



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION I  
2100 RENAISSANCE BLVD., SUITE 100  
KING OF PRUSSIA, PA 19406-2713

January 17, 2017

EA-16-193

Mr. Anthony Vitale  
Site Vice President  
Entergy Nuclear Operations, Inc.  
Indian Point Energy Center  
450 Broadway, GSB  
P.O. Box 249  
Buchanan, NY 10511-0249

**SUBJECT: INDIAN POINT NUCLEAR GENERATING - INTEGRATED INSPECTION  
REPORT 05000247/2016003 AND 05000286/2016003 AND NOTICE OF  
VIOLATION (EA-16-193)**

Dear Mr. Vitale:

On September 30, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Indian Point Nuclear Generating (Indian Point), Units 2 and 3. On October 26, 2016, the NRC inspectors discussed the results of this inspection with you and other members of your staff. The results of this inspection are documented in the enclosed report.

The NRC inspectors documented seven findings of very low safety significance (Green) in this report. Six of these findings involved violations of NRC requirements. For five of these findings, the NRC is treating the associated violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy. If you contest the violations or significance of these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement; and the NRC Resident Inspector at Indian Point. In addition, if you disagree with a cross-cutting aspect assignment 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 Inspector at Indian Point.

One violation associated with a finding of very low safety significance (Green) is cited in the enclosed Notice of Violation (Notice), and the circumstances surrounding it are described in the enclosed inspection report. The violation describes two examples of Entergy's failure to conduct operations to minimize the introduction of residual radioactivity into the subsurface (groundwater) of the site. The violation is similar to two NCVs previously identified by the NRC involving groundwater contamination events in 2014 and 2015 (NRC Inspection Reports 05000247/2015002 and 05000247/2015003). Corrective actions for these NCVs were insufficiently broad to address Entergy's ineffective floor drain and radioactive liquid draining operational controls, resulting in Entergy's continued failure to minimize groundwater contamination occurrences. The NRC evaluated this violation in accordance with the NRC

Enforcement Policy. The current Enforcement Policy is available for review on the NRC's Web site at <http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html>. This violation meets the criteria in Section 2.3.2.a of the Enforcement Policy to be dispositioned as an NCV. However, the NRC is citing the violation in the enclosed Notice because Entergy's actions for these most recent events do not adequately address the broader concern regarding a lack of control and management of the site floor drain system. Accordingly, the NRC is issuing the Notice and requiring a response from Entergy, as described below.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. In your response, describe a comprehensive corrective action plan for maintaining an effective floor drain system and a process for evaluating and using the floor drains to handle the volume and flowrates for draining activities being conducted. If you have additional information that you believe the NRC should consider, you may provide it in your response to the Notice. The NRC's review of your response will determine whether further enforcement action is necessary to ensure your compliance with regulatory requirements.

This letter, its enclosures, 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." To the extent possible, your response should not include any personal privacy or proprietary information so that it can be made available to the Public without redaction.

Sincerely,

*/RA/*

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

Docket Nos. 50-247 and 50-286  
License Nos. DPR-26 and DPR-64

Enclosures:

1. Notice of Violation
2. Inspection Report 05000247/2016003  
and 05000286/2016003 w/Attachment:  
Supplementary Information

cc w/encl: Distribution via ListServ

Letter to Mr. Anthony J. Vitale from Eugene M. DiPaolo dated January 17, 2017

SUBJECT: INDIAN POINT NUCLEAR GENERATING - INTEGRATED INSPECTION REPORT 05000247/2016003 AND 05000286/2016003 AND NOTICE OF VIOLATION (EA-16-193)

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**NOTICE OF VIOLATION**

Entergy Nuclear Operations, Inc.  
Indian Point Nuclear Generating Unit 2

Docket No. 50-247  
License No. DPR-26  
EA-16-193

During an NRC inspection conducted between July 1 and September 23, 2016, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

Title 10 of the *Code of Federal Regulations* (10 CFR) 20.1406(c) requires, in part, that licensees shall, to the extent practical, conduct operations to minimize the introduction of residual radioactivity into the site, including the subsurface.

Contrary to the above, on two occasions between January 2016 and July 2016, Entergy failed to conduct operations to minimize the introduction of residual radioactivity into the subsurface of the site. Specifically, Entergy has not maintained its floor drain system clear of obstructions and interferences, and has not verified the ability of the floor drains to handle the volume and flowrates for draining activities being conducted. As a result, repeated spills of contaminated water within the radiologically controlled area leaked into the groundwater (subsurface of the site). Specifically, in January 2016, a spill caused by floor drain obstructions resulted in the backup of contaminated water onto the floor and subsequent leakage to the subsurface of the site. Similarly, a subsequent June/July 2016 groundwater contamination event occurred due to an obstructed flow path through a floor drain in the Unit 2 spent fuel building, which spilled to the subfloor and contaminated the subsurface of the site.

This violation is associated with a Green Significance Determination Process finding.

Pursuant to the provisions of 10 CFR 2.201, Entergy is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001 with a copy to the Regional Administrator, Region I, and a copy to the NRC Resident Inspector at Indian Point, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation; EA-16-193" and should include: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) a description of a more comprehensive corrective action plan for maintaining an effective floor drain system and a process for evaluating and using the floor drains to handle the volume and flowrates for draining activities being conducted that will be taken to address the repeated problems with maintaining and controlling the floor drain systems, and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>, to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (i.e., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days of receipt.

Dated this 17<sup>th</sup> day of January, 2017.

**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION I**

Docket Nos. 50-247 and 50-286

License Nos. DPR-26 and DPR-64

Report Nos. 05000247/2016003 and 05000286/2016003

Licensee: Entergy Nuclear Northeast (Entergy)

Facility: Indian Point Nuclear Generating Units 2 and 3

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

Dates: July 1, 2016, through September 30, 2016

Inspectors: B. Haagensen, Senior Resident Inspector  
G. Newman, Resident Inspector  
S. Rich, Resident Inspector  
J. Ambrosini, Senior Resident Inspector, Millstone  
F. Arner, Senior Reactor Analyst  
S. Elkhiamy, Project Engineer  
J. Furia, Senior Health Physicist

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

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## SUMMARY

Inspection Report 05000247/2016003 and 05000286/2016003; 07/01/2016 – 09/30/2016; Indian Point Nuclear Generating (Indian Point), Units 2 and 3; Maintenance Risk Assessments and Emergent Work Control, Operability Determinations and Functionality Assessments, Surveillance Testing, Radiological Hazard Assessment and Exposure Controls, Occupational As Low as Reasonably Achievable (ALARA) Planning and Controls, Follow Up of Events and Notices of Enforcement Discretion, and Other Activities.

This report covered a three-month period of inspection by resident inspectors and announced inspections performed by regional inspectors. The inspectors identified seven findings of very low safety significance (Green), including one Notice of Violation (NOV), five non-cited violations (NCVs), and one finding (FIN). The significance of most findings is indicated by their 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. All violations of U.S. Nuclear Regulatory Commission (NRC) requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated August 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

### Cornerstone: Mitigating Systems

- Green. The inspectors identified a Green NCV of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.65(a)(4) because between August 1, 2016, and August 17, 2016, Entergy did not perform an adequate risk assessment for the maintenance on the Unit 3 Appendix R diesel generator (ARDG). As a result, they did not take the required risk mitigating actions (RMAs). Entergy wrote Condition Report (CR)-IP3-2016-2538, changed fire risk status to Yellow, and began implementing RMAs on August 17, 2016.

The inspectors determined that this performance deficiency was more than minor because it is associated with the Protection Against External Factors attribute of the Mitigating Systems cornerstone and adversely affected its objective to ensure the reliability of systems that respond to initiating events to prevent undesirable consequences. Specifically, due to the inadequate risk assessment, Entergy did not perform shiftly walkdowns for transient combustibles and related fire and ignition sources on the available safe shutdown train. Using IMC 0609.04, "Initial Characterization of Findings," and IMC 0609, Appendix K, "Maintenance Risk Assessment and Risk Management Significance Determination Process," the inspectors determined that the failure to conduct RMAs for the unavailability of the ARDG required further assessment. A Region I senior reactor analyst (SRA) used SAPHIRE, Revision 8.1.14, and the Indian Point Unit 3 Standardized Plant Analysis Risk (SPAR) Model, Revision 8.20, to complete an evaluation this performance deficiency. The incremental conditional core damage probability (ICCDP) for this finding was calculated to be less than 1E-7 or very low safety significance (Green). This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Identification, because Entergy did not identify that an improperly racked-in breaker had a fire risk impact when combined with other plant conditions. [P.1 – Problem Identification and Resolution, Identification] (Section 1R13)

- Green. The inspectors identified a self-revealing Green NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," because between 2012 and 2016, Entergy did not



perform vendor specified inspections of the 23 emergency diesel generator (EDG) automatic voltage regulator (AVR) cards. As a result, on March 7, 2016, and March 10, 2016, the 23 EDG failed to run due to poor voltage regulation caused by degraded connections on the AVR card. Entergy replaced the AVR card in the 23 EDG, repaired similarly degraded solder joints on the AVR cards for the 21 and 22 EDGs, and wrote CR-IP2-2016-1260 and CR-IP3-2016-1370.

The inspectors determined that this performance deficiency was more than minor because it is associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and adversely affected its objective to ensure the reliability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the 23 EDG failed to run on March 7, 2016, and March 10, 2016. The inspectors evaluated the finding in accordance with IMC 0609, Appendix A and concluded it required a detailed risk evaluation (DRE). The DRE was performed by a Region I SRA and concluded the performance deficiency resulted in a change in core damage frequency of low E-8/year or very low safety significance (Green). The inspectors determined that this violation was not indicative of current performance because the last time Entergy would reasonably have been prompted to create corrective actions to perform periodic inspections was during the initial inspections in 2010. Therefore, no cross-cutting aspect was assigned. (Section 1R15)

- Green. The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," because Entergy did not take timely corrective action to perform an inspection of the 33 EDG AVR card. As a result, the degraded solder connections on the card were not repaired for an excessive period of time. Entergy repaired the solder joints on the AVR card in the 33 EDG and wrote CR-IP3-2016-3018.

This performance deficiency was more than minor because it is associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and adversely affected its objective to ensure the reliability of systems that respond to initiating events to prevent undesirable consequences. The existence of degraded solder joints on the AVR card decreases the reliability of the EDG, and the untimely corrective action allowed the degradation to exist for longer than necessary without being corrected. In accordance with IMC 0609, Appendix A, "The Significance Determination Process for Findings at Power," the inspectors determined that the finding was of very low safety significance (Green) because the 33 EDG maintained its operability or functionality, it did not represent a loss of system or function, and it did not involve external mitigation systems. The inspectors determined that this finding had a cross-cutting aspect in the area of Human Performance, Conservative Bias, because leaders did not take a conservative approach to decision making, particularly when information is incomplete or conditions are unusual. Specifically, Entergy did not inspect the 33 EDG AVR cards at the first available opportunity due to resource constraints. [H.14 – Human Performance, Conservative Bias] (Section 1R22)

- Green. The inspectors identified a self-revealing Green NCV for failing to comply with Technical Specification (TS) Limiting Condition of Operation (LCO) 3.8.1, "Electrical Power Systems, Alternating Current (AC) Sources – Operating," from February 26, 2014, to March 29, 2016. Specifically, Entergy failed to maintain the auto transfer function for the 6.9 kilovolt (kV) offsite electrical buses in an operable condition because the safety injection (SI) anticipatory signal to the station auxiliary transformer (SAT) load tap changer (LTC) was disconnected. As a result, one of two qualified offsite AC circuits was not operable. Entergy

initiated corrective actions and promptly restored the SAT LTC SI signal to operation prior to restarting the plant from the refueling outage.

