentation with this style connector was identified and repaired.

B. Four sets of extraction tools were purchased and made available for shop use.

C. An issue report was initiated to create a preventative maintenance task to periodically inspect the connectors for wear.

D. An issue report was initiated to ensure connectors are installed and maintained properly in the future.

E. As the result of an audit, a root cause analysis was performed to address the human performance issues relative to this event.

V. ADDITIONAL INFORMATION

A. Affected Component Identification:

Component or System	IEEE 803 EIIS Funct	IEEE 805 System ID
Post Accident Monitoring	IP	IP
Radiation Indicator	RI	IP

B. Previous Similar Events:

A review of Calvert Cliffs' licensee event reports over the past several years was performed. The review did not identify any similar reportable events where the operability of the PAM instrumentation was challenged due to connector failures.