Entergy

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Anthony J. Vitale
Site Vice President

NL-16-090

September 6, 2016

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

SUBJECT: Licensee Event Report # 2016-009-00 "Automatic Reactor Trip due to Actuation of the Trip Logic of the Reactor Protection System During Preparation for Testing"
Indian Point Unit No. 2
Docket No. 50-247
DPR-26

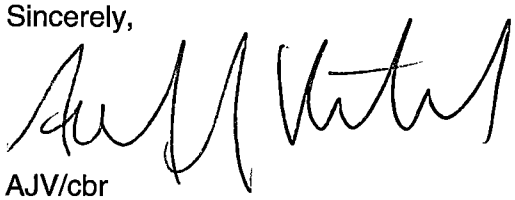
Dear Sir or Madam:

Pursuant to 10 CFR 50.73(a)(1), Entergy Nuclear Operations Inc. (ENO) hereby provides Licensee Event Report (LER) 2016-009-00. The attached LER identifies an event where the reactor automatically tripped, which is reportable under 10 CFR 50.73(a)(2)(iv)(A). As a result of the reactor trip, the Auxiliary Feedwater System was actuated, which is also reportable under 10 CFR 50.73(a)(2)(iv)(A). This condition was recorded in the Entergy Corrective Action Program as Condition Report CR-IP2-2016-04320.

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, Licensing at (914) 254-6710.

Sincerely,



AJV/cbr

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

NRC FORM 366
(11-2015)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE: Automatic Reactor Trip Due to Actuation of the Trip Logic of the Reactor Protection System During Preparation for Testing

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
7	6	2016	2016	- 009	- 00	9	6	2016	FACILITY NAME	DOCKET NUMBER

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)(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)
100%	☐ 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)(i)
	☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 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 NUMER *(Include Area Code)*
John Favreau, Maintenance Engineer	(914) 254-5857

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

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

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 15 single-spaced typewritten lines)*

On July 6, 2016, Instrument and Control (I&C) technicians were preparing to perform 2-PT-2M3A (RPS Logic Train B Actuation Logic Test and Tadot). Prior to starting the test, the I&C technicians were unable to locate key #184 that was identified in the test as associated with the reactor trip breaker B bypass key switch. Control Room staff recommended obtaining key #183 associated with reactor trip breaker A bypass key switch to use in lieu of key #184. To ensure the key would work prior to starting the test, the train B bypass key switch was positioned by an I&C technician to the Defeat position. Because reactor trip Bypass Breaker B was in the racked out position, when the key switch was taken to the Defeat position, it caused the normal Reactor Trip Breaker B to open, which initiated a reactor trip (RT) and auxiliary feedwater system actuation. The direct cause was an I&C technician turned the key interlock to defeat on switchgear Channel B Reactor Protection Logic without having the BYB Bypass breaker racked in and closed. The root cause was Indian Point personnel emphasized work culture production goals without fully recognizing the need to maintain fundamental standards and expectations for nuclear workers. Key corrective actions included site all-hands meeting discussing the event, lessons learned, reinforced expectations and the Fleet Refocus Initiative. As an interim action, all essential work that effects generation was required to have direct oversight by a superintendent or above, all work start authorizations provided by operations undergo a work challenge utilizing a new checklist from this event. Complete the actions associated with the Fleet Refocus Observation program. The event had no effect on public health and safety.

NRC FORM 366A (11-2015) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018

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) CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Indian Point 2	05000-247	2016	- 009	- 00

NARRATIVE

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

DESCRIPTION OF EVENT

On July 6, 2016,while at 100 percent reactor power, preparations were in progress to commence a scheduled bi-monthly surveillance test in accordance with 2-PT-2M3A [RPS Logic Train B Actuation Logic Test and TADOT (>25% Reactor Power)]. The purpose of the surveillance is to perform actuation logic testing of the Reactor Protection System {JC} logic Train B in accordance with Technical Specification (TS) 3.3.1 (Reactor Protection System Instrumentation) Table 3.3.1-1, Function 20, Surveillance Requirement 3.3.1.5. The test had been originally scheduled for June 30, 2016, but due to concerns about Battery Changer 22 grounds, the test was re-scheduled for the following week.

At approximately 07:30 hours, on July 6, 2016, a pre-job briefing was held with four I&C technicians and the I&C job Supervisor. Subsequent to the briefing, the I&C technicians went to the Control Room {NA} and informed the Control Room Supervisor (CRS) of the test and what to expect. In the prerequisites section of 2-PT-2M3A, the breaker interlock key number 182, 184 or equivalent was to be obtained from operations prior to commencing the test. At approximately 9:15 hours, I&C personnel determined neither key number 182 nor key number 184 could be found in the Control Room key locker. The CRS suggested that the Train A key number 183 could be used as an equivalent because it was believed that both trains were keyed the same.

