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

March 9, 1993

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 Nos. DPR 53 and DPR 69
Licensee Event Report 93-001
Technical Specification 3.0.3 Entry; Loss of Control Room Air Conditioning

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/RCG/bjd
Attachment

cc: D. A. Brune, Esquire
J. E. Silberg, Esquire
R. A. Capra, NRC
D. G. McDonald, Jr., NRC
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NRC FORM 366 (5-92) U. S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES: 5/31/952
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 1	05000 317	1 OF 08

TITLE (4)
Technical Specification 3.0.3 Entry: Loss of Control Room Air Conditioning

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 NUMBERS(S)
02	02	93	93	-- 001 --	00	03	09	93	Calvert Cliffs U2	05000 318
										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	20.402(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 (include Area Code)
R, C. Gradle, Compliance Engineer	410-260-3738

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

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	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 February 2, 1993, at 9:55 a.m., both independent Control Room Emergency Ventilation System Air Conditioning trains (CR HVACs) were declared inoperable at Calvert Cliffs and the plant entered Technical Specification 3.0.3. The No. 12 CR HVAC train was determined to be inoperable while No. 11 CR HVAC train was removed from service for scheduled routine maintenance. Immediate action restored No. 11 CR HVAC train to OPERABLE status at 10:30 a.m., 35 minutes after the start of the event. At the time of the event Units 1 and 2 were at 100 percent power.

The immediate cause of No. 12 CR HVAC being inoperable was determined to be insufficient system refrigerant inventory. This event did not result in any significant safety consequences.

Immediate corrective actions included charging No. 12 CR HVAC with additional refrigerant, performing appropriate surveillance testing and restoring it to an OPERABLE status on February 3, 1993. We are performing a detailed design review of the CR HVAC system to define guidelines for system refrigerant inventory requirements under design outdoor air temperature conditions.

I. DESCRIPTION OF EVENT

On February 2, 1993, at 9:55 a.m., both independent Control Room Emergency Ventilation System Air Conditioning trains (HVACs) were declared inoperable at Calvert Cliffs. The No. 12 CR HVAC train was determined to be inoperable while No. 11 CR HVAC train was removed from service for scheduled routine maintenance. Since there is no ACTION requirement for both Control Room (CR) HVAC trains being inoperable, the plant entered Technical Specification (TS) 3.0.3. Immediate corrective action restored No. 11 CR HVAC train to OPERABLE status at 10:30 a.m., 35 minutes after the start of the event. At the time of the event both Units were at 100 percent power.

Calvert Cliffs has a single Control Room from which both Unit 1 and Unit 2 operations are conducted. The CR Emergency Ventilation System consists of two independent and redundant CR HVAC trains. The air conditioning units are field installed customized units. Detailed design and as-built technical manual information does not exist for these units. Each CR HVAC train has an individual source of outside air and draws on the common exhaust header for recirculation air. Normally, one CR HVAC train is in operation with the other train in standby.

Each CR HVAC train has an air handling unit, evaporator, liquid receiver, air-cooled condenser, compressor, and a head pressure control system that permits operation during low outdoor air temperatures (Figure 1). Low ambient temperature operation prevents excessive heat rejection capacity in the air-cooled condenser and the condenser backpressure regulating valve closes allowing liquid refrigerant to backup or "stack" in the condenser coils. To maintain adequate compressor suction pressure, a condenser bypass regulating valve opens bypassing hot refrigerant gas directly to the receiver.

On January 30, 1993, we completed an approved modification to No. 12 CR HVAC head pressure control system (the modification is not currently installed on No. 11 CR HVAC train). The modification, in part, increased the size of the hot gas bypass line and its condenser bypass regulating valve, providing higher hot gas flow during low ambient temperature operations. During the restoration of the train, utility refrigeration mechanics recharged the original inventoried amount of refrigerant, approximately 700 pounds, back into the system. The maximum total refrigerant inventory is limited by design to 80 percent receiver capacity (approximately 800 pounds of refrigerant). The train was then started and run continuously for a period of 12 hours as required by established plant procedures. The train passed its post modification test and was declared

operable. Outside temperature during the post-modification testing did not fall below 25 degrees Fahrenheit.

