NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
McGuire Nuclear Station, Unit 1	0 5 0 0 0 3 6 9	1 OF 0 4

TITLE (4)
Control Area Ventilation Trains A and B Inoperable

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 6	0 4	8 4	8 4	0 1 8	0 1	0 3	2 2	8 5	McGuire Unit 2	0 5 0 0 0 3 7 0
										0 5 0 0 0

OPERATING MODE (9): 1

POWER LEVEL (10): 1 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

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)
P. B. Nardoci, Licensing	7 0 4 3 7 3 - 7 4 3 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 June 4, 1984 at ∿ 2000, the train B chiller of the control area ventilation (VC) system tripped due to low oil level and was declared inoperable (2105). Train A of VC had been previously declared inoperable because of maintenance work. The inoperability of both trains of VC, while a unit is on-line, is prohibited by Technical Specification 3.7.6. Accordingly, at 2205 the control operators started to reduce power on units one and two as required by Technical Specification 3.0.3. Units 1 and 2 were in Mode 1 at 100% power at the time of this event.

At approximately 2230, five gallons of oil were added to the chiller and the chiller restarted. With VC Train B then operable, the control operators stopped reducing power with each Unit having reached 97% power. Train B of VC was declared operable at 2255. The Units were returned to 100% power at 2312.

This event is attributed to Unusual Service Conditions, due to the cooling load of the control room area being insufficient to fully load the train B chiller. Duke Power is continuing its review of this problem to determine any further corrective actions.

In addition, the failures of printed circuit cards in the Process Control System (PCS) cabinets, which have occurred in this and other events involving overheating in the PCS cabinets, have been examined. Use of heat sinks and improved cooling in the PCS cabinets is expected to alleviate the problems.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

On June 4, 1984 at ∿ 2000, the train B chiller [EIIS:HX] of the control area ventilation (VC) system [EIIS:VI] tripped due to low oil level and, after two attempts to restart it, and one attempt to provide VC cooling using the train "A" VC chiller and train "B" air handling unit, was declared inoperable (2105). Train A of VC had been previously declared inoperable for maintenance work on air handling Unit #1. The inoperability of both trains of VC, while a unit is on-line, is prohibited by Technical Specification 3.7.6. Accordingly, at 2205 the control operators started to reduce power on units one and two as required by Technical Specification 3.0.3. Units 1 and 2 were in Mode 1 at 100% power at the time of this event.

At approximately 2230, five gallons of oil were added to the chiller and the chiller restarted. With VC train B then operable, the control operators stopped reducing power with each Unit having reached 97% power. Train B of VC was declared operable at 2255. The Units were returned to 100% power at 2312.

This event is attributed to Unusual Service Conditions, due to the cooling load of the control room area being insufficient to fully load the train B chiller.

After the VC train B chiller tripped low oil level, five gallons of oil was added to the reservoir. The train B chiller was restarted and observed to be operating satisfactorily before being declared operable. This was not the first time oil has been needed to be added to the chillers. This occurred more frequently during the initial startup of the VC system and when the chillers were operated in series. When the chillers were no longer operated in series and as more heat loads developed in the plant, the frequency of these trips on low oil level decreased. (Ref. Previous LER RO-369/82-72 for similar events).

When the chiller package is in operation, it is normal for a portion of the oil to mix with the refrigerant and travel through the refrigerant cycle. The oil, which accumulates in the evaporator, is returned to the oil reservoir by the velocity of the refrigerant. Therefore, when the chiller is not fully loaded, the refrigerant is traveling at a slower velocity resulting in some of the oil not being returned to the reservoir. When enough oil is trapped in the evaporator, the oil level (as indicated by the sight glasses on the chiller) drops to a point where either more oil is added or the chiller trips. After the oil has been added, the chiller is restarted and loaded. The oil in the evaporator is returned to the reservoir where there is now an excess. The excess oil must be removed or the chiller will eventually trip on high bearing temperatures resulting from the compressor's transmission operating in and overheating the oil when the reservoir is overfilled. In this instance three gallons of oil were removed several hours after the oil had been added and the chiller restarted. (All of the added oil is eventually removed over a long period of time.)

The main reason for the problem with the VC chillers is that they are not fully loaded. The chillers are only loaded to about 80% of capacity, whereas, they were designed to be operated at 100% capacity. The head load calculated during plant design was too large compared to the actual heat load; therefore, the chillers were oversized. The problem of adding oil to the chillers and then removing some occurs three to four times a year. Everytime the heat load is reduced, the possibility of a chiller trip is increased.

Duke Power Company is continuing its review of this problem to determine further corrective actions. The chilled water system will be reviewed to determine the feasibility of using components from both trains to make one train for cooling. If the review finds that this is feasible, the "Control Area Ventilation/Chilled Water System" procedure will be revised accordingly.