The failure to restore the LTC SAT SI signal following maintenance activities was a performance deficiency that was more than minor because it is associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the failure to reinstate the SAT LTC SI anticipatory signal following maintenance resulted in the qualified offsite source of AC power becoming inoperable for a period of time in excess of the TS allowable outage time. In accordance with IMC 0609, Appendix A, "The Significance Determination Process for Findings at Power," the inspectors determined that the finding was of very low safety significance (Green) because a detailed risk analysis determined the likelihood of core damage was less than E-8/year. The inspectors determined that the finding had a cross-cutting aspect of Human Performance, Work Management, because Entergy did not implement a process of controlling and executing work activities. The work process did not coordinate with different groups or job activities to ensure the state links were restored at the end of the work activities. [H.5 – Human Performance, Work Management] (Section 4OA3)

#### **Cornerstone: Occupational/Public Radiation Safety**

- Green. The inspectors identified a self-revealing NCV of TS 5.7.1e when workers entered the Unit 2 Fuel Storage Building (FSB) truck bay that was posted and controlled as a high radiation area (HRA) without receiving a briefing on the dose rates prior to entering the HRA. Specifically, on June 6, 2016, two nuclear plant operators (NPOs) entered the Unit 2 FSB truck bay to hang tags on the backup spent fuel pool cooling filters. The NPOs signed in on a HRA radiation work permit (RWP) but did not receive a briefing on the radiological conditions in this work area. After entering the HRA, one worker received an electronic dosimeter dose rate alarm; and subsequently, both workers promptly exited the area. Immediate corrective actions included restricting the access of the two NPOs to the radiologically controlled area (RCA). The issue was entered into Entergy's corrective action program (CAP) as CR-IP2-2016-03610.

The failure to adhere to a radiological briefing prior to entry into a HRA is a performance deficiency that was reasonably within Entergy's ability to foresee and correct. The performance deficiency was determined to be more than minor based on similar example 6.h in IMC 0612, Appendix E, "Examples of Minor Issues," and because it adversely affected the Human Performance attribute of the Occupational Radiation Safety cornerstone objective. Specifically, Entergy violated the TS 5.7.1e HRA radiological briefing requirements designed to protect workers from unnecessary radiation exposure. Using IMC 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process," the finding was determined to be of very low safety significance (Green) because it did not involve: (1) ALARA occupational collective exposure planning and controls, (2) an overexposure, (3) a substantial potential for overexposure, or (4) an impaired ability to assess dose. The inspectors determined that the finding had a cross-cutting aspect of Human Performance, Procedure Adherence, in that the workers did not follow processes, procedures, and work instructions for entering a posted HRA. [H.8 – Human Performance, Procedure Adherence] (Section 2RS1)

- Green. The inspectors identified a self-revealing finding (FIN) of very low safety significance due to Entergy having unintended occupational collective exposure resulting from performance deficiencies in work planning while preparing to perform reactor cavity liner repair activities during the spring 2016 Unit 2 refueling outage. Inadequate work planning that included an incomplete scope of work, welding method qualification, and inadequate timing of shield placement resulted in unplanned, unintended collective exposure due to conditions that were reasonably within Entergy's ability to foresee. The work activity planning deficiencies resulted in the collective exposure for these activities increasing from the planned dose of 2.386 person-rem to an actual dose of 10.305 person-rem. This issue was entered into Entergy's CAP as CR-IP2-2016-02528, CR-IP2-2016-02502, and CR-IP2-2016-02548.

The performance deficiency was more than minor because it was associated with the Program and Process attribute of the Occupational Radiation Safety cornerstone and adversely affected the cornerstone objective to ensure the adequate protection of the worker health and safety from exposure to radiation. Additionally, the performance deficiency was more than minor based on similar example 6.i in Appendix E of IMC 0612, "Examples of Minor Issues," in that the actual collective dose exceeded 5 person-rem and exceeded the planned, intended dose by more than 50 percent. In accordance with IMC 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process," the finding was determined to be of very low safety significance (Green) because Entergy had an issue involving ALARA Planning, and Unit 2's current three-year rolling average collective dose is less than the significance determination process criterion of 135 person-rem per pressurized water reactor unit. The finding had a cross-cutting aspect in the area of Human Performance, Work Management, in that the lack of accurate planning for work activities adversely impacted radiological safety. [H-5 – Human Performance, Work Management] (Section 2RS2)

- Green. The inspectors identified an NOV of 10 CFR 20.1406(c), "Minimization of Contamination," for Entergy's failure to conduct operations to minimize the introduction of residual radioactivity into the subsurface of the site (groundwater). Specifically, Entergy did not maintain the floor drain systems clear of obstructions and interferences and did not verify the ability of the floor drains to handle the volume and flowrates for draining activities being conducted. In January 2016, a spill caused by multiple floor drain obstructions resulted in the backup of contaminated water onto the floor of the 35-foot elevation of the primary auxiliary building (PAB) and the subfloor of the FSB and subsequent leakage to onsite groundwater. Entergy entered this issue into their CAP as CR-IP2-2016-00264, CR-IP2-2016-00266, and CR-IP2-2016-00564 with actions to characterize and evaluate the leak. Similarly, in June/July 2016, another event occurred due to an obstructed flow path through a floor drain in the FSB, which spilled to the subfloor and contaminated the onsite groundwater. This event was documented by Entergy in CR-IP2-2016-05060.

The issue is more than minor because it is associated with the Program and Process attribute of the Public Radiation Safety cornerstone and adversely affected the cornerstone objective to ensure Entergy's ability to prevent inadvertent release and/or loss of control of licensed material to an unrestricted area. In accordance with IMC 0609, Appendix D, "Public Radiation Safety Significance Determination Process," the finding was determined to be of very low safety significance (Green) because Entergy had an issue involving radioactive material control but did not involve transportation or public exposure in excess of 0.005 Rem. The finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Resolution, in that effective corrective actions to address issues identified in two

prior groundwater contamination events since 2014 were not implemented in a timely or effective manner, which could have prevented two additional groundwater contamination events that occurred in 2016. [P.3 – Problem Identification and Resolution, Resolution] (Section 4OA5)

## REPORT DETAILS

### Summary of Plant Status

Unit 2 began the inspection period at 100 percent power. On July 6, 2016, Unit 2 experienced a reactor trip caused by a human performance error. Operators returned Unit 2 to 100 percent power on July 8, 2016. On August 6, 2016, Unit 2 reduced power to 80 percent due to a trip of both heater drain pumps. They restarted the pumps and returned to 100 percent power the following day. Unit 2 remained at or near 100 percent power for the remainder of the inspection period.

Unit 3 operated at 100 percent power during the inspection period.

### 1. REACTOR SAFETY

#### **Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity**

1R01 Adverse Weather Protection (71111.01 – 3 samples)

.1 Readiness for Seasonal Extreme Weather Conditions

a. Inspection Scope

The inspectors performed a review of Entergy's readiness for the onset of seasonal high temperatures. The inspectors reviewed procedure OAP-048, "Seasonal Weather Preparation (Units 2 and 3)." The focus areas were the switchgear rooms and service water (SW) pump areas. The inspectors reviewed the updated final safety analysis report (UFSAR), TSs, control room logs, and the CAP to determine what temperatures or other seasonal weather could challenge these systems and to ensure Entergy had adequately prepared for these challenges. The inspectors reviewed station procedures, including Entergy's seasonal weather preparation procedure and applicable operating procedures. The inspectors performed walkdowns of the selected systems to ensure station personnel identified issues that could challenge the operability of the systems during hot weather conditions. Documents reviewed for each section of this inspection are listed in the Attachment.

b. Findings

No findings were identified.

.2 Summer Readiness of Offsite and AC Power Systems

a. Inspection Scope

The inspectors performed a review of plant features and procedures for the operation and continued availability of the offsite and alternate AC power system to evaluate readiness of the systems prior to seasonal high grid loading. The inspectors reviewed Entergy's procedures affecting these areas and the communications protocols between the transmission system operator and Entergy. This review focused on the material condition of the offsite and alternate AC power equipment. There were no changes to the established program since the last inspection. The inspectors assessed whether

Entergy established and implemented appropriate procedures and protocols to monitor and maintain availability and reliability of both the offsite AC power system and the onsite alternate AC power system. The inspectors evaluated the material condition of the associated equipment by reviewing CRs and open work orders (WOs) and walking down portions of the offsite and AC power systems including the Units 2 and 3 transformer yards.

b. Findings

No findings were identified.

.3 Readiness for Impending Adverse Weather Conditions

a. Inspection Scope

The inspectors reviewed Entergy's preparations for a Category 1 thunderstorm warning on July 25, 2016. The inspectors reviewed the implementation of adverse weather preparation procedures including OAP-008, "Severe Weather Preparations," before the onset of and during this adverse weather condition. The inspectors walked down the Unit 2 SW pumps, the Unit 2 transformer yard, and the Unit 3 transformer yard to ensure system availability and that there were no problems as a result of the severe weather. The inspectors verified that operator actions defined in Entergy's adverse weather procedure maintained the readiness of essential systems. The inspectors discussed readiness and staff availability for adverse weather response with operations and work control personnel. The inspectors discussed severe weather preparedness with operators and maintained an awareness of severe weather issues throughout the inspection period.

b. Findings

No findings were identified.

1R04 Equipment Alignment

Partial System Walkdowns (71111.04Q – 5 samples)

a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

Unit 2

- 22 auxiliary boiler feedwater pump (ABFP) while 21 ABFP was out of service (OOS) for planned maintenance on July 18, 2016
- Gas turbine 2/3 fuel forwarding system EDG fuel oil reserve on August 31, 2016
- Component cooling water (CCW) system while 21 CCW pump and discharge check valve were inoperable during troubleshooting on September 21, 2016

### Unit 3

- 31 and 32 EDGs while 33 EDG was unavailable due to planned testing on 480V bus 5A on September 15, 2016
- ARDG and support systems following maintenance on September 29, 2016 (this sample was part of an in-depth review of the ARDG system)

The inspectors selected these systems based on their risk-significance relative to the reactor safety cornerstones at the time they were inspected. The inspectors reviewed applicable operating procedures, system diagrams, the UFSAR, TSs, CRs, and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have impacted system performance of their intended safety functions. The inspectors also performed field walkdowns of accessible portions of the systems to verify system components and support equipment were aligned correctly and were operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no deficiencies. The inspectors also reviewed whether Entergy had properly identified equipment issues and entered them into the CAP for resolution with the appropriate significance characterization.

#### b. Findings

No findings were identified.

### 1R05 Fire Protection

#### .1 Resident Inspector Quarterly Walkdowns (71111.05Q – 6 samples)

##### a. Inspection Scope

The inspectors conducted tours of the areas listed below to assess the material condition and operational status of fire protection features. The inspectors verified that Entergy controlled combustible materials and ignition sources in accordance with administrative procedures. The inspectors verified that fire protection and suppression equipment was available for use as specified in the area pre-fire plan (PFP) and passive fire barriers were maintained in good material condition. The inspectors also verified that station personnel implemented compensatory measures for OOS, degraded, or inoperable fire protection equipment, as applicable, in accordance with procedures.

### Unit 2

- ARDG/station blackout diesel generator (PFP-160A was reviewed) on August 4, 2016
- Diesel fire pump house (PFP-265 was reviewed) on August 5, 2016
- Independent spent fuel storage installation pad (PFP-266A was reviewed) on September 29, 2016
- Transformer yard (PFP-263 was reviewed) on September 29, 2016

Unit 3

- Transformer yard (PFP-380 was reviewed) on September 27, 2016
- ARDG (PFP-388 was reviewed) on September 29, 2016 (this sample was part of an in-depth review of the ARDG system)

b. Findings

No findings were identified.

.2 Fire Protection – Drill Observation (71111.05A – 1 sample)a. Inspection Scope

The inspectors observed a fire brigade drill scenario conducted on September 25, 2016, that involved a pressurized oil leak fire on the Unit 3 main boiler feedwater pump (MBFP) lube oil purifier located on the turbine building, 15-foot level. The inspectors evaluated the readiness of the plant fire brigade to fight fires. The inspectors verified that Entergy personnel identified deficiencies, openly discussed them in a self-critical manner during the debrief, and took appropriate corrective actions as required. The inspectors verified that the fire brigade:

- Properly used turnout gear and self-contained breathing apparatus
- Properly used and laid out fire hoses
- Employed appropriate fire-fighting techniques
- Brought sufficient fire-fighting equipment to the scene
- Effectively used command and control
- Searched for victims and for propagation of the fire into other plant areas
- Conducted smoke removal operations
- Properly used pre-planned strategies
- Adhered to the pre-planned drill scenario
- Met drill objectives

The inspectors also evaluated the fire brigade's actions to determine whether these actions were in accordance with Entergy's fire-fighting strategies.

b. Findings

No findings were identified.

1R11 Licensed Operator Regualification Program (71111.11Q – 5 samples)Unit 2.1 Quarterly Review of Unit 2 Licensed Operator Performance in the Main Control Rooma. Inspection Scope

The inspectors observed and reviewed the Unit 2 reactor startup conducted on July 7, 2016. The inspectors observed infrequently performed test or evolution briefings,



pre-shift briefings, and reactivity control briefings to verify that the briefings met the criteria specified in Entergy's operating procedure 2-POP-1.2, "Reactor Startup," and administrative procedure EN-OP-115, "Conduct of Operations." Additionally, the inspectors observed test performance to verify that procedure use, crew communications, and coordination of activities between work groups similarly met established expectations and standards.

b. Findings

No findings were identified.

