Nuclear Operating Company

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

December 19, 2019
NOC-AE-19003695
10 CFR 50.73

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

South Texas Project
Unit 2
Docket No. STN 50-499
Licensee Event Report 2019-002-00
Incorrect Sequencer Part Replacement Leads to Undervoltage Signal and
Valid Actuation of Emergency Diesel Generator

Pursuant to reporting requirements of 10 CFR 50.73(a)(2)(iv)(A), STP Nuclear Operating Company hereby submits the attached South Texas Project Unit 2 Licensee Event Report 2019-002-00 describing an event that resulted in the actuation of Emergency Diesel Generator (EDG) 23.

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 Wendy Brost at 361-972-8516 or me at 361-972-4778.

Kimberly A. Harshaw
Vice President of Regulatory Affairs and
General Counsel

Attachment: Unit 2 LER 2019-002-00, Incorrect Sequencer Part Replacement Leads to Undervoltage Signal and Valid Actuation of Emergency Diesel Generator

cc:

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
1600 E. Lamar Boulevard
Arlington, TX 76011-45

NRC FORM 366 (04-2018)

U.S. NUCLEAR REGULATORY COMMISSION

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.

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/)

1. Facility Name	2. Docket Number	3. Page
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4. Title

Incorrect Sequencer Part Replacement Leads to Undervoltage Signal and Valid Actuation of Emergency Diesel Generator

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
10	24	2019	2019	– 002	– 00	12	19	2019	Facility Name N/A	Docket Number 05000

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: *(Check all that apply)*			
6	☐ 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)
Wendy Brost, Licensing Engineer	(361) 972-8516

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	EK	OB	OPTO	Y						

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

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

During a maintenance activity on October 24, 2019, a 24V opto-isolator module was installed in the Unit 2 C-Train Load Sequencer (Sequencer 2C) instead of the required 125V module. Due to the installation and subsequent failure of this incorrect part, Sequencer 2C initiated an electrical bus strip signal and the C-Train 4.16kV bus was deenergized. Consequently, an undervoltage signal was sent to Sequencer 2C which then sent a valid Engineered Safety Features (ESF) actuation signal to Emergency Diesel Generator (EDG) 23. The C-Train ESF loads were shed but EDG 23 did not automatically start because it had been placed in Pull-To-Stop to support Sequencer 2C maintenance activities. EDG was taken out of Pull-To-Stop by the Control Room staff to allow it to auto start and load the bus. This event is reportable as an event that resulted in the automatic actuation of an emergency AC electrical power system. Corrective actions planned include work guideline changes, personnel briefings, and updates to the STP master parts list.

The 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 safety-related equipment associated with this event. Therefore, there was no adverse effect on the health and safety of the public.

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NARRATIVE

I. Description of Reportable Event

A. Reportable event classification

This event is reportable pursuant to 10 CFR 50.73(a)(2)(iv)(A) as an event or condition that resulted in the automatic actuation of a system listed in 10 CFR 50.73(a)(2)(iv)(B), specifically, emergency AC electrical power system. Emergency Diesel Generator (EDG) 23 was sent a valid actuation signal from the Unit 2 C-Train Load Sequencer (Sequencer 2C) after the sequencer detected an undervoltage condition.

B. Plant operating conditions prior to event

Prior to the event on October 24, 2019, Unit 2 was operating in Mode 6 (Refueling).

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, the Unit 2 Train-C ESF Sequencer had been declared inoperable for maintenance. EDG 23 had also been declared inoperable for maintenance on Low-Head Safety Injection (LHSI) pump 2C circuitry.

D. Background information

STP has one Engineered Safety Feature (ESF) load sequencer for each actuation train load group. Each sequencer has independent sensor channels, power supplies, and actuated devices. The ESF load sequencer detects the existence of a Loss of Offsite Power (LOOP) by the simultaneous receipt of any two out of four undervoltage, sustained degraded voltage, or degraded voltage plus SI signals which indicate that the normal preferred power source to the 4.16kV ESF bus has dropped below acceptable limits, or has failed completely.

Upon receipt of any two out of four signals, the ESF load sequencer automatically (1) sheds all loads on the appropriate 4.16kV ESF bus, (2) starts the appropriate EDG, (3) trips the 4.16kV ESF power supply breakers to disconnect the Class 1E onsite power system from the offsite source, and (4) energizes the equipment for this emergency event in programmed steps.

Per the STP Technical Specifications, an operable ESF load sequencer is required for operability of the associated EDG in Modes 1, 2, 3, and 4.

NARRATIVE

E. Narrative summary of the event

Timeline (Note: All times are Central Daylight Time):

October 23, 2019 [1703]:	EDG 23 declared INOPERABLE to support maintenance on LHSI pump 2C
October 24, 2019 [1400]:	Upon completion of troubleshooting for blocking circuit of ESF Sequencer, released Equipment Clearance Order (ECO) 94195, Revision 4
October 24, 2019 [1420]:	Unit 2 Control room received 'C' Train ESF Sequencer trouble alarm, Condition Report (CR) 19-12372 generated Operator Action Statement (OAS) 34036 entry declared 'C' Train ESF Sequencer INOPERABLE due to alarm
October 24, 2019 [1435 - 1931]:	Work package drafted, reviewed, and approved; Sequencer 2C equipment pre-work walkdowns performed
October 24, 2019 [2051]:	Work Start granted by Operations Maintenance workers install incorrect opto-isolator (24V instead of 125 V, ODC-24 instead of ODC-24A) Loss of Emergency Bus E2C (4.16kV) due to undervoltage strip signal from C-Train ESF Sequencer In-service Spent Fuel Pool (SFP) cooling pump 2B secured due to loss of E2C electrical bus (4.16kV)
October 24, 2019 [2114]:	Power restored to 4.16kV E2C electrical bus when EDG 23 starts
October 24, 2019 [2122]:	Started SFP pump 2A and restored SFP cooling with no measurable increase in SFP temperature
October 25, 2019 [0224]:	Event report to NRC per the 10 CFR 50.72(b)(3)(iv)(A) due to the automatic actuation of a system listed in 10 CFR 50.72(b)(3)(iv)(B). Event Notification # 54351
October 28, 2019 [0425]:	EDG 23 declared OPERABLE
October 30, 2019 [0454]:	Sequencer 2C declared OPERABLE