The VC system has a dual purpose. Air temperature is maintained below a maximum point in the areas the VC serves, and it maintains control room air quality, with filters [EIIS:FLT], in the event of an accident. In this incident, the air quality was not affected because the filters were still operable. The trip of train B chiller while the other train was down for repair caused a loss of all cooling for the control room area, resulting in an increase of temperatures in the control room. This could have eventually resulted in electronic equipment failure and/or reactor trip. The health and safety of the public was unaffected by this incident.

Circuit Card Failures

Problem Description:

Numerous card failures have been experienced at McGuire. Twelve LERs have been submitted (369/81-125, 81-172, 82-18, 83-57, 83-90, 83-104, 83-108, 84-02, 84-18, 370/83-60, 84-09, 84-31) which involved reactor trips or spurious instrument indications caused by failures of printed circuit cards. The failures appear to be directly attributable to overheating in the Process Control System (PCS) cabinets. In some cases, the spurious indication(s) disappeared when adequate ventilation was restored to the cabinets. Generally however, failures of the Control Ventilation (VC) system resulted in erratic signals for over a month after ventilation is restored. This extended period of erratic behavior is apparently a result of the degradation of some cards which do not fail immediately, but upon which the overheating has had a significant deleterious effect, causing a shortened life expectancy.

In this incident, after the chiller tripped, the temperature in the Control Room started to rise. Technical Specification Surveillance Requirement 4.7.6 states the Control Room temperature cannot exceed 120°F. The manufacturer recommends that the cards not be operated outside a temperature range of 75°F ± 10°F any longer than is absolutely necessary. As temperature increased, the Control Room received numerous alarms on Unit 1 indicating HI NC LOOP C T_{ave} because of a erroneous signal from the NC LOOP C T_{cold} card. To prevent further alarms, the differential temperature (ΔT) and Tave circuits were bypassed. An interview with the Nuclear Control Operators revealed that alarms were also received for pressurizer level on Unit 1. There were a few other alarms received on both units, but the Nuclear Control Operators could not remember the details eight months after the event. A review of the alarm typers and utility typers revealed no unusual alarms except the HI NC LOOP C T_{ave} alarm on Unit 1. Since not all alarms received in the Control Room print on the typers, this information had to be obtained from the operators memory.

Corrective Actions:

In June 1984, after this incident, maintenance personnel rebalanced the airflow in the control area ventilation system to provide additional cooling to the PCS 7300 cabinets. In the five months prior to this rebalancing, thirty-five (35) card failures occurred. In the five months after the rebalancing, thirteen (13) card failures occurred. These facts indicate that additional cooling of the cards has improved their reliability.

On the night of the incident, several measures were taken to cool the PCS 7300 cabinets. First, the cabinet doors were opened to provide cooling. Second, the computer room and Control Room doors were opened and fans with duct were used to blow cool air from the computer room to the PCS 7300 area of the Control Room. Both of these helped. The maximum temperatures, as remembered by the operators, reached in the PCS 7300 area was 90°F and in the control board area was 86°F.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Modifications are planned which will provide heat sinks on the PCS cards. The modifications will be implemented by September, 1985 for Unit 1 and June, 1985 for Unit 2. In addition, personnel reviewed the chilled water system to determine the feasibility of using components from both trains to make one train for cooling. A procedure change was implemented on OP/0/A/6450/11, Control Area Ventilation/Chilled Water System to include this capability.

Safety Analysis:

The VC system has a dual purpose. Air temperature is maintained below a maximum point in the areas VC serves, and it maintains control room air quality, with filters, in the event of an accident. In this incident, the air quality was not affected because the filters were still operable. The trip of train B VC chiller while the other train was down for repair caused a loss of all cooling for the Control Room area, resulting in an increase of temperature. This temperature rise resulted in erroneous signals being generated. Had the temperature continued to rise, there could have been electronic equipment failure and/or reactor trip. The high Control Room temperature may have contributed to PCS 7300 card failures in the following months after the incident. There is no evidence that any safety systems were degraded as a result of this event. The health and safety of the public were not affected by this incident.

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March 22, 1985

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: McGuire Nuclear Station
Docket Number 50-369
Licensee Event Report 369/84-18; Revision 1

Gentlemen:

On July 5, 1984, Duke Power Company submitted Licensee Event Report (LER) 369/84-18, concerning the inoperability of both trains of the Control Room Ventilation System. A consequence of this event was a series of spurious alarms, which resulted from overheated circuit cards in the Process Control System (PCS). This phenomenon has been observed in other events which involved overheating of the PCS cabinets. Attached is Revision 1 to LER 369/84-18. This revision contains a discussion of card failures in the PCS, including the consequences and corrective actions which have been implemented or are planned to address the problem.

Very truly yours,

H. B. Tucker /SAG

Hal B. Tucker

SAG:scs

Attachment

cc: Dr. J. Nelson Grace, Regional Administrator
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