



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION I  
2100 RENAISSANCE BLVD.  
KING OF PRUSSIA, PA 19406-2713

November 21, 2016

Mr. Anthony J. Vitale  
Site Vice President  
Entergy Nuclear Operations, Inc.  
Indian Point Energy Center  
450 Broadway, GSB  
Buchanan, NY 10511-0249

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT 3 – SUPPLEMENTAL  
INSPECTION REPORT 05000286/2016009 AND ASSESSMENT FOLLOW-UP  
LETTER

Dear Mr. Vitale:

On October 13, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed a supplemental inspection using Inspection Procedure (IP) 95001, "Supplemental Inspection for One or Two White Inputs in a Strategic Performance Area," at your Indian Point Nuclear Generating (Indian Point) Unit 3. On October 13, 2016, the NRC inspection team discussed the results of this inspection with Mr. John Ferrick and other members of your staff. The results of this inspection are documented in the enclosed report.

In the fourth quarter of 2015, your staff reported an unplanned automatic reactor trip on December 14, 2015, that caused the "Unplanned Scrams per 7,000 Hours Critical" performance indicator (PI) to cross a threshold from Green to White. Based on your report, the NRC assigned a White PI Action Matrix input to the Initiating Events cornerstone in the fourth quarter of 2015.

In response to this Action Matrix input, the NRC informed you in the Annual Assessment Letter, dated March 2, 2016, that a supplemental inspection under IP 95001, "Supplemental Inspection for One or Two White Inputs in a Strategic Performance Area," would be required. On July 11, 2016, you informed the NRC that Indian Point Unit 3 was ready for the supplemental inspection.

The NRC performed this supplemental inspection to determine if (1) the root and contributing causes for the significant issues were understood; (2) the extent of condition and extent of cause for the identified issues were understood; and (3) your completed or planned corrective actions were sufficient to address and prevent repetition of the root and contributing causes. The inspection consisted of examination of activities conducted under your license as they relate to safety, compliance with the Commission's rules and regulations, and the conditions of your operating license.

Based on the results of this inspection, the NRC concluded that Entergy performed a satisfactory evaluation of the White PI and met the inspection objectives. Entergy's evaluation of the root and contributing causes associated with four unplanned reactor scrams was generally appropriate. Entergy appropriately identified the root cause to include decision making regarding single point vulnerabilities that led to reactor scrams.

Overall, Entergy satisfactorily identified the individual and collective performance issues associated with the White PI and has appropriate corrective actions either implemented or planned to address these issues. The NRC has determined that completed or planned corrective actions were sufficient to address the performance that led to the White PI.

NRC inspectors documented one self-revealing finding of very low safety significance (Green) in this report. The finding did not involve a violation of NRC requirements.

If you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U. S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC, 20555-0001; with copies to the Regional Administrator, Region I; and the NRC Resident Inspectors at Indian Point.

Based on the guidance in Inspection Manual Chapter 0305, "Operating Reactor Assessment Program," and the results of this inspection, the White PI will be closed and Indian Point Unit 3 will transition from the Regulatory Response Column of the NRC's Action Matrix to the Licensee Response Column as of the date of the cover letter to this report.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and the NRC Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

**/RA/**

Eugene M. DiPaolo, Chief  
Reactor Projects Branch 2  
Division of Reactor Projects

Docket No. 50-286  
License No. DPR-64

Enclosure:  
Inspection Report 05000286/2016009  
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**U.S. NUCLEAR REGULATORY COMMISSION**

## REGION I

Docket No. 50-286

License No. DPR-64

Report No. 05000286/2016009

Licensee: Entergy Nuclear Northeast (Entergy)

Facility: Indian Point Nuclear Generating Unit 3

Location: 450 Broadway, GSB  
Buchanan, NY 10511-0249

Dates: September 19, 2016 through October 11, 2016

Inspectors: E. Carfang, Senior Resident Inspector, Lead Inspector  
J. Schussler, Project Engineer

Approved by: Eugene M. DiPaolo, Chief  
Reactor Projects Branch 2  
Division of Reactor Projects

Enclosure

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## SUMMARY

IR 05000286/2016009; 09/19/2016 – 10/07/2016; Indian Point Nuclear Generating (Indian Point), Unit 3; Supplemental Inspection – Follow-up of Events and Notices of Enforcement Discretion.

A senior resident inspector and regional inspector performed this inspection. The inspectors identified one self-revealing finding of very low safety significance (Green) during this inspection. The finding did not involve a violation of regulatory requirements. The significance of most findings is indicated by its color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects Within the Cross-Cutting Areas," dated December 4, 2014. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6, dated July 2016.

### Cornerstone: Initiating Events

The NRC staff performed this supplemental inspection in accordance with Inspection Procedure (IP) 95001, "Supplemental Inspection for One or Two White Inputs in a Strategic Performance Area," to assess Entergy's root cause evaluation (RCE) and corrective actions taken in response to four unplanned scrams of Unit 3 during 2015. Overall, the inspectors determined Entergy satisfactorily evaluated and addressed the performance issues that resulted in the multiple reactor scrams at Unit 3 and concluded that Entergy successfully met the inspection objectives of IP 95001.

