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Robert W. Walpole
Manager, Regulatory Assurance

NL-19-055

May 23, 2019

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop O-P1-17
Washington, D.C. 20555-0001

SUBJECT: **Licensee Event Report # 2019-002-00, "Automatic Reactor Shutdown
Due to Turbine Trip Caused by Generator Trip"**
Indian Point Unit No. 2
Docket No. 50-247
DPR-26

Dear Sir or Madam:

Pursuant to 10 CFR 50.73(a)(1), Entergy Nuclear Operations Inc. (ENO) hereby provides Licensee Event Report (LER) 2019-002-00. The attached LER identifies an event where the reactor was automatically shutdown due to a turbine trip caused by a generator trip, which is reportable under 10 CFR 50.73(a)(2)(iv)(A). This event was recorded in the Entergy Corrective Action Program as Condition Report CR-IP2-2019-01454.

There are no commitments made or revised in this letter. Should you have any questions regarding this submittal, please contact Mr. Robert Walpole, Manager, Regulatory Assurance at (914) 254-6710.

Sincerely,

A handwritten signature in black ink, appearing to read "RWW/gd".

RWW/gd

cc: Mr. David Lew, Regional Administrator, NRC Region I
NRC Resident Inspector's Office
Ms. Bridget Frymire, New York State Public Service Commission

IEZZ
NRR



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 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 Indian Point Unit 2	2. Docket Number 05000-247	3. Page 1 OF 4
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4. Title
Automatic Reactor Shutdown Due to Turbine Trip Caused by Generator Trip

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
3	24	2019	2019	002	00	5	23	2019		05000
									Facility Name	Docket Number
										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)						
10. Power Level 96%	<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)						
	<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 Michael Cioffi	Telephone Number (Include Area Code) (914) 254-6663
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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
B	BQ	TW	O015	Y					

14. Supplemental Report Expected	15. Expected Submission Date	Month	Day	Year
<input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date) <input checked="" type="checkbox"/> No				

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)
On March 24, 2019 at approximately 1445 during a power ascension from a previous trip with indicated reactor power at approximately 96%, the reactor automatically tripped on a turbine trip due to a direct trip from the Main Generator regulator cubicle. All control rods fully inserted and plant equipment responded normally to the unit trip. This reactor protection system (RPS) actuation was reported under 10 CFR 50.72(b)(2)(iv)(B).

The auxiliary feedwater system actuated following the automatic trip as expected. This specified system actuation was reported under 10 CFR 50.72(b)(3)(iv)(A). During the event offsite power remained available and stable. No primary or secondary reliefs lifted, and all required safety systems functioned properly. The plant was stabilized in hot standby (Mode 3) with decay heat being removed via the steam generators to the atmospheric steam dumps.

This event had no effect on the public health and safety.



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

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
Indian Point Unit 2	05000-247	YEAR 2019	SEQUENTIAL NUMBER - 002	REV NO. - 00

NARRATIVE

Note: The Energy Industry Identification System Codes are identified within the brackets { }.

On March 24, 2019 at approximately 1445, while operating at approximately 96% indicated reactor power, Unit 2 experienced a regulator {RG} cubicle direct trip due to degraded -15V power supply {JX} voltage. The power supply voltage degradation was sensed by the regulator cubicle trip board, which provides continuous monitoring of the system's power supply output voltages. The regulator cubicle trip board provided a valid trip signal to the system's TRIP-R relays {94}, which actuated the 86P generator lockout relay {86}. The 86P initiated the generator {GEN} trip and associated automatic actions, including turbine {TRB} and reactor {RCT} trip. This relaying scheme operated as designed, and was initiated by an actual degradation in power supply output voltage. At the time of the event, power ascension was in progress; there were no other major activities going on at the time. The Auxiliary Feedwater (AFW) system {BA} automatically actuated as expected. All control rods {AA} fully inserted and all required safety systems functioned properly. The plant was stabilized in hot standby with decay heat being removed via the steam generators {SG} to the atmospheric steam dumps {PCV}. There was no radiation release. The emergency diesel generators {EK, DG} did not start, as offsite power remained available and stable. The following notifications were made to the NRC under Event Notification number 53954 at 1740 hours: 4-hour non-emergency per 10CFR50.72(b)(2)(iv)(B) for RPS actuation (scram); 8-hour non-emergency per 10CFR50.72(b)(3)(iv)(A) for an event or condition that resulted in the actuation of the AFW system.

CAUSE OF EVENT

The direct cause of the event was a short circuit on a -15V DC wire in the Exciter Cubicle Metering Panel {PL}. This directly caused the condition by allowing the -15V DC power supply voltage to degrade sufficiently for a generator trip signal to be initiated as designed.

The root cause of the event was the fact that an original GENERREX Exciter Cubicle wire was not routed and anchored to prevent shifting and subsequent damage due to normal system vibration. This caused the condition by allowing the wire sufficient freedom of movement for it to become damaged and cause an automatic generator trip.

