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 FACIL: 50-388 Susquehanna Steam Electric Station, Unit 2, Pennsylvania      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 88-012-01: on 880706, RWCU Sys Div I isolation occurred when RHR Pump B started & on 880721, RWCU Sys Div 1 isolation occurred when ESW Pump A started. Caused by problem w/steam leak detection temp modules. Modules replaced. W/921204 ltr.

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NOTES: Maxwell, G

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**Pennsylvania Power & Light Company**

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December 4, 1992

U.S. Nuclear Regulatory Commission  
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SUSQUEHANNA STEAM ELECTRIC STATION  
LICENSEE EVENT REPORT 88-012-01  
FILE R41-2  
PLAS - 549

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

Attached is Licensee Event Report 88-012-01 which is an update to LER 88-012-00. LER 88-012-00 documented three similar events which occurred over a two week period of time and which were determined to be reportable per 10CFR50.73(a)(2)(iv) in that unplanned Engineered Safety Feature actuations occurred when the Unit 2 Reactor Water Cleanup system isolated on three occasions concurrently with the start of large induction motors.

  
H.G. Stanley  
Superintendent of Plant - Susquehanna

JJM/mjm

cc: Mr. T. T. Martin  
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LICENSEE EVENT REPORT (LER)

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) <b>Susquehanna Steam Electric Station - Unit 2</b>	DOCKET NUMBER (2) <b>0 5 0 0 0 3 8 8</b>	PAGE (3) <b>1 OF 0 6</b>
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TITLE (4)  
**Reactor Water Cleanup System Isolations Concurrent With Large Induction Motor Starts**

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 7	0 6	8 8	8 8	0 1 2	0 1	0 4	0 9	2 0	SSES - Unit 1	0 5 0 0 0 3 8 7
THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)										

OPERATING MODE (9) <b>1</b>	POWER LEVEL (10) <b>0 9 0</b>	<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)
		<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 50.38(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)
		<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.38(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		<input type="checkbox"/> 20.405(a)(1)(iii)	<input type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	
		<input type="checkbox"/> 20.405(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
		<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME <b>J. J. Meter - Power Production Engineer</b>	TELEPHONE NUMBER
	AREA CODE: <b>7 1 7</b> NUMBER: <b>5 4 2 - 1 8 7 3</b>

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
B	CIE	IMODR	R2181	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)       NO

EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

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

Three events have occurred over a period of two weeks in which the Unit 2 Reactor Water Cleanup system has isolated at the same time large induction motors on Unit 1 have been started. On July 6, 1988 a RWCU System Division I isolation occurred when the Unit 1 RHR Pump "B" was started and on July 21, 1988 a RWCU System Division 1 isolation occurred when the ESW "A" Pump was started. Initial findings pointed to a problem with new model Riley RWCU steam leak detection temperature modules installed in Unit 2 during the second refuel outage. Bench testing of the new model Riley modules indicate that when temperatures are close to the trip setpoint, the modules are susceptible to tripping when subjected to instrument a.c. voltage drops associated with large induction motor starts. The three events described in this report were determined to be reportable per 10CFR50.73(a)(2)(iv), in that each case an unplanned ESF actuation occurred. There is no indication that the RWCU leak detection system would not perform its design function of isolating the RWCU containment isolation valves in the case of a significant RWCU steam leak outside of containment. Corrective actions included temporarily raising the setpoints to a value still below the Technical Specification limit for the two instruments and reinstalling the original model Riley modules which had been removed during the outage. Upgraded modules were subsequently purchased and installed in all RWCU leak detection systems at the station.

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 (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		8   8	—   0   1   2	—   0   1	0   2	OF	0   6

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

DESCRIPTION OF EVENT

Three events have occurred over a period of two weeks in which the Unit 2 Reactor Water Cleanup (RWCU, EIIS Code: CE) System has isolated at the same time large induction motors on unit 1 have been started. These events are individually described below:

