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John Ferrick  
Director, Regulatory &  
Performance Improvement

NL-16-061

May 27, 2016

U.S. Nuclear Regulatory Commission  
Document Control Desk  
11545 Rockville Pike, TWFN-2 F1  
Rockville, MD 20852-2738

SUBJECT: Licensee Event Report # 2016-006-00, "Technical Specification Prohibited Condition Due to Inoperable 138 kV Offsite Circuits Caused by a Disconnected Safety Injection Signal to the Station Auxiliary Transformer Load Tap Changer"  
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) 2016-006-00. The attached LER identifies an event where there was a Technical Specification (TS) Prohibited Condition due to an inoperable 138 kV offsite power system caused by the Station Auxiliary Transformer (SAT) Load Tap Changer (LTC) not capable of automatically adjusting voltage to maintain required voltage as a result of finding the Safety Injection signal links disconnected. Technical Specification 3.8.1 (AC Sources Operating) specifies, in part, that two qualified circuits between the offsite transmission network and the onsite AC Electrical Power distribution system shall be operable. Operability of the offsite power sources requires the ability to provide the required capacity during design basis conditions. The AC electrical distribution system relies on the SAT LTC to automatically adjust the voltage on 480 volt vital busses for the system to perform as designed. This condition is reportable under 10 CFR 50.73(a)(2)(i)(B). This condition was recorded in the Entergy Corrective Action Program as Condition Report CR-IP2-2016-02293.

IE22  
NRR

There are no new commitments identified 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 "John B. Smith". The signature is written in a cursive style with a long, sweeping underline that extends to the left.

JF/cbr

Attachment: LER-2016-006

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

# LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@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.

<b>1. FACILITY NAME:</b> INDIAN POINT 2	<b>2. DOCKET NUMBER</b> 05000-247	<b>3. PAGE</b> 1 OF 4
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**4. TITLE:** Technical Specification Prohibited Condition Due to Inoperable 138 kV Offsite Circuits Caused by a Disconnected Safety Injection Signal to the Station Auxiliary Transformer Load Tap Changer

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
03	28	2016	2016	006	00	05	27	2016		05000
									FACILITY NAME	DOCKET NUMBER
										05000

<b>9. OPERATING MODE</b>  6	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:</b> (Check all that apply)			
<b>10. POWER LEVEL</b>  000%	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<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)(C)	<input type="checkbox"/> OTHER
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	
	Specify in Abstract below or in NRC Form 366A			

**12. LICENSEE CONTACT FOR THIS LER**

<b>NAME</b> Robin Daley, Supervisor, Engineering Systems-Electrical/I&C	<b>TELEPHONE NUMBER</b> (Include Area Code) (914) 254-6817
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**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	FK	TTC	W121	Y					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input checked="" type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input type="checkbox"/> NO	<b>15. EXPECTED SUBMISSION DATE</b>
	MONTH DAY YEAR 07 31 2016

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

On March 9, 2016, during shutdown for a refueling outage, while performing testing of the safety injection (SI) system, the Station Auxiliary Transformer (SAT) Load Tap Changer (LTC) failed to increase per design upon actuation of an SI signal. The condition was acceptable for the current mode but is unacceptable when the offsite AC electric power distribution and SI System is required to be operable. An investigation was performed and it was discovered on March 28, 2016, that the SAT control cabinet terminal blocks W105 and W106 had their links open thereby preventing proper operation of the LTC. A review of tests and Work Orders (WO) did not identify any previous failed tests or any WO with instructions to open the links. The last successful test of LTC operation was performed on February 26, 2014. The direct cause of the event was open links for the SAT LTC SI signal. The most probable apparent cause was maintenance activities by either IPEC or supplemental personnel that left the SAT states links W105 and W106 open during the 2014 spring outage (2R21). A review was performed of 42 Work Order (WO) tasks conducted during the 2014 spring outage. None of the WO tasks required work on the SAT LTC links or required work in the specific area of the states links. Corrective actions included closure of the SAT LTC Terminal Block states links and testing. The control links for the Unit 3 SAT will be inspected to verify they are in the correct position. All troubleshooting work orders will require concurrent verification that any equipment manipulation is restored to its original configuration. The SAT LTC Preventive Maintenance (PM) procedure will be revised to insure steps are added to require independent verification for all LTC SI logic control link manipulation. The event had no significant effect on public health and safety.

## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Indian Point Unit 2	05000-247	2016	- 006	- 00	2 OF 4

## NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

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

## DESCRIPTION OF EVENT

On March 9, 2016, during shutdown for a refueling outage, while performing testing of the safety injection (SI) system in accordance with 2-PT-R013 (Safety Injection), the Station Auxiliary Transformer (SAT) {FK} Load Tap Changer (LTC) {TTC} failed to increase per design upon actuation of an SI signal {BQ}. The condition was acceptable for the current mode but is unacceptable when the offsite AC electric power distribution and SI System is required to be operable (Mode 4 and above). An investigation was performed and it was discovered on March 28, 2016, that the SAT control cabinet {CAB}, terminal blocks {BLK} W105 and W106 in terminal box BA3 had their links open thereby preventing proper operation of the LTC. A review of tests and Work Orders (WO) did not identify any previous failed tests or any WO with instructions to open the links. The last successful test of LTC operation was performed on February 26, 2014. The event in which the SAT LTC failed to operate correctly during testing was recorded in the Indian Point Energy Center corrective action program (CAP) as CR-IP2-2016-01386. The condition where the SAT control cabinet terminal block links were discovered open was recorded in the CAP as CR-IP2-2016-02293.

The SAT is part of the plant AC Electrical Power Distribution System which consists of two offsite circuits (a 138 kV circuit and a 13.8 kV circuit), each of which has a preferred and a backup feeder. The onsite AC standby power circuit consists of three Emergency Diesel Generators. The plant electrical distribution system is configured around 6.9 kV buses Nos. 1,2,3,4,5 and 6. All offsite power to the 480 volt safeguards buses enters the plant via 6.9 kV buses 5 and 6 which are normally connected to the 138 kV offsite circuit but have the ability to be connected to the 13.8 kV offsite circuit. The 138 kV offsite circuit consists of either 138 kV feeder 95332 (preferred feeder) or 138 kV feeder 95331 (backup feeder) and 138 kV/6.9 kV SAT including the automatic tap changer, circuit breakers ST5 and ST6 which supply 6.9 kV buses 5 and 6. When the plant is operating, 6.9 kV buses 1,2,3 and 4 typically receive power from the main generator via the Unit Auxiliary Transformer (UAT). However, when the main generator or UAT is not capable of supporting this configuration, 6.9 kV buses 1 and 2 receive offsite power via bus 5 and 6.9 kV buses 3 and 4 receive offsite power via 6.9 kV bus 6. Following a unit trip, 6.9 kV buses 1,2,3 and 4 will auto transfer (dead fast transfer) to 6.9 kV buses 5 and 6 in order to receive offsite power. The 6.9 kV buses Nos. 2,3,5 and 6 supply power to the 480 volts safeguards power buses (5A, 6A, 2A and 3A) using 6.9 kV/480 volt Station Service Transformers (SSTs).

The SAT is a 138 kV/6.9 kV transformer with the primary function to provide electric power to 6.9 kV buses 5 and 6 during on-line operations and 6.9 kV auxiliary buses 1 through 6 during shutdown and startup modes of operations. The SAT and UAT have automatic load tap changers (LTC), which is operated under load to maintain the secondary voltage at 6.9 kV. The SAT LTC is used to mitigate the fast transfer of 6.9 kV system from buses 1 through 4 to buses 5 and 6. This fast transfer typically will cause a voltage drop across the transformer. With the LTC in automatic and responding after 2 seconds, this voltage will be restored in 1 minute. In November 2002, the SAT LTC had a tap changer control circuit modification to enhance the voltage profile by raising taps on initiation of an SI signal. Upon initiation of a SI signal the new circuit takes over control of the voltage setpoint and increases the setpoint that increases voltage towards a pre-selected voltage.

The SAT LTC will begin to automatically raise taps to increase secondary voltage in anticipation of the increased loading that will occur thirty seconds later when the 6.9 kV buses 1,2,3 and 4 automatically transfer (fast transfer) to the offsite power supply. The relays in this circuit are located in a box mounted on the outside of the tap changer control cubical.

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The operability of the AC electrical power sources is consistent with the initial assumptions of the accident analysis and is based upon meeting the design basis of the unit. This results in maintaining at least 2 of 3 safeguards power trains energized from either offsite or onsite AC sources during accident conditions in the event of 1) An assumed loss of all offsite power or all onsite AC power and 2) A worst case single failure. Two qualified circuits between the offsite transmission network and the onsite electrical power system and separate and independent diesel generators for each train ensure availability of the required power to shut down the reactor and maintain it in a safe shutdown condition after an anticipated operational occurrence or a postulated Design Basis Accident.

