



South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

November 8, 2007  
NOC-AE-07002232  
10CFR50.73

U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
One White Flint North  
11555 Rockville Pike  
Rockville, MD 20852-2738

South Texas Project  
Unit 1  
Docket No. STN 50-498  
Revision 1 to Licensee Event Report 2006-06,  
Inoperable Auxiliary Feedwater Flow Instrumentation

Reference: Letter dated February 15, 2007, from Ken Coates, STPNOC, to NRC Document Control Desk, "Licensee Event Report 2006-06, Inoperable Auxiliary Feedwater Flow Instrumentation" (ML070580139, NOC-AE-07002098)

Pursuant to 10 CFR 50.73(a)(2)(i)(B), STP Nuclear Operating Company submits the attached revision to Unit 1 Licensee Event Report 2006-06 regarding an inoperable channel of Auxiliary Feedwater Flow Instrumentation resulting in exceeding the allowed outage time of Technical Specification (TS) 3.3.3.6 Action 35. The revision updates the cause of the event and associated corrective action. Revised text is identified by change bars in the margin.

This event did not have an adverse effect on the health and safety of the public.

There are no commitments contained in this event report. Resulting corrective actions will be implemented in accordance with the Corrective Action Program.

If there are any questions regarding this submittal, please contact S. M. Head at (361) 972-7136 or me at (361) 972-8902.

A handwritten signature in black ink, appearing to read "K Coates", is positioned above the printed name.

Ken Coates  
Plant General Manager

awh/

Attachment: South Texas Unit 1 LER 2006-06 Revision 1

STI: 32222412

JE22  
KLR

cc:

(paper copy)

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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 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 and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@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 an 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 South Texas, Unit 1	2. DOCKET NUMBER 05000498	3. PAGE 1 OF 6
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4. TITLE TS 3.3.3.6 Action 35 Allowed Outage Time Exceeded
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5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
12	17	2006	2006	- 006 -	01	11	08	2007	NA	05000
									FACILITY NAME	DOCKET NUMBER
									NA	05000

9. OPERATING MODE 1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)									
10. POWER LEVEL 100	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)						
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)						
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)(B)						
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)						
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)						
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)						
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)						
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER						
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A							

12. LICENSEE CONTACT FOR THIS LER									
NAME Albon W. Harrison (Licensing Engineer)								TELEPHONE NUMBER (Include Area Code) (361) 972-7298	

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	BA	CPU	W120	N	B	EF	INVT	A363	Y

14. SUPPLEMENTAL REPORT EXPECTED					15. EXPECTED SUBMISSION DATE		
<input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE)					<input checked="" type="checkbox"/> NO		
					MONTH	DAY	YEAR

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

At 0945 on December 15, 2006 several loads were lost on distribution panel (DP-1202) associated with the STP Unit 1 Train D inverter following an electrical transient. The loads included a qualified display processing system (QDPS) cabinet that provides auxiliary feedwater (AFW) flow indication and control functions for the Train D turbine driven AFW train. As a result of the loss of AFW flow instrumentation, STP Unit 1 entered Technical Specification (TS) 3.3.3.6 Action 35, and TS 3.7.1.2 Action b. The allowed outage time for the AFW flow indication is 48 hours and expired at 0945 CST on December 17, 2006. The allowed outage time for the turbine-driven (TD) AFW train is 72 hours and would have expired at 0945 CST on December 18, 2006.

STPNOC determined the AFW flow instrumentation channel could not be restored prior to the expiration of the allowed outage times and requested enforcement discretion. NRC granted the enforcement discretion at 0839 on December 17, 2006, effective until 2145 hours on December 18, 2006.

STPNOC found that two of three Electrically Erasable, Programmable, Read-Only Memory (EEPROM) chips located on a QDPS central processing unit (CPU) circuit board had been damaged due to the electrical transient. STPNOC replaced the damaged EEPROMs and affected downstream circuit boards. QDPS Cabinet D2 and the functions above were declared operable at 2155 hours on December 17, 2006.

The electrical transient was caused by a capacitor failure in inverter 1202. The capacitor failure was due to a manufacturing defect. The affected capacitor bank was replaced on December 20, 2006.

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South Texas, Unit 1	05000498	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 6
		2006	006	01	

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

**I. DESCRIPTION OF REPORTABLE EVENT**

**A. REPORTABLE EVENT CLASSIFICATION**

This event is reportable pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by Technical Specifications (TS). The TS 3.3.3.6 Table 3.3-10 Action 35 allowed outage time for AFW Flow Indication was exceeded.