Entergy evaluated the collective station performance in a RCE, "Station Performance Indicator for 'Unplanned Scrams per 7000 Critical Hours' Turned White for the Fourth Quarter of 2015," (Condition Report (CR) IP3-2016-0221) and identified one root cause and two contributing causes. Entergy identified the root cause as "leadership had an insufficient level of awareness/recognition of risk to enter and therefore implement the formal 'Critical Decision Making' (CDM) process to substantially reduce or eliminate risks associated with latent and conditional induced single point vulnerabilities (SPVs)." The two contributing causes identified were "EN-DC-175, 'Single Point Failure Review Process,' did not include a discussion of bridging strategies, a continuous review process, or a program owner to drive process compliance" and "the station demonstrated a high reliance on vendors to provide quality parts, solutions to problems and in-plant troubleshooting, and did not adequately challenge the vendor proposed solutions affecting SPV equipment until after the failure occurred."

The inspectors evaluated these root and contributing causes and determined that generally, Entergy identified the causes and corrective actions to preclude recurrence (CAPRs). Notwithstanding, the inspectors identified a weakness in Entergy's development of the root cause and associated CAPR of the Unplanned Scrams White performance indicator (PI). Inspectors identified that the root cause and corrective action for the White PI were narrowly focused and the effectiveness review for the corrective action did not provide assurance the corrective action would be sustainable. However, inspectors concluded this was not a significant weakness because the weakness was limited to the one RCE, and while narrow, the root cause and corrective actions were adequate. Entergy identified appropriate common cause, contributing causes, extent of condition, and extent of cause with substantive corrective actions. In addition, the four individual root causes identified appropriate corrective actions to address the individual trips, therefore the narrow root cause and corrective actions associated

with the common cause evaluation were not indicative of a general weakness across the evaluations.

During the inspection, Entergy clarified wording in the root cause and updated the effectiveness review for the CAPR based on inspector questions. The effectiveness review was significantly modified to cover a two year period, review CRs in the corrective action program to determine if there were missed opportunities to use the CDM process for SPV issues, and review various site processes for use of CDM. Inspectors determined the effectiveness review is now comprehensive.

Based on the guidance in IMC 0305, "Operating Reactor Assessment Program," and the results of this inspection, the White PI associated with the 2014 unplanned scrams is closed and Indian Point Unit 3 will transfer to the Licensee Response Column of the matrix as of the date of the cover letter of this report.

A self-revealing finding of very low safety significance was identified during the review.

- Green. A green self-revealing finding of ENN-EP-G-004, "Switchyard and Large Power Transformer Preventive Maintenance Guidelines," occurred in that preventive maintenance (PM) was not performed as required on the W96 345kV line insulators. Specifically, the semi-annual corona surveys to identify degradation of insulators were not performed for line W96, which led to an insulator failure and resulted in an automatic trip of the reactor. Entergy replaced the damaged insulator and added the W96 line to the corona survey PM work order.

Inspectors determined that Entergy did not perform PMs in accordance with ENN-EP-G-004, "Switchyard and Large Power Transformer Preventive Maintenance Guidelines," on the 345kV insulators, which is a performance deficiency that was reasonably within Entergy's ability to foresee and correct and should have been prevented. Specifically, the lack of PMs on the insulators allowed the insulators to degrade to a point where the condition of the insulator combined with environmental conditions led to a flashover event and a reactor trip. This finding is more than minor because it is associated with the Initiating Events cornerstone attribute of equipment performance, and adversely affected the cornerstone objective of limiting the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the failure of the insulator led to a reactor trip. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 1 of IMC 0609, Appendix A, "The Significance Determination Process for Findings At-Power," the inspectors determined that this finding was of very low safety significance (Green) because the finding did not cause both a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition. The inspectors determined that the finding had a cross-cutting aspect in Human Performance, Avoid Complacency, because Entergy did not recognize and plan for the possibility of mistakes, latent issues, and inherent risk. Specifically, Entergy performed a site review ensuring appropriate PMs were in place, and did not identify that the PM for the insulator was not being performed. [H.12] (Section 4OA3)

## REPORT DETAILS

### 4. OTHER ACTIVITIES

#### 4OA3 Follow-Up of Events and Notices of Enforcement Discretion (71153 – 4 samples)

- .1 (Closed) Licensee Event Report (LER) 05000286/2015-004-00 and 2015-004-01:  
Automatic Reactor Trip Due to a Turbine-Generator Trip Caused by a Failure of the 31 Main Transformer.

On May 9, 2015, Unit 3 automatically tripped from 100 percent power after an internal fault on the 'A' phase high voltage side of the 31 main transformer. The 31 main transformer differential 'A' phase and the Unit 3 differential 'A' and 'B' phase relays actuated, resulting in a turbine trip and reactor trip via the main generator primary and back-up lock out relays 86P and 86BU, respectively. As a result of this fault, the transformer tank experienced a rapid increase in pressure. This sudden pressure increase fractured the seam weld between the transformer cover and the side wall, allowing the transformer oil to escape and become ignited. The Unit 3 Operations Shift Manager declared a Notice of Unusual Event in accordance with the Emergency Plan Emergency Action Level. The inspectors reviewed Entergy's post-transient evaluation and cause evaluation to verify the accuracy of the LER. The inspectors also reviewed Entergy's corrective actions for the trip, which included increased testing and acceptance criteria for the spare 31 Main Transformer and adding a new four year PM task to perform partial discharge testing of the main and auxiliary transformers.

