CHARLES H. CRUSE
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December 13, 1995

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 95-006
Manual Reactor Trip Due to Loss of 12 Steam Generator Feed Pump

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,

Charles H. Cruse

CHC/MDM/bjd

Attachment

cc: D. A. Brune, Esquire
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L. B. Marsh, NRC
D. G. McDonald, Jr., NRC
T. T. Martin, NRC
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NRC FORM 366 (4-95)

U. S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES: 04/30/98
ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENISNG PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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, Unit 1	05000 317	1 OF 05

TITLE (4)

Manual Peactor Trip Due to Loss of 12 Steam Generator Feed Pump

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 NAME	DOCKET NUMBER 05000
11	16	95	95	-- 006	-- 00	12	13	95	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (Check one or more) (11)					
POWER LEVEL (10)	100	20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)		
		20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)		
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71		
		20.2203(a)(2)(ii)	20.2203(a)(4)	X 50.73(a)(2)(iv)	OTHER		
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below		
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)			

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (include Area Code)
M. D. Milbradt, Compliance Engineer	410-260-4352

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 15 single-space typewritten lines) (16)

On Thursday, November 16, 1995, at approximately 2252 hours, Calvert Cliffs Unit 1 was manually tripped following the loss of the 12 Steam Generator Feed Pump (SGFP). Unit 1 was operating at 100 percent power at the time of the trip.

At approximately the same time 12 SGFP tripped, the pump's standby lube oil pump started due to a pressure decrease in the oil system. A troubleshooting team determined oil losses from the SGFP trip mechanism and turbine thrust allowed oil pressure to drop and to trip the pump before the standby pump could restore pressure. The cause for the initial oil pressure decreases has not been determined.

The trip mechanism and thrust for the pump were cleaned and adjusted. A check valve was also installed in the control oil portion of the system to further increase the trip margin. Unit 1 was restarted on November 20, 1995, using 11 SGFP; 12 SGFP was returned to service on December 3, 1995

I. DESCRIPTION OF EVENT

On Thursday, November 16, 1995, at approximately 2252 hours, Calvert Cliffs Unit One was manually tripped following the loss of the 12 Steam Generator Feed Pump (SGFP). Following the reactor trip, 11 SGFP tripped on high discharge pressure and the Auxiliary Feedwater Actuation System (AFAS) automatically actuated. Once core heat removal was assured and a positive steam generator (SG) level trend was noted, auxiliary feedwater (AFW) was secured. Unit 1 was operating in MODE 1 at 100 percent power at normal operating temperature and pressure at the time of the trip. Unit 2 was not affected.

At approximately 2251 hours, operators received indication 12 SGFP had tripped. Operators then successfully reset the SGFP but were unable to feed the SGs with it before low level SG pre-trips were received at -29 inches; a manual reactor trip was then initiated before the automatic low level trip setpoint of -46 inches was reached. Shortly thereafter, 11 SGFP tripped on high discharge pressure. Steam generator levels continued to decrease without either SGFP feeding the SGs. When levels reached -170 inches AFAS channels A and B actuated and AFW flow was initiated. Emergency Operating Procedures EOP-0, "Post-Trip Immediate Actions," and EOP-1, "Reactor Trip," were implemented, respectively.

Immediately after the event, the Plant General Manager formed a Significant Incident Finding Team (SIFT) to determine the cause of the event and develop effective corrective actions. Since no electrical trip alarm was present at the local SGFP panel, the investigators concluded the trip was mechanical in nature. Mechanical SGFP trips can be caused by an overspeed of the turbine, pulling the local mechanical trip handle, or a loss of control oil pressure. Computer printouts showed the high pressure auxiliary lube oil pump for 12 SGFP, in this event "B" pump, started approximately two seconds prior to 12 SGFP tripping, indicating the SGFP tripped due to a loss of high pressure oil. There was no indication of an overspeed or trip lever mechanical trip.

High pressure oil to 12 SGFP is normally supplied by a single operating lube oil pump, either the "A" or "B" pump. Normal operating pressure is approximately 230 psig. If pressure decreases to 170 psig, the auxiliary pump will start to supply oil to the system. High pressure oil is used for opening the SGFP turbine stop valves. The oil is reduced to lower pressures for controlling governor valve position, control oil to the SGFP trip mechanism, and the pump and turbine bearings. As mentioned above, it appears as though there was a decrease in oil system pressure that was large and rapid enough to allow the hydraulic dump valve to actuate and trip the SGFP, even though the "B" lube oil pump started and provided oil. An inspection of the oil system after the trip did not show any observable leakage and pressure in the oil system returned to a normal value with only one pump in service.

