



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

March 22, 2016
NOC-AE-16003354
10 CFR 50.73

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

South Texas Project
Unit 1
Docket No. STN 50-498
Licensee Event Report 2016-001-00
Unit 1 Manual Reactor Trip due to Loss of Main Feedwater to C Train Steam Generator
When the Steam Generator Feedwater Regulating Valve Failed Closed

Pursuant to 10 CFR 50.73(a)(2)(iv)(A), STP Nuclear Operating Company (STPNOC) hereby submits the attached South Texas Project (STP) Unit 1 Licensee Event Report (LER) 2016-001-00 for a valid manual actuation of the Reactor Protection System and for a valid automatic actuation of the Auxiliary Feedwater System.

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

There are no commitments in this letter.

If there are any questions, please contact Robyn Savage at (361) 972-7438 or me at (361) 972-7566.

A handwritten signature in black ink, appearing to read "G. T. Powell".

G. T. Powell
Site Vice President

rds

Attachment: Unit 1 LER 2016-001-00

IEZZ
NRR

STI: 34290779

cc:

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**LICENSEE EVENT REPORT (LER)**(See Page 2 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 and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollections.Resource@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 5

4. TITLE

Unit 1 Manual Reactor Trip due to Loss of Main Feedwater to C Train Steam Generator When the Steam Generator Feedwater Regulating Valve Failed Closed

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
01	26	2016	2016	001	00	03	22	2016	N/A	N/A
									FACILITY NAME	DOCKET NUMBER
									N/A	N/A

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
1	20.2201(b)	20.2203(a)(3)(i)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(A)
	20.2201(d)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(B)	50.73(a)(2)(viii)(B)
	20.2203(a)(1)	20.2203(a)(4)	50.73(a)(2)(iii)	50.73(a)(2)(ix)(A)
	20.2203(a)(2)(i)	50.36(c)(1)(i)(A)	✓ 50.73(a)(2)(iv)(A)	50.73(a)(2)(x)
10. POWER LEVEL	20.2203(a)(2)(ii)	50.36(c)(1)(ii)(A)	50.73(a)(2)(v)(A)	73.71(a)(4)
	20.2203(a)(2)(iii)	50.36(c)(2)	50.73(a)(2)(v)(B)	73.71(a)(5)
	20.2203(a)(2)(iv)	50.46(a)(3)(ii)	50.73(a)(2)(v)(C)	73.77(a)(1)
	20.2203(a)(2)(v)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(D)	73.77(a)(2)(i)
	20.2203(a)(2)(vi)	50.73(a)(2)(i)(B)	50.73(a)(2)(vii)	73.77(a)(2)(ii)
	50.73(a)(2)(i)(C)		OTHER Specify in Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER**LICENSEE CONTACT**

Robyn Savage, Licensing Engineering Specialist

TELEPHONE NUMBER (Include Area Code)

(361) 972-7438

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
X	JB	CBD	W120	Y					

14. SUPPLEMENTAL REPORT 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 January 26, 2016, at 2324 hours, the Control Room received a Steam Generator Steam Flow/Feed Flow mismatch alarm. Operators found Steam Generator (SG) Train C Feedwater Regulating Valve closed and in manual. SG C Feedwater Regulating Valve could not be manually reopened. At 2325 hours, Operators manually tripped the Unit 1 reactor due to lowering level on SG C. The Auxiliary Feedwater (AFW) system automatically actuated on a SG low level signal and operators took manual control of AFW at 2327 hours.

The cause of loss of Main Feedwater to SG C was a failure of the Manual 7300 Series Tracking Driver (NTD) circuit card which forced SG C Feedwater Regulating Valve closed and prevented the operators from taking manual control or switching back to automatic valve control. As a corrective action, the Manual NTD circuit card was replaced. The manual actuation of the Reactor Protection System and subsequent automatic AFW actuation are both reportable under 10 CFR 50.73(a)(2)(iv)(A). The event was of very low risk significance and no radioactive release occurred; therefore, there was no adverse effect on the health and safety of the public.

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

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 and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@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	2. DOCKET	3. LER NUMBER			PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
South Texas Unit 1	05000498	2016	- 001	- 00	2 OF 5

NARRATIVE**I. Description of reportable event****A. Reportable event classification**

This event is reportable under §50.73(a)(2)(iv)(A) as an event or condition that resulted in a manual actuation of the Reactor Protection System and also as an event or condition that resulted in an automatic actuation of the Auxiliary Feedwater (AFW) {BA} system.

B. Plant operating conditions prior to event

On January 26, 2016, Unit 1 was operating in Mode 1 at 100 percent power.

C. Status of structures, systems, and components (SSCs) that were inoperable at the start of the event and that contributed to the event

There were no SSCs that were inoperable at the start of the event that contributed to the event.

D. Narrative summary of the event

On January 26, 2016, at 2324 hours, STP Unit 1 Control Room received a Steam Generator Steam Flow/Feed Flow mismatch alarm. C Train Steam Generator (SG) Feedwater Regulating Valve {SJ} failed and could not be manually reopened.

At 2325 hours, Operators manually tripped the Unit 1 reactor due to lowering level in SG C which is reportable under §50.73(a)(2)(iv)(A) as a valid manual actuation of the Reactor Protection System.

At 2325 hours, all four AFW pumps actuated due to lowering SG C level. This event is reportable under §50.73(a)(2)(iv)(A) as a valid automatic actuation of the AFW system.

At 2327 hours, operators took manual control of AFW.

At 2333 hours, Operations tripped Steam Generator Feedwater Pumps 11, 12 and 13 and placed Startup Feedwater Pump in service.

