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

May 24, 2018
NOC-AE-18003577
10 CFR 50.73

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

South Texas Project
Unit 2
Docket No. STN 50-499
Licensee Event Report 2018-001-00
Unit 2 Condition Prohibited by Technical Specifications That Could Have
Prevented the Fulfillment of a Safety Function Due to Two Inoperable Extended Range Monitors

Pursuant to reporting requirements 10 CFR 50.73(a)(2)(i)(B) and 10 CFR 50.73(a)(2)(v)(A) and (D), STP Nuclear Operating Company hereby submits the attached South Texas Project Unit 2 Licensee Event Report 2018-001-00 for a condition prohibited by the plant Technical Specifications that could have prevented the fulfilment of a safety function.

Additional evaluation is ongoing to confirm whether this event resulted in a condition that could have prevented the fulfilment of a safety function. A supplement to this Licensee Event Report will be submitted once this evaluation is complete.

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

There are no commitments in this submittal.

If there are any questions, please contact Mr. Drew Richards at 361-972-7666 or me at 361-972-7344.

James Connolly
Site Vice President

amr/JC

Attachment: Unit 2 LER 2018-001-00, Unit 2 Condition Prohibited by Technical Specifications That Could Have Prevented the Fulfillment of a Safety Function Due to Two Inoperable Extended Range Monitors

STI 34673696

cc:

(paper copy)

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Unit 2 LER 2018-001-00

Unit 2 Condition Prohibited by Technical Specifications That Could Have Prevented the Fulfillment of a Safety Function Due to Two Inoperable Extended Range Monitors

NRC FORM 366 (02-2018) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 03/31/2020

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 Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by 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 Number	3. Page
South Texas Unit 2	05000499	1 OF 6

4. Title

Condition Prohibited by Technical Specifications That Could Have Prevented the Fulfillment of a Safety Function Due to Two Inoperable Extended Range Monitors

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	05000
03	25	2018	2018	001	00	05	24	2018	Facility Name	Docket Number
									N/A	05000

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: *(Check all that apply)*			
3	☐ 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)
000	☐ 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)(ii)
	☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(iii)
		☐ 50.73(a)(2)(i)(C)	☐ Other (Specify in Abstract below or in NRC Form 366A	

12. Licensee Contact for this LER

Licensee Contact	Telephone Number (Include Area Code)
Drew Richards, Licensing Engineer	(361) 972-7666

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable To ICES	Cause	System	Component	Manufacturer	Reportable To ICES
A	IG	JIC		N					

14. Supplemental Report Expected	15. Expected Submission Date	Month	Day	Year
☒ Yes (If yes, complete 15. Expected Submission Date) ☐ No		06	25	2018

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On March 25, 2018, South Texas Unit 2 was in Mode 3 shutting down for a refueling outage when the extended range excore neutron flux monitors, NI-0045 and NI-0046, failed to meet required channel check criteria. NI-0045 was declared inoperable, the applicable Technical Specification Action statements were entered, and a work package was generated for repair and calibration of NI-0045.

Subsequent reviews concluded that NI-0046 was actually the inoperable monitor. Therefore for six hours and eleven minutes, while NI-0045 had been rendered inoperable during maintenance and testing activities, both extended range monitors were inoperable. Technical Specification requirements had not been met for having two inoperable extended range monitors. Additionally, with both extended range monitors inoperable in Modes 3, 4, and 5, the Operators would not have been able to use these monitors to detect a potential unmonitored return to criticality due to an inadvertent Reactor Coolant System dilution event.

Both extended range monitors were returned to operable status and corrective actions involving training are planned.

Additional evaluation is ongoing to confirm whether this event resulted in a condition that could have prevented the fulfilment of a safety function. A supplement to this Licensee Event Report will be submitted once this evaluation is complete.

NARRATIVE

I. Description of Reportable Event

A. Reportable event classification

This event is reportable under:

§50.73(a)(2)(i)(B): "Any operation or condition which was prohibited by the plant's Technical Specifications ..."

§50.73(a)(2)(v): "Any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to:

- (A) Shut down the reactor and maintain it in a safe shutdown condition;

...

- (D) Mitigate the consequences of an accident."

Additional evaluation is ongoing to confirm whether this event resulted in a condition that could have prevented the fulfilment of a safety function. A supplement to this Licensee Event Report (LER) will be submitted once this evaluation is complete.

B. Plant operating conditions prior to event

Prior to the event, South Texas Unit 2 was shutting down in preparation for a planned refueling outage. The event began when the plant entered Mode 3 (Hot Standby). A fast reactor shutdown was performed per procedure by opening the reactor trip breakers with the reactor at approximately 7.5% rated thermal power.

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

At the start of the event, both (i.e., two out of two) extended range excore neutron flux monitors were inoperable. There were no other structures, systems, or components inoperable that contributed to the event.

