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

July 29, 2013
NOC-AE-13003014
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 2013-002-00
Steam Turbine-Driven Auxiliary Feedwater Pump Flow Regulating Valve
Inoperable for Longer than Allowed by Technical Specifications

Pursuant to 10 CFR 50.73(a)(2)(i)(B), STP Nuclear Operating Company (STPNOC) submits the attached South Texas Project (STP) Unit 1 Licensee Event Report (LER) 2013-002-00 regarding the steam turbine-driven auxiliary feedwater (AFW) pump flow regulating valve being inoperable for longer than allowed by Technical Specifications.

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

There are no commitments in this letter. Corrective actions will be implemented in accordance with the STP Corrective Action Program.

If there are any questions regarding this report, please contact Ken Taplett at (361) 972-8416, or me at (361) 972-7566.

G. T. Powell
Site Vice President

kjt

Attachment: Unit 1 LER 2013-002-00

IE22
NRR

STI 33720438

cc:
(paper copy)

Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
1600 East Lamar Boulevard
Arlington, TX 76011-4511

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

NRC 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
Chris O'Hara
Jim von Suskil
NRG South Texas LP

Kevin Pollo
Richard Peña
City Public Service

Peter Nemeth
Crain Caton & James, P.C.

C. Mele
City of Austin

Richard A. Ratliff
Robert Free
Texas Department of State Health Services

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES: 10/31/2013

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LICENSEE EVENT REPORT (LER)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
South Texas Unit 1	05000498	1 OF 6

4. TITLE

Steam Turbine-Driven Auxiliary Feedwater (AFW) Pump Flow Regulating Valve Inoperable for Longer than Allowed by Technical Specifications

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
									N/A	N/A
12	14	2012	2013	002	00	07	29	2013	FACILITY NAME: N/A	DOCKET NUMBER: N/A

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)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (*Include Area Code*)
Ken Taplett, Licensing Engineer	361-972-8416

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

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 May 20, 2013 with Unit 1 in Mode 1 at 100 percent power, the auxiliary feedwater (AFW) flow loop 4 channel D high limit was found low out of tolerance during the performance of a scheduled surveillance. This condition resulted in the flow control valve for steam turbine-driven AFW pump not being capable of providing required flow to its respective steam generator under all accident conditions thus making the pump and flow regulating valve inoperable. Subsequently, it was determined that this condition had existed since December 14, 2012 during an earlier troubleshooting activity. The affected components were inoperable for a period longer than permitted by Technical Specifications. The steam turbine-driven AFW pump and flow regulating valve were restored to operable status on May 21, 2013. The overall AFW system safety function was met because multiple trains of AFW were available during this period. This condition was determined to be reportable on May 29, 2013.

The cause of this event was that procedures were not implemented properly due to unclear requirements. Corrective actions include clarification of procedure guidance.

The risk significance of the event is considered very small. This event did not result in any offsite release of radioactivity or increase in offsite dose rates. There were no personnel injuries or damage to any other safety-related equipment.

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

NRC FORM 366A
(10-2010)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
South Texas Unit 1	05000498	2013	- 002 -	00	2 OF 6

NARRATIVE

I. DESCRIPTION OF EVENT

A. REPORTABLE EVENT CLASSIFICATION

This event is reportable pursuant to 10 CFR 50.73(a)(2)(i)(B), any operation or condition which was prohibited by the plant's Technical Specifications.

B. PLANT OPERATING CONDITIONS PRIOR TO EVENT

Unit 1 was operating in Mode 1 Power Operation 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

The event resulted from the steam turbine-driven auxiliary feedwater (AFW) pump [EIIS: BA, P] being inoperable for a period of time longer than permitted by Technical Specifications (TS). There were no other structures, systems, or components that were inoperable at the start of the event and that contributed to the event.

D. NARRATIVE SUMMARY OF THE EVENT

With Unit 1 at 100 percent power on May 20, 2013, instrumentation and control (I&C) maintenance personnel performing regularly scheduled surveillance testing for AFW flow loop 4 channel D calibration (flow channel F-7526) found the AFW flow high limit was low out-of-tolerance.

Subsequent troubleshooting revealed that the tuning constant (hysteresis) for the high limit set point was set to 0 gallons per minute (gpm) whereas the constant is required to be set to 35 gpm. As a result, the high limit set point for controlling AFW flow from the steam turbine-driven AFW pump to Train D steam generator (SG) would actuate the flow regulating valve between approximately 583 and 542 gpm. When this condition was discovered, the steam turbine-driven AFW pump had already been declared inoperable and the associated Technical Specification required action had been entered for planned maintenance and surveillance testing.

