



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

July 7, 2011
NOC-AE-11002693
File No.: G25
10 CFR 50.73
STI: 32893768

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

South Texas Project
Unit 2
Docket No. STN 50-499
Revision 2 of Licensee Event Report 2010-005
Startup Feed Pump 24 Breaker Failure and Unit 2 Reactor Trip

- References:
1. Letter dated January 3, 2011, from L. W. Peter, STPNOC, to NRC Document Control Desk, "Licensee Event Report 2010-005 Startup Feed Pump 24 Breaker Failure and Unit 2 Reactor Trip," (NOC-AE-10002630) (ML110070064)
 2. Letter dated April 4, 2011, from L. W. Peter, STPNOC, to NRC Document Control Desk, "Revision 1 of Licensee Event Report 2010-005 Startup Feed Pump 24 Breaker Failure and Unit 2 Reactor Trip," (NOC-AE-10002659) (ML111010019)

Pursuant to 10 CFR 50.73, STP Nuclear Operating Company (STPNOC) submits the attached Unit 2 Licensee Event Report (LER) 2010-005 Revision 2 to address the Unit 2 Reactor trip that occurred on November 3, 2010.

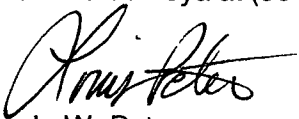
This condition is considered reportable under 10 CFR 50.73(a)(2)(iv)(A), any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B) of this section.

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

The attached LER is the planned LER supplement described in Ref. 2 above including a correction to the reporting criteria where criterion 20.2203(a)(3)(i) was inadvertently checked. This LER supplement provides the results of the respective Root Cause Evaluation and revises the appropriate reporting criteria accordingly.

There are no commitments contained in this LER.

If there are any questions on this submittal, please contact either J. A. Loya at (361) 972-8005 or me at (361) 972-7158.


L. W. Peter
Plant General Manager

JAL

Attachment: Revision 2 of Licensee Event Report 2010-005

LE22
NRR

cc:
(paper copy)

Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
612 East Lamar Blvd, Suite 400
Arlington, Texas 76011-4125

Balwant K. Singal
Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North (MS 8 B1)
11555 Rockville Pike
Rockville, MD 20852

Senior Resident Inspector
U. S. Nuclear Regulatory Commission
P. O. Box 289, Mail Code: MN116
Wadsworth, TX 77483

C. M. Canady
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

(electronic copy)

A. H. Gutterman, Esquire
Morgan, Lewis & Bockius LLP

Balwant K. Singal
U. S. Nuclear Regulatory Commission

John Ragan
Catherine Callaway
Jim von Suskil
NRG South Texas LP

Ed Alarcon
Kevin Pollo
Richard Pena
City Public Service

Peter Nemeth
Crain Caton & James, P.C.

C. Mele
City of Austin

Richard A. Ratliff
Texas Department of State Health
Services

Alice Rogers
Texas Department of State Health
Services

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: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollect@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-1104), 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 2

2. DOCKET NUMBER

05000499

3. PAGE

1 OF 5

4. TITLE

Startup Feed Pump 24 Breaker Failure and Unit 2 Reactor Trip

5. EVENT DATE

MONTH DAY YEAR

11 03 2010

6. LER NUMBER

YEAR SEQUENTIAL REV
NUMBER NO.

2010 005 2

7. REPORT DATE

MONTH DAY YEAR

07 07 2011

8. OTHER FACILITIES INVOLVED

FACILITY NAME DOCKET NUMBER

N/A N/A

N/A N/A

9. OPERATING MODE

1

10. POWER LEVEL

100%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR§: (Check all that apply)

- | | | | |
|---|---|--|---|
| <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(b)20.2201 | <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)(viii)(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 checked="" 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 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

FACILITY NAME

Joe Loya, Licensing Engineer

TELEPHONE NUMBER (Include Area Code)

