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NOV 20 2012

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop OP1-17
Washington, DC 20555-0001

**SUSQUEHANNA STEAM ELECTRIC STATION**
**LICENSEE EVENT REPORT 50-388/2012-001-01**
**UNIT 2 LICENSE NO. NPF-22**
**PLA-6933** **Docket No 50-388**

*Reference: (1) Letter from PPL (J. M. Helsel) to NRC Document Control Desk, "Susquehanna Steam Electric Station Licensee Event Report 50-388/2012-001-00" dated July 9, 2012 (ML12192A205).*

Attached is supplemental Licensee Event Report (LER) 50-388/2012-001-01 submitted to provide additional information associated with the Susquehanna Unit 2 event described in Reference 1. This event was determined to be reportable in accordance with 10 CFR 50.73(a)(2)(v)(D).

There were no actual consequences to the health and safety of the public as a result of this event.

No new regulatory commitments are associated with this LER.

J. M. Helsel

Attachment: LER 50-388/2012-001-01

Copy: NRC Region I
Mr. P. W. Finney, NRC Sr. Resident Inspector
Mr. J. A. Whited, NRC Project Manager
Mr. L. J. Winker, PA DEP/BRP

10-2010) **U.S. NUCLEAR REGULATORY COMMISSION**

APPROVED BY OMB: NO. 3150-0104 EXPIRES:10/31/2013

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resources@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

# LICENSEE EVENT REPORT (LER)

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

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**4. TITLE**

## Two Control Room Floor Cooling Systems Inoperable

| 5. EVENT DATE | | | 6. LER NUMBER | | | 7. REPORT DATE | | | 8. OTHER FACILITIES INVOLVED | |
|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REV NO. | MONTH | DAY | YEAR | FACILITY NAME | DOCKET NUMBER 05000 |
| 05 | 11 | 2012 | 2012 | - 001 | - 01 | 11 | 20 | 2012 | FACILITY NAME | DOCKET NUMBER 05000 |

**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)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☐ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☐ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☒ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

**12. LICENSEE CONTACT FOR THIS LER**

| FACILITY NAME | TELEPHONE NUMER *(Include Area Code)* |
|---|---|
| C. E. Manges, Jr., Senior Engineer - Nuclear Regulatory Affairs | (570) 542-3089 |

**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 |
|---|---|---|---|---|---|---|---|---|---|
| X | VI | DMP | I204 | N | | | | | |

**14. SUPPLEMENTAL REPORT EXPECTED**

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

**15. EXPECTED SUBMISSION DATE**

| MONTH | DAY | YEAR |
|---|---|---|
| | | |


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

On 5/11/12 at 1603 hours, while operating at 100% power, Unit 2 entered LCO 3.0.3 due to two control room floor cooling systems being inoperable. 0V117A Control Room Floor Cooling Unit fan's discharge damper failed earlier during the same day at 0523 hours, rendering the associated 0V117A fan inoperable. The redundant 'B' train fans and associated Control Structure Chiller automatically started as a result of a fan low flow interlock. The control switch for the 'A' train logic was left in 'Start' and the control switch for the 'B' train logic was left in 'Auto' as directed by the alarm response procedure. During application of a clearance order for repair of the failed 0V117A fan damper, the 'A' control room cooling fan switch was placed in 'Stop' position. This resulted in an automatic start of the 'A' Control Structure Chiller and all the associated 'A' fans except for the control room cooling fan, and a shutdown of the 'B' train fans and chiller. This condition caused the loss of both control room cooling fans and LCO 3.7.3, "Control Room Emergency Outside Air Supply (CREOAS) System," Condition E; LCO 3.7.4, "Control Room Floor Cooling System," Condition D; LCO 3.0.3; TRO 3.7.9, "Control Structure HVAC," and TRO 3.8.6, "Emergency Switchgear Room Cooling," were entered at 1603 hours. The control room operators immediately recognized the loss of cooling and took manual action to restart the 'B' train. LCO 3.0.3 was exited at 1618 hours without a reactor power reduction. This event is reportable as a loss of entire safety function under 10CFR50.73(a)(2)(v)(D).

