STP Nuclear Operating Company
South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

March 20, 2003
NOC-AE-03001493
File No.: G25
10CFR50.73
STI: 31577599

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

South Texas Project
Unit 1
Docket No. STN 50-498
Licensee Event Report 03-001
Partial Loss of Offsite Power in Units 1 and 2 resulting in Engineered Safety Feature Actuation

Pursuant to 10CFR50.73(a)(2)(iv)(A), the South Texas Project submits the attached Unit 1 Licensee Event Report 03-001 concerning the partial Loss of Offsite Power (LOOP) in Units 1 and 2 and actuation of Engineered Safety Feature Standby Diesel Generators for Units 1 and 2. The cause of the partial Loss Of Offsite Power was the de-energizing of the switchyard North bus due to a malfunctioning motor operated circuit switcher.

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

Corrective actions number 1, 2 and 3 are the only commitments contained in this event report.

If there are any questions on this submittal, please contact W. R. Bealefield, Jr. at (361) 972-7696 or me at (361) 972-7849.

E. D. Halpin
Plant General Manager

Attachment: LER 03-001 (South Texas, Unit 1)

IE22

cc:
(paper copy)

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

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.

LICENSEE EVENT REPORT (LER)

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

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4 TITLE

Partial Loss of Offsite power to Unit 1 and Unit 2 resulting in Engineered Safety Feature Actuations

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
01	19	2003	2003	- 01 -	00	03	20	2003	South Texas Unit 2	05000 499
									FACILITY NAME	DOCKET NUMBER 05000

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)
William R. Bealefield, Jr.	361-972-7696

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
X	FK	BKR	S &C	YES	D	EK	33	ABB	Yes

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)

On January 19, 2003 at 1255, Unit 1 was in Mode 1 at 100% power and Unit 2 was in Mode 3 with the 2A and 2D Reactor Coolant Pumps running. While placing the North Bus Shunt Reactor in the switchyard in service, Unit 1 Standby Transformer received a lockout due to an over-current condition on the neutral of the Shunt Reactor. This caused the North Bus to clear and isolate the North Bus Shunt Reactor.

Unit 1 experienced a partial Loss of Offsite Power (LOOP) to Standby Bus 1G and 1H which supply power to Engineered Safety Feature (ESF) Trains 1B and 1C. The Train 1B and Train 1C Emergency Diesel Generators (EDG) started as a result of the ESF Actuation – LOOP. The Train 1C components automatically loaded per design. The Train 1B Sequencer did not automatically load resulting in the manual loading of the Train 1B components by the Reactor Operators.

Unit 2 experienced a partial LOOP due to the loss of the Unit 1 Standby Transformer which was supplying power to Auxiliary Busses 2F, 2J and Standby Bus 2F, which supplies ESF Train 2A. The Train 2A Emergency Diesel Generator automatically started and loaded as expected.

The cause of the loss of Unit 1 Standby Transformer was de-energizing the switchyard North Bus, which provides power to the Standby Transformer, due to a malfunctioning motor operated circuit switcher.

There was no impact to radiological safety, safety of the public or safety of station personnel.

Corrective actions include changing the protective relay scheme for the Shunt Reactor.

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

DESCRIPTION OF EVENT

On January 19, 2003 at 1253 Unit 1 was in Mode 1 at 100% power and Unit 2 was in Mode 3 with the 2A and 2D Reactor Coolant Pumps (RCP) running. At approximately 1254, the Unit 1 Shift Supervisor was informed by the CenterPoint Energy Dispatcher that CenterPoint Energy would be placing the North Bus Shunt Reactor in service to lower grid voltage because of low load conditions. At 1255, CenterPoint Energy attempted to close the North Bus Shunt Reactor Switcher via remote control. The Circuit Switcher closed on 2 of the 3 phases causing a current in the Shunt Reactor neutral to flow due to an imbalance. This caused the neutral time over-current protective relay to operate and start the process to clear the imbalance condition. The clearing of the imbalance condition caused all switchyard circuit breakers connected to the North Bus to open. This isolated power to Standby Transformer 1 and all 13.8 kV busses fed by the transformer. After clearing the Shunt Reactor from the North Bus, all switchyard circuit breakers closed. Based on the initiating event all STP protective relaying operated as designed.

