Richard L. Anderson
Vice President – Nuclear Operations

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August 11, 2003

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop OP1-17
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 50-387/2003-004-00
LICENSE NO. NPF-14
PLA-5654 **Docket No. 50-387**

Attached is Licensee Event Report (LER) 50-387/2003-004-00. This event was determined to be reportable per 10 CFR 50.73(a)(2)(v)(D), for a condition that could have prevented the fulfillment of a safety function. This event is also reportable per 10 CFR 50.73(a)(2)(i)(B) for a condition prohibited by Technical Specifications (TS).

On June 11, 2003 at 1217 hours, the 'A' Control Structure (CS) Chiller tripped while the redundant 'B' train was inoperable for planned maintenance. With both trains of the CS Heating, Ventilation and Air Conditioning (HVAC) system inoperable, Unit 1 and Unit 2 entered TS 3.0.3 and a controlled shutdown of the units was commenced at 1315 hours. At 1320 hours on June 11, 2003, the 'B' train of CS HVAC system was declared operable and the shutdown was aborted. In accordance with 10 CFR 50.72(b)(2)(i), a four-hour ENS notification (EN# 39919) was made to the NRC at 1407 hours on June 11, 2003 for the initiation of a TS required plant shutdown.

This event resulted in no actual adverse consequences to the health and safety of the public. No commitments are associated with this LER.

Richard L. Anderson
Vice President – Nuclear Operations

Attachment

IE22

cc: Mr. H. J. Miller
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Mr. S. L. Hansell
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Mr. R. Osborne
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P. O. Box 8469
Harrisburg, PA 17105-8469

NRC FORM 366 (7-2001)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

LICENSEE EVENT REPORT (LER)

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

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Susquehanna Steam Electric Station - Unit 1	05000387	1 OF 5

4. TITLE

Loss of Control Structure Chiller Safety Function due to Spurious Chiller Trip

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									Susq. SES - Unit 2	05000388
06	11	2003	2003	– 004 –	00	08	11	2003	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE	1
10. POWER LEVEL	100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

	20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)
	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 Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)		
	20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)	X	50.73(a)(2)(v)(D)		
	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)		

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Brenda W. O'Rourke - Nuclear Regulatory Affairs	(570) 542-1791

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED				15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

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

On June 11, 2003 at 1217 hours, the 'A' Control Structure (CS) chiller tripped while the 'B' CS chiller was inoperable for planned maintenance. With the 'A' and 'B' CS chillers inoperable, both trains of the Control Room Emergency Outside Air Supply (CREOAS) system and the Control Room Floor Cooling system were inoperable. In addition, the emergency source of cooling water to the Unit 1 Emergency Switchgear Room Coolers was inoperable. With two trains of the CREOAS system and Control Room Floor Cooling inoperable, Unit 1 and Unit 2 entered Technical Specification (TS) 3.0.3 and a controlled shutdown of the units was commenced. A four-hour ENS notification was made to the NRC at 1407 hours on June 11, 2003 in accordance with 10 CFR 50.72(b)(2)(i) due to the initiation of a TS-required plant shutdown. This LER is being submitted in accordance with 10 CFR 50.73(a)(2)(v)(D), for a condition that could have prevented the fulfillment of a safety function and 10CFR 50.73(a)(2)(i)(B).

The most probable cause for the CS chiller trip was due to a loose connection identified at Point 40 within the "High Bearing or High Motor Temperature" circuit. Another potential cause was a momentary loss of the "High Bearing or High Motor Temperature" circuit due to an unknown electrical transient. Thermography will be performed to check the Reactor Building (RB) and Turbine Building (TB) chillers for loose electrical connections. To prevent the station chillers from tripping due to operational perturbations, a modification will be performed to install a short time delay within the trip relays for the "High Bearing or High Motor Temperature" circuit for the CS chillers. Similar modifications to the RB and TB chillers are also being investigated. The safety significance of this event was minimal and did not impact the health and safety of the public.