Due to concerns with the short Technical Specification (TS) 8-hour Allowed Outage Time (AOT) for the test the I&C technicians wanted to ensure the key would work prior to entering the TS Limiting Condition for Operation (LCO) and starting the test and discussed it with the CRS. The key concerns were discussed with the CRS. After a brief discussion, the I&C technicians believed that Operations gave them permission to test the key prior to starting the surveillance test. Operations believed that the I&C technicians would test the key during the surveillance.

At approximately 9:30 hours, two of the I&C technicians, one operator and two Nuclear Plant Operator (NPOs) took key number 183 (designated for Train A) to the location of the Reactor Trip Breakers (RTBs) {BKR}(Cable Spreading Room) {NA}. The 8-hour TS LCO was not entered. Two non-licensed operators (NPOs) were present in the Cable Spreading Room to rack in the bypass breaker when requested by the I&C technicians. The Field Shift Supervisor (FSS) was also there to inspect cables that were utilized with the Rod Drop Testing during the recent outage. One of the I&C technicians called the Control Room and told another I&C technician, who was staged in the Control Room, that they would receive an annunciator on Panel SK, Window 2-5. The Control Room operator acknowledged the alert of an expected alarm and the I&C technician in the Control Room relayed the acknowledgement to the I&C technician in the Cable Spreading Room containing the RTBs.

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An I&C technician signaled the other I&C technician that was at the RTBs to test the key. Without using a procedure or an approved work instruction, the other I&C technician positioned the Train B bypass key switch to defeat. Because reactor trip Bypass Breaker B was in the racked out position, when the train B bypass key switch was taken to the Defeat position, it caused the normal Reactor Trip Breaker B to open, which initiated a reactor trip (RT) at approximately 9:38 hours.

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 by the condenser {SG}. The auxiliary feedwater system {BA} actuated as expected due to steam generator low level from shrink effect.

Normally during performance of the test, the train B bypass key switch is only positioned to Defeat after Bypass Breaker B has been closed and the Reactor Trip Breaker B has been opened. The condition was recorded in the Indian Point Energy Center (IPEC) Corrective Action Program (CAP) in Condition Report CR-IP2-2016-04320.

The reactor protection system (RPS) {JC} initiates a reactor shutdown, based on values of selected unit parameters, to protect against violating the core fuel design limits and reactor coolant system pressure boundary during anticipated operational occurrences and to assist the Engineered Safety Feature Systems in mitigating accidents. The RPS instrumentation is segmented into four distinct but interconnected modules one of which is reactor trip switchgear that includes the reactor trip breakers (RTBs) and Bypass Breakers. These components provide a means to interrupt power to the control rod drive mechanisms (CRDMs) and allows the rod cluster control assemblies (RCCAs) or rods to fall into the core and shut down the reactor. The bypass breakers allow testing of the RTBs at power. The control rod drive system is designed such that the control rods are held in place and are capable of being moved only when its power supply is energized. Two RTBs placed in series with the control rod drive power supply remain closed as long as their respective under-voltage coils are kept energized by the RPS logic buses. Two bypass breakers are provided to allow in service testing of either RTB. The key-interlock switch is provided such that if both bypass breakers are closed at the same time while racked in, both bypass breakers will be tripped. This interlock is defeated in the test position with the key to allow for tripping of the undervoltage device of the bypass breaker when the reactor is in operation. The key interlock switch at the Reactor Trip Switchgear is placed in the Defeat position to prevent repeated breaker operation as the logics are tripped and reset.

During normal testing of the RPS Logic, the bypass breaker is racked in and closed and the key-interlock switch would then only bring in the alarm in the Control Room supervisory annunciator. For this event the bypass breaker was not racked in (closed).

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The bypass breakers must be manually closed and under no circumstances should both bypass breakers be racked in and closed at the same time. During normal testing of Channel B, the associated key-interlock switch would have been placed in the defeat position. This would have resulted in: 1) Illuminating a red light on the Train B cabinet, 2) Annunciating an alarm RTB & BYA Train B Defeat on the Control Room supervisory annunciator, 3) Opened up the closing circuit of RTB which is being tested, 4) Opened up the coil circuit of undervoltage trip devices for breakers RTB and BYA which is being tested and preventing the unit from tripping. In this event the key bypass switch was turned to the defeat position while the Bypass Breaker was still racked out (open) which de-energized the undervoltage coil for the B RTB which caused it to open and trip the unit.

An extent of condition (EOC) review determined the condition is bounded to only the RTBs because they are the only breakers with a key-interlocked switch such that if both bypass breakers are closed at the same time while racked in, both bypass breakers will be tripped. The test procedure for unit 2 calls for key number 182, 184 or allows for an equivalent key to be used. This is vague guidance unlike unit 3 which only has one key. The Unit 2 test procedure 2-PT-2M3A will be revised to remove "equivalent."

CAUSE OF EVENT

The direct cause of the RT was due to operating the "B" RPS bypass key out of sequence during Reactor Protection logic testing. An I&C technician turned the key interlock to defeat on switchgear Channel B Reactor Protection Logic without having the BYB Bypass Breaker racked in and closed, which opened the undervoltage tripping device of the RTB and tripped the reactor. The I&C technician turned the key without procedural guidance. The I&C technicians were testing the key with verbal guidance from operations, due to vague procedure guidance in 2-PT-2M3A, that allowed an equivalent key to be used (number 183). Due to not stopping when unsure (conservative decision making), the I&C technicians tested the key prior to starting the surveillance because of perceived time pressure.

