R. L. Anderson
Vice President - Nuclear Operations

PPL Susquehanna, LLC
769 Salem Boulevard
Berwick, PA 18603
Tel. 570.542.3883 Fax 570.542-1504
rlanderson@pplweb.com

ppl™

NOV 1 9 2003

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

SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 50-387/2003-06-00
LICENSE NO. NPF-14 **Docket No. 50-387**
PLA-5692

Attached is Licensee Event Report 50-387/2003-006-00. This event was determined reportable per 10 CFR 50.73(a)(2)(iv)(A) in that the Unit 1 reactor automatically scrammed on low water level following a trip of the 'C' Reactor Feed Pump. The initiation of the automatic scram, subsequent injections of both the HPCI and RCIC systems, and the containment isolations resulting from the transient are considered unplanned actuations of systems that mitigate the consequences of significant events. All safety systems functioned as designed. There were no actual consequences to the health and safety of the public as a result of this event.

No new regulatory commitments have been created through issuance of this report.

Richard L. Anderson

Richard L. Anderson
Vice President - Nuclear Operations

Attachment

IE22

cc: Mr. H. J. Miller
Regional Administrator
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Mr. S. L. Hansell
Sr. Resident Inspector
U.S. Nuclear Regulatory Commission
P.O. Box 35
Berwick, PA 18603-0035

Mr. R. Osborne
Allegheny Electric Cooperative
P. O. Box 1266
Harrisburg, PA 17108-1266

Mr. R. R. Janati
Bureau of Radiation Protection
Rachel Carson State Office Building
P. O. Box 8469
Harrisburg, PA 17105-8469

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION
(7-2001)

LICENSEE EVENT REPORT (LER)

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

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004
Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@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 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.

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Susquehanna Steam Electric Station - Unit 1	05000387	1 OF 5

4. TITLE
Automatic Scram and ECCS Injection Following 'C' Reactor Feed Pump Turbine Trip

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
09	24	2003	2003	- 006 -	00	11	19	2003	FACILITY NAME	DOCKET NUMBER

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)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)
	20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)
	20.2203(a)(1)		50.36(c)(1)(i)(A)	X	50.73(a)(2)(iv)(A)		73.71(a)(4)
	20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)
	20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)		OTHER Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)		
	20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)		
	20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(vii)		
	20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)		
	20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)		

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Eric J. Miller - Nuclear Regulatory Affairs	570 / 542-3321

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
A	SJ	TRB	G080	Y					

14. SUPPLEMENTAL REPORT EXPECTED				15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

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

At 00:53 on September 24, 2003 with Unit 1 in Mode 1 at 100% power, an automatic reactor scram occurred in response to low reactor water level conditions. While performing required testing of the 'C' Reactor Feed Pump Turbine (RFPT), a control room operator incorrectly manipulated the 'C' RFPT lockout key switch instead of the Reset pushbutton thus causing the turbine to trip. Although the 'A' and 'B' Reactor Feed Pumps increased speed in an attempt to maintain reactor inventory levels, the reactor automatically scrammed when water level reached the Low-Level RPS initiation setpoint. HPCI and RCIC automatically initiated to assist the operating Feed Pumps with level restoration. Numerous Primary Containment Isolations occurred as designed during the transient. Susquehanna was designed to withstand a single RFPT trip without experiencing a Rx Low-Level Scram. This event suggests that previous changes made at Susquehanna have affected the plant's integrated response to the loss of a single RFPT and have cumulatively resulted in a reduction of the originally designed operating margin. The RFPT trip has been attributed to human performance error. Error prevention techniques will be reinforced to support desired human performance attributes. The scram that resulted following the human performance error has been attributed to the reduction in operating margin resulting from inadequate identification of operating margin requirements in plant change processes. Corrective actions have been initiated to strengthen station operating margin controls within plant change processes. This event is reportable for Unit 1 as an unplanned actuation of systems that mitigate the consequences of significant events per 10 CFR 50.73(a)(2)(iv)(A). There were no actual adverse consequences to the fuel, any plant equipment, or to the health and safety of the public as a result of this event.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Susquehanna Steam Electric Station - Unit 1	05000387	2003	- 006 -	00	2 OF 5

