BALTIMORE
GAS AND
ELECTRIC

CALVERT CLIFFS NUCLEAR POWER PLANT
1650 CALVERT CLIFFS PARKWAY • LUSBY, MARYLAND 20657-4702

CHARLES H. CRUSE
PLANT GENERAL MANAGER
CALVERT CLIFFS

October 27, 1992

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

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 2; Docket No. 50-318; License No. DPR 69
Licensee Event Report 92-007
Manual Trip Caused by Stuck Open 23 Moisture
Separator/Reheater Relief Valve

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,

Charles H. Cruse

CHC/MDM/bjd
Attachment

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

Cert No P 046603384

IE22
1/1

05000318

NRC FORM 366 (5-92) U. S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES: 5/31/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), 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 2	05000 318	1 OF 07

TITLE (4)
Manual Trip Caused by Stuck Open 23 Moisture Separator/Reheater Relief Valve

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)
09	29	92	92	-- 007 --	00	10	27	92		05000
										05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (Check one or more) (11)					
POWER LEVEL (10)	077	20.402(b)	20.405(c)	X	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)	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 (include Area Code)
Mike 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
E	SB	RV	0243	Yes						

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 September 29, 1992, at 1141, Calvert Cliffs Unit 2 was manually tripped due to high temperatures on the Main Turbine Rear Thrust Bearing Faces. The bearing temperatures rose as a direct result of a pressure imbalance caused by the lifting and failure to reseat of the 23 Moisture Separator/Reheater (MSR) shell-side relief valve while at power. At the time of the trip Unit 2 was at 77 percent power. The relief valve lifted at normal system pressure apparently due to the combined effects of pilot disc leakage and setpoint drift. The valve in question has been repaired, the frequency of inspection for MSR relief valve pilots has been doubled, and a vendor modification to aid in closing the main disc will be scheduled for the next refueling outage.

I. DESCRIPTION OF EVENT

On September 29, 1992, at 1141, Calvert Cliffs Unit 2 was manually tripped due to high temperatures on the Ma' Turbine Rear Thrust Bearing Faces. The Thrust Bearing temperatures started t rise while power was being reduced during a controlled shutdown. A controlled shutdown from 100 percent power was initiated after a shell-side relief valve (2-RV-4024) lifted on 23 Moisture Separator/Reheater (MSR) and could not be reseated. At the time of the trip Unit 2 was at 77 percent power.

Calvert Cliffs Unit 2 has four separate two-stage MSRs. The MSRs are used to dry out and raise the temperature of cold reheat steam. Cold reheat steam exits the High Pressure (HP) Turbine and is sent through two separate stages in the MSRs where it becomes hot reheat steam before entering the Low Pressure (LP) Turbines. Drying out and reheating the steam increases turbine efficiency and enhances the reliability and life of the LP turbine blading.

On August 1, 1992 Unit 2 was manually tripped from 100 percent power after losing Condensate and Steam Generator Feed system pumps. Following the trip, operators discovered that 2-RV-4024 had opened and failed to reseat. Plant Engineering and Maintenance personnel, with input from Operations, evaluated the relief valve performance following the trip and concluded that it could be expected to lift after a Turbine trip and thus was functioning properly at the time. Subsequent discussions with the turbine manufacturer in September confirmed it is not uncommon for these relief valves to lift after a turbine trip due to spikes in steam pressure to the MSR. BG&E personnel did not believe the valve would inappropriately open when the plant was at power.

After the main valve failed to reseat on August 1, 1992, an Issue Report (IR) was written and an MR was generated to shut the valve. Maintenance applied Plant Air to the chamber on top of the main valve disc and forced the main valve closed. A root cause analysis and corrective maintenance to determine why the valve failed to reseat was not performed prior to restarting Unit 2 because the valve could fulfill its safecy function, there was no reason to expect it to lift at power, and failure to reseat after a trip would not pose any unacceptable consequences. The valve was due to be inspected during the 1993 Spring Refueling Outage. The valve is inspected every two refueling outages in accordance with the Calvert Cliffs Preventive Maintenance (PM) Program, and the valve was last inspected in 1987.

On August 6, 1992, with Unit 2 at 100 percent power, 2-RV-4024 was reported to be leaking steam through its discharge piping. A Maintenance Request (MR) was

written to address the issue and discussions were held between Operations, Maintenance, and Engineering personnel concerning the severity of the leak and plan of action. At the time, with the MSR in service, it could not be determined whether the pilot or the main valve disc was leaking by. A Maintenance Order (MO) was generated to disassemble and repair the valve during the next forced Unit 2 outage.

On September 29, 1992, Calvert Cliffs Unit 2 was operating at 100 percent power. At approximately 1010, a loud noise, sounding like a relief valve lifting, was heard in the Control Room. Reports from personnel in the Turbine Building and indications from instrumentation in the Control Room confirmed that 23 MSR Shell-side Relief Valve, 2-RV-4024, had lifted. Licensed utility operators including Control Room Operators, Shift Supervisor, and General Supervisor-Nuclear Plant Operations assessed the situation and decided to lower power, and thus steam pressure in the MSR, to reseat the relief valve.

