

CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9907140154 DOC. DATE: 99/07/08 NOTARIZED: NO DOCKET #
 FACIL: 50-388 Susquehanna Steam Electric Station, Unit 2, Pennsylvania 05000388
 AUTH. NAME AUTHOR AFFILIATION
 METER, J.J. Pennsylvania Power & Light Co.
 SAUNDERS, R.F. Pennsylvania Power & Light Co.
 RECIPIENT NAME RECIPIENT AFFILIATION

SUBJECT: LER 99-003-00: on 990608, unplanned ESF actuation - generator load reject & reactor scram, occurred. Caused by failure of neutral bushing in "A" main transformer due to defective subcomponent. Entire transformer replaced. With 990708 ltr.

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 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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Robert F. Saunders
Vice President - Nuclear Site Operations

Susquehanna Steam Electric Station
P.O. Box 467, Berwick, PA 18603
Tel. 570.542.3256 Fax 570.542.1504
rfsaunders@pppl.com



July 8, 1999

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
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Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 50-388/99-003-00
PLA - 5085 FILE R41-2

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

Attached is Licensee Event Report 99-003-00. This report is being made pursuant to 10CFR50.73(a)(2)(iv), in that Susquehanna Unit 2 experienced an unplanned automatic actuation of an Engineered Safety Feature (ESF). The Reactor Protection System actuated upon a Turbine Control Valve Fast Closure resulting from a Main Generator Load Rejection. The Generator Load Rejection occurred when the 'A' Main Transformer experienced a failure of a neutral bushing, isolating the Main Generator and Main Transformers from the Power Grid.

Robert F. Saunders
Vice President - Nuclear Site Operations

Attachment

copy: 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

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LICENSEE EVENT REPORT (LER)

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, 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)
05000388

PAGE (3)
1 OF 4

TITLE (4)
Unplanned ESF Actuation - Generator Load Reject and Reactor Scram

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 NAME	DOCKET NUMBER
06	08	99	99	-- 003	-- 00	07	08	99	FACILITY NAME	DOCKET NUMBER 05000
									FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	POWER LEVEL (10)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
1	100	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)
		<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(x)
		<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 73.71
		<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 20.2203(a)(4)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> OTHER
		<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
		<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME Joseph J. Meter - Senior Engineer, Licensing	TELEPHONE NUMBER (Include Area Code) 570 / 542-1873
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)										
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
A	EL	XFMR	A020	Y						

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

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

At 1206 hours on June 8, 1999, with Unit 2 in Mode 1 (Power Operation) at 100% power, a unit primary lockout signal, created when one of the three single-phase main transformers failed, caused a Main Turbine trip. In accordance with plant design, the Turbine Control Valves closed and an automatic reactor scram occurred. All major equipment operated per design during the transient. Emergency Core Cooling Systems (ECCS) were not challenged and no abnormal operator actions were required to place the unit in a stable condition. The cause of the event was attributed to a failure of a neutral bushing in the 'A' Main Transformer due to a defective subcomponent. Failure of the bushing caused an electrical arc in the transformer resulting in a pressure spike inside the transformer oil tank and subsequent generator load rejection. Inadequate processing (human error, other utility personnel) by PP&L, of a 1990 manufacturer advisory for the defective bushing, led to its installation. The entire 'A' Main Transformer was replaced along with an acceptable bushing. The remaining in-service Unit 1 and Unit 2 main transformers were inspected for the defective bushings and none were found. Two spare bushings were found defective and segregated to prevent use. Any defective bushings of the same type will be prevented from being procured and installed through administrative processes. Personnel that process manufacturer advisories will be provided with information on this event. A review of manufacturer advisories will be conducted. The plant was safely shutdown, and there were no safety consequences or compromises to public health or safety during this event.

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TEXT CONTINUATION

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

EVENT DESCRIPTION

At 1206 hours on June 8, 1999, with Unit 2 in Mode 1 (Power Operation) at 100% power, a unit primary lockout signal, created when one of the three single-phase main transformers (EISS Code: EL) (2X101A) failed, resulting in a Main Turbine (EISS Code: TA) trip. Per design, the Turbine control valves closed and an automatic Reactor scram occurred. Both Reactor Recirculation (EISS Code: AD) pumps tripped per design via the End of Cycle – Recirculation Pump Trip (EOC-RPT) logic circuitry. All control rods inserted fully. Two Safety Relief Valves (EISS Code: SB) automatically lifted to control Reactor pressure and properly reseated. Reactor water level reached a minimum of +0.4 inches before recovering to +35 inches using Feedwater (EISS Code: SJ). All major equipment operated per design during the transient. There were no Emergency Core Cooling System (ECCS) initiations and no Diesel Generator (EISS Code: EK) starts. There were no challenges to Containment (EISS Code: NH). No abnormal operator actions were required to place the unit in a stable condition.

CAUSE OF EVENT

At 1206 hours on June 8, 1999, with Unit 2 operating at 100% power, a unit primary lockout signal was created when one of the three single-phase main transformers failed. The failure occurred at the 'A' main transformer (2X101A) high side neutral bushing. This primary lockout signal caused a main generator load rejection and main turbine trip. The lower end piece of the bushing separated while under full electrical load. The transformer winding lead remained attached to the separated bushing piece. It caused an electrical arc and pressure spike within the transformer oil tank. This actuated the main transformer sudden pressure relay as designed and resulted in a unit primary lockout signal and generator load reject.