TS Surveillance Requirement 4.7.1.2.1.b.3 requires verifying that each AFW flow regulating valve limits the flow to each SG between 550 and 675 gpm. AFW flow is controlled by the Qualified Display Processing System (QDPS) [EIIS: IU]. The control switches for the AFW flow regulating valve are lined up to automatically inject AFW to the SG if an actuation signal occurs. The AFW flow transmitter and QDPS control the AFW flow delivered to the SG. The valve is normally open. With the set points set correctly, the valve receives a signal to close when flow reaches 640 gpm until the flow decreases to 605 gpm. At this point, the valve remains in its throttled position with no signal to close or open. If flow lowers to the low limit set point of 550 gpm, a signal is received to open the valve until flow increases to 585 gpm. This design minimizes excessive cycling of valve.

The safety-related design function of the flow control valve is to automatically open and close as required to maintain required flow to the SG under changing conditions of SG pressure. The valve motor duty cycle is 5 minutes of run time in a 60 minute period. The incorrect high limit set point resulted in a flow control valve operating band of approximately 550 to 583 gpm. This condition would lead to continuous cycling of the valve. As a result, it is expected that the valve motor would overheat

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

NRC FORM 366A
(10-2010)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
South Texas Unit 1	05000498	2013	- 002 -	00	3 OF 6

NARRATIVE

and fail following a demand. Although the flow control valve would fail in a throttled opened position, it would no longer respond to automatic control as required or allow manual control from either the control room or auxiliary shutdown stations. With the incorrect high limit set point reducing the automatic operating band of the flow control valve, the valve would receive a signal to cycle in the direction opposite of the direction that the valve is currently moving rather than from an at-rest condition with the normal automatic operating band. The valve is expected to fail under this condition as well.

A review of equipment history determined that the QDPS previously experienced a failure on December 14, 2012 with Unit 1 in Mode 1 at 100 percent power. The work performed to restore the QDPS to service included replacement of multiple components that are associated with the tuning constants. Subsequent investigation determined that the tuning constant (hysteresis) for the high limit set point was inadvertently corrupted during the troubleshooting activities. This condition went undetected during input calibration following troubleshooting and repairs in December until the channel calibration was performed on May 21, 2013. Therefore, it was concluded that the condition described above that would have resulted in damage of the flow control valve existed for the period of time from December 14, 2012 until May 21, 2013.

TS 3.7.1.2 requires one steam turbine-driven AFW pump capable of being powered from an operable steam supply system in Modes 1, 2 and 3. Based on the operation of the valve and valve motor as described above, the steam turbine-driven AFW pump flow control valve would not provide the required flow to its SG under all accident conditions. Therefore, the steam turbine-driven AFW pump was considered incapable of performing its safety function from December 14, 2012 due to an inoperable flow regulating valve until the condition was corrected on May 21, 2013. As a result, the steam turbine-driven AFW pump was inoperable during this same period of time. This condition requires entry into TS 3.7.1.2 Action b. Action b. requires that with the steam turbine-driven AFW pump inoperable, or with any two AFW pumps inoperable, within 72 hours restore the AFW pump(s) to operable status or apply the requirements of the Configuration Risk Management Program (CRMP), or be in at least Hot Standby (Mode 3) within the next 6 hours and in Hot Shutdown (Mode 4) within the following 6 hours. Unit 1 was in the Modes of Applicability during the majority of this period. This time period exceeded the TS 3.7.1.2 allowed outage time for an inoperable steam turbine-driven AFW pump. This condition was determined to be reportable on May 29, 2013 pursuant to 10 CFR 50.73(a)(2)(i)(B), any operation or condition which was prohibited by the plant's Technical Specifications.

Action d of TS 3.8.1.1 was not satisfied whenever a standby diesel generator was inoperable for maintenance during the period of time that the steam turbine-driven AFW pump was inoperable. When in Modes 1, 2 or 3, this action requires that with one standby diesel generator inoperable, the steam turbine-driven AFW pump is verified to be operable. If the condition is not satisfied within 24 hours, apply the requirements of the CRMP, or be at least hot standby within the next 6 hours and in cold shutdown within the following 30 hours.

A review of data from the work order performed on QDPS in December 2012 determined that no other component or system was affected other than the high limit set point value for the steam turbine-driven AFW flow control valve. In addition, a review of work order history since the last scheduled surveillance testing for the other AFW train flow loop channel calibrations performed in both Unit 1 and Unit 2 did not find any work performed on these channels similar to the work performed Unit 1 AFW flow loop 4 channel D.