D. Background information

South Texas Unit 2 has two extended range excore neutron flux monitors ("extended range monitors") that are referred to as NI-0045 and NI-0046. The extended range monitors have several functions:

1. In Modes 3, 4, and 5, the extended range monitors provide input to a flux multiplication alarm. The flux multiplication alarm is used to detect a potential unmonitored return to criticality due to an inadvertent Reactor Coolant System dilution event. (Reference: South Texas Technical Specification 3.3.1)

2. In Modes 1, 2, and 3, the extended range monitors provide remote shutdown monitoring capability at the auxiliary shutdown panel in the event that the Control Room becomes unavailable. (Reference: South Texas Technical Specification 3.3.3.5)

3. In Modes 1, 2, and 3, the extended range monitors provide accident monitoring capability following an accident. (Reference: South Texas Technical Specification 3.3.3.6)

4. In Mode 6, one extended range monitor may be substituted for one inoperable source range neutron flux monitor. (Reference: South Texas Technical Specification 3.9.2)

E. Narrative summary of the event

NOTE: all times are Central Standard Time

March 25, 2018 00:50 South Texas Unit 2 performed a fast reactor shutdown per procedure by opening the reactor trip breakers with the reactor at approximately 7.5% rated thermal power. The Unit entered Mode 3.

March 25, 2018 01:55 Extended range monitor NI-0045 was declared inoperable due to failure to meet required channel check criteria. NI-0045 was reading 10 counts per second (cps), the lowest reading on the scale, and NI-0046 was reading 90,000 cps; the maximum allowed deviation with the highest reading monitor reading over 1,000 cps is by a factor of ten. The applicable Technical Specification Action statements were entered for one extended range monitor being inoperable in Mode 3:

- Technical Specification 3.3.1 (Reactor Trip System Instrumentation), Action 5a [Applicable in Modes 3, 4, 5]
- Technical Specification 3.3.3.5 (Remote Shutdown System) [Applicable in Modes 1, 2, 3]
- Technical Specification 3.3.3.6 (Accident Monitoring Instrumentation), Action 42 [Applicable in Modes 1, 2, 3]

Extended range monitor NI-0046 was later determined to be the inoperable extended range monitor. Although declared inoperable at this time, NI-0045 was later determined to have been Operable prior to being removed from service for corrective maintenance.

March 25, 2018 09:16 Extended range monitor calibration procedure commenced for NI-0045. Performance of this calibration resulted in extended range monitor NI-0045 being removed from service and becoming inoperable. Extended range monitor NI-0046 was later determined to be inoperable (see above), so at this time both extended range monitors NI-0045 and NI-0046 were inoperable. The Technical Specification 3.3.1, Action 5b, requirements for two inoperable extended range monitors were not met for this condition. The Technical Specification 3.3.3.5 and 3.3.3.6 Action requirements for both extended range monitors being inoperable were met; these specifications have a 30-day and 7-day, respectively, shutdown action statement.

March 25, 2018 10:07 South Texas Unit 2 entered Mode 4. Technical Specifications 3.3.3.5 and 3.3.3.6 are no longer applicable.

March 25, 2018 12:34 Extended range monitor NI-0045 calibration procedure completed satisfactorily; NI-0045 remains inoperable pending completion of work package review.

March 25, 2018 13:30 South Texas Unit 2 entered Mode 5.

March 25, 2018 15:27 Extended range monitor NI-0045 declared Operable following review of calibration work package and channel check. Although extended range monitor NI-0046 was later determined to be inoperable, sufficient time had elapsed such that it was tracking with NI-0045 and the channel check criteria was met.

March 25, 2018 15:44 Extended range monitor NI-0046 was declared inoperable due to exhibiting sluggish response during and following plant shutdown. It was determined that NI-0046, and not NI-0045, was inoperable at 01:55 following failure to meet required channel check criteria.

March 25, 2018 20:33 Extended range monitor calibration procedure commenced for NI-0046.

March 28, 2018 20:12 South Texas Unit 2 entered Mode 6; extended range monitors no longer required to be Operable per Technical Specifications.

E. Narrative summary of the event (continued)

April 7, 2018 01:25 Extended range monitor NI-0046 calibration procedure completed satisfactorily; NI-0046 remains inoperable pending completion of work package review.

April 16, 2018 02:51 South Texas Unit 2 entered Mode 5 (exited Mode 6 planned refueling outage). Technical Specification 3.3.1 Action requirements were met.

April 23, 2018 03:04 Extended range monitor NI-0046 declared Operable following review of calibration work package and channel check.

F. Method of discovery

This event was discovered after Engineering review of the event determined that extended range monitor NI-0046 was the faulty instrument.