.2 Quarterly Review of Unit 2 Licensed Operator Requalification Testing and Training

a. Inspection Scope

The inspectors observed Unit 2 licensed operator simulator training on August 10, 2016, which included an instrument failure, a loss of 138kV offsite power, followed by a loss of the 345kV grid, and a station blackout. The inspectors evaluated operator performance during the simulated event and verified completion of risk significant operator actions, including the use of abnormal and emergency operating procedures. The inspectors assessed the clarity and effectiveness of communications, implementation of actions in response to alarms and degrading plant conditions, and the oversight and direction provided by the control room supervisor. The inspectors verified the accuracy and timeliness of the emergency classification made by the shift manager and the TS action statements entered by the shift technical advisor. Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance problems.

b. Findings

No findings were identified.

Unit 3

.3 Quarterly Review of Unit 3 Licensed Operator Performance in the Unit 3 Main Control Room

a. Inspection Scope

The inspectors observed and reviewed swapping of main lube oil coolers in accordance with 3-SOP-LO-001, "Main Lube Oil System Operation," Revision 40, conducted on September 30, 2016. The inspectors observed pre-job briefings to verify that the briefings met the criteria specified in Entergy's administrative procedure EN-OP-115, "Conduct of Operations." Additionally, the inspectors observed operator performance to verify that procedure use, crew communications, and coordination of activities between work groups similarly met established expectations and standards.

b. Findings

No findings were identified.

.4 Quarterly Review of Unit 3 Licensed Operator Regualification Testing and Training

a. Inspection Scope

The inspectors observed licensed operator simulator training on August 10, 2016, which included the rupture of the letdown line, a mispositioned control valve, a misaligned control rod, and a steam generator tube rupture. The inspectors evaluated operator performance during the simulated event and verified completion of risk significant operator actions, including the use of abnormal and emergency operating procedures. The inspectors assessed the clarity and effectiveness of communications, implementation of actions in response to alarms and degrading plant conditions, and the oversight and direction provided by the control room supervisor. The inspectors verified the accuracy and timeliness of the emergency classification made by the shift manager and the TS action statements entered by the shift technical advisor. Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance problems.

b. Findings

No findings were identified.

.5 Quarterly Review of Unit 3 Licensed Operator Regualification Testing and Training

a. Inspection Scope

The inspectors observed operating crew performance during an emergency planning drill on September 14, 2016, which included a failure of a steam generator level instrument, loss of the 6A electrical bus, a turbine trip without reactor trip, a small break loss of coolant accident, and entry into FR-C.2, "Response to Inadequate Core Cooling." The inspectors evaluated operator performance during the simulated event and verified completion of risk significant operator actions, including the use of abnormal and emergency operating procedures. The inspectors assessed the clarity and effectiveness of communications, and the oversight and direction provided by the control room supervisor. The inspectors reviewed the accuracy and timeliness of the emergency classification made by the shift manager and shift technical advisor. Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance problems.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12Q – 2 samples)

Routine Maintenance Effectiveness

a. Inspection Scope

The inspectors reviewed the samples listed below to assess the effectiveness of maintenance activities on structure, system, and component (SSC) performance and reliability. The inspectors reviewed system health reports, CAP documents,

maintenance WOs, and maintenance rule basis documents to ensure that Entergy was identifying and properly evaluating performance problems within the scope of the maintenance rule. For each SSC sample selected, the inspectors verified that the SSC was properly scoped into the maintenance rule in accordance with 10 CFR 50.65 and verified that the (a)(2) performance criteria established by Entergy was reasonable. As applicable, for SSCs classified as (a)(1), the inspectors assessed the adequacy of goals and corrective actions to return these SSCs to (a)(2). Additionally, the inspectors ensured that Entergy was identifying and addressing common cause failures that occurred within and across maintenance rule system boundaries.

### Unit 3

- ARDG and auxiliaries (this sample was part of an in-depth review of the Unit 3 ARDG system) on June 28, 2016
- Reactor protection and controls system on August 28, 2016

#### b. Findings

No findings were identified.

### 1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 7 samples)

#### a. Inspection Scope

The inspectors reviewed station evaluation and management of plant risk for the maintenance and emergent work activities listed below to verify that Entergy performed the appropriate risk assessments prior to removing equipment for work. The inspectors selected these activities based on potential risk significance relative to the reactor safety cornerstones. As applicable for each activity, the inspectors verified that Entergy performed risk assessments as required by 10 CFR 50.65(a)(4) and that the assessments were accurate and complete. When Entergy performed emergent work, the inspectors verified that operations personnel promptly assessed and managed plant risk. The inspectors reviewed the scope of maintenance work and discussed the results of the assessment with the station's probabilistic risk analyst to verify plant conditions were consistent with the risk assessment. The inspectors also reviewed the TS requirements and inspected portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met.

### Unit 2

- 21 ABFP and 138kV feeder 33332 OOS for maintenance on July 18, 2016
- Emergent work due to instrument air piping leak on August 8, 2016
- 23 station battery OOS for maintenance on September 14, 2016
- 13.8kV feeders 13W92 and 13W3 OOS for planned maintenance on September 28, 2016

### Unit 3

- 32 ABFP OOS for maintenance on August 8, 2016

- ARDG and 31 residual heat removal pump OOS for maintenance on August 16, 2016 (this sample was part of an in-depth review of the ARDG system)
- 31 EDG OOS for surveillance on September 20, 2016

b. Findings

Introduction. The inspectors identified a Green NCV of 10 CFR 50.65(a)(4), “Requirements for Monitoring the Maintenance Effectiveness at Nuclear Power Plants,” because between August 1, 2016, and August 17, 2016, Entergy did not perform an adequate risk assessment for the maintenance on the Unit 3 ARDG. As a result, they did not take the required RMAs.

Description. The Unit 3 ARDG was declared non-functional on June 28, 2016, due to a failed battery charger. Entergy performed a modification to replace the battery charger and cleared the tag-out to restore the diesel generator to service on July 27, 2016. Entergy determined that the ARDG was available at this time, although the post-modification testing was not complete, in accordance with guidance in procedure IP-SMM-WM-101, “Fire Protection and Maintenance Rule (a)(4) Risk Assessment.” On July 31, 2016, the input breaker to the battery charger tripped open. Entergy determined that the ARDG was no longer available for risk purposes and commenced corrective maintenance. On August 1, 2016, during rounds, an operator discovered that the output breaker for the ARDG was crooked in its cubicle. The following day, maintenance staff reported a crackling noise from the output breaker indicating that it was not making proper contact in its crooked position. During follow-up interviews, Entergy determined that the output breaker had been racked in improperly while the tag-out was being cleared on July 27, 2016.

Per IP-SMM-WM-101, and the Equipment OOS risk tool, fire risk is Green when taking a component OOS for maintenance results in only one safe shutdown path and that component will be OOS for less than thirty days. If the component will be OOS for more than thirty days, fire risk is Yellow and RMAs are required in certain fire areas, depending on the component. With the Unit 3 ARDG OOS, the Unit 2 ARDG is the only remaining credited safe shutdown path. After thirty days in this configuration, RMAs are required in the 31 and 33 EDG rooms, the cable spreading room, the switchgear room, the control room, and the upper electrical tunnel. These actions include shiftily walkdowns to look for transient combustibles, prohibiting hot work, confirming functionality of the fire protection equipment, postponing maintenance on fire protection equipment, and limiting work in the areas affected.

On August 16, 2016, the inspectors asked Entergy whether fire risk was Green or Yellow. Entergy stated that they considered fire risk to be Green because the ARDG had only been OOS since July 31, 2016, which was less than thirty days. The inspectors observed that since the breaker had been racked in incorrectly while they were restoring from the original battery charger replacement, the ARDG had been OOS continuously since June 28, 2016, a time period greater than thirty days. Entergy’s response was that they had not considered the impact of the breaker on risk. As a result, Entergy wrote CR-IP3-2016-2538, changed fire risk status to Yellow, and began implementing RMAs on August 17, 2016.

Analysis. The inspectors determined that not performing an adequate risk assessment for the work on the Unit 3 ARDG was within Entergy’s ability to foresee and correct and

was a performance deficiency. The inspectors determined that this performance deficiency was more than minor because it is associated with the Protection Against External Factors attribute of the Mitigating Systems cornerstone and adversely affected its objective to ensure the reliability of systems that respond to initiating events to prevent undesirable consequences. Specifically, due to the inadequate risk assessment, Entergy did not perform shiftly walkdowns for transient combustibles and related fire and ignition sources on the available safe shutdown train.

Using IMC 0609.04, "Initial Characterization of Findings," and IMC 0609, Appendix K, "Maintenance Risk Assessment and Risk Management Significance Determination Process," the inspectors determined that the failure to conduct RMAs for the unavailability of the ARDG required further assessment. A Region I SRA used SAPHIRE, Revision 8.1.14 and the Indian Point Unit 3 SPAR Model, Revision 8.20 to complete the DRE of this performance deficiency. To calculate the ICCDP for this finding, the SRA used an exposure time of 16 days and modeled the unavailability of the ARDG by setting the generator's output breaker basic event (ACP-CRB-00-52EG4) failure probability to 1.0. Truncation for the analyses was set to 1.0E-11. The ICCDP for this finding was calculated to be less than 1E-7 or very low safety significance (Green). The dominant core damage sequences involve fires leading to a station blackout event resulting in a small break loss of coolant accident associated with reactor coolant pump seal failures.

This finding has a cross-cutting aspect in the area of Problem Identification and Resolution because Entergy did not identify that an improperly racked-in breaker had a fire risk impact when combined with other plant conditions. [P.1]

Enforcement. 10 CFR 50.65(a)(4) states that before performing maintenance activities, the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities. Contrary to this, between August 1, 2016, and August 17, 2016, Entergy did not adequately assess and manage the increase in risk from maintenance on the Unit 3 ARDG. Entergy wrote CR-IP3-2016-2538, changed fire risk status to Yellow, and began implementing RMAs on August 17, 2016. Because this violation was of very low safety significance (Green) and Entergy entered this performance deficiency into the CAP, the NRC is treating this as an NCV in accordance with Section 2.3.2.a of the NRC Enforcement Policy. **(NCV 05000286/2016003-01, Failure to Adequately Assess Fire Risk Associated with Maintenance on the Unit 3 ARDG)**

1R15 Operability Determinations and Functionality Assessments (71111.15 – 8 samples)

a. Inspection Scope

The inspectors reviewed operability determinations and functionality assessments for the following degraded or non-conforming conditions:

Unit 2

- CR-IP2-2016-05220, missed implications of baffle bolt jetting indications on Units 2 and 3 spent fuel on August 22, 2016
- CR-IP-2016-05418, metal impact monitor system functionality assessment on September 1, 2016

- CR-IP2-2016-05503, through-wall leak on non-essential SW header between 23 Zurn strainer and SWN-2-2, 23 SW pump discharge valve on September 6, 2016
- CR-IP2-2016-05757, 21 CCW pump motor baker test results invalid on September 21, 2016
- CR-IP2-2016-05877, unexpected drop in SW header pressure on September 27, 2016

### Unit 3

- CR-IP3-2016-01961, prompt operability determination for implications of degraded baffle bolts on July 11, 2016
- CR-IP3-2016-02910, bus 5A undervoltage time delay relay 62-2/5A failed to meet acceptance criteria on September 15, 2016
- CR-IP3-2016-01370, EDG AVR card solder joint cracking extent of condition on September 23, 2016

The inspectors selected these issues based on the risk significance of the associated components and systems. The inspectors evaluated the technical adequacy of the operability determinations to assess whether TS operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the TSs and UFSAR to Entergy's evaluations to determine whether the components or systems were operable.

The inspectors confirmed, where appropriate, compliance with bounding limitations associated with the evaluations. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled by Entergy. The inspectors determined, where appropriate, compliance with bounding limitations associated with the evaluations.

#### b. Findings

##### (Closed) Unresolved Item (URI) 05000247/2016001-06: 23 EDG Automatic Voltage Regulator Failure

Introduction. The inspectors identified a self-revealing Green NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," because between 2012 and 2016, Entergy did not perform specified inspections of the 23 EDG AVR cards. As a result, on March 7, 2016, and March 10, 2016, the 23 EDG failed to run due to poor voltage regulation caused by degraded connections on the AVR card.