**B. PLANT OPERATING CONDITIONS PRIOR TO THE EVENT**

At the time of discovery, Unit 1 was operating at 100%.

**C. STATUS OF STRUCTURES, SYSTEMS, OR COMPONENTS THAT WERE INOPERABLE AT THE START OF THE EVENT AND THAT CONTRIBUTED TO THE EVENT**

No equipment that was inoperable at the initiation of the event contributed to the event.

**D. NARRATIVE SUMMARY OF THE EVENT, INCLUDING DATES AND APPROXIMATE TIMES**

At 0945 on December 15, 2006 with Unit 1 at 100% power, D train distribution panel 1202 (DP1202) generated a voltage transient that resulted in the loss of multiple loads due to fuses clearing and damage to the connected loads. The transient was indicated by ground fault and inverter trouble alarms in the control room. However, following the transient, inverter 1202 was found to be operating normally. An Engineering evaluation determined the inverter was degraded but operable. The loads listed in Section II.C below were lost from the inverter.

The Operators responded appropriately to the electrical transient and its effects. The Operators were temporarily required to take manual control of pressurizer level and Steam Generator (SG) 1D and SG 1C level.

The most limiting TS actions were due to the inoperable AFW Flow indication with a 72-hour shutdown action required by TS 3.7.1.2 ACTION b and a 48-hour shutdown action required by TS 3.3.3.6 ACTION 35. STPNOC determined that restoration of the QDPS Auxiliary Processing Cabinet (APC) D2 and the AFW flow instrumentation channel would likely require replacement of EEPROM chips that were not available on site. Consequently, STPNOC determined that the function could not be restored prior to the expiration of the allowed outage time. In a teleconference on December 17, 2006, STPNOC requested enforcement discretion to extend the allowed outage time to 2145 on December 18, 2006. NRC granted the enforcement discretion at 0839 on December 17, 2006.

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STPNOC found that two of three EEPROM chips located on a QDPS CPU circuit board had been damaged due to the electrical transient. STP replaced the damaged EEPROMs and affected downstream circuit boards. QDPS Cabinet D2 and the functions above were declared operable at 2155 hours on December 17, 2006.

The electrical transient was caused by failure of a capacitor in the C805 capacitor bank in inverter 1202. The capacitor failure was due to a manufacturing defect in the internal capacitor lead. The affected capacitor bank was replaced on December 20, 2006.

E. THE METHOD OF DISCOVERY OF EACH COMPONENT OR SYSTEM FAILURE, OR PROCEDURAL OR PERSONNEL ERROR

Control Room Operators noted an electrical transient on a Distribution Panel (DP1202) for the 120VAC distribution system. Visual inspection revealed a failed capacitor in the C805 capacitor bank in inverter 1202 that supplies power to DP1202. Following the electrical transient, the Control Room Operators noted that several electrical loads supplied by DP1202 were no longer in operation. The affected loads included a QDPS cabinet that provides AFW flow indication and control functions for the Train D turbine-driven AFW train.

II. COMPONENT OR SYSTEM FAILURES

A. FAILURE MODE, MECHANISM, AND EFFECTS OF EACH FAILED COMPONENT

The failed C805 capacitor was inspected after replacement of the capacitor bank. The inspection revealed that the failure mode was a short circuit to ground caused by the internal capacitor lead to the capacitor casing. The effect was an over-voltage electrical transient caused the loads identified below to be lost from the inverter. The failure was a Maintenance Rule Functional Failure.

B. CAUSE OF EACH COMPONENT OR SYSTEM FAILURE

The failure of the C805 capacitor was due to a manufacturing defect. Off site failure analysis of the failed capacitor found that outside internal lead had either been folded incorrectly or the insulation had a pre-existing flaw. In either case the lead was either in touch with the side of the capacitor housing (can) or within close enough proximity to the can that when the insulation broke down it resulted in a short circuit to the can causing the capacitor to fail which resulted in a short circuit to ground.

The cause of the fuse and load failures is a design incompatibility between the 120 volt AC system and the connected loads. The ungrounded system design allows a high voltage bus to ground transient to be created under the conditions that existed when C805 faulted. The ground capacitors and varistors in the loads then coupled the transient to the loads. This resulted in load fuses clearing, varistors failing and power supply damage/failure.

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

Surge protection for the EEPROMs is provided at the AC input to the QDPS cabinet. Testing of the surge suppressors found they were undamaged. The most probable cause of the QDPS EEPROM damage was the same design incompatibility that caused the other loads to fail.