The causes of the event included a control switch design deficiency and less than adequate clearance order preparation, review and application authorization. Immediate corrective actions were taken to modify alarm response procedures. Key corrective actions that are planned include replacing control switches to correct the design deficiency and revising the Susquehanna clearance order procedure to provide better guidance for developing clearance orders for equipment that is in an atypical configuration due to system transient.

Susquehanna Unit 1 was in Mode 5 at the time of the event and therefore was unaffected because the associated Unit 1 Technical Specifications were not applicable.

There were no adverse consequences to the health and safety of the public as a result of this event.

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NARRATIVE

CONDITION PRIOR TO THE EVENT

Unit 2 – Mode 1, 100 percent Rated Thermal Power

The 0V117A Control Room Floor Cooling Unit fan's discharge damper (HD-07831A) was inoperable at the start of the event and contributed to the event.

EVENT DESCRIPTION

Timeline

A chronological timeline or sequence of events leading up to and immediately following the event follows:

The Control Structure (CS) Heating, Ventilation, and Air Conditioning (HVAC) system [EIIS Code: VI] was operating in a normal line-up configuration prior to 0523 hours on 05/11/2012. The 'A' chiller and train were in service and the 'B' train was in standby, or in 'AUTO' mode. Both train fans were in 'AUTO' and slaved to the associated running chiller's operating status.

On 05/11/2012 at 0523 hours, Control Room personnel noted a change in Control Room HVAC background noise and found the 0V117A Control Room Floor Cooling Unit fan's discharge damper (HD-07831A) closed. Subsequently the 'A' CS HVAC system shutdown on loss of 0V117A fan and 0K112A CS chiller shutdown. The "Control Room Cooling Fan Failed" alarm lit up on the control panel in the Control Room. Control Room personnel utilized Alarm Response Procedure AR-029-001 and entered Off Normal Procedure ON-030-001 "Loss of Control Structure Chilled Water." The 0K112B CS chiller automatically started on the 0K112A CS chiller shutdown and the Division 2 CS HVAC was in service.

Limiting Condition for Operation (LCO) 3.7.3, LCO 3.7.4, Technical requirement for Operation (TRO) 3.7.9, and TRO 3.8.6 were entered for 'A' Control Room Cooling being inoperable due to failed fan discharge damper HD-07831A. A Condition Report was generated to document the issue and request repair support.

On 05/11/2012 at 1603 hours, during application of the clearance order for the damper repair work, the fan hand switch, HS-07831A, was placed in "STOP" to secure power to Fan 0V117A. With the hand switch in the 'STOP' position, the "Control Room Cooling Fan Failed" alarm cleared, and subsequently, the 0K112A CS chiller started as well as Fans 0V103A and 0V115A in the train. With 'A' train back in service as the lead system, the 'B' system shutdown returning itself to standby status. The ventilation to the Control Room from the 'A' train was not in service and the 'B' was shutdown; therefore, there was no air flow to the Control Room creating a condition that resulted in entry into ON-030-001. This condition caused a loss of both Control Room Fans 0V117A and 0V117B and LCO 3.0.3 was entered.

On 05/11/2012 at 1612 hours, Operations took action to start 0K112B CS chiller in accordance with the operating procedures to restore Control Room Cooling.

On 05/11/2012 at 1615 hours, Operations placed the 0K112A CS chiller in standby.

At 1618 hours, LCO 3.0.3 was exited.

On 05/11/2012 at 2127 hours, an ENS notification (47919) was made to the NRC in accordance with 10 CFR 50.72(b)(3)(v) & (vi) for an event that could have prevented the fulfillment of a safety function. As such, this event is being submitted in accordance with 10CFR50.73(a)(2)(v)(D) as a loss of entire safety function.

