

# ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9204100026      DOC. DATE: 92/04/06      NOTARIZED: NO      DOCKET #  
 FACIL: 50-387 Susquehanna Steam Electric Station, Unit 1, Pennsylvania      05000387  
 AUTH. NAME      AUTHOR AFFILIATION  
 RYDER, T.S.      Pennsylvania Electric Co.  
 STANLEY, H.G.      Pennsylvania Electric Co.  
 RECIP. NAME      RECIPIENT AFFILIATION

SUBJECT: LER 92-003-00: on 920307, ESFA occurred when RWCU Sys inboard & outboard CI valves automatically closed. On 920308 second ESFA took place. Caused by RWCU pump design. Sealless pumps installed & operating procedure changed. W/920406 ltr.

DISTRIBUTION CODE: IE22T      COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 6  
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES: LPDR 1 cy Transcripts. 05000387 A

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April 6, 1992

U.S. Nuclear Regulatory Commission  
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SUSQUEHANNA STEAM ELECTRIC STATION  
LICENSEE EVENT REPORT 92-003-00  
FILE R41-2  
PLAS - 521

Docket No. 50-387  
License No. NPF-14

Attached is Licensee Event Report 92-003-00. This event was determined reportable per 10CFR50.73(a)(2)(iv) in that unplanned actuations of Engineered Safety Features occurred when the Reactor Water Cleanup System primary containment isolation valves isolated once due to a high flow signal and a second time due to a high differential flow signal.

H.G. Stanley  
Superintendent of Plant - Susquehanna

TSR/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: 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) Susquehanna Steam Electric Station - Unit 1		DOCKET NUMBER (2) 0 5 0 0 0 3 8 7	PAGE (3) 1 OF 0 5
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TITLE (4)  
RWCU Actuations Due to High Flow and High Differential Flow Signals

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 3	0 7	9 2	9 2	0 0 3	0 0	0 4	0 6	9 2		0 5 0 0 0

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

OPERATING MODE (9) 1	20.402(b)	20.405(c)	<input checked="" type="checkbox"/>	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 0 10 11	20.405(a)(1)(i)	50.36(c)(1)	<input type="checkbox"/>	50.73(a)(2)(v)	73.71(c)
	20.405(a)(1)(ii)	50.36(c)(2)	<input type="checkbox"/>	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
	20.405(a)(1)(iii)	50.73(a)(2)(i)	<input type="checkbox"/>	50.73(a)(2)(viii)(A)	
	20.405(a)(1)(iv)	50.73(a)(2)(ii)	<input type="checkbox"/>	50.73(a)(2)(viii)(B)	
	20.405(a)(1)(v)	50.73(a)(2)(iii)	<input type="checkbox"/>	50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME T.S. Ryder - Power Production Engineer	TELEPHONE NUMBER AREA CODE: 7 1 7 5 4 2 - 3 2 3 5
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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	C E F T		R 3 6 9	Y					
X	C E R L Y		A 1 0 9	N					

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)

On March 7, 1992 at 1330 hours with Unit 1 in Condition 1 at 1% power in preparation to commence the Unit 1 Sixth Refueling and Inspection Outage, an Engineered Safety Feature (ESF) actuation occurred when Reactor Water Cleanup (RWCU) System's inboard and outboard containment isolation valves automatically closed. On March 8, 1992 with Unit 1 in Condition 4, a second ESF actuation occurred at 0604 hours when the same valves automatically closed again while Operations was in the processing of restoring the RWCU System from the previous isolation. A RWCU System high flow signal initiated the first RWCU unplanned ESF actuation. A high differential flow signal initiated the second unplanned ESF actuation. In both cases the root cause was the existing RWCU Pump design which allows depressurization through the pump seals with a contributing factor being an inadequate RWCU Operating Procedure. This event has been determined to be reportable per 10CFR50.73(a)(2)(iv), in that two unplanned ESF actuations occurred when the RWCU System primary containment isolation valves automatically closed following receipt of a high flow and a high differential flow signal. There was no loss of coolant inventory nor was there any damage or degradation of RWCU piping integrity due to this event. There were no safety consequences or compromise to public health or safety. The RWCU containment isolation valves performed their function of containment isolation, as per design. Corrective actions include installation of sealless RWCU Pumps, Operating Procedure changes, a high flow logic time delay modification, and replacement of damaged and defective RWCU instrumentation.