The Main Generator requires an excitation system (an "exciter") {EXC} to produce and control the magnetic field necessary for proper operation. The Generator also requires an Automatic Voltage Regulator (AVR) {RG} to govern and adjust the machine's terminal voltage and reactive power output. The Unit 2 Main Generator employs a modified General Electric GENERREX Compound Potential Source (CPS) system as its exciter and a Basler Digital Excitation Control System (DECS) as its AVR.

The GENERREX exciter and voltage regulator circuitry is separated into two distinct cabinets, the Exciter Cubicle and The Regulator Cubicle. The Exciter Cubicle cabinet, located adjacent to the generator, houses all the circuitry necessary to synthesize and adjust the control signals for the system's power handling components. This cabinet houses all of the circuitry required to drive the rectifier cabinets, and is ultimately responsible for regulation. The cabinet is located on the turbine pedestal, and therefore is subject to the effects of vibration from the turbine-generator.

Circuit cards located in both the Exciter Cubicle and Regulator Cubicle require DC power for operation. Any variation in the supply voltage can affect the output of the card, which can ultimately affect the ability to control Main Generator terminal voltage and reactive power. Because of the sensitivity of the circuit cards to voltage variations, the power supply voltages are continuously monitored for any degradation. The system is designed



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Indian Point Unit 2	05000-247	2019	- 002	- 00

such that a degradation of more than approximately 2V on both power supplies of the same voltage will result in a direct unit trip.

The GENERREX system is equipped with a pair of fully redundant power supplies for each of the five supplied voltages. Each power supply in a pair is connected in parallel, and each supply has the capacity to support the entirety of the system on its own. A failure of a single power supply will not result in a loss of voltage for that bus, since its partner will be able to provide the required voltage in its place. It is possible for a common mode failure, such as a short circuit, to affect both power supplies simultaneously. Post-trip investigation discovered that a wire running between two terminal strips in the Exciter Cubicle metering panel had contacted the metal tab used to secure the terminal strip label, and had evidence of burning and arcing. The shorted wire caused the output of both parallel -15V DC power supplies to degrade by more than 2V. This degraded supply voltage was sensed by the system's voltage monitoring circuits and a valid generator trip signal was initiated as designed.

Contributing causes are

- The first contributing cause of this event was the fact that an exposed metal edge allowed for a path to ground. This contributed to the condition by providing both a surface for the wire insulation to abrade against and a path to ground to facilitate the short circuit.
- The second contributing cause of this event was a failure to perform an extent of condition on a previous, similar event in 2010. This contributed to the condition by potentially allowing the condition to exist for a longer period of time before its discovery.
- The third contributing cause of this event was a failure to replace the GENERREX equipment in a timely manner in accordance with industry guidance. This contributed to the condition by not removing the latent condition via a replacement of the system.

CORRECTIVE ACTIONS

The following corrective actions have been or will be performed under the Entergy Corrective Action Program to address the causes of this event:

1. Replace all damaged wiring associated with the -15V DC short in the GENERREX Exciter Cubicle Metering Panel - complete
2. Route and secure of all wires found in the GENERREX Exciter Cubicle Metering Panel – complete
3. Harden system by covering sharp edges with approved tape to prevent wire shorts due to contact – complete
4. Inspect and harden remaining GENERREX Cabinets as well as the Unit 3 Exciter by rerouting wires where possible to reduce chance of failure due to normal system vibration while also covering sharp edges that may contact wiring – complete
5. Credit historical revisions to Procedure EN-LI-102 that include improved decision-making, implementing INPO SOER 11-2 - complete
6. Revise the GENERREX Preventative Maintenance procedure (2-IC-PC-I-E-GENERREX) to include closeout/restoration instructions for inspection of hardening actions taken and to verify that any new areas identified are hardened in accordance with Engineering Standard ENN-EE-S-008-IP prior to system closeout. The intent of this action is to ensure that the sustainability of the CAPR is maintained. - pending



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EVENT ANALYSIS

The event was reported under 10 CFR 50.72(b)(2)(iv)(B) for actuation of the Reactor Protection System “the licensee shall report any event or condition that results in actuation of the reactor protection system (RPS) when the reactor is critical except when the actuation results from and is part of a pre-planned sequence during testing or reactor operation” This event was also reported under 10 CFR 50.72(b)(3)(iv)(A) as an event or condition that results in valid actuation of the auxiliary feedwater system, and is reportable under 10 CFR 50.73(a)(2)(iv)(A).

PAST SIMILAR EVENTS

A review was performed of applicable Entergy Fleet Condition Reports and internal Operating Experience (OE) in a ten-year period, and it was determined that there was no commonality of causes, barriers, or corrective actions.

SAFETY SIGNIFICANCE

This event had no effect on the health and safety of the public. There were no actual safety consequences for the event because it was an uncomplicated manual reactor trip with no other transients or accidents, and the required primary safety systems performed as designed.

For this event, all control rods inserted as required upon initiation of the reactor trip. The RCS pressure remained below the setpoint for pressurizer power operated relief valve (PORV) {AB, RV} and code safety valve {AB, RV} operation, and above the setpoint for automatic SI actuation. Following the reactor trip, the plant was stabilized in hot standby with decay heat being removed by the steam generators to the atmospheric steam dumps.