361-972-8005

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	SJ	BRK	GE	Y					

14. SUPPLEMENTAL RESPONSE EXPECTED

☐ YES (if yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH DAY YEAR

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

On November 3, 2010, the Startup Feed Pump (SUFP) 24 was being started to support a scheduled Partial Discharge Analysis as a preventive maintenance activity. At 1021 hours the SUFP was started but then after approximately 4 seconds the pump breaker tripped open. Computer data shows that approximately 8 seconds after the pump breaker tripped the voltage on Standby Bus 2H (which supplies power to the SUFP) spiked low to near zero volts and the Unit 2 reactor tripped on Reactor Coolant Pump (RCP) Undervoltage (the 2C RCP is also powered by Standby Bus 2H). Standby Diesel Generator 23 started and began supplying Engineered Safety Features (ESF) Bus E2C due to Loss of Offsite Power to the ESF bus. Standby Bus 2F experienced a momentary voltage drop of approximately 1 second (Standby Buses 2F and 2H are both fed by the X winding of the Unit 2 Auxiliary Transformer) resulting in some A train loads being secured. Following the reactor trip, the plant was stabilized in MODE 3 at Normal Operating Pressure and Temperature.

At 1038 hours an Unusual Event was declared for Unit 2 due to the breaker cubicle explosion associated with the SUFP breaker failure (ENS Event Number 46387). The breaker malfunction did not result in a fire. The Unusual Event was terminated at 1240 hours when the plant was stabilized in MODE 3.

There were no personnel injuries, no offsite radiological releases, and no damage to safety-related equipment.

This LER is the planned LER supplement described in Revision 1 including a correction to the reporting criteria where criterion 20.2203(a)(3)(i) was inadvertently checked. This LER supplement provides the results of the respective Root Cause Evaluation and revises the appropriate reporting criteria accordingly.

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
South Texas Unit 2	05000499	YEAR	SEQUENTIAL NUMBER	REV. NO	2 OF 5
		2010	005	02	

I. DESCRIPTION OF EVENT**A. REPORTABLE EVENT CLASSIFICATION**

This event is reportable pursuant to 10 CFR 50.73(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.

B. PLANT OPERATING CONDITIONS PRIOR TO EVENT

South Texas Project (STP) Unit 2 was in Mode 1 at 100% power.

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

No other structures, systems, or components were inoperable at the start of the event that contributed to the event.

D. NARRATIVE SUMMARY OF THE EVENT

On November 3, 2010, the Startup Feed Pump (SUFP) 24 was being started to support a scheduled Partial Discharge Analysis as a preventive maintenance activity. Following the pre-job brief, a Licensed Operator Training (LOT) Trainee made a plant announcement and then placed the hand switch to Start at 1021 hours. The SUFP started but then after approximately 4 seconds the pump breaker tripped open. Computer data shows that approximately 8 seconds after the pump breaker tripped the voltage on Standby Bus 2H (which supplies power to the SUFP) spiked low to near zero volts and the Unit 2 reactor tripped on Reactor Coolant Pump (RCP) Undervoltage (the 2C RCP is also powered by Standby Bus 2H). Standby Diesel Generator (SDG) 23 started and began supplying Engineered Safety Features (ESF) Bus E2C due to Loss of Offsite Power (LOOP) to the ESF bus. Standby Bus 2F experienced a momentary voltage drop of approximately 1 second duration (Standby Buses 2F and 2H are both fed by the X winding of the Unit 2 Auxiliary Transformer) resulting in some A train loads being secured, however the low voltage condition cleared on Bus 2F prior to the point at which associated time delay relays would have started Standby Diesel Generator 21 (ESF Train A). Following the reactor trip, the plant was stabilized in MODE 3 at Normal Operating Pressure and Temperature.

At 1038 hours an Unusual Event was declared for Unit 2 due to the breaker cubicle explosion associated with the SUFP breaker failure (ENS Event Number 46387). The breaker malfunction did not result in a fire. The Unusual Event was terminated at 1240 hours when the plant was stabilized in MODE 3.

An Operator in the Turbine Generator Building (TGB) reported substantial damage had occurred to the SUFP Breaker. The front door and access panels for Cubicle 1A in 13.8 KV Standby Bus 2H had been blown open or deformed.

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All protective relay's red flags were actuated on the SUFP motor breaker cubicle except for the lower unit of the 46 current balance relay. Most of the relay flags were probably caused by shock/vibration from the breaker explosion except for the 86 Lockout Relay, which requires rotary motion to actuate. It is unclear whether the 86 Lockout Relay was actuated by shock/vibration causing one of the associated protective relays (50/51, 51G, 87, 46) to momentarily close an output contact resulting in the electrical actuation of the 86 relay or whether the 86 relay was actuated when one or more of the protective relays was actuated by a valid signal.