As power was being reduced, Maintenance and Engineering personnel discussed ways of shutting the valve using guidance found in the manufacturer's technical manual. The power reduction continued and at approximately 1135, high temperature alarms were received in the Control Room for the Turbine Thrust Bearing Rear Faces. The high temperatures were a direct result of the stuck-open relief valve. With the relief valve open, extraction steam pressure to 23 MSR decreased. This decrease in pressure created a differential pressure across the HP turbine allowing it to thrust towards the Main Generator. The temperature on the thrust bearing rear face increased to the alarm setpoint and in accordance with Abnormal Operating Procedure (AOP)-7E, Operations personnel evaluated the situation and elected to manually trip the unit based on the bearing temperatures.

Unit 2 was manually tripped at 1141 from 77 percent power. Control Room personnel satisfactorily implemented the appropriate Emergency Operating Procedures for a plant trip and all safety functions were verified. Following the trip, Auxiliary Feedwater (AFW) flow was initiated and a cooldown was initiated through the Atmospheric Dump Valves (ADVs).

II. CAUSE OF EVENT

The primary cause of this event was the lifting and failure to reseat of 2-RV-4024. Failure of this valve to reseat resulted in a differential pressure across the HP turbine leading to an increase in turbine thrusting and high thrust bearing face temperatures. The plant was tripped in accordance with

procedures after indications of the high thrust bearing face temperatures were received.

The relief valve on 23 MSR, 2-RV-4024, is a pilot operated safety relief valve (see Figure 1). The operation of the valve is as follows: System pressure (hot reheat steam) enters the main valve and flows up through the sensing tube. Steam also flows out through a clearance between the tube and a floating washer on the main valve disc into the top of the chamber to pressurize the top of the main valve disk. Additional flow occurs between the top of the sensing tube and the disc for the pilot valve, down into the top of chamber to help pressurize the top of the main valve disc. When system pressure increases and the pilot valve setpoint is reached, the pilot opens allowing pressure in the chamber to exhaust through an outlet. When pressure in the chamber decreases to approximately 58 percent of the system pressure a lifting force on the main valve disc is created causing the main valve to open.

After 2-RV-4024 lifted on September 29, 1992, the valve was opened and inspected for damage in accordance with the outstanding MO. First the pilot valve was removed and tested. Three simulated lift tests were performed and in all three the pilot relieved at approximately 12[illegible] psi, which is lower than the required 150 psi setpoint. Further inspection determined there was excessive leakage past the pilot disc. A root cause analysis performed by Plant Engineering concluded the combination of the pilot setpoint drifting low plus leakage past the pilot disc allowed excessive leakage to develop through the pilot and thus the pressure in the chamber bled off. When pressure in the chamber reached approximately 58 percent of system pressure, the main valve opened. The valve manufacturer has also confirmed that if excessive leakage exists on the pilot valve, the chamber can depressurize and allow the main valve to open.

The main valve body was also inspected for damage. Corrosion and pitting were discovered on the guide for the main plug. Additionally, excessive wear was found on the packing rings and O-rings. This condition appears to have contributed to the disc becoming stuck and unable to reseat without assistance.

III. ANALYSIS OF EVENT

This event is reportable under 10 CFR 50.73 (a)(2)(iv). This event resulted in both manual and automatic operation of the Reactor Protection and Engineered Safety Features Actuation Systems, respectively. The plant was manually tripped after high Thrust Bearing Rear Face temperature alarms were received.

This event resulted in no significant consequences to the public health and safety. The manual trip of the plant was conducted as prescribed in approved plant procedures. All safety systems functioned as required. Steam Generator Feed Pumps were removed from service after vacuum in the Main Condenser started to decrease due to 2-RV-4024 failing to reseat. A cooldown to MODE 5 was initiated using the Atmospheric Dump Valves (ADVs). During the cooldown, 22 ADV began to oscillate in its position and would not respond to its controller signal. It was later determined that the valve stem packing had been blown out and the leaking steam had damaged the controller. Cooldown through the ADVs was continued until 2-RV-4024 was reseated, vacuum was restored, and the cooldown could be continued using the Turbine Bypass Valves. The trip transient also caused an expected spike of the steam generator water level instrument causing an Auxiliary Feedwater Actuation Signal (AFAS) which initiated auxiliary feedwater flow (AFW). Operations personnel then operated AFW in accordance with procedure to feed the steam generators. This type of AFAS actuation was previously reported in LER 318/91-004. Therefore, this event presented no threat to the health and safety of the public or plant personnel.

IV. CORRECTIVE ACTIONS

A. Immediately following the event, an engineering root cause analysis was performed by Plant Engineering and Maintenance to determine why 2-RV-4024 had lifted and failed to reseat. The valve was disassembled, inspected and completely overhauled. Both the engineering analysis and the maintenance repairs were completed prior to the restart of Unit 2.

B. Changes will be initiated to modify the PM frequency for inspecting the MSR relief valves such that the pilots on the valves will be inspected every refueling outage versus the current interval of every two refuelings.