During the physical restoration of the associated states links it was noted that "positive force" was required to move the sliding portion of the link back into position, which does not support a potential conclusion that the links vibrated loose and opened due to the normal operating vibration of the transformer. The lack of specific work instructions for this component and the need to apply "positive force" to reclose the links indicates that the links were likely to have been deliberately opened during a maintenance activity. I&C and Engineering reviewed 42 work order tasks (including feeder trip checks associated with the station aux transformer) performed during the 2R21 refueling outages but did not identify any which specifically directed states links W105 and W106 to be opened. No evidence of online work was found which would have established a time of inoperability.

An extent of condition (EOC) review of station transformers was conducted and the only SSC on/in which a high risk condition exists is on the U3 Station Aux Transformer. All SI functions tests have been successful on this transformer; however, it is prudent to verify the position of the SI control links on this transformer.

Cause of Event

The direct cause of the event was that SAT LTC Control Cabinet Terminal Blocks W105 and W106 had open links for the SAT LTC SI signal. An evaluation of the blocks determined they require positive force to open. An investigation determined the last documented successful test of SAT LTC SI functionality was February 26, 2014 (prior refueling outage). The most probable apparent cause was maintenance activities by either IPEC or supplemental personnel that left the SAT states links W105 and W106 open during the 2014 spring outage (2R21). A review was performed of 42 Work Order (WO) tasks conducted during the 2014 spring outage. None of the WO tasks required work on the SAT LTC links or required work in the specific area of the states links. A review was performed on the SAT I&C procedure for instrument calibrations and no documented manipulation of SAT links was identified. Prior functionality testing has been satisfactory. Additional investigations are being performed to identify the specific cause.

Corrective Actions

The following corrective actions that will be or have been performed under Entergy's Corrective Action Program to address the cause:

- The SAT LTC Terminal Block links were closed and testing completed satisfactorily.
- The control links for the Unit 3 SAT will be inspected to verify they are in the correct position.
- All troubleshooting work orders will require concurrent verification that any equipment manipulation is restored to its original configuration.
- The SAT LTC Preventive Maintenance (PM) procedure will be revised to insure steps are added to require independent verification for all LTC SI logic control link manipulation.

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FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

Event Analysis

The event is reportable under 10 CFR 50.73(a)(2)(i)(B). The licensee shall report any operation or condition which was prohibited by the plant's TS. This condition meets the reporting criteria because Technical Specification 3.8.1 (AC Sources-Operating) specifies the following AC electrical sources to be operable in modes 1,2,3 and 4:

- 1) Two qualified circuits between the offsite transmission network and the onsite AC electrical power distribution system, and
- 2) Three diesel generators capable of supplying the onsite power distribution subsystem.

TS 3.8.1 has a Note that the automatic transfer function for the 6.9 kV buses shall be operable whenever the 138 kV offsite circuit is supplying 6.9 kV bus 5 and 6 and the UAT is supplying 6.9 kV buses 1,2,3 and 4. Qualified offsite circuits are those that are described in the UFSAR and are part of the licensing basis for the unit. Each offsite circuit must be capable of maintaining rated frequency and voltage, and accepting required loads during an accident, while connected to the Engineered Safety Features buses. UFSAR Section 7.5.2.1.12.1 discusses the SAT LTC SI signal feature. With the SAT LTC SI actuation signal disconnected, the 138 kV offsite circuit is no longer a qualified circuit therefore is inoperable. With the as-found LTC condition, an event resulting in an SI and fast bus transfer could cause the secondary voltage to drop below the degraded voltage setpoint for more than 10 seconds, resulting in a separation of the safety buses from offsite power (LOOP).

Past Similar Events

A review was performed of the past three years of Licensee Event Reports (LERs) for events reporting a TS violation due to inoperable 138 kV offsite power distribution system. No LERs were identified.

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 there were no accidents or events during the degraded condition.

There were no significant potential safety consequences of this event.

A probabilistic risk evaluation was performed for failure of the SAT LTC to increase to the required voltage following actuation of a SI signal. The risk evaluation for the SAT LTC boosting function involved estimating the increase in core damage frequency (CDF) and large early release frequency (LERF) using a baseline case which only includes initiating events that generate an SI signal. Pending the outcome of further investigations, the time of consideration was conservatively determined to be since the SAT LTC was last verified to be operable for SI actuations on February 26, 2014. Even in this situation, the results of the risk evaluation concluded the risk impact associated with the failure of the SAT LTC to increase voltage following an SI signal is non-risk significant per NRC Regulatory Guide 1.174 (i.e., the increase in CDF is less than 1E-6/year and the increase in LERF is less than 1E-7/year).