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Constellation
Nuclear

Calvert Cliffs
Nuclear Power Plant

A Member of the
Constellation Energy Group

February 27, 2001

U.S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 1; Docket No. 50-317; License No. DPR 53
Licensee Event Report 2000-006, Revision 01
Number 12 Containment Spray pump Circuit Breaker Failed to Close

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,

Peter Katz

PEK/JKK/bjd

Attachment

cc: R. S. Fleishman, Esquire
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Director, Project Directorate I-1, NRC
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NRC FORM 366 (1-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

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LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Calvert Cliffs Nuclear Power Plant, Unit 1	050000 317	1 OF 005

TITLE (4)
Number 12 Containment Spray Pump Circuit Breaker Failed to Close

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										050000
11	10	2000	2000	- 006	- 01	02	27	2001	FACILITY NAME	DOCKET NUMBER
										050000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)					
		20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
POWER LEVEL (10)	100	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
		20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)	Specify in Abstract below
		20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)	or in NRC Form 366A
		20.2203(a)(2)(v)	X	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)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
J. K. Kirkwood	410-495-2013

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	BE	BKR	B455	Y						

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (16)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO				

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

During surveillance testing on November 10, 2000, at 0200, the Asea Brown Boveri, Inc. 4-kV Vacuum Circuit Breaker for 12 Containment Spray Pump failed to close upon the receipt of an auto-start signal. Troubleshooting revealed the breaker tripped free. This same breaker failed to close during similar surveillance testing on October 12, 2000, and subsequent testing indicated the breaker was operating satisfactorily.

The breaker was replaced with a General Electric Magne-Blast circuit breaker. The General Electric breaker was satisfactorily tested and 12 Containment Spray Pump was declared operable November 10, 2000, at 1800. Unit 1 was in Mode 1, operating at 100 percent power at the time of the event, the event had no affect on the operation of the unit.

The breaker failed to close because the breaker was not inserted fully into the cubicle, allowing the trip-free interlock to contact the interlock cam on the cubicle.

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* (17)

I. DESCRIPTION OF EVENT

During surveillance testing on November 10, 2000, at 0200, the Asea Brown Boveri, Inc. (ABB) 4-kV Horizontal Rollout Vacuum Circuit Breaker for 12 Containment Spray Pump (CSP) failed to close upon receipt of an Engineered Safety Feature Actuation System (ESFAS) safety injection actuation signal (SIAS) auto-start. With the aid of a technician from the manufacturer of the circuit breaker operating mechanism, plant staff conducted detailed troubleshooting, including the use of a data recorder to monitor electrical parameters, during the breaker testing. The breaker tested satisfactorily and the Surveillance Test Procedure (STP) was conducted satisfactorily at 1430 November 10, 2000. During a subsequent performance of the STP at 1500 the same day, the breaker again failed to close. We did not have a reasonable assurance of operability of the 12 CSP due to the intermittent failure of the ABB circuit breaker. The ABB circuit breaker was removed from the 12 CSP breaker cubicle and replaced with a General Electric (GE) Magne-Blast 4-kV circuit breaker. The STP was successfully performed on 12 CSP with the GE Magne-Blast circuit breaker installed, and 12 CSP was returned to service.

Earlier, on October 12, 2000, Plant Operators were conducting an STP involving the 12 Saltwater Pump. During the STP for the 12 Saltwater Pump, the 12 CSP breaker operated satisfactorily. However, operators noticed a problem that required repeating the STP. During the retest, the 12 CSP breaker failed to close upon receipt of an auto-start signal from the SIAS. Troubleshooting and subsequent testing and cycling of the breaker revealed no operating problems with the breaker. The breaker was reinstalled in the 12 CSP breaker cubicle, tested satisfactorily, and the 12 CSP was returned to service. Plant Staff increased the frequency of the STP from quarterly to monthly to more closely monitor the affected breaker.

II. CAUSE OF EVENT

The breaker failed to close because the breaker was not inserted fully into the cubicle, allowing the trip-free interlock to contact the interlock cam on the cubicle.

The trip-free interlock is a safety feature designed to prevent the circuit breaker from being inserted or removed from a cubicle with the breaker closed. The interlock is a roller, mechanically linked to the breaker jackscrew cover plate, and the breaker operating mechanism. When the jackscrew cover plate is moved to allow use of the breaker-racking tool, the trip-free interlock will trip open a closed breaker, or prevent an open breaker from closing. When the jackscrew cover plate is returned to closed, normal operation of the breaker can resume. The trip-free interlock roller engages a cam on the side of the breaker cubicle. When the breaker is inserted in the cubicle, the roller engages the cam and trips open a closed breaker, or prevents closing an open breaker. The trip-free roller is freed when it runs past the cam on full insertion of the breaker. Upon removal of the breaker, the trip-free roller engages the cam on the side of the cubicle, tripping open a closed breaker, and preventing an open breaker closing.

