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NL-16-102

September 14, 2016

U.S. Nuclear Regulatory Commission
Document Control Desk
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Rockville, MD 20852-2738

SUBJECT: Licensee Event Report # 2015-005-01, "Automatic Reactor Trip Due to a Turbine-Generator Trip Caused by the Trip of 345kV Main Generator Output Breaker 3 due to a Failure of South Ring Bus 345kV Breaker 5"
Indian Point Unit No. 3
Docket No. 50-286
DPR-64

Reference: 1. Licensee Event Report # 2015-005-00, letter NL-15-087, dated August 14, 2015

Dear Sir or Madam:

Pursuant to 10 CFR 50.73(a)(1), Entergy Nuclear Operations Inc. (ENO) hereby provides Licensee Event Report (LER) 2015-005-01. The attached LER is a revision to an LER submitted by Reference 1, that identified an event where the reactor was 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-IP3-2015-03487. 345 kV breaker 5 is owned by Con Edison and they performed an investigation and evaluation of the failed breaker and provided the results to Entergy. This LER was revised based on the results of the investigation of the failed breaker 5. As a result of degraded unplanned scrams performance indicator, further evaluation was performed and a revised root cause evaluation issued. Changes as a result of additional evaluations are included in this LER revision.

IEZZ
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 "Andrew White". The signature is written in a cursive, flowing style.

AJV/cbr

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

LICENSEE EVENT REPORT (LER)

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 Records and FOIA/Privacy Service 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.

1. FACILITY NAME: INDIAN POINT 3

2. DOCKET NUMBER
05000-286

3. PAGE
1 OF 5

4. TITLE: Automatic Reactor Trip Due to a Turbine-Generator Trip Caused by the Trip of 345kV Main Generator Output Breaker 3 due to a Failure of South Ring Bus 345kV Breaker 5

| 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 |
| 6 | 15 | 2015 | 2015 | 005 - 01 | | 9 | 14 | 2016 | FACILITY NAME | DOCKET NUMBER 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)(i)(C) | <input type="checkbox"/> 50.73(a)(2)(vii) | | | | | | |
| 10. POWER LEVEL 100% | <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 checked="" 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 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

| | |
|--|--|
| NAME Tom O'Connor, Engineering Systems-Electrical | TELEPHONE NUMBER (Include Area Code) (914) 254-5837 |
|--|--|

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 | BKR | I004 | Y | | | | | |

14. SUPPLEMENTAL REPORT EXPECTED

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

15. EXPECTED SUBMISSION DATE

| MONTH | DAY | YEAR |
|-------|-----|------|
| | | |

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

On June 15, 2015, an automatic reactor trip (RT) occurred due to a Main Turbine-Generator trip as a result of a direct generator trip from the Buchanan switchyard. All control rods fully inserted and all required safety systems functioned properly. The plant was stabilized in hot standby with decay heat being removed by the condenser. There was no radiation release. The emergency diesel generators did not start as offsite power remained available. The auxiliary feedwater system actuated as expected due to steam generator low level from shrink effect. Prior to the RT, Con Edison requested that Main Generator Output breaker 1 be opened to support removing 345kV feeder W97 from service for removal of a Mylar balloon on a 345kV conductor at the Millwood substation. After breaker 1 was opened, Main Generator Output breaker 3 opened initiating a direct generator trip signal due to a fault in South Ring Bus breaker 5. Direct cause of the RT was failure of 345kV breaker 5 due to an internal fault which activated protective relays that opened the remaining Main Generator Output breaker 3 which initiated a trip sequence that resulted in a RT. The root cause was Indian Point Energy Center did not provide formal notification of industry operating experience (OE) to Con Edison owner of breaker 5. The specific OE pertained to ITE Type GA breakers. Corrective actions include replacement of breaker 5. Procedure EN-OE-100 (OE Program) was revised to add a section describing how to initiate formal notification to external groups when OE related to components they own and/or control can affect generation. A new site procedure was issued (SMM-LI-126) to formalize the site process for notifying external groups of OE that can affect generation. The event had no effect on public health and safety.

LICENSEE EVENT REPORT (LER)

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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 June 15, 2015, while at 100 percent reactor power, an automatic reactor trip (RT) {JC} occurred at 19:20 hours, due to a Main Turbine {TA} Main Generator {TB} trip as a result of a direct generator trip from the Buchanan switchyard. 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}. There was no radiation release. The emergency diesel generators {EK} did not start as offsite power remained available. The auxiliary feedwater system {BA} actuated as expected due to steam generator {AB} low level from shrink effect. An investigation into the cause of the event and a post transient evaluation was initiated. The event was recorded in the Indian Point corrective action program (CAP) as Condition Report CR-IP3-2015-03487.