C. All of the Unit 2 MSR shell-side relief valves will be inspected during the upcoming Unit 2 Spring Refueling Outage. Additionally a modification, suggested by the manufacturer, that will aid in closing the main disc will be scheduled for this outage. The existence of this potential modification was not communicated by the vendor to BG&E prior to this event.

V. ADDITIONAL INFORMATION

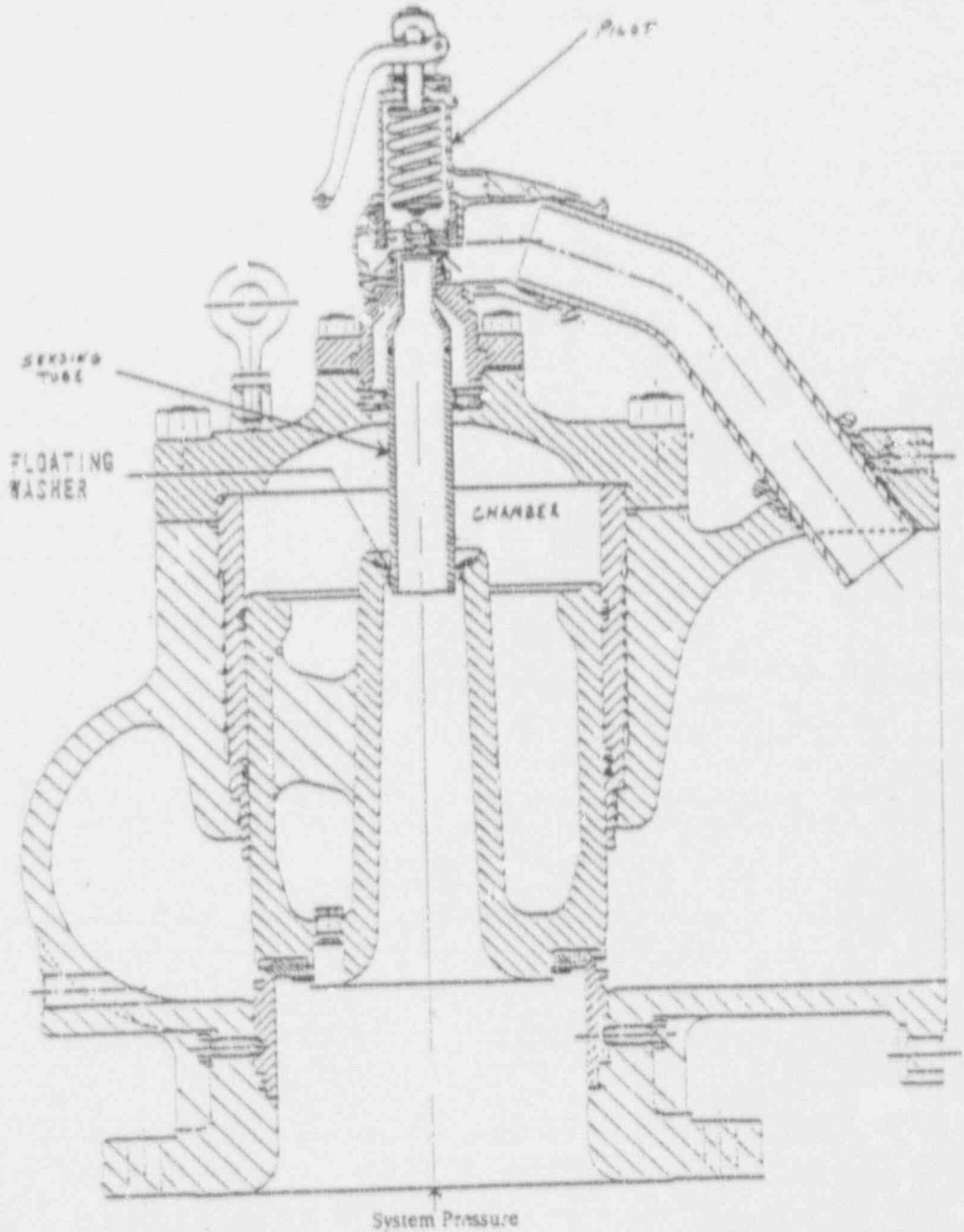
A. Identification of components referred to in this LER.

Component	IEEE 803 EIIS Funct.	IEEE 805 System ID
Moisture Separator Reheater	HX	SB
Turbine	TRB	TA
Relief Valve	RV	SB
Turbine Thrust Bearing		TA

B. Previous Similar Events

A previous event involving a relief valve on a secondary side heat exchanger lifting and failing to reseat, resulting in a plant trip occurred on January 2, 1992 (LER 92-001). In this event, a 3/4 inch tube side relief valve for the Unit 2 26B Feedwater Heater lifted while Unit 2 was at 92 percent power. The valve failed to reseat resulting in feedwater leak. This leak led to electrical grounds in the secondary system which contributed to the decision to manually trip the plant. Although both events involved relief valves, there were no incomplete corrective actions from that event which contributed to this event.

FIGURE 1



3-RV-4024