Additionally, inspectors completed a Problem Identification and Resolution Inspection Procedure 71152 sample on the root cause and corrective actions associated with the Unit 3 main transformer failure. The assessment of this inspection and observations are documented in Section 4OA2 of Indian Point Nuclear Generating – Integrated Inspection Report 05000247/2016001 and 05000286/2016001 (Agencywide Documents Access and Management System Accession No. ML16133A448). The inspectors did not identify any findings or violations of NRC requirements during the review of the LER. This LER is closed.

- .2 (Closed) LER 05000286/2015-005-01: Automatic 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

On June 15, 2015, Unit 3 automatically tripped from 100 percent power on a main turbine trip, which was caused by a main generator lock out when protective relays actuated after output breaker 3 opened when the 'C' phase of breaker 5 faulted to ground. Prior to the reactor trip, the reactor operators opened main generator output breaker 1 at the request of the switchyard owner. The output of Unit 3 feeds in to the south ring bus in the Buchanan 345 kV substation between breakers 1 and 3. With breaker 1 open, the current produced by Unit 3 flowed through only breaker 3. In this configuration, the amount of current flowing through breaker 5 was also increased. When the reactor operators opened breaker 1, 'C' phase on breaker 5 faulted to ground. Breaker 3 opened, as designed, in response to the fault. With both breaker 1 and breaker 3 open, the turbine and, subsequently, the reactor tripped, as designed.



The inspectors reviewed Entergy's post-transient evaluation and cause evaluation to verify the accuracy of the LER. The inspectors also reviewed Entergy's corrective actions for the trip, which included tracking the replacement of breaker 5, and comparing the PM, performed on similar Entergy-owned breakers, to the industry standards. The inspectors did not identify any findings or violations of NRC requirements during the review of the LER. This LER is closed.

.3 (Closed) LER 05000286/2015-007-01: Manual Reactor Trip Due to Decreasing Steam Generator Water Level Caused by a Miss-Wired Circuit Board in the Main Feedwater Pump Speed Control System

On July 8, 2015, Unit 3 was manually tripped due to lowering steam generator water level, caused by the loss of a condensate pump in conjunction with a miss-wired circuit board in the main feedwater pump speed control system. During a load reduction, in response to the loss of a condensate pump, the 31 main boiler feed pump (MBFP) experienced a speed control signal error, which lowered 31 MBFP to its minimum speed, causing steam generator water level to lower due to insufficient feed flow.

The inspectors reviewed Entergy's post-transient evaluation and cause evaluation to verify the accuracy of the LER. The inspectors also reviewed Entergy's corrective actions for the trip. The condensate pump motor was repaired and the miss-wired circuit board was replaced. The inspectors reviewed the LER and did not identify any findings or violations of NRC requirements. This LER is closed.

.4 (Closed) LER 05000286/2015-008-00 and 2015-008-01: Automatic Reactor Trip due to a Turbine-Generator Trip as a Result of a Fault on 345kV Feeder W96 Tower Lines Caused by Pre-Existing Degraded Insulator

On December 14, 2015, Unit 3 experienced an automatic reactor trip caused by a fault on the 345kV lines due to the failure of a previously degraded insulator. Inspectors reviewed both LERs and the RCE for the reactor trip. The revised LER provided information from vendor testing that concluded the most likely cause of the insulator failure was a previously degraded insulator that was damaged during a flashover event. A second potential, but less likely, root cause was bird streamers. The station has taken actions to address both root causes. Entergy replaced the damaged insulators and is performing the required corona surveys. Inspectors identified one self-revealing finding. No violation of a regulatory requirement was identified. This LER is closed.

Introduction. A green self-revealing finding of ENN-EP-G-004, "Switchyard and Large Power Transformer Preventive Maintenance Guidelines," occurred in that a PM was not performed as required on the W96 345kV line insulators. Specifically, the semi-annual corona surveys that look for degradation of the insulators were not performed for line W96, which led to an insulator failure and resulted in an automatic trip of the reactor.

Description. On December 15, 2015, Unit 3 experienced a failure of the insulators on the W96 345kV line, which led to a reactor trip. The insulators were sent to a vendor for analysis, and the vendor determined the most likely cause of the insulator failure was degradation, caused from previous low level grid disturbances, in combination with unfavorable environmental conditions of heavy wet fog. Heavy wet fog can reduce the dielectric properties of air, and, in this case, resulted in the damaged insulators faulting, which led to the reactor trip.

Entergy conducts PMs on the lines to identify degrading equipment. Corona surveys are performed on the high voltage equipment to identify degrading performance so equipment can be repaired or replaced prior to failure. During the RCE (CR IP3-2015-5969), Entergy determined corona surveys were not being performed on the W96 line insulators. The corona surveys are performed to identify degraded conditions prior to insulator failures and are directed by ENN-EP-G-004, "Switchyard and Large Power Transformer Preventive Maintenance Guidelines," Revision 2. The PM is described in PM basis template "EN – Switchyard," Revision 0, and requires the corona scan of all high voltage equipment and connections in the switchyard on a six month periodicity. The corona survey PM was initiated in 2006, however, the W96 line was not added to the PM and, therefore, was never performed. In 2015, Entergy performed a review of the SPV program to review impacts on equipment reliability. The review specifically looked at the corona survey PM, and did not identify that the PM was not being performed on the W96 line insulators. Entergy replaced the damaged insulator and added the W96 line to the corona survey PM work order.