The minimum width of the cubicles, as determined by measurements the vendor made of a sampling of our cubicles for which the 4-kV breakers are designed, is 20-5/8 inches. The maximum width at the corresponding location on the breaker used for 12 CSP is 20-7/8 inches at insulation pads (called "chair rails") on the side of the breaker. A certificate of compliance with design specifications accompanied the breakers, and receipt inspection included inspection of the certificate of compliance. The design dimensions of the breakers was not an issue with receipt inspection, or the installation project. The chair rails on the breaker rubbed against the pins for the shutter/shutter lift pivot points on the cubicle. The rubbing between the breaker and the cubicle caused resistance to insertion that led the installers to believe the breaker was fully inserted. The breaker was actually about 1/8-inch short of full insertion. This position of the breaker allowed the trip-free interlock to remain in contact with the interlock cam on the side of the cubicle causing the sporadic trip-free operation when attempting to close the breaker.

The width at the bind point of three other breakers of this design was measured. All were 20-5/8 inches wide or greater at the chair rails.

III. ANALYSIS OF EVENT

Plant Technical Specification 3.5.2 requires two operable emergency core cooling trains, with an allowed outage time of 72 hours for one inoperable train of emergency core cooling. The 12 CSP was inoperable from the completion of the initial installation of the ABB breaker on October 10, 2000 at 1600 to November 10, 2000 at 1800. The 72 hour allowed outage time was exceeded.

The five other ABB breakers with auto-start requirements have not demonstrated this failure in repeated tests.

The function of the Containment Spray System is to limit the containment atmosphere pressure and temperature after a loss-of-coolant accident (LOCA), and thus reduce the possibility of leakage of airborne radioactivity to the outside environment.

The Containment Spray System is redundant with the containment air cooling system and consists of two 50 percent capacity electric motor-driven pumps, two heat exchangers (the shutdown cooling system heat exchangers), two containment spray headers and nozzles, and all necessary piping, valves, instruments and accessories. The pumps discharge borated water from the Refueling Water Tank through the heat exchangers to the spray headers and nozzles located in the Containment.

The 12 CSP was inoperable from October 10, 2000, until November 10, 2000. During most of this period, 11 CSP was available, as were four containment air coolers (CACs). However, there were several occasions during this period when the redundant train of containment spray was removed from service for surveillance testing or maintenance for a total of 52 hours, 25 minutes.

The design basis accident for containment response is a large break LOCA with maximum safety injection. However, for the analysis of this event, there is no spray flow credited and only one train of CACs available. The containment peak pressure increases from 49.11 psig to 50.38 psig, which exceeds the design limit for containment pressure of 50 psig by 0.38 psi.

Because of safety margins incorporated into the design of the Containment Building, the Containment Building response would be acceptable under the current operability evaluation of the Unit 1 containment structure at a pressure 50.38 psig.

The reason for this small response to spray cooling is that containment peak pressure is reached in about 2 minutes. We use a conservative delay of 1 minute and 11 seconds for spray actuation, therefore there is only about 50 seconds for spray cooling to be effective. This short duration for action lessens the effectiveness of containment spray cooling on the design basis response.

The containment heat removal function is successful, as defined in the probabilistic risk assessment model, when either one-of-two containment spray trains or two-of-four CACs operate. This reportable event resulted in periods where one train and both trains of containment spray were out-of-service. With this reduced redundancy in the containment heat removal function, there was a small increase in core damage frequency (CDF). It also caused a small increase in the large early release frequency (LERF).

There is always some very small probability of having core damage as a result of a LOCA and the complete failure of both containment heat removal systems. However, we determined how much additional risk we incurred during the 30 days we had one of the containment spray trains out-of-service. We considered the different core damage scenarios that might have occurred during that 30-day period. During this time, there were periods when 11 Containment Spray Pump and the 1A Emergency Diesel Generator (EDG) were also out-of-service. The 1A EDG is significant because it provides back-up power to the 11 Containment Spray Pump and two-of-four CACs in the event that offsite power is lost. Each alignment has a different risk contribution. Also, the risk contribution of each is proportional to the length of time in a particular alignment.

This estimate considers LOCAs of all break sizes and induced LOCAs. Induced LOCA scenarios involve power-operated relief valves (PORV) failures, reactor coolant pump seal failures and primary safety relief valve failures. The risk contribution from induced LOCAs is rather small because they require a number of failures to induce the LOCA and then the CACs must fail. The risk contribution from pipe-break type of LOCA is also quite small. The probability of having a LOCA during the one-month time that 12 Containment Spray pump was out-of-service is very small. In addition, the CACs must also fail.

The incremental increase in CDF that occurred as a result of this event is about 1 x 10-8/yr. The LERF increase is estimated to be about 5 x 10-11/year.

Based on these results, we conclude that this event did not result in a significant decrease in protection provided to the health and safety of the public or onsite personnel.

This event is reported in accordance with 10 CFR 50.73(a)(2)(i)(B), "any operation or condition prohibited by plant's Technical Specifications."

IV. CORRECTIVE ACTIONS

A. The suspect ABB breaker was replaced with a GE Magne-Blast breaker. The Magne-Blast breaker tested satisfactorily.

B. The jackscrew cover plate on all ABB 4-kV Vacuum Circuit breakers in use has been secured to prevent actuation of the trip-free interlock.

C. Installation of additional ABB 4-kV Vacuum Circuit breakers is suspended pending resolution of the breaker design width at the insulation pads on the side of the breaker.

V. ADDITIONAL INFORMATION

A. Component Identification

Component	IEEE 803 EIIS Function	IEEE 805 System ID
Circuit Breaker	BKR	BE

B. Previous Similar Events

No other events of this type have occurred at Calvert Cliffs Nuclear Power Plant.