During post-trip testing, engineers attempted to recreate the event by resetting the SGFP and tripping the operating lube oil pump (in this event the

"A" pump). Twelve SGFP was first tested; oil pressure decreased when the pump was turned off and the same conditions experienced on November 16, occurred; the SGFP tripped even though the auxiliary lube oil pump started. The same test was then performed on 11 SGFP and the opposite results were achieved, 11 SGFP did not trip even though oil pressure declined and the auxiliary pump started. After carefully considering 11 SGFP's susceptibility to the problem experienced with 12 SGFP, Calvert Cliffs personnel concluded 11 SGFP was unlikely to be affected. The high discharge pressure trip 11 SGFP experienced after the reactor trip was expected for the given plant conditions. Unit 1 was restarted on November 20, 1995, using 11 SGFP.

II. CAUSE OF EVENT

As part of the SIFT, a troubleshooting team was established to determine why oil pressure in 12 SGFP's lube oil system decreased and how this condition resulted in the SGFP tripping, even though the auxiliary lube oil pump started as expected. Each of the flowpaths and components that relied on high pressure or control oil were inspected. Specifically, the tolerances in the SGFP trip mechanism were checked, cleaned, and brought within specification. The SGFP turbine thrust was also measured and found to be near the maximum allowed thrust. Additionally, the "A" lube oil pump was also inspected and found acceptable (the pump was replaced with a new pump when consumable replacement parts could not be obtained). Following the system inspection and reassembly, the loss of oil pressure test, simulated by tripping the operating oil pump, was performed and 12 SGFP did not trip. Engineers determined the trip mechanism would trip the SGFP if control oil pressure decreased to 10-12 psig, but that the auxiliary pump would now limit the pressure dip to about 17 psig resulting in a satisfactory trip margin. The pressure regulating valve for the pump bearings was also replaced and adjusted within specification, further increasing the trip margin. A power ascension from 70 to 100 percent was commenced on Sunday, December 3, 1995, after 12 SGFP was put back in service.

The SIFT investigation did not identify any single equipment malfunction leading to the event. The team concluded a combination of minor oil losses resulting from the conditions noted with the SGFP trip mechanism and turbine thrust resulted in pressure decreasing to the trip setpoint before the backup pump could restore pressure. The initial perturbation which caused the sudden drop in pressure could not be determined prior to placing the pump in service on December 3, 1995. Temporary instrumentation was installed on the oil system though, and on December 4, 1995, another oil pressure perturbation was recorded. The perturbation appeared to originate from one of the electronic components in the valve hydraulic control oil system. Further investigation in this area is in progress.

III. ANALYSIS OF EVENT

There were no safety consequences associated with this event. The reactor shut down as designed upon receipt of the manual trip signal. Performance of the plant was within the assumptions of the safety analysis.

This item is reportable under the provisions of 10 CFR 50.73(a)(2)(iv) as an Engineered Safety Features actuation.

IV. CORRECTIVE ACTIONS

A. Following the event, 11 SGFP was tested for the same problem found on 12 SGFP. The results of the testing showed its standby oil pump responded to maintain pressure effectively and Unit 1 was restarted using 11 SGFP on November 20, 1995.

B. Components within the SGFP trip mechanism and turbine thrust were inspected and adjusted to within tolerance. These actions resulted in a higher control oil pressure and margin before the SGFP trips on low oil pressure. To further increase the margin, a check valve was added to the control oil system for 11 and 12 SGFPs to prevent inadvertent SGFP trips. A power ascension from 70 to 100 percent was commenced on December 3, 1995, after 12 SGFP was put back in service.

C. Temporary instrumentation was installed on the oil systems for both 11 and 12 SGFPs to monitor system performance and help identify the cause of any perturbation.

The SIFT is still in progress. If additional information affecting the cause or corrective actions is developed, a supplemental LER will be provided.

V. ADDITIONAL INFORMATION

A. Affected Component Identification:

Component or System	IEEE 803 EIIS Funct	IEEE 805 System ID
Main Feed Pump	P	SJ
SGFP Lube Oil Pump	P	SL

B. Previous Similar Events:

There have been three reportable events at Calvert Cliffs involving SGFP trips in which the root cause was undetermined:

1. LER 318/84-008 described an event that occurred on October 3, 1984, when 22 SGFP tripped for no apparent reason. The SGFP oil system was monitored for problems but none were determined; and

2. LER 318/88-004 described an event that occurred on April 27, 1988, when 21 SGFP tripped for no apparent reason. Subsequent analysis determined the most likely cause was a problem with the turbine thrust bearing wear monitor circuitry.

3. LER 317/95-002 described an event that occurred on June 16, 1995, in which 12 SGFP tripped, apparently due to degradation of the SGFP overspeed trip mechanism. Symptoms for this trip differed from those observed in June, indicating a probable different cause. The SIFT for the November 16, 1995, event is reviewing the June 16, 1995, event in light of the testing described in this LER.