**C. SYSTEMS OR SECONDARY FUNCTIONS THAT WERE AFFECTED BY FAILURE OF COMPONENTS WITH MULTIPLE FUNCTIONS**

The loads that were lost from the inverter and their associated TS included the following:

- a) Isolation Relay Cabinet
- b) Steam Generator 1D Power Operated Relief Valve (PORV) servo amplifier (TS 3.3.5.1, TS 3.7.1.6 for inoperable PORV)
- c) QDPS APC D1
  - Inoperable Channel 2 for Steam Generator Narrow Range Level (TS 3.3.1, Table 3.3-1 Item 14 – ACTION 6, TS 3.3.2, Table 3.3-3 Item 5.b – ACTION 20).
  - Inoperable Channel 2 input to automatic Steam Generator (SG) Water Level Control for SG 1D and SG 1C – required manual control of SG level (no TS)
  - Inoperable RCS T-hot for loop 2 (TS 3.3.1, Table 3.3-1 Item 8 & 9 – ACTION 6)
- d) QDPS APC D2
  - Inoperable AFW flow indication (TS 3.3.3.6)
  - Inoperable automatic AFW flow control for Train D AFW (TD AFW, TS 3.7.1.2)
- e) Nuclear Instrument System (NIS) control and instrument power to panel 5Z111ZCP011

**D. FAILED COMPONENT INFORMATION**

The C805 capacitor and the EEPROMs are the primary component failures. The information on the components is coded in Block 13 above.

**III. ANALYSIS OF THE EVENT**

**A. SAFETY SYSTEM RESPONSES THAT OCCURRED**

No safety system responses were required or occurred.

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**B. DURATION OF SAFETY SYSTEM TRAIN INOPERABILITY**

The AFW flow instrumentation was inoperable from 0945 on December 15, 2006 until 2155 December 17, 2006. STP Unit 1 was in TS 3.3.3.6 Action 35 and TS 3.7.1.2 Action b for the same duration.

**C. SAFETY CONSEQUENCES AND IMPLICATIONS**

The event did not have an adverse affect on the health and safety of the public. The incremental conditional core damage probability and the incremental conditional large early release probability for the 36 hour extension to the allowed outage time requested in the enforcement discretion were 8.0E-09 and 1.0E-12, respectively. A detailed assessment is provided in STPNOC's documentation of the enforcement discretion request dated December 18, 2006 (NOC-AE-06002095, ML063620440). The NRC approved the request as described in Notice of Enforcement Discretion for South Texas Project Nuclear Operating Company Regarding South Texas Project, Unit 1 [ ML063540518, TAC NO. MD3829, NOED NO. 06-4-002].

**IV. CAUSE OF THE EVENT**

The electrical transient that initiated the event was caused by the failure of the C805 capacitor.

**V. CORRECTIVE ACTIONS**

- STPNOC replaced the damaged EEPROMs and affected downstream circuit boards.
- The affected capacitor bank was replaced on December 20, 2006 with a bank that was x-rayed prior to installation to confirm acceptability.
- The corresponding capacitor banks for the inverters on the other channels will be replaced as needed. Capacitor banks to be used for replacement will be x-rayed prior to installation to confirm manufacturing flaws like the one that caused the subject capacitor failure are not present.
- STPNOC is evaluating design modifications to the inverter that would better protect downstream loads.

STPNOC submitted a TS change application prior to the event that proposed to change the allowed outage time for the AFW Flow indication channel from 48 hours to 30 days (ML062830032). The application was approved on June 13, 2007 in Amendments 177 & 164. The new allowed outage time will provide adequate time to restore the affected AFW Flow channel to operable status in order to preclude a similar TS violation and associated reportable condition in the future.

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**VI. PREVIOUS SIMILAR EVENTS**

A similar event occurred at STP in December 2005. The initiating cause of the event was a failed capacitor in the same inverter. STPNOC performed a failure analysis of that capacitor and determined that an internal lead in the capacitor had shorted to ground. STPNOC notified the inverter vendor (Ametek) and the capacitor vendor (Aerovox) of our findings. Aerovox subsequently notified STPNOC that changes had recently been made in their manufacturing process to reduce the potential for internal faults. STPNOC replaced all capacitors in all Unit 1 Ametek inverters with newly designed capacitors in the October 2006 refueling outage. The December 2005 event did not result in damage to the EEPROMs because the input line surge suppressor protected the EEPROMS.