Analysis. Inspectors determined that Entergy did not perform PMs in accordance with ENN-EP-G-004, "Switchyard and Large Power Transformer Preventive Maintenance Guidelines," on the 345kV insulators, which is a performance deficiency that was reasonably within Entergy's ability to foresee and correct and should have been prevented. Specifically, the lack of PMs on the insulators allowed the insulators to degrade to a point where the damaged insulator in combination with environmental conditions led to a flashover event and a reactor trip. This finding is more than minor because it is associated with the Initiating Events cornerstone attribute of equipment performance and adversely affected the cornerstone objective of limiting the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the failure of the insulator led to a reactor trip. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 1 of IMC 0609, Appendix A, "The Significance Determination Process for Findings At-Power," the inspectors determined that this finding was of very low safety significance (Green) because the finding did not cause both a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition.

The inspectors determined that the finding had a cross-cutting aspect in Human Performance, Avoid Complacency, because Entergy did not recognize and plan for the possibility of mistakes, latent issues, and inherent risk. Specifically, Entergy performed a site review ensuring appropriate PMs were in place, and did not identify the PM for the insulator was not being performed. [H.12]

Enforcement. This finding does not involve enforcement action because no violation of a regulatory requirement was identified. Because this finding does not involve a violation and is of very low safety significance (Green), it is being identified as a finding. **(FIN 05000286/2016009-01, 345 kV Insulator Failure Causes Reactor Trip)**

#### 4OA4 Supplemental Inspection (IP 95001)

##### .01 Inspection Scope

The NRC staff performed this supplemental inspection in accordance with IP 95001 to assess Entergy's evaluation of a White PI, which affected the Initiating Events

cornerstone in the Reactor Safety strategic performance area. The inspection objectives were:

- To provide assurance that the root causes and contributing causes of risk-significant performance issues are understood;
- To provide assurance that the extent of condition and extent of cause of risk-significant performance issues are identified; and
- To provide assurance that Entergy's corrective actions for risk-significant performance issues are sufficient to address the root and contributing causes and prevent recurrence.

Indian Point Unit 3 experienced four unplanned reactor trips from May 9, 2015, to December 14, 2015, which caused Unit 3 to exceed the performance threshold for unplanned scrams per 7000 critical hours. The four unplanned reactor trips of Unit 3 in 2015 were:

- On May 9, 2015, an automatic reactor trip of Unit 3 occurred when a high energy fault on the high voltage 'A' phase of the 31 main transformer caused the failure of the main transformer. This caused a main generator trip, turbine trip, and reactor trip.
- On June 15, 2015, an automatic trip of Unit 3 occurred when 345 kV breaker 5 experienced an internal fault on the 'C' phase when 345 kV breaker 1 was opened due to a Mylar balloon on the 345 kV line. This caused a main generator trip, turbine trip, and reactor trip.
- On July 8, 2015, a manual trip of Unit 3 occurred when operators tripped the unit at approximately fifteen percent steam generator water level. During a load reduction, in response to the loss of a condensate pump, the 31 MBFP experienced a speed control signal error, which lowered 31 MBFP to its minimum speed, causing steam generator water level to lower due to insufficient feed flow.
- On December 14, 2015, an automatic trip of Unit 3 occurred when an insulator failed on the W96 tower 4 transmission line due to a fault on the 345 kV line. The insulator failure resulted in a main generator trip, turbine trip, and reactor trip.

The inspectors reviewed the RCEs for each of the unplanned trips to assess the adequacy of the corrective actions taken in response to the events.

Entergy informed the NRC on July 11, 2016, that they were ready for the IP 95001 supplemental inspection.

The inspectors reviewed Entergy's RCEs; reviewed applicable corrective action program documents; and interviewed licensing, engineering, maintenance, work management, and operations management personnel to ensure that the root and contributing causes were understood and corrective actions taken or in progress were appropriate to address the identified causes and to prevent recurrence of the issues.

## .02 Evaluation of the Inspection Requirements

### 02.01 Problem Identification

- a. *IP 95001 requires that the inspection staff determine that Entergy's evaluation documented who identified the issue (i.e., licensee-identified, self-revealing, or NRC-identified) and under what conditions the issue was identified.*

The inspectors determined that Entergy's RCE adequately described the conditions through which these were identified. All four trips were appropriately described as self-revealing.

Overall, the inspectors determined that Entergy's RCEs effectively documented who identified the issue and the conditions under which the issue was identified.

- b. *IP 95001 requires that the inspection staff determine that Entergy's evaluation documented how long the issue existed and prior opportunities for identification.*

The inspectors determined that Entergy's RCEs adequately documented how long the issues, leading to each of the four unplanned scrams, existed and that prior opportunities for identification were identified.

#### May 9, 2015 Automatic Reactor Trip Caused by a Failure of the 31 Main Transformer

Entergy determined that the May 9, 2015, automatic reactor trip was the result of a vendor design/manufacturing deficiency that caused an internal fault on the 'A' phase high voltage side of the transformer and the 'A' phase high voltage bushing. The failure of the 31 main transformer 'A' phase high voltage side was catastrophic and without precursors, or indications, of impending failure. The 31 main transformer was originally installed in 2007 and the 'A' high voltage bushing was replaced in 2013. Prior to the failure, Entergy conducted regularly scheduled surveillance tests and troubleshooting to identify possible 'as built' vendor design/manufacturing deficiencies. Specifically, during a 2015 outage, several tests were performed to identify an internal fault, including power factor and capacitance, excitation current, winding resistance, insulation resistance, and leakage reactance testing. All tests were within required limits. Notwithstanding satisfactory test results, Entergy did determine, absent a specific transformer internal deficiency, that there were opportunities and processes in place such that after the 2015 outage, management should have been aware of the continuing 31 main transformer operational condition and the associated risks. Entergy determined there was a failure of station leadership to recognize the risk and formally capture decisions in the CDM process. Inspectors determined that while opportunities existed to utilize the CDM process, the transformer failure ultimately was not within Entergy's ability to foresee and correct and using the CDM process would not have prevented the failure. Inspectors did not identify a performance deficiency associated with the failure of the main transformer trip.

