



JUN 24 2019

L-2019-128
10 CFR 50.73

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Re: St. Lucie Unit 1
Docket No. 50-335
Reportable Event: 2019-001-00
Date of Event: April 25, 2019
Automatic Reactor Trip Caused by Main Generator Ground Resulting
in Generator Lockout/Loss of Load

Licensee Event Report 2019-001 is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

Respectfully,

A handwritten signature in blue ink that reads 'Daniel DeBoer'.

Daniel DeBoer
Site Director
St. Lucie Plant

DD/KWF

Attachment

cc: St. Lucie NRC Senior Resident Inspector
St. Lucie NRC Program Manager



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/>)

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 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 St. Lucie Unit 1	2. DOCKET NUMBER 05000335	3. PAGE 1 OF 3
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4. TITLE
Automatic Reactor Trip Caused by Main Generator Ground Resulting in Generator Lockout/Loss of Load

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
4	25	2019	2019	001	0	6	24	2019	n/a	05000
									FACILITY NAME	DOCKET NUMBER
									n/a	05000

9. OPERATING MODE 1

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (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)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)

10. POWER LEVEL 100

<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
<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)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT K. W. Frehafer, Licensing Engineer	TELEPHONE NUMBER (Include Area Code) (772) 467-7748
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13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO ICES	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO ICES
X	TB	TG	S125	Y					

14. SUPPLEMENTAL REPORT EXPECTED YES (If yes, complete 15. EXPECTED SUBMISSION DATE) NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR
8	30	2019

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

On April 25, 2019, St. Lucie was in Mode 1 at 100 percent reactor power. At 0918 hours the reactor tripped due to a generator lockout during reactive power lagging capability testing. The trip was uncomplicated and all safety systems responded as designed. The plant was stabilized in Mode 3 with decay heat removal via the main feedwater system and condenser steam bypass system.

The direct cause of the generator lockout was attributed to a localized breach in the ground wall insulation of stator bar B17. Determination of the underlying cause(s) requires that the quarantined equipment undergo testing at the original equipment manufacturer (OEM) testing facility.

The generator repairs and post maintenance testing were successfully completed.

Automatic reactor trips are analyzed events in the Updated Final Safety Analysis Report (UFSAR). The trip and post trip actions were uncomplicated. Therefore, this event had no impact on the health and safety of the public.



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

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St. Lucie Unit 1	05000335	YEAR	SEQUENTIAL NUMBER	REV NO.
		2019	- 001 -	0

NARRATIVE

Description

On April 25, 2019, St. Lucie was in Mode 1 at 100 percent reactor power. At 0918 hours the reactor tripped due to a generator lockout during reactive power lagging capability testing when the generator backup ground protection relay 64GB/881 tripped [EIS:TB:64]. Automatic turbine and reactor trips occurred in response to the lockout as expected.

The reactor trip was uncomplicated and all systems responded as required. The unit was stabilized in Mode 3 with decay heat removal accomplished with the main feedwater system and main condenser steam bypass system.

The required 10 CFR 50.72 4-hour NRC notification of the automatic operation of the reactor protection system while critical was completed at 1204 hours.

A team was established to investigate the cause of the main generator ground and effect repairs.

Cause of the Event

Investigation of the ground fault required disassembly of the generator. The failure investigation team determined that the direct cause of the generator ground resulted from failure of the ground wall insulation in the phase C stator winding. After generator disassembly and rotor removal, the fault was located to a specific half-coil stator bar in the bottom of slot 17 (B17) in the stator core. The fault was determined to be unrepairable in place. FPL made the decision to perform a generator rewind to address the faulted coil. The failed B17 bar and several control bars were quarantined pending additional forensic analysis.

Analysis of the Event

This event is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A) as any event or condition that resulted in the automatic operation of the reactor protection system.

The St. Lucie Unit 1 Main Generator is an 1800 rpm direct hydrogen intercooled synchronous unit originally supplied by the Westinghouse Electric Company with a rating of 1000 MVA. During the 2011 SL1-24 outage various modifications were performed by Siemens Energy, the current OEM, to achieve increased output for the Extended Power Uprate project. These modifications included rotor replacement and stator rewind to increase the rating from 1000 MVA to 1200 MVA. No significant generator maintenance activities have been performed since the generator rewind.

Many failure processes (mechanical, thermal and electrical) have been documented which can ultimately lead to a ground fault in the stator of a generator. A fault tree was developed to investigate a range of possible causes for each of these failure processes. The fault tree reflects input from relevant EPRI and IEEE publications on rotating electrical machines and their insulation systems.

Evidence available at the time of this LER is limited to field test data and observations captured during the generator rewind. This available data has proven insufficient to determine the dominant failure process; therefore, various potential causal factors remain open. Additional lab tests are planned to identify the specific failure process and ultimately lead to the underlying causal factors. These additional activities will be carried out at a Siemens testing facility.

An extent of condition review of Unit 2 generator maintenance history has been completed. The Unit 2 generator completed high potential testing in September 2018 and the insulation successfully withstood the high potential test voltage. FPL concluded that a similar ground fault is not present and is not likely in the near term.



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NARRATIVE

Safety Significance

The generator lockout turbine trip initiated a loss of load actuation in the reactor protection system resulting in an automatic reactor trip, which is an analyzed event in the UFSAR. The operational crew entered 1-EOP-01, Standard Post Trip Actions, and then transitioned to 1-EOP-02, Post Trip Recovery. All control element assemblies (CEAs) fully inserted into the core and the trip was uncomplicated with all safety functions satisfied. The plant was established in Mode 3 hot standby conditions.

The event did not impact the environment and there were no radiological or security related implications. Therefore, this event had no impact on the health and safety of the public.

Corrective Actions

1. The rewind of the St. Lucie Unit 1 Generator is complete.

The following planned corrective action is being tracked in the St. Lucie Corrective Action Program (CAP):

1. The underlying causal factors will be determined at the Siemens testing facility.

Failed Components Identified

Tags: TURB GEN

Manufacturer: Westinghouse

Model No.: 688J791-1

Similar Events

None