



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

December 15, 1999
NOC-AE-000726
File No.: G26
10CFR50.73

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

South Texas Project
Unit 2
Docket No. STN 50-499
Supplement to Licensee Event Report 98-004
Unit 2 Shutdown Required By Technical Specifications
Due To Failure In Solid State Protection System (SSPS) Test Circuitry

Pursuant to 10CFR50.73, the South Texas Project Nuclear Operating Company submits the attached supplement to Unit 2 Licensee Event Report 98-004 regarding the completion of a plant shutdown required by Technical Specification 3.3.2. This event did not have an adverse effect on the health and safety of the public.

Licensee commitments are found in the corrective action section of the attachment. If you should have any questions on this matter, please contact Mr. S. M. Head at (361) 972-7136 or me at (361) 972-7800.

G. L. Parkey
Plant General Manager

JRM/

Attachment: LER 98-004 Supplement (South Texas, Unit 2)

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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
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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

FACILITY NAME (1) South Texas, Unit 2	DOCKET NUMBER (2) 05000 499	PAGE (3) PAGE 1 OF 5
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TITLE (4)
Plant Shutdown Required By Technical Specification 3.3.2 Due To Failure In SSPS Test Circuitry

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
12	28	98	98	-- 004	- 01	12	15	99		05000
										05000

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

LICENSEE CONTACT FOR THIS LER (12)

NAME Scott M. Head - Licensing Supervisor	TELEPHONE NUMBER (Include Area Code) (361) 972-7136
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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
X	JC	RLY	W120	N					

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 15 single-spaced typewritten lines) (16)

On December 28, 1998, Unit 2 was in Mode 1 at 100% power. At 1428 hours on December 28, 1998, Unit 2 entered Technical Specification (TS) 3.3.2 Action 14 due to two indicated failures in the Train "S" Solid State Protection System (SSPS) Containment Isolation Phase A Train A and B actuation circuits. The indicated failures were found during a scheduled surveillance. South Texas Project Unit 2 was shutdown and entered Mode 3 at 1916 hours on December 28, 1998. Troubleshooting identified a failure within the test circuitry, and two SSPS test circuit cards (Semiautomatic Testing Circuit Card and a Tester Clock Counter Circuit Card) were replaced. Manual testing verified proper operation of the Phase A actuation circuitry and that the SSPS was always capable of performing its intended safety function. The required surveillance was completed resulting in SSPS being declared operable at 0552 hours on December 29, 1998. The cause of the event was determined to be a degraded Testing Circuit Card in conjunction with a 16 kHz induced noise signal in the testing circuitry, which in turn caused the associated test circuit Safeguards Driver Card to cycle on and off. This cycling of the Safeguards Driver card caused the Testing Circuit Card to sense an apparent (but not actual) failure in the SSPS actuation circuitry being tested. This condition did not affect the ability of the testing circuitry to detect a true failed logic circuit, did not invalidate any SSPS testing previously performed, and did not impact the ability of SSPS to perform its intended function. Corrective actions include replacement of the Test Circuit Card, unbundling of test circuitry wiring to minimize induced noise, and revision of logic test surveillance procedures to incorporate a manual testing method in the event a test failure is indicated.

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DESCRIPTION OF EVENT:

On December 2, 1998 with Unit 2 at 100% power, a walkdown of the Solid State Protection System (SSPS) cabinets in Unit 2 found that one of four normally lit Light Emitting Diodes (LEDs) on the tester board in Train "S" was not illuminated. The tester board is part of the semiautomatic tester used to test the SSPS circuitry. A Condition Report (CR) was generated to investigate this problem, which resulted in a work package scheduled for performance on December 28, 1998, to correct the problem prior to performing surveillance test 0PSP03-SP-0005S (SSPS Logic Train S Functional Test). Prior to commencing work per the work package, a reactor trip breaker surveillance test 0PSP03-SP-0006S (Train S Reactor Trip Breaker TADOT) was performed. The test caused the trip breaker to open unexpectedly. Evaluation of this problem determined that the problem in the tester circuit caused the trip breaker to open during the surveillance test.

Troubleshooting activities confirmed the tester circuit board had one output failed. The tester circuit board was replaced with one from the warehouse that had been satisfactorily tested at the onsite metrology lab. After replacement of the circuit board, all of the required LEDs were illuminated and indications on the panel were normal. This work was completed at approximately 1100 hours on December 28, 1998 without taking SSPS Train S logic cabinet out of service. The post maintenance test specified for this work was the satisfactory completion of logic test 0PSP03-SP-0005S.