#### June 15, 2015 Automatic Reactor Trip Caused a Failure of South Ring Bus 345kV Breaker 5

Entergy determined that the June 5, 2015, automatic reactor trip was the result of a direct generator trip from the Buchanan switchyard. The Unit 3 output is fed into the

south ring bus in the Buchanan 345 kV substation switchyard, between breakers 1 and 3. The switchyard is owned by an external entity who requested to open one of two 345kV Unit 3 output breakers, breaker 1. Consequently, all current was directed through breaker 3, the remaining Unit 3 output breaker. In June 2003, Indian Point Unit 3 experienced the failure of an ITE Imperial Corporation GA25-30 breaker, output Breaker 3, which was replaced with a different design, GE-Hitachi HVB. This failure was subject to an RCE and the cause was determined to be inadequate maintenance. During the extent of condition for the 2003 failure, Entergy recognized that Unit 3 output breaker 1 was the same manufacture and consequently replaced it, as well. While Entergy implemented corrective actions to replace the Unit 3 output breakers 1 and 3 based on performance issues and industry information, the station did not formally communicate this to the switchyard owner. Entergy missed the opportunity to formally provide specific operating experience to an external entity. Inspectors determined there was no standard requiring communication of the operating experience to the switchyard owner, therefore, no performance deficiency was identified.

#### July 8, 2015 Manual Reactor Trip from a MBFP Speed Control System Failure

Entergy determined that the July 8, 2015, manual trip was the result of a failure of the MBFP speed control system with a miss-wired speed control card. The card was replaced in 2013 during the refueling outage (3R17). The following cycle, control room alarms occurred that indicated an unexpected condition with the 31 MBFP speed demand signal. In response, Entergy wrote a work order in August 2014 to replace the track and hold card in the March 2015 refueling outage (3R18) using the 2 year PM task to test the function of the card. Entergy determined there were prior opportunities to identify the track and hold card issue because the 2 year PM did not adequately test the function of the card, and the purchase order for the card did not require specific vendor testing of the card to validate the function. Inspectors determined that no standard contained requirements for repair of the condensate motor or testing controls for the MBFP card, therefore, no performance deficiency was identified.

#### December 14, 2015 Automatic Reactor Trip from Degraded Insulator Failure

Entergy determined that the December 14, 2015, automatic trip was most likely the result of a previously damaged insulator on the W96 345kV line failing due to poor weather conditions (fog) reducing the dielectric properties of air. Entergy discovered that corona survey PMs to detect degradation in high energy systems were not performed on the W96 line. The last visual inspection PM was performed in March 2013. Between the visual inspection of the insulators and the insulator failure in December 2015, the site had experienced two low level energy events from grid disturbances in October 2013 and March 2014. The corona PM reasonably could have identified the damaged insulator, had it been performed on the required 6 month frequency, prior to the reactor trip in December 2015. Inspectors determined a performance deficiency existed in that Entergy did not perform PMs on the W96 insulators. This is documented as a self-revealing Green finding of very low safety significance in section 4OA3.

Overall, the inspectors determined that Entergy's RCEs effectively documented that the decision making challenges regarding SPV issues had existed for several years and prior opportunities to identify SPVs, through equipment reliability efforts and vendor quality issues, were documented.

- c. *IP 95001 requires that the inspection staff determine that Entergy's evaluation documented the plant-specific risk consequences, as applicable, and compliance concerns associated with the issue.*

Entergy documented the risk associated with the unplanned scrams in a qualitative manner, as allowed by EN-LI-118, "Causal Evaluation Process," and EN-HU-104, "Engineering Risk and Rigor." Entergy determined there were no significant challenges to safety as a result of any of the unplanned scrams.

Overall, the inspectors determined that Entergy's evaluation documented the plant specific risk consequences and compliance concerns associated with the issues.

- d. Findings

One finding was identified and is documented in section 4OA3 of this report.

## 02.02 Root Cause, Extent of Condition and Extent of Cause Evaluation

- a. *IP 95001 requires that the inspection staff determine that Entergy evaluated the problem using a systematic methodology to identify the root and contributing causes.*

Entergy used various approaches to identify the root and contributing causes of each unplanned scram as well as the overall reasons for the Unplanned Scram PI change from Green to White, including barrier analysis, event and causal factors, failure mode analysis, and organizational and programmatic analysis.

Entergy identified one root cause and two contributing causes that led the Unplanned Scram PI to cross the White threshold. Entergy identified the root cause as "leadership had an insufficient level of awareness/recognition of risk to enter and therefore implement the formal 'CDM' process to substantially reduce or eliminate risks associated with latent and conditional induced SPVs." Entergy identified two contributing causes as "the Single Point Failure Review Process procedure, EN-DC-175, did not include a discussion of bridging strategies, a continuous review process, or a program owner to drive process compliance" and "the station demonstrated a high reliance on vendors to provide quality parts, solutions to problems and in-plant troubleshooting, and did not adequately challenge the vendor proposed solutions affecting SPV equipment until after the failure occurred."