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

EVENT DESCRIPTION

At 00:53 on September 24, 2003 with Unit 1 in Mode 1 at 100% power, an automatic reactor scram occurred in response to low reactor water level conditions. A human performance error that occurred during testing of the Reactor Feed Pump Turbine (RFPT; EIIS Code: SJ) initiated the event sequence that led to this Reactor Protection System (RPS; EIIS Code: JC) actuation. The control room operator (Utility, Licensed) had successfully performed Emergency Governor and Trip Lockout testing on the 'A' and 'B' RFPT's as directed by station procedures. During testing of the 'C' Feed Pump Turbine, the operator incorrectly manipulated the 'C' RFPT lockout key switch instead of the Reset pushbutton thus causing the RFPT to trip. The Reactor Recirculation pumps (EIIS Code: AD) ran back to approximately 45% speed as water level began to drop in response to the partial loss of Feedwater flow. Although the 'A' and 'B' Reactor Feed Pumps increased speed in an attempt to maintain reactor inventory levels, the reactor automatically scrammed when water level reached the Low-Level RPS initiation setpoint. All rods successfully inserted. Reactor power was approximately 81% at the time of the scram. Level dropped to approximately – 48". The Reactor Core Isolation Cooling system (RCIC; EIIS Code: BN) and the High Pressure Coolant Injection system (HPCI; EIIS Code: BJ) automatically initiated to assist the 'A' and 'B' Reactor Feed Pumps in level restoration. Both Reactor Recirculation pumps tripped upon receipt of an Automatic Transient Without Scram-Recirc Pump Trip (ATWS-RPT) low water level signal. Both pumps were, however, manually restarted to avoid thermal stratification. Numerous Primary Containment Isolations (EIIS Code: JM) also occurred as designed during the transient. Following the scram, reactor pressure was controlled using Main Steam Bypass Valves (EIIS Code: JI). Post-scram conditions were maintained within procedural operating requirements.

Susquehanna was designed to withstand a single Reactor Feed Pump Turbine trip, at high power operation, without experiencing a Rx Low-Level Scram. Early plant testing demonstrated that the Unit 1 operating margin for a loss of Feed Pump transient was at least 15 inches above the Rx Low-Level Scram setpoint. As such, the scram of September 24, 2003 was not anticipated. This event suggests that previous changes made at Susquehanna, from the time of original design until September 24, 2003, have affected the plant's integrated response to the trip of a single Reactor Feed Pump Turbine. These changes involved Reactor Recirculation Runback performance, Reactor Feed Pump response and capabilities, Power to Flow Map operating domains, steam generation rates, and other parameters. The cumulative effect of these changes has resulted in the unintentional reduction of the original operating margin. This reduction of margin has led to an automatic reactor scram and the subsequent initiation of emergency core cooling systems following a RFPT trip, a transient not expected to attain such results.

CAUSE OF EVENT

The RFPT trip has been attributed to human performance error and a less than adequate use of essential human performance tools. Most significantly, self-checking, peer checking, and 3-part communication were not effectively utilized. Also, inadequate identification of critical activities and critical steps within procedures were identified as causal factors.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Susquehanna Steam Electric Station - Unit 1	05000387	2003	- 006 -	00	3 OF 5

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

CAUSE OF EVENT (continued)

The cause of the automatic reactor scram has been attributed to a reduction in operating margin resulting from inadequate identification of operating margin requirements in plant change processes.

EXTENT OF CONDITION

Investigation of this event has revealed that changes to the Susquehanna Unit 1 and Unit 2 operating domain (Power/Flow Map) have been implemented since the start of commercial operation which have compromised the reliability of a design function originally intended to sustain power operations (i.e., Recirculation flow runback associated with the #2 limiter). Thus, the plant's *operational margin* has been reduced.