Description. A URI was issued in NRC Inspection Report 05000247/2016001. This item is closed based on the finding described below. On March 7, 2016, approximately one hour after the trip of the 3A normal feed breaker, the 23 EDG tripped on overcurrent while powering the 6A 480V safety bus. The 6A bus remained de-energized for approximately one hour until the crew restored the 6A bus via off-site power. The 23 EDG was declared inoperable. All four 480V safety buses were restored to off-site power. Entergy suspected that an overcurrent relay had spuriously tripped, replaced the overcurrent relays, and retested the 23 EDG satisfactorily on March 8, 2016. However,

subsequent bench testing of the overcurrent relays demonstrated that they were accurately calibrated.

On March 10, 2016, during performance of PT-R14, "Automatic SI System Electrical Load and Blackout Test," the 23 EDG exhibited anomalous behavior during the train 'B' load sequencing. During this test, the voltage on safety bus 6A dropped to approximately 200V when the 23 auxiliary feedwater pump was sequenced onto the bus (CR-IP2-2016-01430) and the sequencer failed to complete the first two sequences. The 23 EDG was again declared inoperable and the period of inoperability was backdated to March 7, 2016, when it originally tripped. Further troubleshooting and additional failure modes analysis by Entergy initially determined that the cause of both events may have been a degraded resistor (R25) on the 23 EDG AVR card.

The 23 EDG AVR card was replaced, and the 23 EDG was again tested satisfactorily. The voltage anomaly issues exhibited during the March 10, 2016, test were documented in CR-IP2-2016-01430 which was closed in CR-IP2-2016-01260 to be included in the causal assessment associated with the tripping of 23 EDG breaker on March 7, 2016. Entergy assigned a vendor to perform confirmatory laboratory bench testing and failure analysis of the 23 EDG AVR card. The vendor report attributed the cause of the March 10, 2016, loss of voltage control to a degraded solder joint on the L1 magnetic amplifier on the AVR card. The vendor report explicitly did not attribute the event on March 7, 2016, to the same cause. Entergy assigned a corrective action in CR-IP2-2016-01260 to review the cause of the 23 EDG overcurrent trip on March 7, 2016, and in light of the vendor report. On September 1, 2016, Entergy documented that their initial investigation into the failure on March 7, 2016, concluded that the failure was most likely due to an intermittent connection to the L1 mag amp on the AVR card. Since they have determined the causes of the failures on March 7, 2016, and March 10, 2016, are likely the same direct cause, this violation closes URI 05000247/2016001-06, 23 Emergency Diesel Generator Automatic Voltage Regulator Failure. The URI is closed because it was determined that there was a performance deficiency.

In 2007, Entergy received a 10 CFR 21 notification (ML072750470) that there was a potential for solder joint cracks on their AVR cards and wrote CR-IP2-2007-3825 and CR-IP3-2007-3686. Cracked solder joints on the AVR cards affect the ability of the EDG to achieve and/or maintain voltage. Because the connectivity of the joint can be degraded by vibration, the impact on voltage regulation may be intermittent. The notification recommended an initial inspection to look for cracked solder joints and then subsequent inspections every refueling outage once the cards had been in service for 15 years. Entergy wrote a corrective action to write work requests to perform the initial inspections but did not write any corrective actions to address the need for recurring inspections. Entergy performed the initial inspections for all of their cards in 2009 and 2010 and did not find any degraded solder joints on any of the Unit 2 EDGs, although the AVR card from the Unit 3 32 EDG did have degraded solder joints and was repaired. Entergy did not establish a preventive maintenance activity to perform the subsequent inspections every two years as stated in the service bulletin.

In response to the events of March 7, 2016, and March 9, 2016, Entergy performed extent of condition inspections on both the 21 and 22 EDG AVR cards and identified partially cracked solder joints on both cards. Entergy repaired the solder joints and replaced the cards. Like the 23 EDG AVR card, the AVR card for the 21 EDG is also original equipment, while the 22 EDG AVR card was replaced more recently.

Analysis. The failure to establish recurring (two-year) inspections of the AVR cards that had longer than 15 years in service is a performance deficiency that was reasonably within Entergy's ability to foresee and correct. The inspectors determined that this performance deficiency was more than minor because it is associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and adversely affected its objective to ensure the reliability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the 23 EDG failed to run on March 7, 2016, and March 10, 2016.

The performance deficiency represented a loss of function of a single train (23 EDG) for greater than its TS allowed outage time of seven days. Inspection of the 21, 22, and 23 EDG AVR cards all showed substantial degradation of the solder joints to the L1 mag amp. The 22 EDG AVR card was observed to have degradation in the solder joint and had been previously replaced in 2010. This degraded condition likely existed prior to the failure on March 7, 2016. As a result, the failure mechanism could have activated at any time between the last successful test on February 7, 2016, and the failure at the next demand event on March 7, 2016. The inspectors evaluated the finding in accordance with IMC 0609, Appendix A, "The Significance Determination Process for Findings at Power," Exhibit 2, "Mitigating Systems Screening Questions." The inspectors noted that while the degraded 23 EDG AVR had resulted in a trip of the EDG on March 7, 2016, it was subsequently run on March 8, 2016, and twice on March 9, 2016, during test 2-PT-R014, "Automatic SI System Electrical Load and Blackout Test." During this test, the 'A' side logic was completed with no anomalies noted with the 23 EDG; however, during the 'B' side test, the 6A bus voltage dropped to 200V with several equipment load sheds automatically occurring prior to success on the third attempt to load the EDG. The 23 EDG did not trip during this test because the low voltage relay protection is overridden during an emergency start (when the EDG is started from an SI signal). Subsequently, the AVR was identified as the likely cause of the voltage drop during the March 9, 2016, test and the EDG was declared inoperable. While the facts support an intermittent type of failure (several successful runs after March 7, 2016, without the AVR being repaired), the inspectors concluded that the previous failure on March 7, 2016, was most likely caused by the degraded AVR function. Therefore, the inspectors determined that the 23 EDG trip on March 7, 2016, represented an actual loss of function for greater than its TS allowed outage time and a DRE was performed.

The Region I SRA determined that the estimated increase in core damage frequency associated with this performance deficiency is low E-8/year or very low safety significance (Green). The DRE was performed with the conservative assumption that the intermittent failures would have resulted in impacting at-power conditions going back to the last successful 23 EDG surveillance test performed on February 7, 2016. The SRA used the guidance within the Risk Assessment of Operational Events, Volume 1 – Internal Events, Section 2.4, to determine an exposure time at unit power conditions of T/2 or 14 days from the last successful test due to the unknown nature of the failure mechanism. This provided a bounding assessment. The SRA used the Systems Analysis Programs for Hands-On Evaluation, Revision 8.1.4, and the SPAR Model for Indian Point Unit 2, Model Version 8.19. The SRA considered the last load test which resulted in unexpected load shedding to be a failure. Therefore, the last 5 times the EDG had run, two of the runs were considered to be failures for a 0.40 failure probability. Additionally, the SRA had to make modifications to update the model to perform the evaluation. This included revising the base case SPAR model to substitute the Unit 2 ARDG for the combustion turbine which is no longer used for the offsite power recovery



fault trees. The SRA reviewed Entergy's probabilistic risk assessment model and established a failure probability for the ARDG of  $5E-2$  based on a review of the Entergy's probabilistic risk assessment model which included operator actions and equipment failure modeling.

The condition case was represented by developing post-processing rules to recognize that the 23 EDG ran for over 75 minutes on March 7, 2016, prior to its failure. Modifications to the SPAR model were performed to recognize that plant procedures direct alignment of the ARDG to restore power to any safety-related 480V bus which becomes de-energized (2A, 3A, 5A, or 6A buses) during a loss of offsite power (LOOP) event and failure of an EDG. Therefore, if the 23 EDG would have failed during an at power event, procedures direct for the ARDG to be aligned to its respective bus. The SRA developed the modification only for LOOP events where capability may not exist to isolate a failed open power operated relief valve (PORV). For events where a PORV cannot be isolated, the ARDG is not credited due to timing considerations in aligning the ARDG for this type of loss of coolant scenario. The SRA determined for this intermittent failure condition, modeling should provide for the capability to isolate a failed open PORV associated with the 23 EDG powered block isolation valve because the 23 EDG had run for a nominal 75 minutes prior to its initial failure on March 7, 2016. Additionally, the SRA made a conservative modeling assumption related to common cause, by setting the 23 EDG failure to run basic event to "TRUE" to increase the probability of common cause failure for all of the EDGs, even though the failure was intermittent. The common cause failure probability for the EDGs was increased to  $4.7E-3$  from its nominal value of  $1.4E-4$ . Finally, the 23 EDG failure rate was set at a 40 percent probability of failure due to the recent performance data. As a result, the SRA determined that the estimated increase in core damage frequency associated with the performance deficiency was  $1.5E-8$ /yr for the 14-day exposure time assumed at-power conditions. The dominant core damage sequences for the at-power condition involved LOOP events with failure of the auxiliary feedwater system and feed and bleed. The dominant core damage cutset consisted of a LOOP with failure of the turbine driven auxiliary feedwater pump, failure of the 22 EDG to run, failure of the 23 EDG to run, and failure of the ARDG to align power to a safety bus.

Because the 23 EDG AVR was not replaced and repaired until after the March 9, 2016, test anomaly, the SRA also reviewed the risk associated with the EDG being degraded during the unit shutdown condition until the AVR was repaired and the 23 EDG clearance removed on March 16, 2016. The SRA determined the shutdown risk using IMC 0609, Appendix G, Attachment 1, "Shutdown Operations Significance Determination Process Phase 1 Initial Screening Characterization of Findings." The SRA noted the March 7, 2016, loss of safety bus power event and residual heat removal cooling was caused by inadequate guidance in procedures, resulting in an overcurrent condition on the Bus 3A normal supply breaker as part of load test setup activities for a surveillance test. Without this error, the trip of the 23 EDG would not have caused a loss of residual heat removal cooling; and, therefore, the EDG performance deficiency was not relevant to any shutdown initiating event. The performance deficiency associated with the 23 EDG was evaluated within Exhibit 3 – Mitigating Systems Screening Questions. Because the 23 EDG was conservatively assumed to have lost its safety function for greater than its TS outage time, a Phase 2 evaluation within Appendix G was performed.

Using Worksheet 3, "Loss of Offsite Power in plant operating state 1 (Head On, Reactor Coolant System Closed)," for the limiting condition, the SRA made the following

assumptions: 1) initiating event likelihood equal to two given the exposure time, 2) emergency AC credit of three based upon the availability of the 21 and 22 EDGs, 3) steam generator cooling credit of three based on the fact that the 24 reactor coolant pump was in operation and providing forced circulation, and 4) a credit of one for recovery of offsite power before core damage (RLOOP3). Based upon the Phase 2 worksheet results, the shutdown safety significance of the performance deficiency was estimated in the E-9 range. The SRA noted the condition would also be in the E-8 range considering a plant operating state 2 condition (reactor coolant system vented) with no credit given for aligning the Unit 2 ARDG. Therefore, the total risk (at-power and shutdown) for this condition was estimated to be in the E-8 range or of very low safety significance (Green) and was considered to be a conservative bounding analysis (i.e., assuming EDG exposure time 14 days at power, EDG common cause effect and no recovery of buses with ARDG during the outage risk evaluation).

The inspectors determined that this violation was not indicative of current performance because the last time Entergy would reasonably have been prompted to create corrective actions to perform periodic inspections was during the initial inspections in 2010. Therefore, no cross-cutting aspect was assigned.

Enforcement. 10 CFR 50, Appendix B, Criterion XVI, states that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. Contrary to this, between 2010 and March 2016, Entergy's CAP did not assure that a condition adverse to quality associated with the safety-related EDG system was promptly identified and corrected. Specifically, they did not perform the recommended once per refueling cycle inspections of the EDG AVR cards, and as a result, the 23 EDG failed to run due to undetected degraded connections. Entergy replaced the AVR card in the 23 EDG, repaired the solder joints in the AVR cards for the 21 and 22 EDGs, and wrote CR-IP2-2016-1260 and CR-IP3-2016-1370. Because this violation was of very low safety significance (Green) and Entergy has entered this performance deficiency into the CAP, the NRC is treating this as an NCV in accordance with Section 2.3.2.a of the NRC Enforcement Policy. **(NCV 05000247/2016003-02, Missed Inspections on Automatic Voltage Regulator Cards Results in Emergency Diesel Generator Failure to Run)**

This URI is closed.