Each root cause associated with the individual trips was reviewed by the inspectors to ensure root causes and contributing causes were identified. In general, Entergy performed comprehensive RCEs for the individual trips, however, inspectors identified one issue associated with the RCE for the July 8, 2015, trip. Inspectors identified that CR IP3-2015-3795 incorrectly identified that Entergy's motor repair specification, SPEC-06-00001-MULTI, lacked motor repair criteria as a contributing cause. Inspectors identified that the procedure did not apply to the condensate motor repair in 2013, because the procedure only applied to repairs of safety-related equipment at the time of the motor repair (CR IP3-2016-2967). The procedure revision in May 2016 now applies to non-safety-related motors and does contain repair criteria. To correct the contributing cause, Entergy updated the contributing cause to state that no standard contained repair requirements. Inspectors reviewed the change and did not identify any additional concerns.

Overall, inspectors determined that Entergy evaluated the issues using a systematic methodology to identify root and contributing causes.

- b. *IP 95001 requires that the inspection staff determine that Entergy's RCE was conducted to a level of detail commensurate with the significance of the problem.*

Overall, the inspectors determined that Entergy conducted the RCE for the White PI for Unplanned Scrams with a level of detail commensurate with the significance of the issue. Entergy's evaluation of the root and contributing causes associated with four unplanned scrams was generally appropriate. Entergy appropriately identified the root cause to include leadership's failure to use formal risk-based decision making processes for SPVs. Entergy defines SPV as equipment whose failure could cause a unit power reduction of five percent or more. Entergy focused on conditional and latent SPVs, which are SPVs that may be created through other equipment failures or removal of equipment from service.

Inspectors reviewed the root cause statement, and understood the root cause as a knowledge issue regarding procedure usage. Through personnel interviews, inspectors determined that the intent of the root cause statement was to describe a leadership behavior gap rather than a knowledge gap. Specifically, the root cause was not that leadership was unaware of a process to document decisions, but that they were not utilizing the process for SPVs.

Inspectors also observed that the initial causal evaluations, prior to exceeding the White PI threshold for Unplanned Scrams, identified different causes than those presented to the inspectors in the final RCEs, indicating deficiencies in the original causal evaluations. Examples include:

- The 31 main transformer failure's initial causal evaluation did not identify any contributing causes. The final causal evaluation identified a contributing cause of not adequately implementing the Operational Decision Making Process when, post-outage, the transformer experienced abnormal levels of gassing.
- The 345kV breaker failure did not initially identify an apparent cause, due to not owning the failed equipment. The final causal evaluation identified a root cause of not providing formal notification of industry operating experience to the breaker owner.
- The MBFP trip's initial causal evaluation identified that the vendor failed to perform adequate testing of parts. The final causal evaluation determined the Entergy procurement process was inadequate to ensure sufficient quality of parts.
- The W96 345 kV insulator failure's initial causal evaluation identified bird streamers as the cause and was approved on the day the third party vendor testing was performed on the insulator. Entergy's causal evaluation process allows for a "probable cause" when additional information is required to determine the root cause and has a loop back corrective action to update any changes from the data. The vendor information identified the most probable cause as previous damage to the insulators.

Entergy captured the observation on causal evaluation quality in CR IP3-2016-3006. Inspectors determined the final revisions of the individual RCEs appropriately identify root and contributing causes.

Although inspectors identified a weakness in the common cause RCE, the inspectors determined it was not a significant weakness. In response to inspectors' questions, Entergy added additional wording to the RCE to discuss and clarify the intent of the root cause (CR 2016-3005). Entergy defined "awareness" as the use and application of risk tools available to make critical decisions. In general, Entergy conducted comprehensive RCEs for the individual trips and implemented corrective actions. In the common cause root cause, Entergy identified an appropriate common cause and contributing causes and developed comprehensive corrective actions to address the causes identified. Based on the substantial actions taken and the overall adequacy of the RCEs, inspectors determined the weakness in the common cause root cause did not rise to the level of a significant weakness.

- c. *IP 95001 requires that the inspection staff determine that Entergy's RCE included a consideration of prior occurrences of the problem and knowledge of prior operating experience.*

Entergy's RCE included an evaluation of internal and external operating experience. Entergy also reviewed similar occurrences of this event at both Indian Point units and appropriately identified events that had the same causal factors and considered this in the development of corrective actions.

Overall, the inspectors determined that Entergy's RCE included a consideration of prior occurrences of the issue and knowledge of operating experience.

- d. *IP 95001 requires that the inspection staff determine that Entergy's RCE addressed the extent of condition and the extent of cause of the problem.*

Entergy reviewed other NRC PIs to ensure challenges to margin, that went uncorrected prior to the Unplanned Scram PI changed to White, do not exist in other PIs. Entergy also reviewed leadership and staff awareness of risk associated with latent and conditional SPVs. Training was conducted to increase site awareness of risks associated with SPVs and actions needed to address SPVs. Inspectors verified the changes made to the contributing cause in CR IP3-2015-3795 did not require changes to the extent of condition or extent of cause performed by Entergy.