Prior to the RT Control Room operators were informed by the Con Edison District Operator (DO) at 11:43 hours, of an issue on 345 kV feeder W97 {FK}. At 16:15 hours, the Con Edison DO reported the issue with feeder W97 which also affected feeder W93 requiring both feeders to be de-energized. The outage for the scheduled work was expected to last approximately one hour and was designated a Category 2 emergency (Equipment is in danger of failure but does not pose an immediate hazard to people or other equipment) in accordance with IP-SMM-OP-104 (Offsite Power and Continuous Monitoring and Notification). The issue concerned a Mylar balloon on the top conductor of feeder W97 just outside of the Millwood 345 kV substation. To support the Con Edison request for removing feeder W97 from service, the Unit 3 Main Generator Output breaker {BKR} (345kV Breaker 1) had to be opened. On June 15, 2015, at 19:16 hours, 345kV Breaker 1 was opened in accordance with 3-SOP-EL-017 (Operation of 345kV Breakers #1 and #3). Shortly after opening 345kV Breaker 1, South Ring Bus {FK} 345kV Breaker 5 failed causing Main Generator Output Breaker 3 to auto open and the automatic trip of feeders Y88, W98 and W96. In accordance with design, opening of 345kV Breakers 1 and 3 will trip the 86 Primary and 86 Backup lockout relays and initiate a turbine trip which will cause a RT. The following relays were tripped: 1) 345kV Line BU Ground Fault Detected (W96), 2) 345kV Line Backup Phase Fault Detected (A, C), 3) 345kV Line Phase Fault Detected (A, C), 4) 345kV Line Primary Ground Fault Detected.

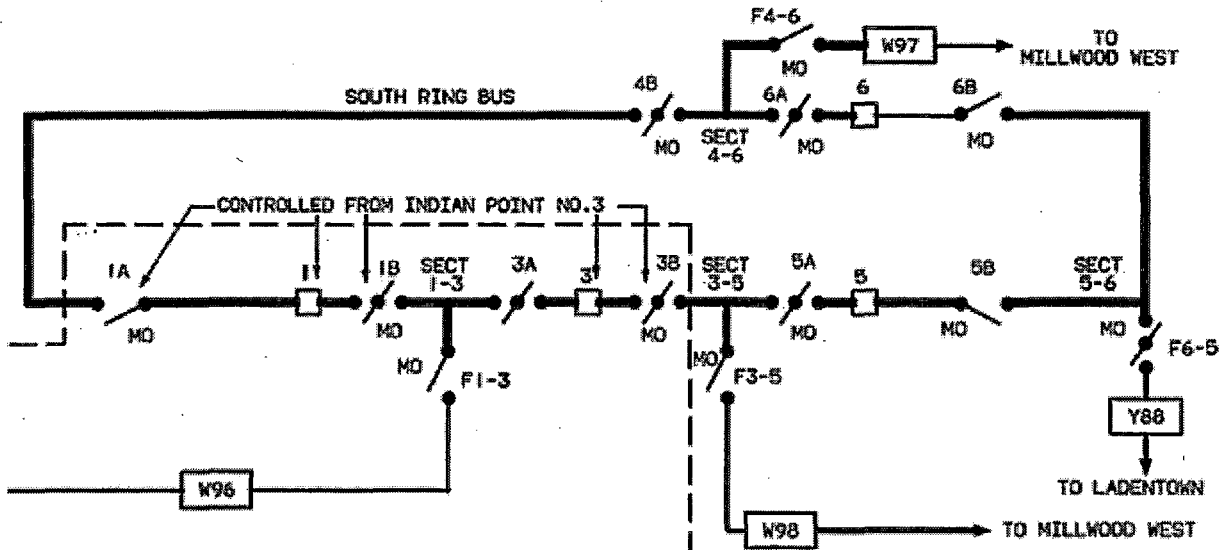
The Unit 3 High Voltage Electrical Distribution System consists of the following subsystems: 1) 22kV system, 2) 345kV system, and 3) 138kV and 13.8kV system. The Unit 3 Main Generator supplies electrical power at 22kV through isolated phase bus to the two Main Transformers (MT). The MTs increase the voltage of the generator output to 345kV which is transmitted to the Buchanan Substation South Ring Bus via feeder W96. The Buchanan Substation contains two 345kV Ring Buses (North and South) and a 138kv bus. The South Ring Bus is normally supplied by Unit 3 and the North Ring Bus by Unit 2. The South Ring Bus is connected to the Millwood West Substation via two feeders, W97 and W98 and to the Ladentown Substation via feeder Y88. The South Ring Bus consists of four 345kV breakers, numbered 1, 3, 5 and 6. The 345kV breaker #5 was a Power Circuit Breaker, Type 345GA 25-30, SN 41-39006-2044, manufactured by ITE Imperial Corporation {I004} in 1971 and installed in 1973. This breaker is owned by Con Edison.

An extent of condition (EOC) investigation determined that the Indian Point Energy Center (IPEC) does not own any 345kV circuit breakers manufactured by ITE. Prior to replacement in 2003, Main Generator Output Breakers 1 and 3 were ITE circuit breakers.