Unit 1 began this event in a normal electrical configuration with the exception of Unit 1 Standby Transformer supplying some Unit 2 electrical loads. Unit 1 experienced a partial Loss of Offsite Power (LOOP) to Standby Bus 1G and 1H which provides power to Engineered Safety Feature (ESF) Trains 1B and 1C. Both the Train 1B and Train 1C Emergency Diesel Generators (EDG) started as a result of the ESF actuation. The Train 1C sequencer operated as expected. The Train 1C components automatically loaded per design. The Train 1B sequencer did not load resulting in the manual loading of the Train 1B components by the Reactor Operators in accordance with station off-normal procedures. The Unit 1 Standby Transformer re-energized approximately one minute after the Shunt Reactor cleared. This event resulted in a Technical Specification (TS) 3.0.3 entry in Unit 1 due to the loss of two offsite power sources and the B Train EDG (due to the failure of the B Train sequencer). At 1345, Unit 1 exited TS 3.0.3 when offsite power was restored to B Train. At 1406, offsite power was restored to C Train.

Unit 2 began this event in a standard alternate configuration due to ongoing work on the Main Generator Output Circuit Breaker. Unit 2 experienced a partial LOOP due to the loss of Unit 1 Standby Transformer which was supplying power to Auxiliary Busses 2F, 2J and Standby Bus 2F, which supplies power to ESF Train 2A. The Train 2A EDG automatically started and loaded as expected. As a result of the LOOP, Unit 2 experienced a loss of circulating water and loss of condenser vacuum. The Steam Generators (SG) were already being supplied by the Auxiliary Feedwater (AFW) system therefore there was no interruption of SG cooling. Both Train A and D RCPs tripped resulting in entry into TS 3.4.1.2 Action B and C. There was a loss of charging due to the LOOP resulting in a loss of RCP seal injection, however, component cooling water flow to the thermal barrier maintained seal cooling. Charging was restored to supply seal injection. At 1840, when starting RCP 2A, pressurizer Power Operated Relief Valve (PORV) 655A opened and reseated due to a pressure spike.

The cause of the failure of the Unit 1 1B Sequencer to sequence loads onto the B train EDG was mis-positioned switch contacts for the Mechanism Operated Cell (MOC) switch for the output breaker for the B Train EDG. The mis-positioned switch contacts were the result of an incorrectly adjusted operating linkage for the switch.

Unit 1 remained at 100% power and Unit 2 remained in Mode 3.

EVENT SIGNIFICANCE

This event resulted in no personnel injuries, radiation exposure, offsite radiological releases or damage to important safety related equipment. This event is reportable pursuant to 10CFR50.73(a)(2)(iv)(A) "any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B) of this section". Section (a)(2)(iv)(B) includes "emergency ac electrical power systems, including emergency diesel generators (EDGs)."

The Conditional Core Damage Probability (CCDP) for Unit 1 is 1.9E-7. This represents the cumulative risk over baseline risk for non-functionality of Train 1B sequencer assuming a T/2 period since the last surveillance test. The CCDP includes all known maintenance activities during this time.

The CCDP for Unit 2 is 1.2E-7. This is a slightly conservative value, assuming the unit is in Mode 1 while the unit was actually in Mode 3 and given a Loss Of Main Transformer (LOMT). The LOMT event best represents the actual plant configuration at the time of the loss of the Unit 1 Standby Transformer.

CAUSE OF EVENT

Root Causes for the Partial Loss Of Offsite Power:

1. The first root cause for this event is associated with the malfunction of the C phase of the Shunt Reactor Circuit Switcher that did not close. The open phase set up a current imbalance that caused currents to flow in the neutral of the Shunt Reactor and actuated the time over-current relay trip which in turn tripped the North Bus Circuit Breakers. The Circuit Switcher was inspected and tested to determine the root cause for the Circuit Switcher malfunctioning. No fault could be identified and the Circuit Switcher functioned as designed during repeated testing. Since the exact cause of the Circuit Switcher malfunctioning could not be found, this root cause is indeterminate. There are no known corrective actions relative to this Circuit Switcher that will prevent a future Circuit Switcher induced phase imbalance.