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.

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		9   2	—   0   0   3	—   0   0	0   2	OF 0   5

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

DESCRIPTION OF EVENT

On March 7, 1992 at 1330 hours with Unit 1 in Condition 1 at 1% power in preparation to commence the Unit 1 Sixth Refueling and Inspection Outage, an Engineered Safety Feature (ESF) actuation occurred when Reactor Water Cleanup (RWCU, EIIS Code: CE) System's inboard and outboard containment isolation valves, HV-144F001 and HV-144F004 respectively, automatically closed. On March 8, 1992 with Unit 1 in Condition 4, a second ESF actuation occurred at 0604 hours when the same valves automatically closed again while Operations was in the processing of restoring the RWCU System from the previous isolation.

CAUSE OF EVENT

The first RWCU unplanned ESF actuation at 1330 hours on March 7, 1992 was initiated by a RWCU System high flow signal which actuated the isolation logic per design to automatically close the inboard and outboard RWCU containment isolation valves. The root cause for this actuation was the existing RWCU Pump design which allows system depressurization through the pump seals. A contributing causal factor was attributed to a less than adequate RWCU Operating Procedure. Background information leading up to this high flow isolation is as follows:

At approximately 1140 hours on March 7, the RWCU HV-144F004 valve had isolated due to loss of cooling water to the RWCU Non-Regenerative Heat Exchangers (NRHX) as an indirect consequence of a shield block bumping a limit switch assembly on a Reactor Building Closed Cooling Water (RBCCW, EIIS

Code: CC) return valve to the Drywell Cooling System. The shield block was being moved from the Drywell Equipment Hatch as one of the preliminary activities for the refueling outage. The RWCU isolation was initiated because of a design feature to protect the RWCU Filter Demineralizer Units from excessive temperatures which could damage their resin beads. As such, it was not a reportable event since HV-144F004 did not close due to a containment isolation logic actuation.

Between 1140 and 1330 hours, Operations restored cooling water to the NRHX and was in the process of restoring the RWCU System. The section of the RWCU Operating Procedure that deals with restoring RWCU following an automatic isolation provides two criteria for determining if the system is required to be filled and vented as part of restoration. The first condition is that greater than two hours has elapsed since the isolation occurred. The second condition is for RWCU System temperature to be greater than saturation temperature for actual RWCU System Pressure. Neither of these conditions existed when Operations was performing this section of the procedure and so the decision was made not to fill and vent RWCU as part of the restoration process. When HV-144F004 was opened per procedure, the RWCU System high flow signal was initiated resulting in the ESF actuation. It is believed that there was a rapid flow of water into the RWCU System piping because the system was not completely filled. The root cause of this actuation was the the existing RWCU

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 600 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.

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

Pump design which allows system depressurization through the pump seals. A contributing causal factor was attributed to an Operating Procedure which did not accurately account for system variables such as RWCU Pump seal leakage in specifying the criteria needed to determine when filling and venting is required.

The second unplanned ESF actuation of RWCU which occurred at 0604 hours on March 8, 1992 was initiated by a high differential flow signal to the RWCU System containment isolation logic which resulted in the automatic closure of the HV-144F001 and HV-144F004 valves. The root cause for this actuation was again the existing RWCU Pump seal design allowing RWCU System depressurization through the pump seals. A contributing causal factor was again attributed to a less than adequate RWCU Operating Procedure. Background information leading up to this isolation is as follows:

Between 1330 hours on March 7, 1992 and 0604 hours the next day when the second ESF actuation occurred, the following activities took place. Systems Engineering personnel conducted a RWCU System piping inspection and found no abnormalities. Operations personnel filled and vented RWCU System piping overnight per the RWCU Operating Procedure. They isolated the demineralized water supply used for backfilling the RWCU System at approximately 0430 hours the next day (March 8, 1992). Instrumentation and Controls (I&C) personnel then backfilled applicable RWCU instruments from approximately 0435 to 0500 hours. The inboard and outboard RWCU containment isolation valves were opened at approximately 0600 hours and the 'A' RWCU Pump was placed in service. At 0603 hours the 'B' RWCU Pump was placed in service. Approximately 30 seconds later, RWCU flow began to oscillate, both RWCU Pumps tripped on a system low flow signal and at 0604 a high differential flow signal initiated the containment isolation logic resulting in the closure of the HV-144F001 and HV-144F004 valves.