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Figure of South Ring Bus at Buchanan 345kV Substation



As a result of two successive in-service failures of breaker 3, both breaker 1 and 3 were replaced in 2003 with HVB Model SF6 circuit breakers. Con Edison had previously replaced breaker 6 in 2009. Breaker 5 was replaced due to its failure reported in this LER leaving no other ITE 345 kV Type GA breakers in the Buchanan switchyard. 138kV breakers are considered similar in that they are high power circuit breakers. 138kV breaker BT5-6 is ITE Imperial Model 230GA similar to 345 kV breaker 5. It was determined that any failures during testing or maintenance, aside from an in-service failure, would not pose the same operational risk, as the components are out of service when tested or maintained. Based on the results of Preventive Maintenance (PM)s performed on BT5-6, it was determined the probability of an in-service failure was medium. 138kV breaker BT5-6 is scheduled for replacement in the 2019 refueling outage. The PMs performed and their periodicities are consistent with ENN-EP-G-004 (Switchyard and Large Power Transformer Preventive Maintenance Guidelines). A review of the PM results did not show any negative or degrading trend. An EOC corrective action was included in the action plan to perform an internal inspection of breaker BT5-6 at the next available opportunity. The risk to continued operation is considered low due to the low number of operating cycles this breaker experiences. Low operating cycles reduces the stress on the contact support structure. Similar high voltage breakers are 345 kV GE-Hitachi HVB breakers 1, 3, 6, 7, 9 and 11. The failed breaker 5 was replaced with an GE-Hitachi HVB breaker. Currently all PMs for these breakers are complete and no PMs have been deferred and no adverse trends have been noted.

Significant Operating Experience Report (SOER) 99-01 (Loss of Grid) reported a significant increase in RTs due to switchyard and grid related events. Reviews following several of these events found that written agreements between plant and grid operators on grid and switchyard design, maintenance, and operation did not exist or were ineffective. Such agreements are considered important to provide reliable off-site power sources to nuclear plants to maintain plant safety. In 2003 IPEC had industry information and empirical data showing ITE Imperial Type GA breakers were unreliable. At that time IPEC had knowledge that Con Edison owned ITE Imperial Type GA breakers that were in service in the south ring bus (breakers 5 and 6). In 2007, IPEC conducted single point failure reviews that included switchyard components. Breakers 5, 6 and 11 were excluded as they were owned by Con Edison.

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

Prior to August 15, 2012, the OE program did not require switchyard and grid OE sharing, IPEC should have formally notified Con Edison of ITE Imperial Type GA breaker unreliability, the detrimental effect failure of the breakers would have on generation and requested Con Edison to take timely action to intensify PM or replace the Buchanan 345 kV breaker 5. Breaker 6 was replaced in 2009.

The Cause of Event

Direct cause of the RT was failure of Buchanan 345kV breaker 5 due to age-related degradation of the C phase contacts. This degradation was due to misalignment of the contacts that resulted in a hot spot due to high resistance. Con Edison who owned the breaker, determined the contact support system failed due to repeated cycling (fatigue failure). The failure of breaker 5 activated protective relays that opened the remaining Main Generator Output breaker 3 which initiated a trip sequence that resulted in an immediate Generator Trip, Turbine Trip and RT. The root cause was Indian Point Energy Center did not provide formal notification of industry operating experience (OE) to Con Edison. The specific incident pertains to the OE on ITE Type GA breakers that could impact IPEC generation. The condition was exacerbated by the OE process (EN-OE-100) that did not have a trigger for formal communication of important OE information to external groups that control and own equipment critical to IPEC generation.

IPEC does attend periodic face-to-face meetings with Con Edison to discuss reliability concerns and pending projects in the Buchanan Switchyard which could affect IPEC operation.

Corrective Actions

The following are some of the corrective actions that have been performed under the Corrective Action Program (CAP) to address the causes of this event.

- A detailed inspection and failure analysis of 345kV breaker 5 was performed by Con Edison to identify the specific failure mechanism and root cause. The Con Edison results were discussed with Entergy and a Root Cause Evaluation performed that included the results obtained from Con Edison.
- 345kV Breaker 5 was replaced by Con Edison.
- Procedure EN-OE-100 (OE Program) was revised by including a new section describing how to initiate formal notification to external groups when OE related to components they own and/or control can affect generation.
- A new IPEC site procedure was prepared (SMM-LI-126) that formalizes the process for notifying external groups of operating experience that can affect generation at IPEC.

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 (RPS) including RT and AFWs actuation. This event meets the reporting criteria because an automatic RT was initiated at 19:20 hours, on June 15, 2015, and the AFWs actuated as a result of the RT. On June 15, 2015, at 20:15 hours, a notification was made in accordance with 10 CFR 50.72: a 4-hour non-emergency notification for an actuation of the reactor protection system {JC} while critical under 10 CFR 50.72(b)(2)(iv)(B), and an 8-hour notification under 10CFR50.72(b)(3)(iv)(A) for a valid actuation of the AFW System (Event Log #51156).

As all primary safety systems functioned properly there was no safety system functional failure reportable under 10CFR50.73(a)(2)(v).

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

Past Similar Events

A review was performed of previous Licensee Event Reports (LERs) in the past three years reporting a RT as a result of a high voltage breaker failure. 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 the event was an uncomplicated reactor trip with no other transients or accidents. 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.

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. This event was bounded by the analyzed event described in FSAR Section 14.1.8 (Loss of External Electrical Load). All components in the RCS were designed to withstand the effects of cyclic loads due to reactor system temperature and pressure changes. 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.