2. The second root cause is the South Texas 345 kV Shunt Reactor protective relaying scheme. The design at the time of this event allowed the Shunt Reactor neutral time over-current protective relay to trip the 345 kV Bus Circuit Breakers. A better design will have the Shunt Reactor neutral time over-current protective relay trip its circuit switcher leaving the 345 kV bus intact.

Complicating the consequences of the subject LOOP was the fact that both Units had ESF trains powered from the Unit 1 Standby Transformer.

Apparent Cause of the malfunction of the 1B Train Load Sequencer:

1. The Mechanism Operated Cell (MOC) switch for the 1B Train EDG output breaker had mis-positioned switch contacts which did not send a signal to the sequencer to indicate that the EDG breaker was closed. The mis-positioned switch contacts were caused by an incorrectly adjusted switch linkage. The cause of the incorrectly adjusted MOC switches was incomplete MOC inspection

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

instructions in 4160 kV switchgear and Gould breaker test procedures. The lack of specific inspection criteria has been identified as an issue in the industry, including several EPIX failure reports. Information recently received from the vendor provides measurements to verify alignment.

CORRECTIVE ACTIONS

1. STPNOC plans to have changes made to the Shunt Reactor neutral over-current protective relay scheme to trip the Shunt Reactor Circuit Switcher instead of tripping the AC bus circuit breakers. CenterPoint Energy will implement this change to the scheme.
This corrective action will be completed by July 15, 2003.

2. As an interim compensatory action, a hold tag was placed on the controls for the North Bus Shunt Reactor Circuit Switcher to hold it in the open position. This hold tag was placed by CenterPoint Energy at the Energy Control Center in January 2003 and will remain in place until the protective relay scheme changes are made by corrective action 1. A hold tag was also placed on the controls for the South Bus Shunt Reactor Circuit Switcher to maintain it in the closed position.

3. Design engineering will develop a recommendation for improving the reliability of standard alternate electrical lineups.
This corrective action will be completed by July 15, 2003.

4. The procedure for 4160-Volt Gould Breaker testing was revised to verify the contact tabs of the MOC switches are centered in the view window for the breaker with the breaker open and closed. This procedure was revised on February 20, 2003.

5. The procedure for 4160-Volt Class 1E Switchgear Maintenance was revised to verify the contact tabs for the MOC are centered and to adjust if necessary.
This procedure was revised on February 20, 2003.

ADDITIONAL INFORMATION

The Shunt Reactor is a Mark IV manufactured by S & C, Catalog number 382373 for 345 kV applications.

The mis-adjusted Mechanism Operated Cell (MOC) for the B Train EDG output breaker is model type L2 manufactured by ABB.

A search was conducted to attempt to find similar operating experience with motor operated circuit Switchers. No events were found in the last three years. STP's only previous events of Circuit Switcher malfunction occurred during the construction period in 1984 and 1985. The cause of the malfunction in both cases was identified as misalignment of the Circuit Switcher.

STP Nuclear Operating Company has had two switchyard events in the past three years, however neither of these events involved the shunt reactors or the Shunt Reactor Circuit Switchers.

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

The cause of the Unit 2 PORV lifting when the 2A RCP was started is as follows:

Prior to the pump start, the Reactor Coolant System (RCS) was about 16 degrees cooler than the Steam Generators (SG) due to low decay heat and isolation of the SGs. The SGs acted like a heat source instead of a heat sink. This resulted in a moderate RCS heatup and pressurizer (PZR) insurge when RCP 2A was started, PZR level increased approximately 4 percent which rapidly increased pressure. The PZR pressure control system responded to open both spray valves. RCP 2A was the only RCP started during this event. Previous events have revealed that the use of only RCP 2A does not create enough differential pressure across the PZR to drive adequate spray flow, especially with both spray valves open. In this condition the PZR spray water from RCP 2A likely short-cycled through the 2D spray valve to bypass spray flow that would otherwise travel to the PZR spray nozzle. With little to no spray flow, pressure continued to drift up to the PORV open setpoint of 87.5 percent.

Plant procedures have been revised to ensure operators verify the delta temperature between RCS and SG secondary side is less than ten degrees before starting a RCP when primary temperature is greater than 350 degrees. Procedures previously allowed the temperature verification to be omitted.

In addition, for starting the first RCP, guidance has been provided to direct placing the spray valve for the RCP not being started in manual to prevent bypassing spray flow from the PZR.