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

CONDITIONS PRIOR TO EVENT

Unit 1, Mode 1, 100 percent Rated Thermal Power
Unit 2, Mode 1, 100 percent Rated Thermal Power

EVENT DESCRIPTION

On June 11, 2003, Control Structure (CS) Heating, Ventilation and Air Conditioning (HVAC) fan 0V103B (EIIS: FAN) and Computer Room Floor Cooling fan 0V115B were removed from service for scheduled maintenance. Clearances were applied and the breakers to each respective fan were opened. Due to the interlocks and permissives within the control logic of the CS HVAC system, these actions rendered the 'B' train of the CS HVAC system inoperable (including CS chiller 0K112B) (EIIS: KM). With both fans out of service, the Limiting Condition for Operation (LCO) for Technical Specification (TS) 3.7.3 was entered due to one train of the Control Room Emergency Outside Air Supply (CREOAS) system (EIIS: VI) being inoperable. In addition, the LCO for TS 3.7.4 was entered due to one train of the Control Room Floor Cooling system being inoperable.

At approximately 1217 hours on June 11, 2003, the 'A' CS chiller 0K112A tripped. Local alarm indication at CS chiller 0K112A indicated the chiller tripped on "High Bearing or High Motor Temperature." However, a review of the as-found chiller parameters did not indicate that an actual trip of the "High Bearing or High Motor Temperature" circuit had occurred. The 'A' CS chiller was successfully restarted at approximately 1247 hours but was not declared operable since the cause of the trip had not been determined. With the 'A' and 'B' CS chillers inoperable, both trains of the CREOAS and Control Room Floor Cooling systems were made inoperable. As such, with both trains of the CREOAS system (TS 3.7.3) and the Control Room Floor Cooling system (TS 3.7.4) inoperable, Unit 1 and Unit 2 entered TS 3.0.3 and a controlled shutdown of both units was commenced at 1315 hours. At 1320 hours on June 11, 2003, the 'B' train of CS HVAC system was declared operable and the shutdown was aborted. A four-hour ENS notification (#39919) was made to the NRC at 1407 hours on June 11, 2003 in accordance with 10 CFR 50.72(b)(2)(i) due the initiation of a TS-required plant shutdown.

In accordance with 10 CFR 50.73(a)(2)(v)(D), this LER is being submitted for a condition that could have prevented the fulfillment of a safety function. This event is also reportable in accordance with 10 CFR 50.73(a)(2)(i)(B) for the initiation of a TS-required plant shutdown.

CAUSE OF EVENT

The most probable cause for the CS chiller trip was due to a loose connection identified at Point 40 within the "High Bearing or High Motor Temperature" circuit. A loose connection can create a high resistance termination and subsequent voltage drop across the electrical connection. If the voltage drop becomes significant enough, the downstream voltage may be insufficient to hold-in the downstream relay coils. If the downstream relay coils de-energize, the chiller will trip.

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

CAUSE OF EVENT (continued)

Another potential cause for the spurious trip of CS Chiller 0K112A on "High Bearing or High Motor Temperature" was a momentary loss of the "High Bearing or High Motor Temperature" circuit due to an unknown electrical transient. The "High Bearing or High Motor Temperature" trip is monitored and initiated by the two solid state control modules. One control module initiates the "High Bearing Temperature" trip. The other control module initiates the "High Motor Temperature" trip. These solid state control modules are energized with a 24 VAC non-regulated power supply. Electrical transients (i.e. voltage spikes and dips) within a non-regulated power supply can cause operational perturbations within solid state components. Thus, it is possible that an unknown electrical transient caused an operational perturbation of one of the control modules initiating the "High Bearing or High Motor Temperature" trip.

ANALYSIS / SAFETY SIGNIFICANCE

The CS HVAC system provides ventilation and cooling for such areas as the control room, battery rooms, cable spreading rooms and relay rooms.

The CREOAS system is designed to provide a radiologically controlled environment from which each Unit can be safely operated following a Design Basis Accident (DBA). The CREOAS system is designed to maintain the control room environment for a 30-day continuous occupancy after a DBA without exceeding 5 REM whole body dose or its equivalent to any part of the body. To achieve this, one train of the CREOAS system must be available and capable of pressurizing the habitability envelope to greater than or equal to 0.125" WC to prevent the infiltration of air from surrounding buildings. The CS HVAC fans (0V103A/B, 0V115A/B, and 0V117A/B) are part of the CREOAS system and are required to ensure a positive pressure of 0.125" WC within the habitability envelope.