At approximately 5:00 a.m., on February 2, 1993, a licensed Control Room Operator (CRO) stopped No. 11 and started No. 12 CR HVAC. At 5:25 a.m. No. 11 CR HVAC was removed from service for scheduled inspections and preventative maintenance.

While attempting to tag out No. 11 compressor, plant Safety Tagging personnel had difficultly racking out its supply breaker (No. 52-1108). Investigation by Electrical Maintenance personnel found metal shavings on the bottom of the breaker cabinet. The breaker was removed from its cabinet and transported to the Electrical Maintenance Shop. Troubleshooting efforts found the breaker levering (racking) mechanism was binding.

At approximately 7:30 a.m., Control Room personnel observed increasing Control Room air temperatures and proceeded to open outside air dampers to reduce temperatures. The Unit 1 Auxiliary Building Operator (ABO) was dispatched to check No. 12 CR HVAC compressor. The ABO later reported that the compressor was not running. At this point, unsure of the status of the 12 CR HVAC train, Operators contacted the responsible System Engineer.

At approximately 8:00 a.m., the System Engineer and Mechanical Maintenance personnel arrived to assist Operations personnel investigate the compressor problem. Following approximately 2 hours of troubleshooting activity and operability evaluation No. 12 CR HVAC was declared inoperable at 9:55 a.m. and, TS 3.0.3 was entered. During the course of their evaluation they determined refrigerant inventory was low noting that the receiver level gauge read low, there was indication of bubbling in the receiver level gauge, and compressor suction pressure was low. Due to the unusually cold outside air temperature (about 16 degrees Fahrenheit) they concluded the condenser was stacked with liquid refrigerant. Insufficient refrigerant inventory in the receiver induced the low suction pressure at the compressor. They concluded the compressor had tripped on low suction pressure during its attempted starting. Suction pressure was not rising to reset the low suction pressure trip.

Breaker 52-2408, which is identical to Breaker No. 52-1108, was installed in the cubicle for breaker No. 52-1108. 11 CR HVAC train was started, run, and declared OPERABLE at 10:30 a.m. and TS 3.0.3 was exited.

Corrective actions were then begun to return No. 12 CR HVAC train to an operable status and to identify the causes of each inoperability.

II. CAUSE OF EVENT

The immediate cause of No. 12 compressor becoming inoperable was insufficient refrigerant level to support a compressor start at extremely low outside temperatures. During cold outdoor temperature conditions, sufficient refrigerant inventory must be maintained in the air conditioning unit to compensate for density changes and stacking of liquid refrigerant in the condenser while maintaining adequate refrigerant inventory in the receiver. Insufficient refrigerant in the receiver can induce a low compressor suction pressure resulting in a compressor trip during starting. At the time of the event, outside air temperature was approximately 16 degrees Fahrenheit. This caused a significant amount of refrigerant to migrate to the condenser resulting in a low suction pressure at the compressor.

Factors that contributed to the insufficient refrigerant level are as follows:

A. The relationship between required refrigerant inventory and outside air temperature was not quantitatively known for the air conditioning units. We understood a relationship did exist between refrigerant inventory, outside air temperature and compressor suction pressure, but no detailed calculations existed quantifying this relationship. Due to the fact that these are customized field installed units, the vendor manual did not address their actual design parameters (i.e., inventory and design operating condition relationships)

B. The procedures for recharging an air conditioning unit did not clearly specify how to determine the amount of refrigerant required in the system.

Troubleshooting of Breaker 52-1108 revealed that the spacer bushing behind the racking (drive) bolt of the levering mechanism had been worn down. The breaker had never been rebuilt. The spacer bushing wear allowed axial movement of the threaded portion of the worm gear drive shaft which bound up with the rear bearing surface. This binding occurred when the breaker was being racked in the out direction only. The defective levering mechanism did not adversely affect the breakers ability to function when installed in its cubicle. No other levering mechanism failures with a similar failure mode have been observed in the past.