The low flow signal which caused the RWCU Pumps to trip was believed to be a valid low flow condition resulting from the system flow oscillations. The electrical relays which actuated to trip the pumps, however, failed to cause the associated low flow alarms to annunciate in the control room. The flow oscillations were believed to have occurred due to partial depressurization of the RWCU System through leakage out the RWCU Pump seals. A contributing factor was attributed to the Operating Procedure not providing guidance to maintain the demineralized water supply used for filling the RWCU System until just prior to opening the RWCU containment isolation valves. Because filling water was isolated at the RWCU Pumps at approximately 0430 hours, there was about 1.5 hours in which the RWCU System could depressurize through the pump seals prior to opening the containment isolation valves, starting the pumps and returning the system to service.

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.

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The high differential flow signal which actuated the RWCU isolation logic was determined to have resulted from a failed Rosemount flow transmitter. Partial depressurization through the RWCU Pump seals coupled with incomplete system filling due to RWCU Operating Procedure inadequacies resulted in RWCU flow oscillations of a large enough magnitude to cause the Rosemount flow transmitter to fail.

REPORTABILITY/ANALYSIS

The event has been determined to be reportable per 10CFR50.73(a)(2)(iv), in that two unplanned ESF actuations occurred when the RWCU System inboard and outboard primary containment isolation valves automatically closed following receipt of a high flow and a subsequent high differential flow signal to the containment isolation logic for these valves. There was no loss of coolant inventory nor was there any damage or degradation of RWCU piping integrity due to this event. There were no safety consequences or compromise to public health or safety. The RWCU containment isolation valves performed their function of containment isolation, as per design.

In accordance with the guidance provided in NUREG 1022 Supplement 1 Item 14, the required submission date for this report was determined to be April 6, 1992.

CORRECTIVE ACTIONS

Immediate corrective actions that were completed following the second unplanned ESF actuation of the RWCU containment isolation valves are as follows:

- 1) I&C personnel replaced the failed Rosemount differential flow transmitter.
- 2) I&C personnel recalibrated the RWCU Pump low flow sensor. This instrument's setpoint was found to have drifted low.
- 3) Electrical Maintenance personnel replaced the RWCU Pump low flow relays which had failed to actuate low flow annunciation in the Control Room. Proper Control Room annunciation was verified.
- 4) The RWCU System was properly filled and vented and then returned to service on March 9, 1992 following completion of the above actions.

The following actions are being accomplished to prevent recurrence of this event:

- 1) Modifications will be completed to install sealless RWCU Pumps. Target completion dates are May 15, 1992 for Unit 1 and November 20, 1992 for Unit 2.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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- 2) Modifications will be completed to install a time delay on the RWCU System high flow isolation logic to prevent spurious isolations should the RWCU System not be fully solid. Target completion dates are May 15, 1992 for Unit 1 and November 20, 1992 for Unit 2.
- 3) The Unit 2 RWCU Operating Procedure has been revised to require that the RWCU System is always filled and vented following a system isolation. Note that this does not pertain to Unit 1 because the sealless RWCU Pumps are being installed in the current refueling outage.
- 4) The Unit 2 RWCU Operating Procedure will be revised to prevent isolating demineralized fill water too soon prior to opening the RWCU containment isolation valves during system fill and vent evolutions. Target completion date is April 10, 1992.

The procedural changes identified in 3) and 4) above are different from the procedural changes completed following the July 31, 1991 Unit 1 Scram in which RWCU isolated during system restoration (LER 91-008). The earlier changes included steps to determine if the RWCU System could be restored without prior venting and, if determined that venting was required, included steps to properly vent the system. The most recent event pointed out that more procedural guidance is needed on how to properly vent the RWCU System.

ADDITIONAL INFORMATION

Failed Component Identification:

- 1) Component: Transmitter, Flow  
Manufacturer: Rosemount, Inc.  
Model: 1153DB5PAN0016
- 2) Component: Relay, Power  
Manufacturer: Agastat Relay Co.  
Part Number: EGPIN003

Previous Similar Events:

<u>Docket 387</u>	<u>Docket 388</u>
LER 85-007	LER 84-015
87-001	85-024
89-011	86-006
89-016	86-017
	89-004