Overall, the inspectors determined that Entergy appropriately evaluated the extent of condition and extent of cause of the White PI RCE.

- e. *IP 95001 requires that the inspection staff determine that Entergy's root cause, extent of condition, and extent of cause evaluations appropriately considered the safety culture components as described in IMC 0305.*

Overall, the inspectors determined the RCE included a proper consideration of whether the root cause, extent of condition, and extent of cause evaluations appropriately considered safety culture components. Entergy considered several safety culture aspects applicable to this issue: Resources, Consistent Process, Work Management,



and Continuous Learning. Entergy incorporated corrective actions to address the safety culture aspects because all are indicative of current station performance.

f. Findings

No findings were identified.

02.03 Corrective Actions

- a. *IP 95001 requires that the inspection staff determine that (1) appropriate corrective actions are specified by Entergy for each root and contributing cause or that (2) Entergy has an adequate evaluation for why no corrective actions are necessary.*

Inspectors reviewed the RCEs, causal factors, and other issues. The inspectors reviewed all of the corrective actions to ensure that they address the identified causes.

The inspectors generally found the completed and proposed corrective actions to be reasonable with regard to addressing the performance issues identified with this event. Notwithstanding, inspectors identified a weakness in the corrective action for the RCE associated with the White PI.

- The corrective action for the White PI consisted of a short discussion of the CDM process at the daily management meeting to review CRs for six months. Inspectors determined this action was narrow, and represented a weakness when reviewing the effectiveness review that Entergy associated with the action (See Section 02.03.d). Independent of this RCE, the Entergy fleet has taken actions to address procedural requirements in the equipment reliability, work management, and plant health committee process to specifically address SPVs.
- The inspectors identified that the Memorandum of Understanding (MOU) between the switchyard owner and Entergy/Indian Point Unit 2 and Unit 3 did not contain a mutual understanding of how Entergy will communicate operating experience. The inspectors questioned if Entergy's MOU represented an opportunity to obtain mutual agreement on operating experience and the associated response actions. As a result of the inspectors' questions, Entergy initiated a CR to evaluate if an update or change is necessary to the current MOU with respect to operating experience communications (CR IP3-2016-2950).

Overall, the inspectors determined that Entergy specified appropriate corrective actions for the root cause, causal factors, extent of condition, and extent of cause listed in the RCEs.

- b. *IP 95001 requires that the inspection staff determine that Entergy's corrective actions have been prioritized with consideration of risk significance and regulatory compliance.*

Overall, the inspectors determined that Entergy established an appropriate schedule for implementing and completing the corrective actions. The inspectors reviewed the prioritization of corrective actions and verified that the prioritization was made with consideration of risk significance and regulatory compliance.

- c. *IP 95001 requires that the inspection staff determine that a schedule has been established for implementing and completing the corrective actions by Entergy.*

Entergy's corrective action plan provided dates for completion of actions described in the RCE. The inspectors determined that Entergy has implemented or scheduled corrective actions appropriately.

Overall, the inspectors determined that the schedule for implementing and completing the corrective actions was reasonable.

- d. *IP 95001 requires that the inspection staff determine that quantitative or qualitative measures of success have been developed by Entergy for determining the effectiveness of the CAPR.*

Inspectors determined that the individual trip RCEs contained appropriate effectiveness review plans for the associated CAPRs. However, inspectors identified a weakness in that Entergy did not develop an adequate effectiveness review for the CAPR for the RCE associated with the White PI. Specifically, the effectiveness review developed by Entergy included a review, after six months, to confirm Corrective Action Review Group members identify at least 80 percent of the time thresholds were met in CDM procedures such that no NRC PIs for Initiating Events were White for similar causes.

After challenges from the inspectors, Entergy updated the effectiveness plan to include evaluation of various site meetings to determine if the CDM process is used as required. Documentation reviews for SPVs will be conducted. Entergy will conduct personnel interviews and review CRs to determine if missed opportunities existed after implementation of the CAPR. Multiple reviews will occur over a period of 2 years. Inspectors reviewed the changes and determined the changes to be comprehensive.

Overall, inspectors determined that Entergy had a weakness in the area of determining measures for successful effectiveness of the CAPR, however, the issue identified has been corrected. Inspectors determined that the current effectiveness review plan, for the corrective actions associated with the RCEs, are comprehensive. Inspectors determined the overall corrective action objective was met because the CAPR was adequate and the effectiveness review issues were corrected prior to implementation.

- e. *IP 95001 requires that the inspection staff determine that Entergy's corrective actions planned or taken adequately address a Notice of Violation (NOV) that was the basis for the supplemental inspection, if applicable.*

The White PI that was the subject of this inspection was not associated with an NOV. Therefore, this inspection aspect was not applicable and, as a result, not reviewed.

- f. Findings

No findings were identified.

#### 02.04 Evaluation of IMC 0305 Criteria for Treatment of Old Design Issues

Entergy did not request credit for self-identification of an old design issue; therefore, the issues were not evaluated against the IMC 0305 criteria for treatment of an old design issue.

