

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Susquehanna Steam Electric Station - Unit 2										DOCKET NUMBER (2) 0 5 0 0 0 3 8 8				PAGE (3) 1 OF 4									
TITLE (4) Inadvertent RPS and ESF Actuations.																							
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	4	2	7	8	5	8	5	0	1	6	0	0	0	5	2	8	8	5	0	5	0	0	0
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 8. (Check one or more of the following) (11)																					
3		20.402(b)				20.405(c)				<input checked="" type="checkbox"/> 50.73(a)(2)(iv)				73.71(b)									
POWER LEVEL (10)		0 0 0				20.406(a)(1)(i)				50.73(a)(2)(v)				73.71(c)									
		20.406(a)(1)(ii)				50.36(c)(2)				50.73(a)(2)(vii)				OTHER (Specify in Abstract below and in Text, NRC Form 366A)									
		20.406(a)(1)(iii)				50.73(a)(2)(ii)				50.73(a)(2)(viii)(A)													
		20.406(a)(1)(iv)				50.73(a)(2)(iii)				50.73(a)(2)(viii)(B)													
		20.406(a)(1)(v)				50.73(a)(2)(iii)				50.73(a)(2)(ix)													
LICENSEE CONTACT FOR THIS LER (12)																							
NAME D.J. Gandenberger - Power Production Engineer										TELEPHONE NUMBER													
										AREA CODE													
										7 1 1 7		5 1 4 1 2 1 - 1 3 1 9 1 1 1 4											
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																							
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPD		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPD													
SUPPLEMENTAL REPORT EXPECTED (14)												EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR							
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)												<input checked="" type="checkbox"/> NO											

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

On April 27, 1985 at 0835 while preparing to place the 'B' loop of the Residual Heat Removal (RHR) system in service, a waterhammer occurred causing a reactor water level transient. The reactor water level dropped approximately thirty-five inches causing a Reactor Protection System (RPS) actuation. No control rod motion occurred since all rods were fully inserted at the time of the event. No Emergency Core Cooling Systems initiated. The waterhammer and level transient were caused by rapidly filling partially drained down RHR piping from the reactor vessel. The piping was partially drained while warming the injection line in accordance with the Operating Procedure. After restoring the reactor vessel level and resetting the RPS signal, the 'D' RHR pump was started in Shutdown Cooling. A second waterhammer occurred and the Shutdown Cooling suction valves closed due to high flow (an Engineered Safety Feature). The second waterhammer resulted from rapidly collapsing steam pockets in the RHR piping when the pump was started. A walkdown of the system outside of the containment was performed and no damage was found. The Operating Procedure for RHR is being revised to delete the section for injection line warm up to prevent future waterhammers.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/85

FACILITY NAME (1) Susquehanna Steam Electric Station Unit 2	DOCKET NUMBER (2) 0 5 0 0 0 3 8 8 8 5 - 0 1 6 - 0 0 0 2 OF 0 4	LER NUMBER (8)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		

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

On April 27, 1985 at 0835, a waterhammer occurred while preparing to place the 'B' loop of the Residual Heat Removal (RHR) (BO) system in Shutdown Cooling. The waterhammer caused a level transient and the reactor water level dropped approximately thirty-five (35) inches resulting in a Reactor Protection System (RPS) actuation on low level. There was no control rod motion since all rods were already fully inserted. The reactor level transient did not actuate any Emergency Core Cooling Systems (ECCS). Reactor vessel level was restored using the condensate system and the RPS signal was reset.

The cause of the waterhammer was water from the reactor vessel filling partially evacuated piping downstream of the RHR heat exchanger shell side bypass valve (HV-2F048B) when the bypass valve was opened. In accordance with the Operating Procedure, the RHR injection piping was being warmed by back flowing reactor coolant through the RHR piping to the condenser. The condenser was being maintained at 4 in Hg (absolute) by the Mechanical Vacuum Pump. The Operating Procedure had recently been revised to warm the RHR injection line prior to placing Shutdown Cooling in service in response to General Electric's concern of thermal shock of the piping. This was the first time this evolution was performed. A flow path to the condenser was established through HV-2F050B and HV-2F040. (See attached diagram.) When the injection line was sufficiently warmed, flow to the condenser was stopped by closing HV-2F040 and then immediately closing HV-2F050B. This evolution resulted in a partial drain down of the RHR system and a partial vacuum in the piping. When HV-2F048B was opened, it caused a rapid fill of the drained line and the water upstream of HV-2F048B flashed to steam due to the vacuum in the piping.

Operations personnel performed a walkdown of the RHR piping outside of the containment and found no damage or signs of movement. The RHR heat exchanger shell side bypass valve was fully opened and the RHR system was checked to be filled and vented on the containment spray line (valve 251-029), the highest point on the system. At 0945 on April 27, 1985, the 'D' RHR pump was started in accordance with the Operating Procedure with the RHR Injection Isolation valve (HV-2F015B) 100% open. The operator (utility, licensed) started opening the RHR injection line flow control valve (HV-2F017B) when a second waterhammer occurred. The RHR flow recorder indicated a spike up to 12000 gpm. The RHR Shutdown Cooling suction valves closed on high flow (an Engineered Safety Feature) and the 'D' RHR pump tripped. Operations personnel checked the RHR system to determine if it was full of water and when the vent valves on the injection line were opened, steam emerged. The RHR system was then cooled down using the keepfill system with a flowpath established to the suppression pool via the RHR heat exchanger vent valve. A procedure change was initiated to prewarm the RHR injection piping by establishing a flow path to the suppression pool and to prewarm the suction line to the condenser. The RHR injection and suction lines were warmed in accordance with the procedure change. The RHR system was checked to be filled and vented at the injection

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line and containment spray line. The RHR system was walked down by Nuclear Plant Engineering, Technical Section and Operations personnel and no damage or indication of movement was discovered. The 'D' RHR pump was then started and placed into Shutdown Cooling without further incident.

The cause of the second waterhammer was that steam pockets existed in the RHR piping as a result of the first waterhammer and were rapidly collapsed when the RHR pump was started. The excessive flow isolation signal for the Shutdown Cooling suction valves originates at an elbow tap pressure switch. When the waterhammer occurred either a pressure surge and accompanying dp change or an excessive flow condition caused by the collapse of the steam bubble initiated the isolation signal.

The Operating Procedure for RHR will be revised for both Units to delete the section to warm the injection line prior to placing Shutdown Cooling into service. The procedure change which was initiated on April 27, 1985 was cancelled by the Plant Operating Review Committee since there would still be a chance of waterhammer occurring and the suppression pool is not an acceptable place to back flush contaminated reactor grade water on a routine basis. Procedure changes have been written to delete the warm up section of the Operating Procedure until the procedures are revised. The Nuclear Plant Engineering group is evaluating the RHR to Reactor Recirculation tee for thermal shock since the RHR injection line has never previously been warmed prior to placing Shutdown Cooling in operation and will not be warmed in the future. The pressure and flow instrumentation which is normally surveilled on the RHR system was checked for operation and calibration. No discrepancies were noted due to the waterhammer.





Pennsylvania Power & Light Company

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May 28, 1985

U.S. Nuclear Regulatory Commission
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SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 85-016-00
ER 100450 FILE 841-23
PLAS- 082

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

Attached is Licensee Event Report 85-016-00. This event was determined reportable per 10CFR50.73(a)(2)(iv), in that an inadvertent Reactor Protection System and Engineered Safety Feature actuations occurred due to a waterhammer of the Residual Heat Removal System.

H.W. Keiser
Superintendent of Plant-Susquehanna

DJG/pjg

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