July 6, 1988 Event

At 2115 hours on July 6, 1988 with Unit 2 operating in Condition 1 at approximately 90% power, a RWCU System Division I isolation occurred when the Unit 1 Residual Heat Removal (RHR, EIIS Code: BO) "A" Pump was started for Suppression Pool Cooling. The Unit 2 RWCU Leak Detection Isolation Logic "A" High Temperature alarm annunciated, the RWCU Inboard Isolation Valve (HV-244-2F001) auto-closed, and both RWCU pumps tripped. Proper plant response to the RWCU isolation signal was verified with the exception that the "B" RWCU Filter/Demineralizer (F/D) Hold Pump did not auto start on low system flow as designed. The RWCU isolation was initiated by the actuation of RWCU Containment Penetration Room Ambient Temperature Element TSH-G33-2N600E. A subsequent inspection of the RWCU Containment Penetration Room identified a body to bonnet leak on F/D Bypass Valve HV-244-F104. Room temperature as indicated by the Riley Temperature module for TSH-G33-2N600E was found to be 103°F. A calibrated thermocouple reader yielded a temperature reading of 106.6°F for the TSH-G33-2N600E trip setpoint, which is within the allowable as-found tolerance.

July 19, 1988 Event

At 1857 hours on July 19, 1988 with Unit 2 operating in Condition 1 at 100% power, a RWCU System division II isolation occurred when the Unit 1 RHR 'B' Pump was started for Suppression Pool Cooling. The Unit 2 RWCU Leak Detection Isolation Logic "B" High Temperature alarm annunciated, the RWCU Outboard Isolation Valve (HV-244-2F004) auto-closed, and both RWCU pumps tripped. Proper plant response to the RWCU isolation signal was observed. The RWCU isolation was initiated by the actuation of RWCU Containment Penetration Room Ambient Temperature Element TSH-G33-2N600F. Room temperature as indicated by the Riley Temperature module for TSH-G33-2N600F was found to be 109°F. The as-found trip setpoint for the switch was determined to be 109.2°F., using a calibrated thermocouple reader.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		8   8	-   0   1   2	-   0   1	0   3	OF 0   6

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

July 21, 1988 Event

At 1720 hours on July 21, 1988 with Unit 2 operating in Condition 1 at 100% power, a RWCU System Division I isolation occurred when Emergency Service Water (ESW, EIIIS Code: BI) Pump "A" was started in preparation for Suppression Pool Cooling. The Unit 2 RWCU Leak Detection isolation Logic "A" High Temperature alarm annunciated, the RWCU Inboard Isolation Valve (HV-244-2F001) auto-closed, and both RWCU pumps tripped. Proper plant response to the RWCU isolation signal was observed. The RWCU isolation was initiated by the actuation of RWCU containment penetration Room Ambient Temperature Element TSH-G33-2N600E. As part of the investigation into the earlier events a visicorder had been set up to monitor instrument power to the Division I and II Riley modules during RHR pump starts. The visicorder had not yet been turned on, however, since a trip of the steam leak detection module was not expected from an ESW pump start. TSH-G33-2N600E was reset and at 1726 hours the Residual Heat Removal Service Water (RHR SW, EIIIS Code: BI) "1A" Pump, electrically fed from the "1C" 4KV Bus, was started. No detectable change in voltage to the Riley modules was observed and no modules tripped. At 1730 hours the RHR "1A" Pump was started. Again TSH-G33-2N600E tripped. The visicorder trace indicated that voltage to the Division I Riley modules dropped approximately 14 volts peak to peak and voltage then recovered in about 2.1 seconds. The recorded voltage transient was normal and was well within the design for plant instrument A.C. electrical distribution voltage droop and voltage recovery during large induction motor pump starts. TSH-G33-2N600E was again reset, the isolation signal was cleared, and the RWCU system was placed back in service. Trip setpoint and actual room temperature as indicated by a calibrated thermocouple reader for TSH-G33-2N600E were found to be 115°F. and 114°F. respectively.

CAUSE OF EVENT

An investigation has been initiated to determine the cause of the above RWCU isolation events associated with the simultaneous start of large induction motors. Initial findings pointed to a problem with new model Riley steam leak detection temperature modules which were installed in Unit 2 during the second refuel outage as replacements for the RWCU TSH-G33-2N600E & F modules which had become obsolete. Subsequent bench testing of the new model Riley modules indicated that when temperatures are close to the trip setpoint, the modules are susceptible to tripping when subjected to voltage drops such as are normal in the instrument A.C. electrical distribution system when large induction motors are started. Bench testing of the old model Riley modules revealed that they were not as susceptible to such spurious tripping.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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		YEAR 8   8	SEQUENTIAL NUMBER —   0   1   2	REVISION NUMBER —   0   1	0   4	OF	0   6

