

# ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9406290027 DOC. DATE: 94/06/24 NOTARIZED: NO DOCKET #  
 FACIL: 50-388 Susquehanna Steam Electric Station, Unit 2, Pennsylv 05000388  
 AUTH. NAME AUTHOR AFFILIATION  
 METER, J. J. Pennsylvania Power & Light Co.  
 STANLEY, H. G. Pennsylvania Power & Light Co.  
 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 94-008-00: on 940525, unit 2 in Condition 5 at 0% power, emergency switchgear room cooling subsystems were declared inoperable. Caused by inadequate wiring. Subsystems of DX Unit control were tested. W/940624 ltr.

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# Pennsylvania Power & Light Company

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June 24, 1994

U.S. Nuclear Regulatory Commission  
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SUSQUEHANNA STEAM ELECTRIC STATION  
LICENSEE EVENT REPORT 94-008-00  
FILE R41-2  
PLAS - 605

Docket No. 50-388  
License No. NPF-22

Attached is Licensee Event Report 94-008-00. This report is being made pursuant to 10CFR50.73(a)(2)(v)(D), in that Susquehanna Unit 2 had been in a condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident. An inadequacy in the automatic start function of the Emergency Switchgear Room Cooling subsystems rendered each subsystem's automatic start function inoperable however, the manual start function of each subsystem was not affected by the condition. The condition has been subsequently corrected.



H.G. Stanley  
VP - Nuclear Operations

JJM/mjm

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## LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-630), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) **Susquehanna Steam Electric Station - Unit 2** DOCKET NUMBER (2) **0 5 0 0 0 3 8 8** PAGE (3) **1 OF 0 4**

TITLE (4)

**Emergency Switchgear Room Cooling Declared 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	5	2	5	9	4	9	4	0	0	8	0	5	0	0	0		
0	5	2	5	9	4	9	4	0	0	8	0	5	0	0	0		

OPERATING MODE (9) **5**

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

20.402(b)	20.406(c)	50.73(a)(2)(iv)	73.71(b)
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
20.406(a)(1)(i)	50.38(c)(1)	50.73(a)(2)(v)	73.71(c)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.406(a)(1)(ii)	50.38(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
20.406(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
20.406(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
20.406(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(ix)	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

## LICENSEE CONTACT FOR THIS LER (12)

NAME **Joseph J. Meter - Power Production Engineer** TELEPHONE NUMBER **7 1 7 5 4 2 - 1 8 7 3**

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC
				N					

## SUPPLEMENTAL REPORT EXPECTED (14)

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

## ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On May 25, 1994, at 1100 hours with Unit 2 in Condition 5 at 0% power, both Emergency Switchgear Room Cooling subsystems were conservatively declared inoperable and was determined to be reportable per 10CFR50.73(a)(2)(v)(D). While performing a scheduled Loss Of Offsite Power surveillance test of the Unit 2 'A' 4.16 KV bus, the 'A' Emergency Switchgear Room Cooling subsystem failed to restart as required. Investigation of the condition discovered that a false "motor high temperature" signal was received by the 'A' DX Unit upon restoration of power following the simulated LOOP and that prevented the subsystem from reliability operating as designed. The condition was found to occur intermittently and was due to a "relay race" within the DX Unit control circuitry. The identical configuration was found in the 'B' DX Unit control circuitry also and both Emergency Switchgear Room Cooling subsystems were declared inoperable. This condition rarely occurs and only occurs randomly depending upon the results of the "relay race" when power is restored to the DX Unit Control Panel. The exact cause of the "relay race" is not definitively known since the logic was the original design. However, the difference in pick-up and drop-out times of the involved relays are on the order of milliseconds and any slight variation could have caused the condition. The condition did not create a significant degradation in the Station's ability to protect the health and safety of the public and/or plant personnel. A manual reset and start of the subsystems would have been possible to restore Switchgear Room Cooling. The DX Unit control circuitry was modified and successfully tested to correct the condition.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

DOCKET NUMBER (2)

LER NUMBER (6)

PAGE (3)

Unit 2

Susquehanna Steam Electric Station

0 5 0 0 0 3 8 8 9 4 - 0 0 8 - 0 0 0 2 OF 0 4

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

DESCRIPTION OF EVENT

On May 25, 1994, at 1100 hours with Unit 2 in Condition 5 at 0% power, both Emergency Switchgear Room Cooling (EIIS Code: VA) subsystems were conservatively declared inoperable. While performing a scheduled Loss Of Offsite Power surveillance test of the Unit 2 'A' 4.16 KV bus (EIIS Code: ED), the 'A' Emergency Switchgear Room Cooling subsystem failed to restart as required. The design of the system is for the operating Emergency Switchgear Room Cooling fan to trip during a Loss Of Offsite Power (LOOP) and then restart in approximately 120 seconds. The corresponding cooling system (DX Unit) should start in approximately 260 seconds and provide cooling to Emergency Switchgear rooms. Investigation of the condition by Maintenance and Engineering personnel (Utility, non-licensed) discovered that a false "motor high temperature" signal was received by the 'A' DX Unit upon restoration of power following the simulated LOOP and that prevented the 'A' Emergency Switchgear Room Cooling subsystem from operating as designed. The condition was found to rarely occur and was due to contact miscoordination ("relay race") within the DX Unit control circuitry. The identical configuration was found in the 'B' DX Unit control circuitry and both Emergency Switchgear Room Cooling subsystems were declared inoperable because of the automatic start function only. The manual start function was unaffected. Since the Emergency Switchgear provides power to safety related equipment required for post design basis accident operation, cooling to the Emergency Switchgear is also needed post design basis accident. Therefore, with both subtrains of the Emergency Switchgear Room Cooling systems inoperable, Unit 2 was in a condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident and is reportable per 10CFR50.73(a)(2)(v)(D).