The cause of the bushing failure was a defective aluminum end piece. The end piece was made of cast aluminum with high porosity and susceptibility to stress corrosion cracking. This failure mode was described in a manufacturer advisory received by PP&L in 1990. The manufacturer advisory cited two defective bushings by purchase order and serial number that were procured by PP&L. The two defective bushings were not installed at the time the advisory was issued. They were in the station's spare parts inventory. The opportunity to prevent installation of the defective bushings was missed when the manufacturer advisory was not entered into the Nuclear Department's Industry Events Review Program (IERP). Nuclear Department personnel processed a Replacement Item Evaluation (RIE) to address the advisory. The RIE process only approved the use of an equivalent bushing other than the defective type. It did not prevent defective components from being installed. Use of the IERP would have required an evaluation under the Defective Device List Program. This program in turn would have resulted in adding the defective bushing to the Defective Device List to ensure the defective bushings were not installed in the power plant and to also purge the defective bushings from spare parts inventory. No conclusive cause for the human error of failing to enter the manufacturer advisory into the IERP could be found due to the age of the event.

Both of the defective bushings described in the manufacturer advisory were installed on the Unit 2 'A' main transformer (2X101A) and placed into service during a series of bushing replacements. The first defective bushing was installed in 1992 when the original high side neutral bushing on the spare 2X101A

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transformer failed electrical checks in preparation for transformer changeout. The second defective bushing was installed in 1997 when the first defective bushing had a low oil level. The first defective bushing was sent to the manufacturer for repair and was subsequently returned with the original defective aluminum end piece. It was placed in the spare parts inventory. The second defective bushing failed while in-service on June 8, 1999.

REPORTABILITY/ANALYSIS

This event was determined to be reportable per 10CFR50.73 (a)(2)(iv) in that an unplanned Engineered Safety Feature (ESF) actuation occurred when the Reactor Protection System (EIS Code: JC) initiated an automatic Reactor scram following Turbine Control Valve fast closure with power greater than 24%. All major equipment operated per design during the transient, ECCS was not challenged and no abnormal operator actions were required to place the plant in a stable condition. The plant was safely shutdown and there were no safety consequences or compromises to public health or safety during this event. Generator Load Rejection is an analyzed event in the Final Safety Analysis Report, Chapter 15.

In accordance with the guidance provided in NUREG 1022, Rev. 1, Item 5.1.1, the required submission date for this report was determined to be July 8, 1999.

CORRECTIVE ACTIONS

The entire Unit 2 'A' Main Transformer (2X101A) was replaced along with an acceptable high side neutral bushing. The remaining in-service Unit 1 and Unit 2 main transformers were inspected for the defective bushings and none were found. The spare main transformers were inspected for defective bushings. One was found and has been segregated to prevent use. The spare parts inventory was reviewed for defective bushings. One was found and has been segregated to prevent use.

Corrective actions that are to be completed:

- The defective bushing type will be added to the Nuclear Department Defective Device List to prevent any other defective bushings of this type from being procured and installed.
- The current Industry Events Review Process (IERP) will be revised to address adding defective materials to the Defective Device List Program.
- Personnel that process manufacturer advisories will be provided with information on this event to emphasize the importance of using the IERP process and Defective Device Program for manufacturer advisories.
- All other transformer/bushing advisories from the manufacturer of the defective bushing will be reviewed to determine if there is any need to be incorporated into the IERP process.

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- A review to determine the effectiveness of the IERP process for manufacturer notices will be performed. Due to the similar causes of this event and the event described in LER 99-001-01 (Docket No. 50-387), the review will include manufacturer notices of the early 1990's.

ADDITIONAL INFORMATION

Failed Component Identification: Component - Broken High Side Neutral Bushing for Unit 2 Main Transformer (2X101A)
 Manufacturer - ABB
 Model Number - 025A200BE

Previous Events with similar results, but with dissimilar causes:

Docket No. 50-387 LER 84-034-00 -- Phase-to-phase fault on 230 KV line.

Docket No. 50-388 LER 85-025-00 -- Generator load reject, reactor scram. Lightning strike on 500 KV line caused logic relay failure.

Docket No. 50-387 LER 88-006-00 -- Generator load reject, reactor scram. Worker bumped 230 KV-yard span protection relay.

Docket No. 50-388 LER 88-010-00 -- Generator load reject, reactor scram. Lightning strike on 500 KV line caused misoperation of ground fault relay.

Docket No. 50-387 LER 89-027-00 -- Generator load reject, reactor scram. Loss of electrical services to the 230 KV switchyard caused tripping of main distribution breakers resulting in the generator load reject.

Docket No. 50-388 LER 90-002-00 -- Generator load reject, reactor scram. Actuation of 500 KV line protective circuitry caused tripping of the main distribution breakers resulting in the generation load reject.

Docket No. 50-388 LER 95-005-00 -- Generator load reject, reactor scram. Actuation of 500 KV line protective circuitry caused tripping of the main distribution breakers resulting in the generation load reject

Previous Events with dissimilar results, but with similar causes:

Docket No. 50-387 LER 99-001-01 -- Loss of Both Loops of Residual Heat Removal -- Low Pressure Coolant Inspection.