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

NRC FORM 366A
(10-2010)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
South Texas Unit 1	05000498	2013	- 002 -	00	4 OF 6

NARRATIVE

The design basis to fulfill the safety function requires that the AFW system deliver 500 gpm within one minute of automatic initiation to at least one steam generator after a feedwater line rupture or steam line break and deliver 500 gpm within one minute of automatic initiation to at least two steam generators after a loss of feedwater accident or after a loss of offsite power. The steam generator tube rupture analyses for margin to overfill and offsite dose consequences assume a maximum AFW flow rate of 675 gpm. Trains A, B and C motor-driven AFW pumps were available to perform their safety function during the majority of the period from December 14, 2012 to May 21, 2013 and at least two trains of AFW were available to perform their safety function during the entire period that the steam turbine-driven AFW pump was inoperable. Therefore, the overall AFW system safety function was met during this period.

The Station Blackout (SBO) analysis credits one available motor-driven AFW pump powered from the Alternate Alternating Current (AC) source. Therefore, an inoperable turbine-driven AFW pump did not adversely impact the SBO analysis.

E. METHOD OF DISCOVERY

The inoperable condition was discovered during the performance of regularly scheduled surveillance testing.

II. EVENT-DRIVEN INFORMATION

A. SAFETY SYSTEMS THAT RESPONDED

No safety systems were required to respond to this event.

B. DURATION OF SAFETY SYSTEM INOPERABILITY

The high limit set point for the flow control valve for the steam turbine-driven AFW pump was incorrectly set on December 14, 2012 during a maintenance activity. The flow control valve high limit set point was not correctly set until May 21, 2013. Therefore, the steam turbine-driven AFW pump was inoperable for approximately 158 days.

C. SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT

A risk assessment performed for this event indicates the Incremental Core Damage Probability is less than 1E-06 and the Incremental Large Early Release Probability is less than 1E-07. The risk significance of the event is considered very small.

From December 14, 2012 until May 21, 2013, at least two AFW trains were available to perform the required safety function. During this period, only one AFW train was taken out of service at a time for surveillances and maintenance. Three trains of AFW were available most of the time.

This event did not result in any offsite release of radioactivity or increase of offsite dose rates, and there were no personnel injuries or damage to any other safety-related equipment associated with this event.

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

NRC FORM 366A
(10-2010)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
South Texas Unit 1	05000498	2013	- 002 -	00	5 OF 6

NARRATIVE

III. CAUSE OF THE EVENT

The cause of this event was that procedures were not implemented properly during the performance of maintenance activities on December 14, 2012. Contributing to the event was that insufficient certified personnel were available so that supervision was taken out of a normal supervisory oversight role and became involved in directing the work.

During troubleshooting and repairs on December 14, 2012, the data from a memory chip was downloaded and copied onto the replacement chip. The verification step for the data download to ensure the new memory chip contained the correct data was incorrectly performed so that the transfer of the high limit hysteresis bad data set point had not been noted. Contributing to this were unclear requirements. Verification was required at four different locations in the procedure and was performed by four different individuals. Only one of the three steps required dual verification. Several steps in the procedure contained multiple actions.

IV. CORRECTIVE ACTIONS

Corrective actions include revising affected maintenance procedures to require verification steps be performed independently by a certified technician or a system engineer. Applicable maintenance procedures and post maintenance testing procedures used for developing work instructions will be revised to ensure only one action is specified for each step in the procedure. Another certification class is planned to increase certified resources for working on QDPS.

VI. PREVIOUS SIMILAR EVENTS

There have been no similar reportable events at STP within the last three years that have occurred for the same reason as this event. There have been occurrences of operations or conditions prohibited by the plant's Technical Specifications that resulted from unidentified failures of components. These events include:

- Unit 1 LER 2013-001-00, overpower delta-temperature channel inoperable for longer than allowed by Technical Specifications, due to a failed circuit card.
- Unit 2 LER 2013-003-01, Operational Mode Change prohibited by Limiting Condition for Operation (LCO) 3.0.4 with Limiting Conditions for Operation unknowingly not met for inoperable Essential Cooling Water pump, due to a degraded pump motor bearing.
- Unit 1 LER 2012-001-01, Nuclear Instrumentation channel was inoperable longer than allowed by the LCO, due to inadequate guidance for performing channel checks.
- Unit 2 LER 2010-006-00, Technical Specifications not met for Reactor Coolant System unidentified leakage, due to an unrecognized condition caused by lack of procedural guidance.
- Unit 2 LER 2010-001-01, Essential Cooling Water System leak due to a crack in a heat exchanger return line near a vent valve connection that was not recognized.

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

NRC FORM 366A
(10-2010)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
South Texas Unit 1	05000498	2013	- 002 -	00	6 OF 6

NARRATIVE

VI. ADDITIONAL INFORMATION

None