CAUSE OF EVENT

Although the 10CFR50.72(a)(2)(iii) (D) report of this event stated that a wiring inadequacy was the cause, a subsequent review of electrical schematics for the DX Units revealed that a "relay race" occurred in the DX Units' control panels. Upon loss of AC power to the control panels, all relays within the panels deenergize. Once AC power is restored to the control panels via the Emergency Diesel Generators (EIIS Code: EK), the "9R" and the "13R" relays energize simultaneously. If upon reenergization, the "13R" contact opens prior to the "9R" contact closing, the DX Unit "motor high temperature" signal is prevented and the Emergency Switchgear Room Cooling subsystem will respond as designed. However, the "9R" contact closed prior to the "13R" contact opening and the respective DX Unit received a "motor high temperature" signal. The Emergency Switchgear Room Cooling Room Fan started but then tripped at 130 seconds after panel reenergization because of the DX Unit "motor high temperature signal". The DX Unit auto reset at 260 seconds clearing the "motor high temperature" signal but the DX Unit was prohibited from starting since the Room Fan was not running.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

DOCKET NUMBER (2)

LER NUMBER (6)

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Unit 2

Susquehanna Steam Electric Station

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

This condition rarely occurs depending upon the results of the "relay race" when power is restored to the DX Unit Control Panel. The exact cause of the "relay race" is not definitively known since the logic was the original design. Design parameters of the "9R" and "13R" relays is such that when measured in milliseconds the time required for a relay contact to close is approximately twice as long as that required for a relay contact to open. It is thought that factors such as relay service life, ambient temperature of the circuitry, dirty relay contacts, etc. could effect the time for the contacts to change state on the order of milliseconds.

REPORTABILITY/ANALYSIS

This event was determined to be reportable per 10CFR50.73(a)(2)(v)(D), in that Susquehanna Unit 2 had been in a condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident. This condition has existed since original Unit 2 construction.

The Emergency Switchgear Room Cooling system is necessary to provide adequate cooling for the Switchgear Rooms in a post design basis accident environment. Although automatic restart of the Emergency Switchgear Room Cooling system following a LOOP is required to consider the system Operable, the condition did not create a significant degradation in the Station's ability to protect the health and safety of the public and/or plant personnel. The condition did not effect the Emergency Switchgear Room Cooling system for Unit 1 since DX Units are not utilized in that system. A review of past LOOP testing showed that the 'A' Emergency Switchgear Room Cooling subsystem failed to restart once during ten previous LOOP tests and 'B' Emergency Switchgear Room Cooling subsystem did not trip during its ten previous LOOP tests. Based on the past test history, there is a high probability that the Emergency Switchgear Room Cooling subsystem would have automatically restarted following a Loss Of Offsite Power at the Station.

Even though the "relay race" affected the automatic start logic of the Emergency Switchgear Room Cooling subsystems, the manual start logic was unaffected by the condition. Per design calculations, the Emergency Switchgear would be capable to perform their post design basis accident functions for at least 96 hours without any Switchgear Room Cooling. Therefore Operators could have manually started a DX Unit within this 96 hour period to provide Emergency Switchgear Room Cooling without any impact on operation of the Emergency Switchgear.

In accordance with guidance provided in NUREG 1022, Supplement 1 item 14.1 and 10CFR50.4(d), the required submission date for this report was determined to be 06/24/94.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  Unit 2 Susquehanna Steam Electric Station	DOCKET NUMBER (2)  0 5 0 0 0 3 8 8	LER NUMBER (8)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		9 4	— 0 0 8	— 0 0	0 4	OF	0 4

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

CORRECTIVE ACTIONS

Both of the Unit 2 Emergency Switchgear Room Cooling subsystems were declared inoperable as a result of the investigation of the failure of the 'A' Emergency Switchgear Room Cooling subsystems to restart following the simulated LOOP. Both of the subsystems of the DX Unit control circuitry were modified and successfully tested such that the "motor high temperature" signal automatically resets immediately after control panel reenergization. This prevents a trip of the Room Fan and subsequent lockout of the DX Unit unless an actual "motor high temperature" condition exists.

ADDITIONAL INFORMATION

Failed Component Identification: Not Applicable

## Past Similar Events:

A review of past Licensee Event Reports (LERs) for the station identified two previous events where there was a loss of Emergency Switchgear Room Cooling. The causes of the previous events were different than this event.

Unit 1 (Docket No. 50-387/License No. NPF-14)

LER 92-013

LER 87-022