Since plant operation in an expanded domain has prevented the fulfillment of an original design function (#2 limiter), efforts were initiated to determine if other plant design functions may have been impacted by operation beyond the original design envelope.

This effort, which included review of selected FSAR chapters, licensing submittals, and NRC Safety Evaluation Reports (SERs) associated with key projects that expanded Susquehanna's operating envelope has concluded that:

- The #2 recirculation pump speed limiter is solely intended to maintain power operations in the event of abnormal Balance of Plant circumstances. Its failure to successfully perform its function represents a reduction in power generation reliability, or operational margin.

- The #2 recirculation pump speed limiter does not provide a function related to the safe operation of the Susquehanna Units. The inability of the limiter to prevent a reactor scram does not impact the plant's margin to safety. Erosion of safety related margins in other plant systems or areas, because of plant operation in the extended operating domain, was not evident following performance of this review.

- With the exception of the #2 recirculation pump speed limiter, no additional examples were identified where plant operation in the expanded operating domain had adversely impacted a design function intended to sustain power operations.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Susquehanna Steam Electric Station - Unit 1	05000387	2003	- 006 -	00	4 OF 5

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

REPORTABILITY/SAFETY CONSEQUENCES ANALYSIS

Actual: This event was determined to be reportable under 10 CFR 50.73(a)(2)(iv)(A) in that unplanned actuations of Engineered Safety Features (ESF) occurred as a result of operator error during testing of the Unit 1 "C" Reactor Feed Pump Turbine. The error resulted in actuation of RPS, initiation and injection of the HPCI and RCIC systems, and numerous primary containment isolations.

All safety systems functioned as designed. All control rods inserted and post scram reactor conditions were maintained within procedural requirements. There were no challenges to Primary or Secondary containment (EIIS Code: NH) and integrity was maintained. Water level was restored to the nominal operating band.

Main Steam Line (EIIS Code: SB) and Offgas (EIIS Code: WF) radiation levels indicated no abnormal variations. Reactor coolant activity, in-plant radiation levels and vent release rates (EIIS Code: IL) were all normal based on plant conditions and were well within acceptable limits. There was no evidence of any fuel failure.

Since all ESF systems and components functioned properly and per design, there were no safety consequences or compromises to the health or safety of the public.

Potential: Human performance errors can challenge safety functions of plant structures, systems, and components (SSC). Reduced operating margins challenge Operations personnel and increase the frequency of safety system initiations.

CORRECTIVE ACTIONS

The following corrective actions for this event have been completed:

- The Unit 1 RFPT High Speed Stops were adjusted to increase available speed.
- U1 and U2 Reactor Recirculation pump controller reset rates were increased to provide a faster runback speed to recover lost operating margin.
- Involved individuals (Utility, Licensed) have been coached/counseled on the effective use of error prevention tools and techniques.

The following corrective actions are planned to address Human Performance:

- Error prevention techniques will be reinforced to support desired human performance attributes.

The following corrective actions are planned to address loss of operating margin:

- Station operating margin controls will be strengthened within plant change processes.
- U2 RFPT High Speed Stops will be adjusted to increase available speed.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Susquehanna Steam Electric Station - Unit 1	05000387	2003	- 006	- 00	5 OF 5

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

ADDITIONAL INFORMATION

Failed Component Information:

Component – Unit 1 'C' Reactor Feed Pump Turbine

Model – DRV 631122913

Manufacturer - General Electric

Previous Similar Events:

At Susquehanna, there is no history of scrams resulting from a loss of a single Reactor Feed Pump. In September 1999, loss of a single Reactor Feed Pump resulted in a Recirc #2 limiter runback. At that time, the remaining operational Feed Pumps restored water level to normal levels to avoid a low-water level scram.