Background Information

The Chiller Circulation Pump, 0P162A(B), is the "nerve center" for the CS chiller and CS Ventilation Fan logic. The chiller and fans start from permissives initiated by the Chiller Circulation Pump logic. When CS chiller 0K112A trips, a low flow signal in the "A" loop causes Circulation Pump 0P162B to auto-start with its associated control hand switch in 'AUTO.' When Circulation Pump 0P162B starts, Chiller 0K112B and all associated train fans start.

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## CAUSE OF THE EVENT

A root cause analysis was completed that identified the following root causes:

Root Cause #1: Chiller Circulation Pump Control Switch Design Deficiency

The Chiller Circulation Pump Control Switch (HS08622A/B) is a "break before make" (B-B-M) switch that requires installing a jumper to change positions. This deficiency prevented operators from taking action to place the 'B' chiller in the lead after the 'A' chiller tripped and is also considered an Operator Work-around. When changing the position of the B-B-M switch, the circuit is momentarily interrupted and can cause the system to trip. If this switch had not been a B-B-M switch, the Alarm Response procedure would not have contained a warning against changing position, and the standard operating practice would have been to switch the running chiller to the lead (START). If this switching had been done, application of the Clearance Order and switching fan 0V117A to STOP would not have affected the running ("B") chiller, and the event would not have occurred.

Root Cause 2: Clearance Order Preparation, Review and Application Authorization was Less Than Adequate for this Emergent Condition:

The Clearance Order prepared for working on the 'A' Chiller fan 0V117A (Control Room Floor Cooling A Fan) discharge damper (HD-07831A) did not adequately address impacts and effects on the system, which resulted in an unexpected system response during Clearance Order application. Specifically, the Clearance Order did not consider the impacts of leaving the 'A' Chiller Circulation Pump switch in START and moving the fan switch to STOP.

## ANALYSIS/SAFETY SIGNIFICANCE

Actual Consequences:

There are no actual safety consequences as a result of this event due to its short duration.

Although the Control Room and other vital CS areas were without ventilation for less than 15 minutes, there were no appreciable changes in CS temperature. CS temperatures remained well below FSAR Sections 6.4 and 9.4.1 design limits. Restoration of the system was timely such that a habitable environment was maintained within the specified limits and the operability of equipment was not jeopardized.

Potential Consequences:

The CS ventilation systems maintain a habitable environment for personnel. These systems also assure that CS temperatures will not exceed equipment operability limits. The loss of both CS chilled water systems may prevent the CS ventilation systems from performing these functions. Consequently, Tech Specs requires entry into LCO 3.0.3 for the loss of both CS chilled water systems.

The Control Room Operators would have been challenged with a Unit 2 shutdown in addition to the work and testing associated with the Unit 1 Refueling Outage that was underway at the time. Through Control Room knowledge and training, Operations identified the issue and responded to restore CS ventilation in a timely manner. No reactivity management challenges were encountered.

# LICENSEE EVENT REPORT (LER)
# CONTINUATION SHEET

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## CORRECTIVE ACTIONS

An immediate corrective action was to revise alarm response procedures to include direction to place the running control structure chiller to a "start" configuration when it is decided to maintain that configuration.

Other key corrective actions include the following:

1. The Susquehanna clearance order procedure will be revised to provide better guidance for developing clearance orders for equipment that is in an atypical configuration due to system transient.
2. Chiller Circulation Pump control switches will be replaced with switches with a 'constant contact' design.

## PREVIOUS SIMILAR EVENTS

The following LER's were recently submitted related to Control Structure Cooling issues:

- LER 387/2012-01-00, "Both Control Structure Chillers Inoperable" identified a condition that could have prevented the fulfillment of a safety function associated with the CS Chillers.
- LER 387/2012-002-00, "B Control Structure Chiller Inoperable Concurrent with "A" Emergency Diesel Generator Out of Service" identified a condition that could have prevented the fulfillment of a safety function associated with the CS Chillers.