1R18 Plant Modifications (71111.18 – 3 samples)

Temporary Modifications

a. Inspection Scope

The inspectors reviewed the temporary modifications listed below to determine whether the modifications affected the safety functions of systems that are important to safety. The inspectors reviewed 10 CFR 50.59 documentation and post-modification testing results and conducted field walkdowns of the modifications to verify that the temporary modifications did not degrade the design bases, licensing bases, and performance capability of the affected systems.

Unit 2

- Temporary modification 66349 to repair a crack on vital battery 23, cell 4

Unit 3

- Temporary modification 65773 to replace the failed ARDG battery charger with a digital battery charger (this sample was part of an in-depth review of the ARDG system)
- Temporary modification 66780 to install jumpers in order to maintain bus 5A interlocking relay circuit while relay 62-2/5A is replaced

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 7 samples)a. Inspection Scope

The inspectors reviewed the post-maintenance tests for the maintenance activities listed below to verify that procedures and test activities ensured system operability and functional capability. The inspectors reviewed the test procedure to verify that the procedure adequately tested the safety functions that may have been affected by the maintenance activity and that the acceptance criteria in the procedure were consistent with the information in the applicable licensing basis and/or design basis documents. The inspectors verified that the test results were properly reviewed and accepted and problems were appropriately documented. The inspectors also walked down the affected job site, observed the pre-job brief and post-job critique where possible, confirmed work site cleanliness was maintained, and witnessed the test or reviewed test data to verify quality control hold points were performed and checked, and that results adequately demonstrated restoration of the affected safety functions.

Unit 2

- 21 ABFP recirculation valve FCV-1121 actuator preventative maintenance on July 19, 2016
- Replacement of 138kV breaker BT4-5 on August 12, 2016
- Corrective maintenance on the 21 CCW pump discharge check valve on September 22, 2016

Unit 3

- ARDG protective relay replacement and calibration on August 23, 2016 (this sample was part of an in-depth review of the ARDG system)
- ARDG four-year preventive maintenance on September 2, 2016 (this sample was part of an in-depth review of the ARDG system)
- ARDG battery charger replacement on September 12, 2016 (this sample was part of an in-depth review of the ARDG system)
- Undervoltage relay 62-2/5A replacement on September 17, 2016

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 4 samples)

a. Inspection Scope

The inspectors observed performance of surveillance tests and/or reviewed test data of selected risk-significant SSCs to assess whether test results satisfied TSs, the UFSAR, and Entergy's procedure requirements. The inspectors verified that test acceptance criteria were clear, tests demonstrated operational readiness and were consistent with design documentation, test instrumentation had current calibrations and the range and accuracy for the application, tests were performed as written, and applicable test prerequisites were satisfied. Upon test completion, the inspectors considered whether the test results supported that equipment was capable of performing the required safety functions. The inspectors reviewed the following surveillance tests:

Unit 2

- 2-PT-Q034, 22 auxiliary feed pump quarterly surveillance, on August 1, 2016

Unit 3

- 3-PT-Q062A, 31 charging pump quarterly surveillance test, on August 24, 2016
- 3-PT-Q98C, steam line pressure functional test, on September 13, 2016
- WO 00446386, 31 EDG AVR card inspection, on September 20, 2016

b. Findings

Introduction. The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," because Entergy did not take timely corrective action to perform an inspection of the 33 EDG AVR card. As a result, the degraded connections on the L1 magnetic amplifier card on the 32 EDG were not repaired for a prolonged period of time.

Description. On March 7, 2016, and March 10, 2016, the 23 EDG on Unit 2 experienced voltage control issues while in unit mode. After performing troubleshooting on the voltage regulator card, Entergy determined that the solder joints on the L1 magnetic amp connections were degraded, resulting in intermittent connections that affected the ability to achieve and maintain voltage. Entergy further determined that the solder joints had been the subject of a 10 CFR 21 report in 2007. The solder joints on all six affected diesel generators at Indian Point had been inspected initially in 2009 and 2010, but the recommended follow-up inspections had not been performed. Entergy took action to inspect the AVR cards on the Unit 2 EDGs before the end of the Unit 2 refueling outage in May 2016 and identified indications of degradation in the L1 mag amp solder joints on all three cards.

On May 19, 2016, Entergy wrote a corrective action to perform the same inspections on the 31, 32, and 33 EDG AVR cards, under CR-IP3-2016-1370, CA-5. This corrective

action was originally due on June 10, 2016, with the intent to perform it prior to the next monthly surveillance of each EDG. The EDGs had been evaluated as operable-degraded/non-conforming, and completion of the corrective actions would restore the EDGs to operable status. The inspections were not performed prior to the June surveillances because Entergy staff raised questions about the adequacy of the planned post-maintenance testing. The due date was extended to coincide with the next monthly surveillance test. The inspections were not performed prior to the July surveillances because Entergy prioritized post-outage work at Unit 2 over the inspections and the due date was extended for a second time to August. The inspections were not performed prior to the August surveillances because Entergy once again prioritized other work at the station (repairs to the 23 circulating water pump) over the inspections, and the due date was extended a third time. Entergy's CAP requires that due date extensions include the basis for why the extension is acceptable. The justifications provided for each due date extension were that the EDGs had been determined to be operable-degraded/non-conforming (vice inoperable). The third due date extension also stated that this was an administrative action. Subsequent discussions with management revealed that the scheduling of resources prevented the completion of the Unit 3 EDG AVR card solder joints because of higher priority assignments of resources. These assignments did not rise to the same level of risk significance as the Unit 3 EDG AVR card degradation.

On September 23, 2016, Entergy performed the inspection on the 33 EDG AVR card and identified two solder joints with signs of degradation. They replaced all of the solder joints for the L1 mag amp and returned the diesel generator to service. The 33 EDG performed satisfactorily during its last surveillance run.

Analysis. The failure to ensure that the solder joint cracking on the 33 EDG AVR card was promptly identified and corrected was a performance deficiency that was within Entergy's ability to foresee and correct. Specifically, Entergy extended the due date three times and performed the card inspections nearly four months after identifying that the recommended periodic inspections had not been performed and that degradation had occurred on three identical cards in Unit 2. The performance deficiency is more than minor because it is associated with the Design Control attribute of the Mitigating Systems cornerstone and adversely affected its objective to ensure the reliability of systems that respond to initiating events to prevent undesirable consequences. The existence of cracked solder joints on the AVR card decreases the reliability of the EDGs, and the untimely corrective action allowed this degraded condition to persist without being corrected. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 2 of IMC 0609, Appendix A, "The Significance Determination Process for Findings At-Power," issued June 19, 2012, the inspectors determined that the finding was of very low safety significance (Green) because the 33 EDG maintained its operability or functionality, it did not represent a loss of system or function, and it did not involve external mitigation systems.

The inspectors determined that this finding had a cross-cutting aspect in the area of Human Performance, Conservative Bias, because leaders did not take a conservative approach to decision making, particularly when information is incomplete or conditions are unusual. Specifically, Entergy did not inspect the 33 EDG AVR cards at the first available opportunity due to resource constraints. [H.14]

Enforcement. 10 CFR 50, Appendix B., Criterion XVI, states that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. Contrary to this, between June 2016 and September 2016, Entergy's CAP did not assure that a condition adverse to quality associated with the safety-related EDG system was promptly corrected. Specifically, they did not perform the recommended inspection of the 33 EDG AVR card, and as a result, the degraded condition existed for prolonged period of time. Entergy repaired the degraded solder joints on the AVR card in the 33 EDG and wrote CR-IP3-2016-3018. Because this violation was of very low safety significance (Green) and Entergy has entered this performance deficiency into the CAP, the NRC is treating this as an NCV in accordance with Section 2.3.2.a of the NRC Enforcement Policy. **(NCV 05000286/2016003-03, Untimely Corrective Actions for Degraded Automatic Voltage Regulator Cards)**

### **Cornerstone: Emergency Preparedness**

1EP6 Drill Evaluation (71114.06 – 1 sample)

#### Training Observation

a. Inspection Scope

The inspectors evaluated the conduct of a routine Entergy emergency drill on September 14, 2016, to identify any weaknesses and deficiencies in the classification, notification, and protective action recommendation development activities. The inspectors observed emergency response operations in the simulator to determine whether the event classification, notifications, and protective action recommendations were performed in accordance with procedures. The inspectors also attended the station drill critique to compare inspector observations with those identified by Entergy in order to evaluate Entergy's critique and to verify whether Entergy was properly identifying weaknesses and entering them into the CAP.

b. Findings

No findings were identified.

## **2. RADIATION SAFETY**

### **Cornerstone: Public Radiation Safety and Occupational Radiation Safety**

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01 – 4 samples)

a. Inspection Scope

The inspectors reviewed Entergy's performance in assessing and controlling radiological hazards in the workplace. The inspectors used the requirements contained in 10 CFR 20, TSs, applicable regulatory guides (RGs), and the procedures required by TSs as criteria for determining compliance.

Instructions to Workers (1 sample)

The inspectors reviewed HRA work permit controls and use, observed containers of radioactive materials, and assessed whether the containers were labeled and controlled in accordance with requirements.

The inspectors reviewed several occurrences where a worker's electronic personal dosimeter alarmed. The inspectors reviewed Entergy's evaluation of the incidents, documentation in the CAP, and whether compensatory dose evaluations were conducted when appropriate. The inspectors verified follow-up investigations of actual radiological conditions for unexpected radiological hazards were performed.

Contamination and Radioactive Material Control (1 sample)

The inspectors observed the monitoring of potentially contaminated material leaving the RCA and inspected the methods and radiation monitoring instrumentation used for control, survey, and release of that material. The inspectors selected several sealed sources from inventory records and assessed whether the sources were accounted for and were tested for loose surface contamination. The inspectors evaluated whether any recent transactions involving nationally tracked sources were reported in accordance with requirements.

Risk-Significant HRA and Very High Radiation Area Controls (1 sample)

The inspectors reviewed the procedures and controls for HRAs, very high radiation areas, and radiological transient areas in the plant.

Problem Identification and Resolution (1 sample)

The inspectors evaluated whether problems associated with radiation monitoring and exposure control (including operating experience) were identified at an appropriate threshold and properly addressed in the CAP.

b. Findings

Introduction. A self-revealing Green NCV of TS 5.7.1e was identified when workers entered the Unit 2 FSB truck bay that was posted and controlled as a HRA without receiving a briefing on dose rates in the work area. Specifically, on June 6, 2016, two NPOs entered the Unit 2 FSB truck bay to hang tags on the backup spent fuel pool cooling filters. The NPOs signed in on an RWP but did not receive a radiological briefing on the dose rates in their work area. After entering the area, one worker received an electronic dosimeter dose rate alarm and subsequently both workers promptly exited the area. Immediate corrective actions included restricting the access of the two NPOs to the RCA. The issue was entered into Entergy's CAP as CR-IP2-2016-03610.

Description. On June 6, 2016, two NPOs entered the Unit 2 FSB truck bay, a posted HRA, to hang tags on the backup spent fuel pool cooling filters. The NPOs signed in on a HRA RWP but did not receive a briefing on the radiological conditions in their work area. After entering the area, one worker received an electronic dosimeter dose rate alarm of 991 mrem/hr. The two NPOs exited the HRA after receiving the alarm and reported the incident to radiation protection.

Event follow-up (apparent cause evaluation for CR-IP2-2016-03610) determined that the NPOs entered the RCA at the Unit 2 health physics (HP) control point (HP1) but did not check in with the HP shift technician. They subsequently proceeded to the 80-foot elevation of the Unit 2 PAB where they were expected to dress out and receive a detailed radiological briefing at the outage HP desk. The NPOs bypassed the normal dress-out area and proceeded to the NPO field office, located on the 98-foot elevation of the PAB, to dress-out. After completing dress-out, the NPOs proceeded directly to their work location, a posted HRA, without having received a briefing on radiological conditions from the HP control desk on the 80-foot elevation of the PAB as required. Shortly after entering the Unit 2 FSB truck bay HRA, one NPO received a dose rate alarm, later determined to be at 991 mrem/hr (alarm set point of 900 mrem/hr). Both workers exited the truck bay and proceeded to the HP control point.

TS 5.7.1 requires that activities in a HRA with dose rates greater than or equal to 100 mrem/hr at 30 centimeters from the source but less than 1000 mrem/hr shall be controlled by means of an RWP. This includes specification of radiation dose rates in the immediate work area and other appropriate radiation protection equipment and measures and that all workers shall be briefed on the radiological conditions in their work area prior to entry.