At 1430 hours on December 28, 1998 the surveillance test 0PSP03-SP-0005S commenced, making the Train S logic cabinet inoperable. Technical Specification (TS) 3.3.2 allows the train to be bypassed for up to 2 hours for surveillance testing. This surveillance first tests the tester board, which had been replaced as described above, followed by actuation logic circuit testing. During this testing, 2 indicated actuation circuit failures occurred in the Containment Isolation Phase A Trains A and B circuits. When these indicated failures occurred, TS 3.3.2 Limiting Condition for Operation (LCO) Action 14 was entered which requires the unit be placed in at least HOT STANDBY within 6 hours, and COLD SHUTDOWN within the following 30 hours. Troubleshooting was performed and the Safeguards Driver board was replaced. The post maintenance test specified for this work package was the satisfactory completion of the logic test 0PSP03-SP-0005S. This test indicated the same 2 circuit failures with Phase A Train A and B circuits. Additional troubleshooting instructions were prepared including manual tests of the circuits. The manual tests showed proper operation of the SSPS logic circuits. By this time the plant had been shut down, entering Mode 3 at 1916 hours on December 28, 1998. Success of the manual test indicated that the problem was in the testing circuitry, however the specific component could not be identified. Work instructions were written to replace the Semiautomatic Testing Circuit Card and a Tester Clock Counter Circuit Card. After replacement of the testing circuit card and clock counter circuit card, logic test 0PSP03-SP-0005S was successfully completed. SSPS Train S logic cabinet was declared operable at 0552 hours on December 29, 1998.

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DESCRIPTION OF EVENT (CONTINUED):

Investigation and troubleshooting conducted during refueling outage 2RE07 determined the cause of this event to be a degraded Testing Circuit Card in conjunction with a 16 kHz induced noise signal in the testing circuitry, which in turn caused the associated test circuit Safeguards Driver Card to cycle on and off. This cycling of the Safeguards Driver Card caused the Testing Circuit Card to sense an apparent (but not actual) failure in the SSPS actuation circuitry being tested. The 16 kHz noise signal was induced into the test circuit wiring by wiring associated with the multiplexing clock circuit used to synchronize the multiplexing with the opposite logic train (Train R). The bundling of wires which caused this problem was not found in any other logic train in either unit and thus was unique to Unit 2 Train S. As part of the troubleshooting performed during 2RE07, the 16 kHz wire was unbundled to minimize the induced noise.

Further investigation revealed that the design of the testing circuit is such that the voltage is lowered at the circuit being tested. This lower voltage is near the level at which the circuit's logic state may change. Thus the induced 16 kHz noise signal, along with the voltage lowered by the test circuit was sufficient to cycle the associated Safeguards Driver Card on and off. Although the 16 kHz noise signal has been corrected, there exists a small potential for a degraded component in the test circuit or safeguards driver circuit to lower the voltage in the logic circuit being tested to the point at which the test circuit would sense an apparent failure. Therefore, the logic test surveillance procedures will be revised to incorporate manual testing methods to verify whether a false failure is indicated.

It is important to note that these conditions do not affect the ability of the test circuitry to detect a true failed logic circuit and the ability of the SSPS to perform its intended function was not impacted. In fact, the SSPS was operable throughout the event.

CAUSE OF EVENT:

The cause of the event was determined to be a degraded Testing Circuit Card in conjunction with a 16 kHz induced noise signal in the testing circuitry, which in turn caused the associated test circuit Safeguards Driver Card to cycle on and off. This cycling of the Safeguards Driver card caused the Testing Circuit card to sense an apparent (but not actual) failure in the SSPS actuation circuitry being tested.

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ANALYSIS OF EVENT:

Completion of a plant shutdown required by Technical Specifications is reportable pursuant to 10CFR50.73(a)(2)(i)(A).

The SSPS contains three trains of Engineered Safety Features (ESF) actuation cabinets, which actuate various ESF equipment via relays providing protection to mitigate the consequences of postulated accidents. Each actuation train (A, B, and C) receives redundant inputs from two independent logic trains (R and S).

Since a problem in the SSPS testing circuitry was identified to be the cause of this event, the ability of SSPS to perform its intended safety function was not impacted.

There were no adverse safety or radiological consequences as a result of this event.

CORRECTIVE ACTIONS:

1. The testing circuit card was replaced. The new card did not exhibit the slightly different operating characteristics noted in the comparator circuit of the card that was replaced
2. Logic test 0PSP03-SP-0005S was successfully completed on SSPS Train S to verify operability.
3. Testing will be performed as early as practical, but not later than the next scheduled surveillance (3/21/99), in Unit 2 Train S to provide additional confidence that failed circuits in Phase A Trains A and B can be detected. This action was completed on March 10, 1999.
4. Regularly scheduled surveillance testing will be observed by April 14, 1999 to verify that similar symptoms do not exist on the remaining trains in both units. This action was completed on March 15, 1999.
5. Troubleshooting will be performed during the Unit 2 Fall 1999 refueling outage (2RE07) to determine the root cause of the testing circuit failure. A supplement to this LER will be issued by December 15, 1999 documenting the results of the root cause investigation. Any component failure information identified in the root cause investigation (required in Block 13 of the LER) will be provided at that time. These actions are documented in this Licensee Event Report Supplement.

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CORRECTIVE ACTIONS (CONTINUED):

In addition to the corrective actions identified above in the original Licensee Event Report, the following actions have been or will be taken.

6. The 16 kHz noise-inducing multiplexing circuit wire was unbundled from test circuit wiring. This action was completed November 5, 1999.
7. Logic test surveillance procedures will be revised to incorporate manual testing in the event a failure is indicated. This action will be completed by March 31, 2000.

ADDITIONAL INFORMATION:

In the past three years there have been no similar events regarding completion of a Technical Specification required shutdown due to the inoperability of the SSPS. However, a universal logic board failure in SSPS Train R was found during surveillance testing in June 1995 and is documented in Condition Report 95-7754.