III. ANALYSIS OF EVENT

The two trains of the Control Room Emergency Ventilation System provide redundant capability for cooling and filtering of Control Room air. The system

is designed to ensure equipment operability and habitability in the Control Room during and following all credible accident conditions. Air circulation through the Control Room was never affected and environmental conditions remained within design limits during the event.

The plant is equipped with the means to achieve safe shutdown should it be required in the event of inadequate Control Room cooling. A loss of the Control Room Emergency Ventilation System requires immediate shutdown to MODE 5 (Cold Shutdown) per plant Technical Specifications. During the period when both CR HVAC trains were inoperable, in the unlikely event of a loss of coolant accident with subsequent core damage, Control Room Operators may have been required to initiate outside air ventilation to maintain Control Room temperatures below design requirements. These actions could have increased Operator dose above established limits, but the potential to achieve a safe shutdown would not have been threatened. Most scenarios would have afforded adequate time to restore a train of HVAC equipment to avoid such potential dose consequences.

This event is considered reportable in accordance with 10 CFR 50.73(a)(2)(i)(B), "Any operation or condition prohibited by the plant's Technical Specifications." The total duration of the event was 35 minutes.

IV. CORRECTIVE ACTIONS

Immediate

A. No. 12 CR HVAC compressor breaker was installed and tested in the cubicle for No. 11 CR HVAC compressor breaker. No. 11 CR air conditioner unit was verified as loading and operating satisfactorily and 11 CR HVAC was declared OPERABLE at 10:30 a.m. on February 2.

B. The levering mechanism was replaced in breaker No. 52-1108 and the breaker was operationally tested to ensure no mechanism binding. Electrical resistance checks were performed satisfactorily. Electrical Maintenance personnel coordinated with Operations personnel and breaker No. 52-1108 was racked smoothly into the breaker cubicle 52-2408 for No. 12 CR HVAC compressor on February 2 at approximately 7:30 p.m.

C. A detailed troubleshooting procedure was initiated for No. 12 CR HVAC. The system was charged with 100 pounds of additional refrigerant. At 8:45 p.m. on February 2, 1993, No. 12 CR HVAC train was started and successfully operated during a 1 hour test. The train was then shutdown and allowed to cooldown in preparation for a planned cold start

surveillance test. The surveillance test was commenced at 1:48 a.m. on February 3 and concluded at 2:45 p.m. that same day. No. 12 CR HVAC was declared OPERABLE at 2:45 p.m on February 3.

Actions to Prevent Recurrence:

A. Design Engineering is performing a detailed review of the relationship between required refrigerant inventory and outside air temperature. This relationship is needed to define guidelines between recommended refrigerant inventory and outside air temperature for our CR HVAC system. This information will be utilized in subsequent maintenance activities to ensure the system meets full system design requirements.

B. Procedures for maintenance of the CR HVAC systems will be revised to ensure they specify an appropriate weight of refrigerant.

C. Based upon the guidelines from Design Engineering, we will evaluate methods to ensure that adequate refrigerant inventory is maintained for CR HVAC system operation.

D. Operating practices are being modified to additionally record, at appropriate intervals, the receiver liquid level of the standby CR HVAC train.

V. ADDITIONAL INFORMATION

A. Table of Components and Systems Receiving Mention in this LER.

Component or System	IEEE 803A/83 Funct. Ident.	IEEE 805/84 System Code
CR HVAC	ACU	VI
Compressor	CMP	
Receiver	RCV	
Condenser	COND	
Breaker	BKR	
Evaporator	EVP	

B. Previous Similar Events.

There has been one previous similar event involving an entry into TS 3.0.3 caused by a loss of CR HVAC (LER 318/91-006). This event occurred because procedural guidance was not sufficient to prevent non-condensible gasses from being introduced into the system. This resulted in a reduced air conditioning efficiency that interfered with the systems ability to reject heat during hot days.

