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CHARLES CENTER • P.O. BOX 1475 • BALTIMORE, MARYLAND 21203-1475

R. E. DENTON
GENERAL MANAGER
CALVERT CLIFFS

January 25, 1991

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 and 2; Docket Nos. 50-317 and 50-318;
License No. DPR 53 and DPR 69
Licensee Event Report 89-016, Revision 01

Gentlemen:

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

Very truly yours,

RED/DWM/bjd
Attachment

cc: D. A. Brune, Esquire
J. E. Silberg, Esquire
R. A. Capra, NRC
D. G. McDonald, Jr., NRC
T. T. Martin, NRC
L. E. Nicholson, NRC
R. I. McLean, DNR
J. H. Walter, PSC
Director, Office of Management Information
and Program Control

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NRC FORM 366 (6-89) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Calvert Cliffs, Unit 1	0 5 0 0 0 3 1 7	1 OF 0 4

TITLE (4)
RTDs Not Environmentally Qualified Due to Unsealed Housing

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0 9	0 8	8 9	8 9	0 1 6	0 1	0 1	2 5	9 1	Calvert Cliffs, Unit 2	0 5 0 0 0 3 1 8
										0 5 0 0 0

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
D. W. Muth, Compliance Engineer	3 0 1 2 6 0 - 3 5 9 2

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

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

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

On September 8, 1989 it was determined that the resistance temperature detectors (RTDs) installed in the hot and cold legs of the reactor coolant system in both units had not been properly sealed to prevent moisture intrusion. This condition was assumed to invalidate the Environmental Qualification (EQ) of the RTDs. Subsequent analysis has shown the RTDs were capable of functioning in a post-accident environment.

The root cause of this event was an inadequate procedure. The EQ Design Manual did not specifically require identification and review of mechanical interfaces such as the nipple-to-base interface in the primary RTDs.

We have identified, evaluated, and obtained a qualified thread sealant to be used specifically in applications where a mechanical interface must be environmentally sealed.

Field Engineering Changes have been completed for Unit 1 to properly seal the interface with an environmentally qualified sealant.

A Facility Change Request has been issued to replace the Unit 2 RTDs.

The EQ Design Manual was revised to specifically require identification and review of mechanical interfaces.

I. DESCRIPTION OF EVENT

On September 8, 1989, while Unit 1 was in cold shutdown and Unit 2 was defueled, it was determined that the as-found condition of the resistance temperature detectors (RTDs) did not match the tested configuration. The nipple-to-base interfaces in the RTD housings were not sealed as they had been when the RTDs were tested. This condition was assumed to invalidate the Environmental Qualification (EQ) of the RTDs. The RTDs provide input to the post-accident monitoring instrumentation and are governed by Technical Specification 3.3.3.6. Because the condition existed during MODE 1 operation, the assumed inability of these instruments to function under post-accident conditions and be corrected within the allowed ACTION time was reported as a violation of our Technical Specifications.

During Unit 2 Refueling Outage Number 8, which began in March, 1989, the RTDs were removed from the reactor coolant system (RCS) for routine maintenance. Technical training was provided to the maintenance personnel to familiarize them with the EQ requirements of the RTDs. Personnel attending the training noted several discrepancies between the guidance offered in the training and the condition of the RTDs as found in the field. Engineering personnel were notified and walked down the installed RTDs on Unit 1 during the next Unit 1 shutdown (approximately three weeks later). The walkdown disclosed the fact that the RTDs were not installed as tested. The nipple-to-base interface in the RTD housing was not sealed as the EQ tests required. Moisture intrusion could have occurred as a result of the post-accident environment, and the RTD internals could have been affected. Design Engineering personnel evaluated the unsealed interface to determine if this condition could be considered environmentally qualified. This evaluation concluded that the RTDs were not qualified using the installed configuration, and therefore, they were potentially not qualified for post-accident operation.

II. CAUSE OF EVENT

The root cause of this event was an inadequate procedure in that the EQ Design Manual did not specifically require identification and review of mechanical interfaces such as the nipple-to-base interface in the primary RTDs. The EQ evaluation of the RTDs performed in 1987 recognized the requirement for environmentally sealing the RTD. However, the proper documentation of this requirement was not provided within the EQ File due to the lack of a specific requirement in the EQ Design Manual to identify the mechanical interface. Consequently, the proper installation instructions were not provided to the EQ System Engineer for translation into field requirements.