Analysis. The failure to obtain a radiological briefing prior to entry into a posted HRA is a performance deficiency that was reasonably within Entergy's ability to foresee and correct. The performance deficiency was determined to be more than minor based on similar example 6.h in IMC 0612, Appendix E, and because it adversely affected the Human Performance attribute of the Occupational Radiation Safety cornerstone objective. Specifically, Entergy staff violated the TS 5.7.1 HRA radiological briefing requirement designed to protect workers from unnecessary radiation exposure. Using IMC 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process," the finding was determined to be of very low safety significance (Green) because it did not involve: (1) ALARA occupational collective exposure planning and controls, (2) an overexposure, (3) a substantial potential for overexposure, or (4) an impaired ability to assess dose. The finding was self-revealing because Entergy was made aware of the situation as a result of an electronic dose rate alarm.

The cause of the finding is related to the cross-cutting aspect of Human Performance, Procedure Adherence, in that the workers did not follow processes, procedures, and work instructions for entering a posted HRA. [H.8]

Enforcement. TS 5.7.1e requires that entry into an HRA with dose rates not exceeding 1.0 rem/hr at 30 centimeters from the source be performed by personnel that have been briefed on the radiological conditions in the area prior to entry. Contrary to this requirement, on June 6, 2016, two NPOs entered the Unit 2 FSB truck bay, a posted HRA, to hang tags on the backup fuel pool cooling filters. The NPOs signed in on an RWP but did not receive a briefing on the radiological conditions in the area prior to entry. After entering the area, one worker received an electronic dosimeter dose rate alarm and both workers promptly exited the area. Immediate corrective actions included restricting the access of the two NPOs to the RCA. Because this finding was determined to be of low safety significance (Green) and was entered into Entergy's CAP as CR-IP2-2016-03610, this violation is being treated as an NCV consistent with Section 2.3.2.a of the NRC Enforcement Policy. **(NCV 05000247/2016003-04, Entry into a High Radiation Area without Radiological Briefing)**



## 2RS2 Occupational ALARA Planning and Controls (71124.02 – 2 samples)

### a. Inspection Scope

The inspectors assessed Entergy's performance with respect to maintaining occupational individual and collective radiation exposures ALARA. The inspectors used the requirements contained in 10 CFR 20, applicable RGs, TSs, and procedures required by TSs as criteria for determining compliance.

#### Radiological Work Planning (1 sample)

The inspectors selected the following radiological work activities based on exposure significance for review:

- RWP 20162615, PCI-Baffle Bolt Removal/Repair
- RWP 20162616, Westinghouse-Baffle Bolt Removal/Repair
- RWP 20162601, Radiation Protection Support
- RWP 20162642, Cavity Liner Repair

For each of these activities, the inspectors reviewed ALARA work activity evaluations, exposure estimates, exposure reduction requirements, results achieved (dose rate reductions, actual dose), person-hour estimates and results achieved, and post-job reviews that were conducted to identify lessons learned.

#### Verification of Dose Estimates and Exposure Tracking Systems (1 sample)

The inspectors reviewed the current annual collective dose estimate; basis methodology; and measures to track, trend, and reduce occupational doses for ongoing work activities. The inspectors evaluated the adjustment of exposure estimates or re-planning of work. The inspectors reviewed post-job ALARA evaluations of excessive exposure results.

### b. Findings

Introduction. A self-revealing finding of very low safety significance (Green) was identified due to Entergy having unintended occupational collective exposure resulting from performance deficiencies in planning while preparing to perform reactor cavity liner repair activities during the Unit 2 refueling outage 2R22. Inadequate work planning resulted in unplanned, unintended collective exposure due to conditions that were reasonably within Entergy's ability to foresee. The work activity planning deficiencies resulted in the collective exposure for these activities increasing from the planned dose of 2.386 person-rem to an actual dose of 10.305 person-rem.

Description. Unit 2 has had a long-standing issue with refueling water storage tank water from the reactor refueling cavity (during refueling outages) leaking into the basement of the containment structure. Leakage rates of 4.5 gallons per minute were observed during initial cavity flood-up, and continued throughout the outage, placing an additional burden on the liquid radiological waste system to collect and process this leakage. Due to a period of limited work activity during the outage (2R22), a decision was made to effect repairs by draining down the cavity and performing

welding activities on the cavity liner. Although the cavity liner leakage was a long-standing issue, no extensive work/repair plan existed when this window of opportunity opened.

The original scope of work was an area on the west face of the cavity liner approximately eight feet in length. Upon closer examination of the cavity liner, it was determined by Entergy that the area needing repair was much larger than originally intended on the west face of the cavity liner and also needed to include the opposite face of the liner. The welding method in the original repair plan also proved inadequate to the task, resulting in most of the weld repairs not being able to be appropriately tested. As a result, the repairs had only limited effectiveness, resulting in a small decrease of the cavity leak rate from 4.5 gallons per minute to 3.7 gallons per minute. Initial work was performed on April 4, 2016, without the intended shielding being installed, resulting in an additional 1.1 person-rem of exposure before the appropriate shielding was put in place. The work estimate in person-hours was challenged by scope increases, consisting of greater than expected areas needing repair, difficulty of welding, and the material condition of the cavity walls. Unintended collective exposure that was greater than the planned collective exposure for cavity liner repair work was the result of the limited and inadequate plan for the work to be performed and included the following: (1) conflicts and discrepancies in the original repair plan (CR-IP2-2016-02528), (2) two significant defects beyond the repair plan (CR-IP2-2016-02502), and (3) repairs could not be completed due to the condition of the existing liner in localized areas (CR-IP2-2016-02548).

Consequently, the total collective dose for the reactor cavity liner repair increased from the planned collective dose of 2.386 person-rem to the actual collective dose of 10.305 person-rem. This issue was entered into Entergy's CAP as CR-IP2-2016-02528, CR-IP2-2016-02502, and CR-IP2-2016-02548.

Analysis. The failure to develop an adequate outage work plan for the reactor cavity liner repair work was a performance deficiency that was within Entergy's ability to control and prevent. The performance deficiency was more than minor because it was associated with the Program and Process attribute of the Occupational Radiation Safety cornerstone and adversely affected the cornerstone objective to ensure the adequate protection of the worker health and safety from exposure to radiation. Additionally, the performance deficiency was determined to be more than minor based on similar example 6.i in Appendix E of IMC 0612, in that the actual collective dose exceeded 5 person-rem and exceeded the planned, intended dose by more than 50 percent. In accordance with IMC 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process," the finding was determined to be of very low safety significance (Green) because Unit 2's current three-year rolling average collective dose for 2013-2015 is 39.69 person-rem, which is less than the criteria of 135 person-rem per pressurized water reactor unit. The finding had a cross-cutting aspect in the area of Human Performance, Work Management, in that the process of planning work activities adversely impacted radiological safety. [H.5]

Enforcement. No violation of regulatory requirements occurred. The ALARA rule (10 CFR 20.1101(b)) Statements of Consideration indicate that compliance with the ALARA requirement will be judged on whether Entergy has incorporated measures to track and, if necessary, to reduce exposures, and not whether exposures and doses represent an absolute minimum or whether Entergy has used all possible methods to

reduce exposures. The overall exposure performance of a nuclear power plant is used to determine its compliance with the ALARA rule. Since Unit 2's current three-year rolling average is 39.69 person-rem, which is below the three-year rolling average criterion of 135 person-rem per unit, and has an established ALARA program to reduce exposure consistent with the 10 CFR 20.1101 Statements of Consideration, no violation of 10 CFR 20.1101(b) occurred. Entergy entered this issue into their CAP as CR-IP2-2016-02528, CR-IP2-2016-02502, and CR-IP2-2016-02548. Because this issue does not involve a violation and has very low safety significance, it is identified as a finding. **(FIN 05000247/2016003-05, Failure to Maintain Radiation Exposure ALARA During Unit 2 Reactor Cavity Liner Repairs)**

2RS4 Occupational Dose Assessment (71124.04 – 5 samples)

a. Inspection Scope

The inspectors reviewed the monitoring, assessment, and reporting of occupational dose. The inspectors used the requirements in 10 CFR 20, RG 8.9, RG 8.34, TSs, and procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors reviewed radiation protection program audits, National Voluntary Laboratory Accreditation Program (NVLAP) dosimetry testing reports, and procedures associated with dosimetry operations.

Source Term Characterization (1 sample)

The inspectors reviewed the plant radiation characterization (including gamma, beta, alpha, and neutron) being monitored. The inspectors verified the use of scaling factors to account for hard-to-detect radionuclides in internal dose assessments.

External Dosimetry (1 sample)

The inspectors reviewed dosimetry NVLAP accreditation, onsite storage of dosimeters, the use of "correction factors" to align electronic personal dosimeter results with NVLAP dosimetry results, dosimetry occurrence reports, and CAP documents for adverse trends related to external dosimetry.

Internal Dosimetry (1 sample)

The inspectors reviewed internal dosimetry procedures, whole body counter measurement sensitivity and use, adequacy of the program for whole body count monitoring of plant radionuclides or other bioassay technique, adequacy of the program for dose assessments based on air sample monitoring and the use of respiratory protection, and internal dose assessments for any actual internal exposure.

Special Dosimetric Situations (1 sample)

The inspectors reviewed Entergy's worker notification of the risks of radiation exposure to the embryo/fetus, the dosimetry monitoring program for declared pregnant workers,

external dose monitoring of workers in large dose rate gradient environments, and dose assessments performed since the last inspection that used multi-badging, skin dose, or neutron dose assessments.

Problem Identification and Resolution (1 sample)

The inspectors evaluated whether problems associated with occupational dose assessment were identified at an appropriate threshold and properly addressed in the CAP.

b. Findings

No findings were identified.

**4. OTHER ACTIVITIES**

4OA1 Performance Indicator Verification (71151 – 8 samples)

Mitigating Systems Performance Index

a. Inspection Scope

The inspectors reviewed Entergy's submittals for the following Mitigating Systems Cornerstone performance indicators for the period of July 1, 2015, through June 30, 2016:

Unit 2

- Emergency AC Power System (MS06)
- High Pressure Injection System (MS07)
- Heat Removal System (MS08)
- Residual Heat Removal System (MS09)

Unit 3

- Emergency AC Power System (MS06)
- High Pressure Injection System (MS07)
- Heat Removal System (MS08)
- Residual Heat Removal System (MS09)

To determine the accuracy of the performance indicator data reported during those periods, the inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7. The inspectors also reviewed Entergy's operator narrative logs, CRs, mitigating systems performance index derivation reports, event reports, and NRC integrated inspection reports to validate the accuracy of the submittals.

b. Findings

No findings were identified.

40A2 Problem Identification and Resolution (71152)Routine Review of Problem Identification and Resolution Activitiesa. Inspection Scope

As required by Inspection Procedure 71152, "Problem Identification and Resolution," the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that Entergy entered issues into the CAP at an appropriate threshold, gave adequate attention to timely corrective actions, and identified and addressed adverse trends. In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow up, the inspectors performed a daily screening of items entered into the CAP and periodically attended CR review group meetings. The inspectors also confirmed, on a sampling basis, that, as applicable, for identified defects and non-conformances, Entergy performed an evaluation in accordance with 10 CFR 21.

b. Findings

No findings were identified.

40A3 Follow Up of Events and Notices of Enforcement Discretion (71153 – 3 samples).1 Plant Eventa. Inspection Scope

On July 6, 2016, Unit 2 experienced a reactor trip caused by a human performance error. The inspectors reviewed and observed plant parameters, reviewed personnel performance, and evaluated performance of mitigating systems. The inspectors communicated the plant status to appropriate regional personnel and compared the event details with criteria contained in IMC 0309, "Reactive Inspection Decision Basis for Reactors," for consideration of potential reactive inspection activities. The inspectors verified that Entergy properly reported the event in accordance with 10 CFR 50.72 and 50.73. The inspectors reviewed Entergy's follow-up actions related to the events to assure that Entergy implemented appropriate immediate corrective actions commensurate with their safety significance.

b. Findings

No findings were identified.

.2 (Closed) Licensee Event Report (LER) 05000247/2016-005-00: TS Prohibited Condition Due to a Surveillance Requirement (SR) Never Performed for Testing the Trip of the MBFPs.