The Control Room Floor Cooling system provides temperature control for the control room. The system is designed to provide a controlled environment for maintaining equipment operability for a 30-day continuous occupancy under both normal and accident conditions. Additionally, during accident conditions, the CS Chilled Water system provides the emergency source of cooling to the Unit 1 Emergency Switchgear Room Cooling (ESRC) system (EIIS: VA).

During this event, with CS chillers 0K112A and 0K112B tripped, both trains of the Control Room Floor Cooling and CREOAS systems were rendered inoperable resulting in the loss of their automatic function during a DBA. In addition, with both CS chillers tripped, the emergency source of cooling water to the Unit 1 Emergency Switchgear Room Coolers would not have been available during a DBA.

In accordance with plant design, when CS chiller 0K112A tripped, the 'A' CS HVAC fans also shut down. However, the 'A' CS HVAC fans could have been restored by manually placing their respective handswitches in the START position. Although the automatic design function of both CS HVAC fans was lost, the 'A' CS HVAC fans remained functional for manual initiation. Hence, one division of the CREOAS system remained available at all times during this event.

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ANALYSIS / SAFETY SIGNIFICANCE (continued)

Since train 'A' of the CS HVAC system was restored within 30 minutes, equipment operating temperatures in the CS and the Unit 1 Emergency Switchgear (EIIS: ED) room were not exceeded or challenged. During a loss of CS HVAC, procedure ON-030-001, "Loss of Control Structure HVAC," includes mitigating actions to be taken during such an event. These mitigating actions account for increases in room temperature and for hydrogen build-up. The most limiting action described in procedure ON-030-001 must be performed within three hours following the loss of CS HVAC to avoid any adverse impact to the CS environment. As such, any increase in room temperature or hydrogen concentration was minimal during the time that the CS HVAC system was inoperable. Therefore, this event was bounded by procedure ON-030-001.

Cooling to the Unit 1 ESRC system was maintained throughout this event via the normal source of cooling water (i.e., the Reactor Building (RB) Chilled Water system). Thus, Unit 1 Switchgear Room temperatures were not exceeded or challenged. During a DBA, cooling to the Unit 1 ESRC system would have been lost since the CS Chilled Water system is its emergency source of cooling. However, an engineering calculation has demonstrated that a safe shutdown could be achieved without CS Chilled Water being supplied to the ESRC system for up to 72 hours.

The actual consequences of this event would not have been more severe at different operational modes. Based upon the discussion above, the safety significance of this event was minimal. In addition, there was no impact to the health and safety of the public.

CORRECTIVE ACTIONS

The corrective actions that have been completed are:

- The "High Bearing Temperature" and "High Motor Temperature" components within CS chiller 0K112A were tested. All components tested satisfactorily.
- All accessible terminations within the "High Bearing or High Motor Temperature" circuit of CS chiller 0K112A were checked for tightness. The as-left conditions of all electrical connections were tight and secure.
- Thermography was used to check CS chillers 0K112A and 0K112B for loose electrical connections. No loose connections were identified.

The key corrective actions to be completed are:

- Thermography will be performed to check the RB and Turbine Building (TB) chillers for loose electrical connections.

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

CORRECTIVE ACTIONS (continued)

- To prevent the station chillers from tripping due to operational perturbations of their control modules, a modification will be performed to install a short time delay within the trip relays for the "High Bearing or High Motor Temperature" circuit for the CS chillers. The time delay is sufficient to "ride out" an operational transient without tripping the chiller yet will provide adequate equipment protection. Similar modifications to the RB and TB chillers are also being investigated.

PREVIOUS SIMILAR EVENTS

CR 409481: On June 24, 2002, Unit 2 TB chiller 1K102B tripped on "High Bearing Temperature" and the standby TB chiller 1K102A automatically started. However, based on actual recorded temperatures for the chiller 1K102B, the trip was determined not to be valid, since temperatures were within allowable values. Investigation results concluded that the most likely cause of the chiller trip was due to an electrical transient within the "High Bearing Temperature" instrumentation circuit.