III. ANALYSIS OF EVENT

The RTDs are installed in the hot and cold legs of the RCS. They provide input into the reactor protection system as well as temperature indication during normal operation. In the event of an accident, the RTDs provide input to the Subcooled Margin Monitor, which constitutes one of three Inadequate Core Cooling Instrumentation (ICCI) subsystems. The EQ conditions apply only to the post-accident environment. Therefore, only the post-accident operability of the RTDs was affected by the unsatisfactory seal.

Our ICCI consists of three subsystems: the Subcooled Margin Monitor (SMM), the Core Exit Thermocouples (CETs), and the Reactor Vessel Level Monitoring System (RVLMS). The ICCI is designed to remain functional with one subsystem unavailable. Our CETs and RVLMS are installed and functional. At the time of this event, they had not been declared OPERABLE and were not yet included in our Technical Specifications. However, the systems were functional and met the surveillance requirements of our then-proposed Technical Specifications. In a post-accident condition, we would rely on these subsystems to provide information about core conditions. Operability of the SMM may have been degraded during a Design Basis Event (DBE) due to inaccurate input from the RTDs caused by moisture intrusion via the unsealed threads. However, our evaluation has determined that the lack of sealant did not significantly degrade the ability of the RTDs to perform their safety function. Also, the CETs and RVLMS are a more appropriate means to assess core conditions since their sensors are indicating the vessel temperature rather than the RCP loop temperature.

Our analysis determined, using many conservatisms and the limiting accident conditions, the amount of condensation produced inside the RTD connection head during a postulated DBE. The analysis showed that the amount of moisture would not be significant and would not submerge any of the vital electrical components. Since the majority of the internal components are environmentally qualified for steam conditions (i.e., Raychem Splices, Kapton lead wries, and Brand Rex cable), a complete loss of indication during a DBE was unlikely.

The analysis showed that the only possible failure mode caused by moisture inside the RTD connection head was bridging of the RTD lead wires. This effect was analyzed. Bridging of the lead wires would cause a parallel resistance with the RTD element which would cause the temperature reading to decrease a maximum of approximately 5 degrees Fahrenheit. This error would have decreased to about 1 degree Fahrenheit within an hour. One RTD, due to a cracked Raychem sleeve, would potentially have had significant error. This would have been detectable and would not have caused confusion to the operators. The 1 to 5 degree errors in the remaining RTDs would not have been sufficient to hamper operations. Verification of the readings using independent indication (i.e., CETs) is a requirement discussed in Emergency Operating Procedures (EOP-4). Therefore any erroneous readings would have been verified and the appropriate action taken.

Natural circulation could have been verified even under the worst case combination of erroneous and correct readings. Subcooled margin analysis would also have been verifiable and is primarily based on the CETs. The errors would not have caused the operators to undercool the core.

Based on the above, it is concluded that this condition did not represent a threat to the health and safety of the public or the environment.

IV. CORRECTIVE ACTIONS

1. We have identified, evaluated, and obtained a qualified thread sealant to be used specifically in applications where a mechanical interface must be environmentally sealed.

2. Field Engineering Changes (FECs) 88-08-06 and 88-08-08 have been completed for Unit 1 to properly seal the RTD interfaces with an environmentally qualified sealant.

3. Facility Change Request (FCR) 83-1031 has been initiated to replace the Unit 2 RTDs. The installation instructions will be provided as part of the FCR, and prior to Unit 2 restart will ensure proper sealing of the mechanical interfaces.

4. All EQ files were reviewed for mechanical sealing requirements. No other similar problems were found.

5. The EQ Design Manual was revised to specifically require identification and review of mechanical interfaces. This will ensure that similar situations will be properly evaluated, and the appropriate installation requirements transmitted to the System Engineer.

V. ADDITIONAL INFORMATION

No similar events have previously been experienced, however, one event related to EQ occurred at Calvert Cliffs on June 13, 1988 (LER 88-004, Docket No. 50-317) involving a splice connection which was not environmentally qualified. In the 1988 event, the unqualified splice had been previously identified but had not been repaired due to inadequate review of the maintenance order governing the repair.

Component	IEEE 803 EIIS Funct	IEEE 805 System ID
RTD	TW	IP