The root cause (RC) of the event was that IPEC personnel emphasized work culture production goals for productivity, schedule adherence, and backlog reduction without fully recognizing the need to maintain fundamental standards and expectations for nuclear workers, such as procedure use and adherence and staying in process during work activities. The RC resulted in the I&C technician turning the key without procedure guidance or work instructions and tripped the plant.

CORRECTIVE ACTIONS

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

- Site all-hands meeting was held to discuss the event, the lessons learned, and to reinforce expectations.

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- Site All-hands meeting was held to discuss the Fleet Refocus Initiative.
- Conducted Fleet Refocus Initiative Small Group Meetings.
- Implemented observation activities from the Fleet Refocus Initiative.
- As an interim action all essential work that effects generation was to have direct oversight by a superintendent or above.
- All work start authorizations provided by operations watch personnel must now undergo an additional work challenge utilizing a checklist developed in response to this event. Revised process was formalized by an Operations Standing Order.
- The completion of corrective actions associated with the Fleet Refocus Observation Program will be documented to ensure all personnel apply the essential knowledge, skills, behaviors and practices needed to conduct work safely and reliably.
- Procedures 2-PT-2M3, 2-PT-2M2, and 2-PT-2M2A will be revised to remove the word "equivalent" to prevent any questions on which key to use.

EVENT ANALYSIS

The event is reportable under 10CFR50.73(a)(2)(iv)(A). The licensee shall report any event or condition that resulted in manual or automatic actuation of any of the systems listed under 10CFR50.73(a)(2)(iv)(B). Systems to which the requirements of 10CFR50.73(a)(2)(iv)(A) apply for this event include the Reactor Protection System including reactor trip and AFWS actuation. This event meets the reporting criteria because an automatic reactor trip was initiated at 9:38 hours, on July 6, 2016, and the AFWS actuated as a result of the RT. On July 6, 2016, at 13:16 hours, a four hour non-emergency notification was made to the NRC (Log Number 52067) for an automatic reactor trip while critical and included the eight hour non-emergency notification for the actuation of the AFW system. Both notifications were in accordance with 10CFR50.72(b)(3)(iv)(A). The event was recorded in the Indian Point Energy Center corrective action program (CAP) as CR-IP2-2016-04320.
As all primary safety systems functioned properly there was no safety system functional failure reportable under 10CFR50.73(a)(2)(v).

PAST SIMILAR EVENTS

A review was performed of the past three years of Licensee Event Reports (LERs) for events that involved a reactor trip due to testing of the reactor protection system. No applicable LERs were identified.

SAFETY SIGNIFICANCE

This event had no effect on the health and safety of the public.
This condition had no effect on the health and safety of the public.
There were no actual safety consequences for the event because the event was an uncomplicated reactor trip with no other transients or accidents.

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Required primary safety systems performed as designed when the RT was initiated. The AFWS actuation was an expected reaction as a result of low SG water level due to SG void fraction (shrink), which occurs after a RT and main steam back pressure as a result of the rapid reduction of steam flow due to turbine control valve closure. For this RT there was no actual condition to initiate the reactor trip breaker opening. Event was initiated by human error.

There were no significant potential safety consequences of this event. The RPS is designed to actuate a RT for any anticipated combination of plant conditions to include low SG level. All components in the RCS were designed to withstand the effects of cyclic loads due to reactor system temperature and pressure changes. The reactor trip breakers (RTBs) are in the electrical power supply line from the control rod drive motor generator set power supply to the CRDMs. Opening of the RTBs interrupts power to the CRDMs, which allows the shutdown rods to fall into the core by gravity. Each reactor trip breaker (RTB) is equipped with a reactor trip bypass breaker (RTBB) to allow testing of the trip breaker while the unit is at power. Each RTB and RTBB is equipped with an undervoltage coil and a shunt trip coil to trip the breaker open when needed. The reactor trip signals generated by the RPS automatic trip logic cause the RTBs and associated RTBB to open and shut down the reactor. There are two RTBs in series so that opening either will interrupt power to the rod control system and allow the control rods to fall into the core and shut down the reactor. Each RTB has a parallel RTBB that is normally open. This feature allows testing of the RTBs at power. A trip signal from RPS logic train A will trip RTB A and RTBB B; and a trip signal from logic train B will trip RTB B and RTBB A. During normal operation, both RTBs are closed and both RTBBs are open. When any one train is taken out of service for testing, the other train is capable of providing unit monitoring and protection until the testing has been completed.

For this event, rod control was in automatic and all rods inserted upon initiation of a RT. The AFWS actuated and provided required FW flow to the SGs. RCS pressure remained below the set point for pressurizer PORV or code safety valve operation and above the set point for automatic safety injection actuation. Following the RT, the plant was stabilized in hot standby.