On March 26, 2016, an NRC inspector identified that the trip of the MBFPs was not tested in accordance with TS 3.7.3 (Main Feedwater System) SR 3.7.3.3. This performance deficiency was discovered as a result of an assessment of the failure of the MBFPs steam stop valves to close after the reactor trip on December 5, 2015. TS SR 3.7.3.3 required testing the MBFP trip function every 24 months on an actual or

simulated actuation signal. Surveillance tests 2-PT-V024DS60 and 2-PT-V24DS61 were performed every 24 months, but only tested up to the limit switch contact that actuates the MBFP turbine trip solenoid valves and did not include the trip function of the pump. A review determined the requirement to verify the trip of the MBFPs was added to the TS during the implementation of the improved TS conversion program in 2000 but the corresponding testing for MBFP trip was not added to the surveillance tests. The condition was recorded in the Entergy's CAP in CR-IP2-2016-02247.

The inspectors previously issued a Green NCV of TS 3.7.3 for failing to conduct required surveillance testing on the MBFP trip function as required by SR 3.7.3.3 in NRC Integrated Inspection Report 05000247/2016001. There was no evidence that the MBFP trip function had ever been tested and, therefore, did not qualify for treatment as a missed surveillance under SR 3.0.3. (NCV 05000247/2016001-04, Failure to Implement SR for MBFP Trip Function)

The inspectors did not identify any new issues during the review of the LER. This LER is closed.

.3 (Closed) LER 05000247/2016-006-00: TS Prohibited Condition Due to Inoperable 138kV Offsite Circuits Caused by a Disconnected SI Signal to the Station Auxiliary Transformer LTC

The inspectors reviewed Entergy's actions and reportability criteria associated with LER 05000247/2016-006-00, which was submitted to the NRC on May 27, 2016. On March 9, 2016, during shutdown for a refueling outage, while performing testing of the SI system, the station SAT LTC failed to increase per design upon actuation of an SI signal. At the time, the condition was acceptable for the current mode but was unacceptable when the offsite AC electric power distribution and SI system is required to be operable. An investigation was performed and it was discovered on March 28, 2016, that the SAT control cabinet terminal blocks WI05 and WI06 had their links open thereby preventing proper operation of the LTC. A review of tests and WO did not identify any previous failed tests or any WO with instructions to open the links. The last successful test of LTC operation was performed on February 26, 2014. The inspectors reviewed the LER, the associated apparent cause evaluation analysis, and interviewed Entergy staff.

Introduction. The inspectors identified a self-revealing, Green NCV for failing to comply with TS LCO 3.8.1, "Electrical Power Systems, AC Sources – Operating," from February 26, 2014, to March 29, 2016. During this time, the auto transfer function for the 6.9kV offsite electrical buses was not operable because the SI anticipatory signal to the SAT LTC was disconnected. As a result, one of two qualified offsite AC circuits was not operable.

Description. On March 9, 2016, Entergy discovered that the SAT LTC failed to increase voltage as designed in response to an SI signal during the performance of surveillance test 2-PT-R013, SI System, in Mode 5. Unit 2 conducted the loss of normal power surveillance test by manually actuating the SI signal from the control room. Test results revealed that the SAT LTC would not adjust to raise bus voltage in anticipation of the fast transfer of vital buses from the unit auxiliary transformer (UAT) to the SAT. Upon initiation of an SI signal, the SAT LTC was designed to raise bus voltage within 30 seconds in anticipation of the fast transfer of the vital buses 1 through 4 to buses 5 and 6 when loads are transferred from the UAT to the SAT and safeguards loads are

sequenced in. This anticipatory auto transfer feature is required to be operable by TS LCO 3.8.1 whenever the 138kV offsite line is supplying buses 5 and 6 through the SAT and buses 1, 2, 3, and 4 are supplied from the UAT in modes 1 through 4. With the as-found LTC condition, an event resulting in an SI and fast bus transfer could cause the secondary voltage to drop below the degraded voltage setpoint for more than 10 seconds, resulting in a separation of the safety buses from offsite power.

On March 28, 2016, while in mode 6, Entergy identified that the state links (W105 and W106) that connected the SI anticipatory signal to the SAT LTC were disconnected. A document review over a two-year period did not identify any WOs or other activities which directed these links to be opened. Entergy concluded that the most likely cause was human error during the last outage, 2RFO21, when workers apparently left the links in the open position following maintenance activities. The last successful test of the SAT LTC was conducted on February 26, 2014. Entergy closed the links and reinstated to the SAT LTC SI anticipatory signal protective feature prior to entering mode 4. Entergy also implemented corrective actions to maintenance procedures to require and troubleshooting WOs to require concurrent verification that equipment was restored to the proper configuration.

The failure to reinstitute the anticipatory SI signal to the SAT LTC increased the likelihood that a LOOP to the vital buses during a fast dead bus transfer would occur if a reactor trip and SI had actuated. If the reduction in vital bus voltage caused the degraded voltage relay(s) to actuate during a fast transfer and during the period when safeguards loads were sequenced onto the safety buses, the associated EDGs (which would have already started on the SI signal) would have automatically stripped and resequenced the safety loads onto the vital bus, which would then be powered directly from the EDGs. In addition, the SAT LTC would have responded in automatic control to the voltage transient and may have responded adequately to prevent a reduction in voltage during the loss of normal power test on March 9, 2016.

A note in TS 3.8.1 states "The automatic transfer function for the 6.9kV buses shall be operable whenever the 138kV is supplying 6.9kV bus 5 and 6 and the UAT is supplying 6.9kV bus 1, 2, 3, and 4." UFSAR section 7.5.2.1.12.1 further states, "The LTC is used to maintain the nominal voltage level on the SATs 6.9kV buses by automatically raising or lowering the SAT secondary winding taps in response to voltage variations on the 6.9kV buses. During an SI event, the SI anticipatory signal will raise the LTC tap position, increasing the voltage towards a pre-selected voltage, in anticipation of the increased loads from the fast transfer of the loads held by the four 6.9kV in-house buses to the SAT, thus reducing the severity of a degraded voltage condition on the 480V and 6.9kV buses." As a result, Entergy concluded that TS 3.8.1(a) was not met because the state links were not installed.

Analysis. The failure to reinstall the state links (W105 and W106) following maintenance activities was a performance deficiency that was within Entergy's ability to foresee and prevent. Specifically, since February 2014, the SI anticipatory signal to the SAT LTC was nonfunctional. TS 3.8.1 requires this signal to be functional in order for the associated offsite AC source to be operable. This performance deficiency was more than minor because it is associated with the Equipment Performance attribute of the Mitigating Systems cornerstone to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Using IMC 0609, Appendix A, "The Significance Determination Process for

Findings At-Power,” Exhibit 2, Mitigating Systems Screening Questions, this issue required a DRE because the loss of the SI anticipatory function may have resulted in the SAT being unavailable under low or degraded grid voltage conditions and the second qualified offsite AC power line was therefore inoperable for a period longer than the TS allowable outage time. A Region I SRA completed a DRE using the Unit 2 SPAR model and qualitative analysis. The following assumptions were used in the SPAR model analysis: 1) an exposure period one year (maximum length of time per significance determination process guidance), 2) to mimic the LTC OOS (plant design feature not modeled) the failure probability of the SAT basic event (ACP-TFM-SAT) was increased from 2.27E-5 to 2.27E-4 (one order of magnitude) to represent the increased likelihood of the SAT being rendered unavailable due to a low grid voltage condition, 3) truncation was left at 1E-11, and 4) SAT recovery credit was not provided, although the SAT could be manually restored to service following initial electrical plant stabilization using the EDGs to restore power to the safety buses. Based upon these conservative modeling assumptions and the condition under which the SI anticipatory signal would be relied upon (a coincident loss of coolant accident and SI actuation), the safety significance of this issue is less than E-8/year or very low safety significance (Green). The dominant sequences involve a loss of coolant accident and failure of the EDGs.

The inspectors determined that the finding had a cross-cutting aspect of Human Performance, Work Management, because Entergy did not implement a process of controlling and executing work activities. Specifically, the work process did not coordinate with different groups or job activities to ensure the state links were restored at the end of the work activities. [H.5]

Enforcement. TS 3.8.1 requires two offsite AC electrical sources to be operable when in modes 1 through 4. A note in TS 3.8.1 requires the automatic transfer function for the 6.9kV buses to be operable in modes 1 through 4 whenever the 138kV is supplying 6.9kV bus 5 and 6 and the UAT is supplying 6.9kV bus 1, 2, 3, and 4. The UFSAR concludes that the SAT LTC SI signal feature is required to support the automatic transfer function. Contrary to this requirement, the automatic transfer function was not operable from February 26, 2014, until March 29, 2016. Unit 2 was operating in Mode 1 for most of this time. Entergy entered this condition into their CAP (CR-IP2-2016-01386 and CR-IP2-2016-02293) and restored the SAT LTC anticipatory SI signal by closing the state links W105 and W106. This finding was of very low safety significance and was documented in Entergy’s CAP. Therefore, this violation is being treated as an NCV, consistent with section 2.3.2.a of the NRC Enforcement Policy.

**(NCV 05000247/2016003-06, Failure to Maintain Two Qualified AC Sources of Offsite Power)**

This LER is closed.

#### 4OA5 Other Activities

##### .1 Groundwater Contamination

###### a. Inspection Scope

In February 2016, Entergy notified the NRC of a significant increase in groundwater tritium levels measured at three monitoring wells (MW-30, MW-31, and MW-32) located



near the Unit 2 FSB. In August 2016, Entergy notified the NRC of the detection of Cobalt-58 measured in MW-32 located near the Unit 2 FSB.

b. Findings and Observations

(Closed) URI 05000247/2016001-07: January 2016 Groundwater Contamination

Introduction. The inspectors identified a Green NOV of 10 CFR 20.1406(c) for Entergy's failure to conduct operations to minimize the introduction of residual radioactivity into the subsurface of the site (groundwater). Specifically, Entergy has not maintained the floor drain systems clear of obstructions and interferences and has not verified the ability of the floor drains to handle the volume and flowrates for draining activities being conducted. As a result, repeated spills of contaminated water within the RCA leaked to onsite groundwater. Two previous occurrences in April 2014 (NRC Inspection Report 05000247/2015002) and February 2015 (NRC Inspection Report 05000247/2015003) resulted in a licensee-identified Green NCV and an NRC-identified Green NCV. This inspection report documents two additional similar floor drain backup spill events that resulted in groundwater contamination that are the subject of this violation. Specifically, on January 2016, a spill caused by multiple floor drain obstructions resulted in the backup of contaminated water onto the floor of the 35-foot elevation of the PAB and the subfloor of the Unit 2 FSB with subsequent leakage to onsite groundwater. In June/July 2016, another event occurred due to an obstructed flow path through a floor drain in the FSB, which spilled to the subfloor and contaminated the onsite groundwater.

Description. This violation involves two separate incidents of contaminated water spills that resulted in groundwater contamination due to poor floor drain management. The first incident involved a January 2016 groundwater contamination event. The inspectors previously identified a URI regarding whether Entergy's controls to prevent the introduction of radioactivity into the site groundwater for this occurrence were adequate. Specifically, Entergy obtained increased tritium concentrations from onsite groundwater monitoring well samples in January 2016 indicating that a leak or spill had occurred allowing the introduction of radioactivity into the subsurface of the site. Entergy entered this issue into their CAP as CR-IP2-2016-00264, CR-IP2-2016-00266, and CR-IP2-2016-00564 with actions to characterize and evaluate this new leak. The initial Entergy investigation focused on identifying the source of the contamination which was preliminarily determined to originate from the reject water of a reverse osmosis (RO) skid that was in service from January 16–31, 2016. This causal determination was based on the timing of the groundwater contamination event and based on the unique matching of the radionuclide signature from the groundwater samples and the RO skid reject water.

Based on subsequent completion of Entergy's root cause evaluation, the URI can be evaluated and assessed. Two pathways to the site subsurface were identified. One pathway was the floor drain pathway in the PAB from below the RO unit to the PAB sump, where multiple drain obstructions led to spillage from two uncapped cut drain lines located above the floor on the 35-foot elevation of the PAB, and leakage to the subsurface from the floor wall interface on the 35-foot elevation of the PAB. The second cause was attributed to filling the Unit 2 radiological waste sump 28 until it backed up into the subfloor of the Unit 2 FSB truck bay and subsequently leaked out into the ground, contaminating the groundwater. This was attributed to rerouting a drain path for the RO skid reject water into a floor drain with a higher operating level in radiological waste sump 28 that caused backup into a subfloor drain channel into the subfloor of the

Unit 2 FSB truck bay. This condition was the result of an inoperable radiological waste pump and a temporary drain path arrangement that was not fully evaluated to prevent potential groundwater contamination spills.