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The A.C. distribution system at Susquehanna consists of two separate 230 KV - 13.8 KV Startup Transformers (T-10 and T-20) which are supplied from independent offsite power sources. Each Startup Transformer feeds a 13.8 KV Startup Bus which, in turn, normally supplies four (4) 4.16 KV Engineered Safeguard System (ESS) Busses (two Unit 1 4.16 KV busses and two Unit 2 4.16 KV Busses). Transformer T-10 supplies Division I ESS 4.16 KV Busses on each unit and transformer T-20 supplies Division II ESS 4.16 KV Busses on each unit. In the incidents described by this LER, the starting of large induction motors fed from the Unit 1 Division I ESS Busses resulted in the Unit 2 Division I RWCU isolation, since the Division I isolation instrumentation is also supplied from Division I A.C. power. Similarly, the starting of a large induction motor fed from a Unit 1 Division II ESS bus resulted in a Unit 2 Division II RWCU isolation.

Originally, the cause of the July 6, 1988 event had been attributed to a body to bonnet leak on Filter Demineralizer Bypass Valve HV-244-2F104 which is located in the RWCU Penetration Room. This cause was reevaluated in light of the subsequent events involving RWCU isolation concurrent with RHR and ESW pump starts and determined that sensitivity to supply voltage was actually the cause.

REPORTABILITY/ANALYSIS

The three events described in this report were determined to be reportable per 10CFR50.73(a)(2)(iv), in that in each case an unplanned ESF actuation occurred when a RWCU containment isolation valve isolated. The isolation occurred when the RWCU Penetration Room temperatures approximated the trip setpoint intended to detect a steam leak in the Penetration Room. It appears that the voltage transients were on the instrument A.C. supply to the Riley modules combined with actual high ambient room temperatures resulting in trip actuation of the modules. There was no indication that the RWCU leak detection system would not perform its design function of isolating the RWCU containment isolation valves in the case of a significant RWCU steam leak outside of containment. In each event the ESF system performed its intended function and no safety consequences or compromise to public health or safety occurred.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		8   8	-   0   1   2	-   0   1	0   5	OF	0   6

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

CORRECTIVE ACTIONS

On July 12, 1988 following approval of a temporary setpoint change, the setpoints for TSH-G33-2N600E & F were raised from 110.3°F. to 116°F., still below the Technical Specification limit of 118.3°F. for these instruments. The setpoint of TSH-G33-2N600E after the July 21, 1988 event and following module replacement was readjusted to 116.1°F. The steam packing leak on Filter Demineralizer Bypass Valve HV-244-F104 was repaired on July 9, 1988. The "B" RWCU F/D Hold Pump relay logic was investigated and a flow switch was recalibrated as a result of the hold pump not auto-starting during the July 6, 1988 event. Proper operation was observed following completion of these actions. The original model Riley modules which had been removed for TSH-G33-2N600E & F were reinstalled.

Upgraded temperature modules were subsequently purchased to replace the modules which exhibited sensitivity to voltage dips. A sample replacement module was tested by the Instrumentation and Controls department. The test showed the newest modules tolerated low supply voltages without tripping. All RWCU modules at the Station have been replaced (as discussed in LER 91-010-01, NPF-22).

Additionally, a steam leak detection temperature setpoint design basis review was also performed at the station (see LER 88-016-01, NPF-14). This review demonstrated a need for Technical Specification changes to enhance system performance and/or reduce the risk of spurious actuations. Technical Specification Change Requests were submitted and subsequently approved as Amendments 123 to NPF-14, and 92 to NPF-22. This changed the room high ambient temperature setpoint to 131°F.

No further updates to LER's concerning Riley module perturbations are expected.

ADDITIONAL INFORMATION

Failed Component Identification:

Component: Steam Leak Detection Module

Manufacturer: Riley

Model: #164C5687P103, 104

### LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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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

YEAR	SEQUENTIAL NUMBER	REVISION NUMBER
8 8	- 0 1 2	- 0 1

0 6 OF 0 6

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#### Previous Similar Events:

No previous similar events have been identified in which RWCU isolation have occurred concurrent to RHR or ESW pump starts.

The original Riley modules used were identified at Susquehanna as Riley model #163C1940P001, 2, 3, 4. The replacement Riley modules used at Susquehanna were identified as Riley model #164C5687P103, 104. The latest Riley modules used are 164C5687P 404, 403.