The three arc chute assemblies (one per phase) showed signs of damage and were dark with black soot. The three blow-out coil return straps showed substantial damage. These straps are approximately 1 inch wide by 1/8 inch thick. When a breaker trips and the contacts open to interrupt the current, the resulting arcs from the arcing contacts transfer to the blow-out coil assembly, which includes the blow-out coil return straps. The coils produce a magnetic field which helps to push the arcs into the arc chutes where the arcs are dissipated and cooled. The three return straps had each been melted through which indicates multiple arcs had existed across the breaker contacts during the event.

E. METHOD OF DISCOVERY

The breaker failure, reactor trip, and automatic actuation of the systems listed below were self-revealing.

II. EVENT-DRIVEN INFORMATION**A. SAFETY SYSTEMS THAT RESPONDED**

All required safety systems responded as expected including the following actuations:

1. Reactor Coolant Pump Undervoltage Reactor Trip
2. Reactor Protection System P-16, Turbine Trip
3. Feedwater Isolation Actuation
4. CRE HVAC Emergency Recirculation (C Train LOOP)
5. Reactor Containment Fan Coolers (C Train LOOP)
6. Auxiliary Feedwater Actuation (All AFW pumps actuated)
7. Primary Pressure Control (Pressurizer Spray and Heaters actuated as required)
8. Secondary Pressure Control Actuation (Steam Dumps Actuated)

B. DURATION OF SAFETY SYSTEM INOPERABILITY

N/A

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C. SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT

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

The Incremental Conditional Core Damage Probability (ICCDP) for the Reactor Trip in Unit 2 on November 3, 2010 is 2.82E-07. The resulting Incremental Conditional Large Early Release Probability (LERP) given a turbine trip is 7.21E-09.

III. CAUSE OF THE EVENT

The root cause of the breaker failure in 13.8 KV Standby Switchgear 2H / Cubicle 1A (SUFP 24) and the resulting Unit 2 reactor trip is that the arc failed to extinguish when the breaker opened due to moisture induced contamination shorting out the arc runner spacer between the first and second blow out coils in the upper arc chute assembly.

This caused the arc current to bypass the second coil rather than running through the coil so a magnetic field was not created in the second coil that would have driven the arc further into the arc chute.

This caused damage to the arc chutes and caused plasma (i.e., ionized air) in the cubicle. Eventually the plasma caused a conduction path in the cubicle for the three phases to ground.

The grounding of the three phases caused the voltage on the associated buses to drop to zero and resulted in an explosion (pressure wave) that caused physical damage to the cubicle. The voltage drop caused the Unit 2 reactor to trip on Reactor Coolant Pump (RCP) undervoltage.

IV. CORRECTIVE ACTIONS

1. Revise Preventive Maintenance (PMs) for the 13.8 KV and 4160 V breakers to:
 - (1) Include AC Hi-Pot testing of the whole breaker including arc chutes;
 - (2) Include resistance measurements of the whole arc path through the arc runners and blow out coils [Digital Low Resistance Ohm (DLRO) or ductor testing];
 - (3) Specify that velocity testing of the breaker opening is preferred over the currently performed speed testing.
 - (4) Perform "as found" velocity or speed testing at the beginning of the PMs rather than just performing the tests at the end of the PMs.
2. Revise procedures 0PMP05-NA-0001, 0PMP05-NA-0005, and 0PMP05-NA-0009 to include the following:
 - (1) Address and match the changes made to the 13.8 KV and 4160 V PMs (as discussed above);
 - (2) Ensure that the DLRO/ductor testing includes the whole arc path through the arc runners and blow out coils [currently just checks resistance of breaker contacts];

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(3) Address possible misassembly of arc chutes as discussed in the root cause report.

3. Evaluate the adequacy of the cubicle heaters in the 2H/1A cubicles (SUFPS 14 and 24.

V. PREVIOUS SIMILAR EVENTS

There have been no similar events within the last three years.

VI. ADDITIONAL INFORMATION

None.