At 2355, Main Feedwater was placed in service through the preheater bypass valves and Low Power Feedwater Regulating Valves to feed Steam Generators. The Auxiliary Feedwater Pumps were subsequently secured.

E. Method of discovery

The manual reactor trip and AFW actuation were self-revealing. A Steam Generator Flow/Feed Flow mismatch alarm was received. Operators found SG C Feedwater Regulating Valve closed and in manual. Operators attempted to open the valve both in manual and automatic without success. A manual reactor trip was initiated in response. The AFW system actuated automatically on a SG low level signal.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	3. LER NUMBER			PAGE
South Texas Unit 1	05000498	YEAR	SEQUENTIAL NUMBER	REV NO.	3 OF 5
		2016	- 001	- 00	

NARRATIVE**II. Component failures****A. Failure mode, mechanism, and effects of failed component**

The component failure applicable to this Licensee Event Report (LER) is related to the Manual 7300 Series Tracking Driver (NTD) circuit card {JB} which controls the SG C Feedwater Regulating Valve.

The cause of the Manual NTD circuit card failure was due to an integrated circuit (IC) chip (W30-2) output pin 8 which failed low. This chip is in the PRIORITY LOWER circuit and with the failed condition it forced the circuit card into the manual mode and drove the output to 0%. This caused the Manual/Auto (M/A) station to shift to the manual mode and is the reason Operators could not get the Feedwater Regulating Valve to respond when depressing the RAISE button on the M/A station. This condition caused the SG C Feedwater Regulating Valve to close, lowering SG C level, and resulting in Operators manually tripping the reactor.

B. Cause of component failure

The cause of the NTD circuit card failure was attributed to random failure of an electronic component.

C. Systems or secondary functions that were affected by failure of components with multiple functions

The SG C Feedwater Regulating Valve does not have multiple functions that affect other systems. The failure of this component contributed to the manual reactor trip.

D. Failed component information (Energy Industry Identification System (EIIS) designators provided in {brackets})

Main Feedwater System {SJ}
Feedwater/ Steam Generator Water Level Control System {JB}
7300 Series Tracking Driver NTD card {CBD}
Manufacturer: Westinghouse Electric Corporation {W120}
Model: 2838A45G01

III. Analysis of the event**A. Safety system responses that occurred**

The Reactor Protection System and AFW systems both responded to this event.

B. Duration of safety system inoperability

There were no SSCs that were inoperable at the start of the event that contributed to the event.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	3. LER NUMBER			PAGE
South Texas Unit 1	05000498	YEAR	SEQUENTIAL NUMBER	REV NO.	4 OF 5
		2016	- 001	- 00	

NARRATIVE**C. Safety consequences and implications**

No Technical Specification LCOs were entered due to this event. Operators manually tripped the reactor following the loss of Main Feedwater to SG C.

For the Probabilistic Risk Assessment (PRA) analysis, the initiating event is classified as a Partial Loss of Main Feedwater (PLMFW) – the isolation of main feedwater to SG C led to decreasing levels in the SG C which resulted in a reactor trip. The PLMFW event is a modeled initiating event, and no risk significant equipment was confirmed out of service.

The STP PRA was used to estimate the relevant metrics for a reactor trip, Conditional Core Damage Probability (CCDP) and Conditional Large Early Release Probability (CLERP), given that the PLMFW initiating event actually occurred. The CCDP and CLERP were determined to be 6.1E-07 and 3.6E-08 respectively, indicating very low risk significance.

The event was of very low risk significance and no radioactive release occurred; therefore, there was no adverse effect on the health and safety of the public.

IV. Cause of the event

Prior to the manual reactor trip, SG C Feedwater Regulating Valve closed resulting in lowering water level in SG C due to the random failure of the Manual 7300 Series Tracking Driver circuit card. The Manual NTD card failure forced the Feedwater Regulating Valve closed and prevented further operation of the valve. Operators initiated a manual reactor trip due to lowering SG level and the AFW system actuated automatically on a SG low level signal. There were no human performance errors that contributed to the event.

V. Corrective actions

The Manual NTD circuit card was replaced. The circuit card was installed in 2009. The failure of the card is considered an infant mortality failure (i.e. < 10 years for 7300 circuit cards) and the first documented failure for this type. The Preventive Maintenance replacement frequency for these NTD circuit cards is 15 years.

A review of all Auto and Manual NTD circuit cards installed in the Feedwater Regulating Valve loops in Unit 1 and Unit 2 indicate they were installed 8 to 11 years ago and all have different sequenced serial numbers which indicates they are not manufactured from the same lot.

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	3. LER NUMBER			PAGE
South Texas Unit 1	05000498	YEAR	SEQUENTIAL NUMBER	REV NO.	5 OF 5
		2016	- 001	- 00	

NARRATIVE

VI. Previous similar events

An Operating Experience review was conducted as part of the cause evaluation performed for this event.

Five other NTD card failures occurred while in service since 1998. All but one failure caused a minor plant transient requiring operator action. In 2001, a modification was made to the Feedwater Regulating Valve loops to add dual NTD cards (auto and manual) to increase reliability of this single point vulnerability circuit. In 2004, the loop was modified again to add computer points to monitor the 0-10 VDC output signal of both the Auto and Manual NTD cards which provides an annunciation to alert the Control Room Operators of degraded/failed conditions. The last failure occurred in 2009 in Unit 2 after both modifications were installed. The card failure did not cause a plant transient because the Control Room received an alarm identifying the degraded condition. The 2009 failure occurred after the Manual NTD card was in service for approximately 1 year.

There were no previous STP Licensee Event Reports submitted related to failure of dual tracker (auto and manual) NTD card.