#### 4OA6 Meetings, Including Exit

On October 13, 2016, the inspectors presented the inspection results to Mr. John Ferrick, Director of Performance Improvement, and other members of the Indian Point staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

#### **ATTACHMENT: SUPPLEMENTARY INFORMATION**

## SUPPLEMENTARY INFORMATION

### KEY POINTS OF CONTACT

#### Licensee Personnel

A. Vitale, Site Vice President  
 J. Kirkpatrick, General Manager Plant Operations  
 J. Ferrick, Regulatory and Performance Improvement Director  
 F. Bloise, Electrical Design Engineer  
 G. Dahl, Regulatory Assurance  
 T. O'Conner, Electrical System Engineer  
 J. Lafferty, Equipment Reliability Engineer  
 L. Lubrano, Electrical System Engineer  
 M. Mirzai, Regulatory Assurance  
 A. Nothbaum, Corrective Action Program Corporate Functional Area Manager  
 S. Prussman, Regulatory Assurance  
 J. Reynolds, Root Cause Team Lead  
 J. Timone, Engineering Fix-it Now Lead

### LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED

#### Opened/Closed

05000293/2016009-01	FIN	345 kV Insulator Failure Causes Reactor Trip (Section 4OA3.4)
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#### Closed

05000286/2015004-00 and 2015004-01	LER	Automatic Reactor Trip Due to a Turbine-Generator Trip Caused by a Failure of the 31 Main Transformer (Section 4OA3.1)
05000286/2015005-01	LER	Automatic 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 (Section 4OA3.2)
05000286/2015007-01	LER	Manual Reactor Trip Due to Decreasing Steam Generator Water Level Caused by a Miss-Wired Circuit Board in the Main Feedwater Pump Speed Control System (Section 4OA3.3)
05000286/2015008-00 and 2015008-01	LER	Automatic Reactor Trip due to a Turbine-Generator Trip as a Result of a Fault on 345kV Feeder W96 Tower Lines Caused by Pre-Existing Degraded Insulator (Section 4OA3.4)

## LIST OF DOCUMENTS REVIEWED

### **Section 4OA3: Follow-Up of Events and Notices of Enforcement Discretion**

#### Procedures

EN-DC-175, Single Point Failure Review Form, dated 9/10/07  
ENN-EP-G-004, Switchyard and Large Power Transformer Preventive Maintenance Guidelines, Revision 2

#### Condition Reports

Unit 3:

2015-2913    2015-3487    2015-3795    2015-5952

#### Miscellaneous

EPRI Preventive Maintenance Basis Database – Transformer, dated 9/21/16  
Preventive Maintenance Change Request IP2-06-29636

### **Section 4OA4: Supplemental Inspection**

#### Procedures

EN-DC-153, Preventive Maintenance Component Classification, Revision 14  
EN-DC-324, Preventive Maintenance Program, Revision 17  
EN-DC-335, PM Basis Template, Revision 6  
EN-FAP-MP-009, Enhanced Procurement Process for Non-Safety Related Critical Spares, Revision 3  
IP-SMM-OP-104, Offsite Power Continuous Monitoring and Notification, Revision 13  
EN-LI-118, Cause Evaluation Process, Revision 22  
EN-LI-102, Corrective Action Program, Revision 27  
EN-FAP-OP-006, Operator Aggregate Impact Index Performance Indicators, Revision 2  
EN-DC-336, Plant Health Committee, Revision 9  
EN-FAP-OM-021, Critical Decision Procedure, Revision 4  
IP-SMM-LI-126, Operating Experience Notification Process to External Groups, Revision 0  
3-IC-PC-IE-31, 31 MBFP Lovejoy Speed Control Calibration, Revision 6  
2-IC-PC-IE-21, 21 MBFP Lovejoy Speed Control Calibration, Revision 5  
EN-WM-104, Online Risk Assessment, Revision 14  
EN-WM-101, Online Work Management Process, Revision 14  
EN-OE-100, Operating Experience Program, Revision 25

#### Miscellaneous

2-XFR-006-ELC, Main Transformer Preventive Maintenance, Revision 8  
EC 60855  
FLP-PI-CARBI, CARB Cause Analysis Quality Oversight and Grading Curriculum, Revision 0  
Plant Health Committee Agendas, dated 8/22/16 – 9/19/16  
Purchase Order 10475264, Lovejoy Controls Corp  
Single Point Vulnerabilities Classification List, dated 9/20/16  
Unmitigated SPVs Status Sheet, dated 8/18/16  
IEEE STD 1315-2006, IEEE Guidance for Induction Machinery Maintenance, Testing and Failure Analysis, dated 4/30/07

#### Drawings

504543, Terminal Strip Wiring & Rear Panel Layout, Revision 18  
504542, BFPT Control System, Revision 0

Work Orders

444582	52574743	52572723	420865	419703
198047	193381	193356	198052	

Condition Reports

## Unit 3:

2002-4923	2003-3809	2016-0699	2016-2940	2016-2960	2016-2967
2016-2971	2016-2968	2016-2979	2016-2983	2016-3005	2016-3006

## Unit 2:

2013-4861	2015-5458	2016-5738	2016-5736	2016-5613	2016-5614
2016-4998					

## HQN:

2015-0964
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**LIST OF ACRONYMS**

CAPR	corrective action to prevent recurrence
CDM	critical decision making
CR	condition report
IMC	Inspection Manual Chapter
IP	Inspection Procedure
LER	licensee event report
MBFP	main boiler feed pump
MOU	Memorandum of Understanding
NOV	Notice of Violation
NRC	Nuclear Regulatory Commission, U.S.
PI	performance indicator
PM	preventive maintenance
RCE	root cause evaluation
SPV	single point vulnerability