II. Component failures

A. Failure mode, mechanism, and effects of failed component

Extended range monitor NI-0045 became inoperable when removed from service to perform corrective maintenance (i.e., testing and repair). It was later determined that extended range monitor NI-0045 was Operable prior to being removed from service for testing.

The most likely cause for the sluggish response of extended range monitor NI-0046 was the development of moisture within the cabling inside the Reactor Containment Building (RCB) between the detector and the RCB inboard penetration due to a leak in its environmental enclosure.

The extended range monitors are used in Modes 3, 4, and 5 to alert the Control Room that a potential unmonitored return to criticality due to an inadvertent Reactor Coolant System dilution event was occurring. The effect of both extended range monitors being inoperable is the loss of this function.

B. Cause of component failure

There was no failure of extended range monitor NI-0045; it became inoperable when removed from service to perform corrective maintenance.

As discussed above, the most likely cause for the sluggish response of extended range monitor NI-0046 was the development of moisture within the cabling inside the Reactor Containment Building (RCB) between the detector and the RCB inboard penetration due to a leak in its environmental enclosure.

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

The extended range monitors have several functions:

1. In Modes 3, 4, and 5, the extended range monitors provide input to a flux multiplication alarm. The flux multiplication alarm is used to detect a potential unmonitored return to criticality due to an inadvertent Reactor Coolant System dilution event. This function was affected by this event.
2. In Modes 1, 2, and 3, the extended range monitors provide remote shutdown monitoring capability at the auxiliary shutdown panel in the event that the Control Room becomes unavailable. Although, this function was affected by this event, the Technical Specification Action statement was met with both extended range monitors inoperable.
3. In Modes 1, 2, and 3, the extended range monitors provide accident monitoring capability following an accident. Although, this function was affected by this event, the Technical Specification Action statement was met with both extended range monitors inoperable.
4. In Mode 6, one extended range monitor may be substituted for one inoperable source range neutron flux monitor. This function was not affected by this event.

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

System: Nuclear Instrumentation System (Incore/Excore Monitoring System) {IG}
Component Type: Control, Indicating, Power {JIC}
Component Manufacturer: Thermo Fisher Scientific Inc.

III. Analysis of the event

A. Safety system responses that occurred

No safety systems were required to respond as a result of this event.

B. Duration of safety system inoperability

Extended range monitor NI-0045 was inoperable from 3/25/2018 09:16 until 3/25/2018 15:27 (six hours and eleven minutes)

Extended range monitor NI-0046 was inoperable from 3/25/2018 01:55 until 4/23/2018 03:04 (twenty-nine days, one hour, and nine minutes).

C. Safety consequences and implications

For six hours and eleven minutes, while in Modes 3, 4, and 5, both extended range monitors were inoperable. The STP UFSAR Chapter 15 accident analysis for “Chemical and Volume Control System Malfunction That Results in a Decrease in Boron Concentration in the Reactor Coolant” states that with both extended range monitors inoperable, the potential exist for an unmonitored return to criticality in Modes 3, 4, and 5. The analysis assumes that the Operators secure flow paths from the Reactor Makeup Water System within 15 minutes. Operators are also required to restore at least one extended range monitor to Operable status within one hour, or to secure other dilution flow paths within two hours after initiation of the event. The implications of this event are that the Control Room Operators would not have been able to use the extended range monitors to detect a potential unmonitored return to criticality due to an inadvertent Reactor Coolant System dilution event. Note that the Operators would most likely detect a rise in counts with the source range monitors with the associated audible count rate well before the extended range monitors would provide indication of an approach to criticality.

IV. Cause of the event

The cause of this event is that the operating crew did not have adequate technical knowledge of extended range monitor response following a fast reactor shutdown. A contributing cause is that when faced with the situation with extended range monitor NI-0045 reading 10 cps and extended range monitor NI-0046 reading 90,000 cps, the Control Room did not initially seek input from Engineering regarding proper monitor response. Instead, the decision was made to declare NI-0045 inoperable based on the belief that 10 cps was an abnormal reading when compared to the source range monitor counts.

The most likely cause for the sluggish response of extended range monitor NI-0046 was the development of moisture within the cabling inside the Reactor Containment Building (RCB) between the detector and the RCB inboard penetration due to a leak in its environmental enclosure.

V. Corrective actions

1. Develop and implement training for Licensed Reactor Operators on extended range monitor response and behavior following a fast reactor shutdown.
2. Enforce management expectation that Operations seek assistance from Engineering and other groups to understand and resolve issues.
3. Extended range monitor NI-0046 was corrected and returned to service on April 23, 2018 at 03:04. The leak in the in-containment cable environmental enclosure was corrected on April 22, 2018.

VI. Previous similar events

An operating experience review over the past five years was conducted for similar events regarding extended range, source range, and intermediate range responses. No similar events were found at South Texas Unit 1 or Unit 2.