F. Method of discovery

This event was self-revealed when the loss of electrical bus E2C caused Sequencer 2C to send an ESF actuation signal to EDG 23.

NARRATIVE

II. Component failures

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

The failed component in this event was a 24V opto-isolator module (ODC-24). When ODC-24 was installed in the 125V circuit, it shorted and initiated the event. The failure of ODC-24 caused Sequencer 2C to initiate an electrical bus strip signal and the C-Train 4.16kV bus was deenergized. Consequently, an undervoltage signal was sent to Sequencer 2C which then sent a valid Engineered Safety Features (ESF) actuation signal to Emergency Diesel Generator (EDG) 23.

B. Cause of component failure

The cause of this component failure was a human performance error. The 24V opto-isolator module (ODC-24) failed because it was installed in a location that required a 125V opto-isolator module (ODC-24A). The incorrect part was identified in the work instructions by Work Planning and the Maintenance Technicians performing the part replacement failed to verify that the part number of component being removed matched the new component part number.

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

As a result of the bus strip signal initiated by Sequencer 2C, the in-service SFP cooling pump 2B secured due to the loss of the E2C 4.16kV electrical bus. SFP cooling was restored approximately 31 minutes later following restoration of power to bus E2C and the starting of SFP pump 2B. There was no measurable increase in pool temperature. The reactor was not critical and reactor decay heat removal was not challenged throughout the event.

D. Failed component information

Emergency Onsite Power Supply System { EK }
Isolator, Optic { OB }
Manufacturer: Opto { OPTO }
Model: { ODC-24 }

III. Analysis of the event

A. Safety system responses that occurred

EDG 23 was sent a valid ESF actuation signal from Sequencer 2C after the sequencer detected an undervoltage condition. EDG 23 did not automatically start because it had been placed in Pull-To-Stop to support Sequencer 2C maintenance activities. EDG was taken out of Pull-To-Stop by the Control Room staff and it auto-started and loaded the bus.

B. Duration of safety system inoperability

Unit 2 Train-C ESF load sequencer was inoperable for a period of 5 days, 15 hours, and 34 minutes. Sequencer 2C was declared inoperable on 10/24/19 at 14:20 hours and was declared operable on 10/30/2019 at 04:54 hours.

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EDG 23 was inoperable from 10/23/2019 at 17:03 hours to 10/28/19 at 04:25 hours.

C. Safety consequences and implications

This event resulted in the actuation of the emergency AC electrical power system, however, the initial event was caused by human error and not by external events (LOOP, etc). The undervoltage condition detected by Sequencer 2C was caused by a component failure when the incorrect opto-isolator module was installed. The other trains of emergency AC power were not affected by this error.

The 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.

Therefore, there was no adverse effect on the health and safety of the public.

IV. Cause of the event

The two apparent causes identified for this event were determined to be:

1. Program implementation deficiencies in Work Planning organization and in support by cross-functional organizations for high risk components.
2. Inadequate verification and validation of ESF Sequencer module replacement parts by Maintenance and Work Planning personnel.

V. Corrective actions

Planned corrective actions are as follows:

1. Update STP Maintenance guideline and STP Work Planners guideline to instruct workers to verify parts by manufacturer part number.
2. Update STP Work Planners guideline to list requirements for other organizations (e.g. Operations, Maintenance) for review and implementation of work packages.
3. Brief maintenance shops on station expectations for performing walkdowns.
4. Communicate station expectations to groups involved with high risk component work planning including: the ability and responsibility of all station personnel to stop work when uncertain, adhering to written instructions, and properly identifying and verifying parts.
5. Update the Master Parts List description (instead of a footnote) to note that module ODC-24A is 125V and ODC-24 is 24V.
6. Perform an effectiveness review of corrective actions.

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VI. Previous similar events

A review of internal operating experience (OE) identified two similar events that occurred at STP regarding the installation of an incorrect part in an ESF Sequencer. In both cases, a 24V opto-isolator was installed instead of the required 125V component. These events and their associated corrective actions are summarized below:

- November 1987: A 24V opto-isolator was installed instead of the required 125V component. In this case, the 24V component did not fail, so no ESF actuation occurred. Training was provided as a corrective action, however, it was ineffective in preventing recurrence of this event (Reference Station Problem Report (SPR) 870471).

- April 1990: A 24V opto-isolator was installed on ESF Sequencer 1B. The opto-isolator failed, resulting in the stripping of loads from ESF Bus E1B (SPR 90028). Corrective actions for this event included the creation of new Maintenance Certification that discussed the difference between the opto-isolators. The STP Master Equipment Database (MED) was also modified to alert work planners to the significant difference between the two opto-isolators despite their similar part numbers (ODC-24 and ODC-24A).

Due to the recurrence of this event, an effectiveness review will be performed on the corrective actions identified for this 2019 event.