CONTROL ROOM HVAC TRAIN

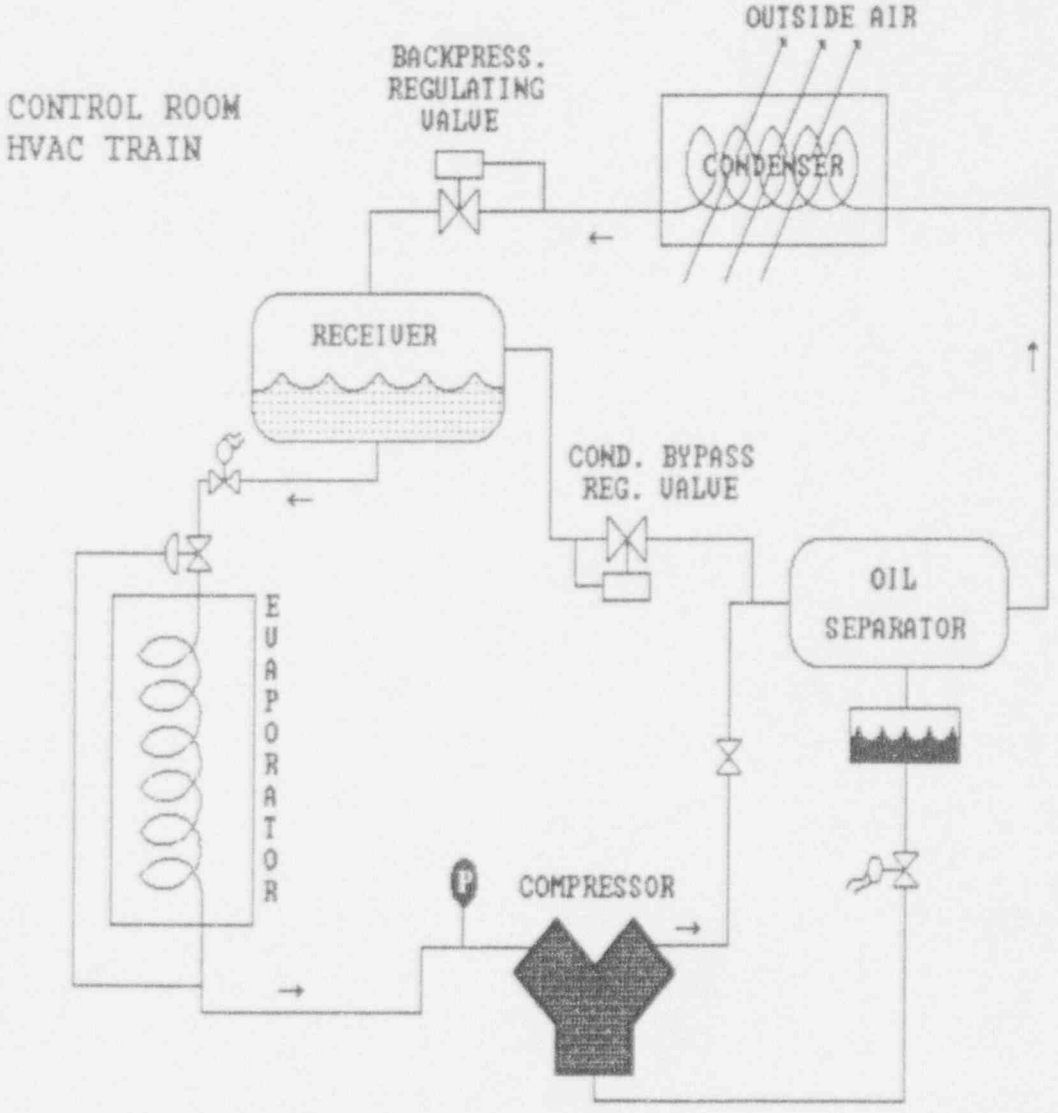

FIGURE 1