L-2015-190
10 CFR § 50.73
July 13, 2015

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555-0001

Re: Turkey Point Unit 4
Docket No. 50-251
Reportable Event: 2015-002-00
Date of Event: May 12, 2015
Reactor Trip Resulting From Generator Differential Lockout

The attached Licensee Event Report 05000251/2015-002-00 is submitted pursuant to 10 CFR 50.73(a)(2)(iv)(A) due to automatic actuation of the Reactor Protection and Auxiliary Feedwater Systems.

If there are any questions, then please call Mr. Mitch Guth at 305-246-6698.

Very truly yours,

Thomas Summers
Vice President
Turkey Point Nuclear Plant

Attachment

cc: Regional Administrator, USNRC, Region II
Senior Resident Inspector, USNRC, Turkey Point Nuclear Plant

IE22
NRR

NRC FORM 366 (02-2014) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 01/31/2017

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.

LICENSEE EVENT REPORT (LER)

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

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4. TITLE

Reactor Trip Resulting From Generator Differential Lockout

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
										05000
5	12	2015	2015	— 002 —	00	7	13	2015	FACILITY NAME	DOCKET NUMBER
										05000

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)(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)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
80%	☐ 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)
Paul F. Czaya	305-246-7150

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSSION DATE	MONTH	DAY	YEAR
YES (*If yes, complete 15. EXPECTED SUBMISSION DATE*) X NO				

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

On May 12, 2015 at approximately 0430 hours with Unit 4 at approximately 80% rated thermal power, an automatic reactor trip occurred in response to a turbine trip. The turbine trip was caused by a generator differential lockout that opened the generator output breaker. During the reactor trip response, the Auxiliary Feedwater System automatically initiated as expected. The unit was subsequently stabilized in Mode 3. All systems responded correctly to the trip. The direct cause of the event was an open circuit caused by a loose connection at a main generator current transformer (CT). The root cause was that the vendor recommended torque value for a stud lugged connection was not used during the engineering change (EC) and work order planning process. The tightening requirement for this type of connection is considered to be skill of the craft; therefore, no torque specification was listed in the EC or work instructions. Corrective action includes: 1) The preventive maintenance procedure and electrical specification will be revised to include connection torque requirements per the vendor work instruction manual for the type of terminal used in the CTs and, 2) A preventive maintenance task will be implemented to periodically inspect and test the Unit 3 and 4 main generator CT connections.

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NARRATIVE

DESCRIPTION OF THE EVENT

On May 12, 2015 at approximately 0430 hours with the Unit 4 reactor [AC, RCT] at approximately 80% rated thermal power, an automatic reactor trip occurred in response to a turbine [TA, TRB] trip. The turbine trip was caused by a generator [TB, GEN] differential lockout that opened the generator output breaker [TB, GEN, BKR]. During the reactor trip response, the Auxiliary Feedwater (AFW) System [BA] automatically initiated as expected. The unit was subsequently stabilized in Mode 3. All systems responded correctly to the trip.

Troubleshooting identified an open circuit across the terminal block points associated with the secondary of the differential protection neutral side phase 'A' current transformer (CT) [TB, GEN, XCT]. Wiring was found burned and a stud in the secondary terminal was found loose. Subsequent inspection found that a lug connecting the field wiring to the CT leads had failed. The failed lug caused an open circuit resulting in the generator lockout.

Event Notification No. 51065 was made to the NRC Operations Center in accordance with 10 CFR 50.72(b)(2)(iv)(B) for a valid actuation of the reactor protection system (RPS) while critical and 10 CFR 50.72(b)(3)(iv)(A) for a valid Engineered Safety Feature actuation of AFW. This report is in accordance with 10 CFR 50.73(a)(2)(iv)(A) due to valid actuations of the RPS and AFW.

CAUSES OF THE EVENT

The direct cause of the lug failure was inadequate tightness of the CT connection.

The root cause was that the vendor recommended torque value for a stud lugged connection, that connects field wiring to the CT, was not used during the engineering change (EC) and work order planning process. The tightening requirement for this type of connection is considered to be skill of the craft; therefore, no torque specification was listed in the EC or work instructions.

Contributing causes:

1. A periodic maintenance activity to check the wiring connections for the CTs had not been established.
2. Operating experience relating to the frequency of main generator CT leads failing was not considered.

ANALYSIS OF THE EVENT

The protection scheme of the main generators at Turkey Point contains a high speed differential relay that monitors the current flow entering and leaving each generator winding to guard against phase to phase shorts or grounds. When a current difference occurs, the relays actuate the lockout relay which causes the generator breaker to open.

The generator differential lockout was caused by a loose connection on the 4G03A CT. This CT is installed on the neutral side of the generator and provides a secondary current signal to the generator differential relay. The relay compares the generator neutral current to the generator output current, which should be equal. When the loose connection caused an open circuit (secondary current went to zero), the differential relay operated and initiated the generator lockout.

The 4G03A CT was installed in 2013 during an extended power uprate outage. The connections were made hand tight using skill of the craft, which is typical for secondary connections. The connection was inadequate and eventually caused the open circuit. The connections on the eleven other CTs installed as part of the generator upgrade were checked and two other loose connections were found and corrected.

The new CTs employ a mechanical compression stud for the electrical connection. During installation, the CT wires were lugged and connected at the top of the mechanical compression stud (the wires were not stripped back and inserted into the slot and compressed). The type of stud on the new generator CTs differs from all other CTs used at Turkey Point.

AFW actuation on steam generator lo-lo level was as expected based on the review of data from previous reactor trips from 100% and simulator trips from 100%.

ANALYSIS OF SAFETY SIGNIFICANCE

At the time of the event, Unit 4 was at approximately 80% power level. The generator differential lockout caused a turbine trip which resulted in the automatic reactor trip. Plant response was as expected. All control rods fully inserted. All systems responded as designed. The unit transitioned to Mode 3. As a result, the safety significance of the event is considered very low.

CORRECTIVE ACTIONS

Corrective action is in accordance with condition report AR 2047137 and includes:

1. A temporary modification was made to disconnect/disable the input of the CT with the failed lug from the differential protection scheme.
2. Other similar CT connections on the Unit 4 main generator were inspected and tested to ensure adequate tightness.
3. Preventive maintenance procedure 0-PME-090.03 and electrical specification SPEC-E-012 will be revised to include connection torque requirements per the vendor work instruction manual for the type of terminal used in the CTs.
4. A preventive maintenance task will be implemented to periodically inspect and test the Unit 3 and 4 main generator CT connections.
5. Similar CT connections in the Unit 3 generator will be inspected during the next refueling outage.

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ADDITIONAL INFORMATION

EIIS Codes are shown in the format [IEEE system identifier, component function identifier, second component function identifier (if appropriate)].

FAILED COMPONENTS IDENTIFIED: None.

PREVIOUS SIMILAR EVENTS: None in the last five years.