Regarding the second groundwater contamination incident, on August 10, 2016, Entergy notified the NRC of the detection of Co-58 in monitoring well MW 32-59 located near the Unit 2 FSB. This sample was drawn on July 5, 2016, and analyzed on the week of August 1, 2016. The concentration detected was 76.7 pCi/l. This event was documented by Entergy in CR-IP2-2016-05060. Following identification of Co-58 in the well sample, Entergy directed its vendor laboratory to recount the sample, and to also immediately send off the next sample taken from MW 32-59, on July 18, 2016, for analysis. The sample recount, together with the counting of the July 18, 2016, sample, confirmed the presence of Co-58. No increase in tritium concentration was seen at MW 32 on either of these dates. The Entergy groundwater team, previously assembled for the January 2016 event (described above), began investigating the cause of this new leak. The presence of Co-58 was determined to be indicative of reactor coolant, due to its relatively short half-life. Since Unit 2 had recently (in June 2016) completed a refueling outage, the source of the leak could also have been from the spent fuel pool, as the two systems were connected throughout the refueling outage. Previously, on July 19, 2016, in CR-IP2-2016-04559, Entergy had identified high levels of contamination in the Unit 2 FSB truck bay subfloor as part of their investigation into the leakage path for the January 2016 event. Analysis of this contamination revealed the presence of Co-58.

Entergy's investigation focused on examination of the source of the contamination with a pathway from the Unit 2 FSB truck bay subfloor. Based on this investigation, Entergy identified that in June 2016 following conclusion of the Unit 2 refueling outage, the spent fuel pool alternate decay heat removal system was drained to sump 28. This equipment contained spent fuel pool water and could, therefore, have been the source of the Co-58 contamination. Review of the drainage pathway from the system to sump 28 identified that the system was drained by pumping its contents to a floor drain located on the west side of the Unit 2 FSB truck bay, with that drain going to sump 28. Further analysis identified that the floor drain used was partially blocked by the presence of another large temporary drain line previously used during the 2015 dry fuel cask storage project. The presence of this second line going into the floor drain significantly reduced the capacity of the drain, resulting in the alternate decay heat removal liquids backing up inside the drain system, back-flowing into the north crane rail sole plate, and then spilling onto the Unit 2 FSB truck bay subfloor, which was already identified as a known leakage pathway to groundwater. This pathway was confirmed by Entergy based on the high contamination levels detected in the north crane rail sole plate and the FSB truck bay subfloor, including the presence of Co-58.

The NRC assessment of the safety significance of these events focused on validating the safety impact of dose to the public from the release of tritium and Co-58 to the site groundwater, and ultimately to the Hudson River. The NRC verified that Entergy's bounding public dose calculations on the groundwater contamination leaks were sufficiently conservative, and a maximum worst case scenario would result in 0.000112 millirem (mrem) per year, which represents a very small fraction of the allowable dose (liquid effluent dose objective of 3 mrem per year).

Analysis. The failure to conduct operations to minimize the introduction of residual radioactivity into the subsurface of the site, as required by 10 CFR 20.1406(c), is a performance deficiency within Entergy's ability to foresee and correct and should have been prevented. Specifically, two events involving the leakage of contaminated water to the onsite groundwater occurred due to Entergy's failure to control and maintain its floor drain systems clear of obstructions and interferences and to verify their ability to handle the volume and flowrates for draining activities being conducted.

The issue is more than minor because it is associated with the Program and Process attribute of the Public Radiation Safety cornerstone and adversely affected the cornerstone objective to ensure Entergy's ability to prevent inadvertent release and/or loss of control of licensed material to an unrestricted area due to the actual contamination of groundwater that occurred. In accordance with IMC 0609, Appendix D, "Public Radiation Safety Significance Determination Process," the finding was determined to be of very low safety significance (Green) because Entergy had an issue involving radioactive material control but did not involve transportation or public exposure in excess of 0.005 Rem.

In accordance with IMC 0310, "Aspects within the Cross-Cutting Areas," dated December 4, 2014, the finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Resolution, in that effective corrective actions to address issues identified in two previous groundwater leaks since 2014 were not implemented in a timely manner, which could have prevented this leak. [P.3]

Enforcement. 10 CFR 20.1406(c) requires, in part, that licensees shall, to the extent practical, conduct operations to minimize the introduction of residual radioactivity into the site, including the subsurface. Contrary to the above, on two occasions between January 2016 and July 2016, Entergy failed to conduct operations to minimize the introduction of residual radioactivity into the subsurface of the site. Specifically, Entergy has not maintained its floor drain system clear of obstructions and interferences and has not verified the ability of the floor drains to handle the volume and flowrates for draining activities being conducted. As a result, repeated spills of contaminated water within the RCA leaked into the site groundwater. Specifically, in January 2016, a spill caused by floor drain obstructions resulted in the backup of contaminated water onto the floor and subsequent leakage to the subsurface of the site. A subsequent June/July 2016 groundwater contamination event occurred due to an obstructed flow path through a floor drain in the Unit 2 FSB, which spilled to the subfloor and contaminated the subsurface of the site.

Entergy's immediate corrective actions included decontamination of the adversely affected plant areas, revision of the operating procedure for radiological waste sump 28, and sealing the Unit 2 FSB subfloor to make it water tight to prevent further groundwater contamination from this location. Entergy's planned corrective action to address the existing groundwater contamination is the start-up and operation of a recovery well system (RW-1). The system will allow for the collection of contaminated groundwater to be returned inside the PAB for processing.

This violation meets the criteria in Section 2.3.2.a of the NRC Enforcement Policy to disposition as an NCV. However, the NRC considered that in April 2014 (NRC Inspection Report 05000247/2015002) and again in February 2015 (NRC Inspection Report 05000247/2015003), Entergy also had contaminated water spills inside the RCA

which leaked to groundwater due to blockages in the Unit 2 floor drain system. Entergy's corrective actions for these previous occurrences were limited to clearing the specific floor drains involved in the flow paths for each event. The NRC concluded that Entergy's actions for these most recent events, while similarly responsive to the specific occurrences, do not adequately address the broader concern regarding a lack of control and management of the site floor drain system. Therefore, the NRC is issuing a NOV and is requiring a response from Entergy that describes a more comprehensive CAP for maintaining an effective floor drain system and a process for evaluating and using the floor drains to handle the volume and flowrates for draining activities being conducted. The NOV is enclosed (Enclosure 1). **(VIO 05000247/2016003-07, Inadequate Control of Floor Drains to Minimize Groundwater Contamination)**

This URI is closed.

.2 (Closed) URI 05000247/2016002-01, CVCS Goal Monitoring Under the Maintenance Rule

a. Inspection Scope

During the 2<sup>nd</sup> quarter of 2016, the inspectors identified issues of potential concern with Entergy's application of 10 CFR 50.65(a)(1), "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Plants," in regards to the reliability of the Unit 2 chemical and volume control system (CVCS). These concerns included the establishment of appropriate (a)(1) goals and whether appropriate justification was established that the corrective actions to address identified maintenance weaknesses were effective prior to removal from (a)(1) status. A URI (05000247/2016002-01) was identified because additional NRC review and evaluation was needed to determine whether three identified issues of concern represented performance deficiencies and whether they were more than minor. The inspectors further evaluated the issues and reviewed against 10 CFR 50.65, Requirements for monitoring the effectiveness of maintenance at nuclear power plants; NUMARC 93-01, Industry guideline for monitoring the effectiveness of maintenance at nuclear power plants, Revision 4A; EN-DC-206, Maintenance Rule (a)(1) Process, Revision 3; and NRC Enforcement Manual, Revision 9.

For two issues of concern identified in URI 05000247/2016002-01, the inspectors determined that Entergy's goals established for each of the issues were adequate to provide reasonable assurance that system components would perform their intended function on demand in accordance with the requirements of 10 CFR 50.65. For these two issues, the inspectors determined that Entergy placed the CVCS system in Maintenance Rule (a)(1) status and established goals to monitor performance. The goals were adequate to provided reasonable assurance that system components would perform their intended function. Therefore, no violation of 10 CFR 50.65(a)(1) occurred. However, the inspectors identified weaknesses in the narrowness of the scope, the applicable time periods, and the technical justification for the goals. The weaknesses are as follows:

- 23 charging pump internal oil tube failure. Although 10 CFR 50.65 industry and site guidance documents provide leeway in whether to establish system, train, or specific component goals, the inspectors concluded that the goal on only the 23 charging

pump was narrowly focused and did not include similar conditions for the 21 and 22 charging pumps

- 22 charging pump check valve failure. Although 10 CFR 50.65 industry, and site guidance documents provide latitude on the number of surveillances and occurrences to monitor in accordance with your goal, the inspectors concluded that the goal with only one fill and vent maintenance activity was narrowly focused and additional activities were not included

The third issue of concern involved a failure of the Unit 2 valve FCV-110A, boric acid flow control valve, to fully open on January 5, 2015. The valve was insufficiently insulated and, as a result, boron crystallized above the valve plug and blocked movement. The inspectors reviewed the (a)(1) action plan for FCV-110A, which specified a monitoring interval of six months to include the winter because previous valve failures had all occurred during the winter months. The inspectors noted that the action plan did not specify a goal and that the actual monitoring interval documented in the corrective action was from April to October 2015 and, therefore, did not include the winter months when failure would most likely occur. The inspectors determined that this was not in accordance with EN-DC-206, "Maintenance Rule (a)(1) Process," Section 5.5[3], which states, in part, that monitoring intervals should be long enough to detect recurrence of the applicable failure mechanism and 5.3[4](h) which states, in part, "Goals should be quantifiable with specific limits, and trendable if practicable." In addition, the inspectors determined that represented a violation of 10 CFR 50.65(a)(1), "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," because the failure to monitor the condition during the winter months against licensee established goals, was a failure to monitor the performance of FCV-110A in a manner sufficient to provide a reasonable assurance that the valve was capable of performing its intended functions. This issue was determined to be a minor violation because the reliability of FCV-110A and the CVCS was not impacted. Although, Entergy's failed to adequately monitor the performance FCV-110A, no valve performance issues or failures occurred during the winter months following repair of the insulation. Consistent with the NRC Enforcement Policy, Section 2.2.2, minor violations generally do not warrant enforcement action but are required to be entered into the station's CAP and actions taken to restore compliance. Entergy entered this issue into their CAP as CR-IP2-2017-00084 for resolution.

URI 05000247/2016002-01 is closed.

b. Findings

No findings were identified.

**4OA6 Meetings, Including Exit**

On October 26, 2016, the inspectors presented the inspection results to Mr. Anthony Vitale, Site Vice President, and other members of Entergy. On January 6, 2017, a telephone call was conducted between Mr. Eugene DiPaolo, Acting Branch Chief, Reactor Projects Branch 2, and Mr. Robert Walpole, Nuclear Safety Assurance Manager, to clarify details associated with the closure of URI 05000247/2016002-01. 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**

Entergy Personnel

A. Vitale, Site Vice President  
J. Kirkpatrick, Plant Operations General Manager  
R. Alexander, Unit 2 Shift Manager  
N. Azevedo, Engineering Supervisor  
K. Baumbach, Chemistry Supervisor  
S. Bianco, Operations Fire Marshal  
C. Bohrens, Unit 2 Shift Manager  
R. Burroni, Engineering Director  
T. Chan, Engineering Supervisor  
R. Daley, Engineering Supervisor  
D. Dewey, Unit 3 Assistant Operations Manager  
R. Dolansky, ISI Program Manager  
R. Drake, Civil Design Engineering Supervisor  
J. Ferrick, Regulatory Assurance and Performance Improvement Director  
D. Gagnon, Security Manager  
L. Glander, Emergency Preparedness Manager  
F. Kich, Performance Improvement Manager  
M. Lewis, Unit 2 Assistant Operations Manager  
N. Lizzo, Training Manager  
B. McCarthy, Operations Manager  
F. Mitchell, Radiation Protection Manager  
E. Mullek, Maintenance Manager  
E. Portanova, System Engineer I (Nuclear)  
M. Tesoriero, System Engineering Manager  
M. Troy, Nuclear Oversight Manager  
R. Walpole, Regulatory Assurance Manager

**LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED**Opened

05000247/2016003-07	VIO	Inadequate Control of Floor Drains to Minimize Groundwater Contamination (Section 4OA5)
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Opened/Closed

05000286/2016003-01	NCV	Failure to Adequately Assess Fire Risk Associated with Maintenance on the Unit 3 Appendix R Diesel Generator (Section 1R13)
05000247/2016003-02	NCV	Missed Inspections on Automatic Voltage Regulator Cards Results in Emergency Diesel Generator Failure to Run (Section 1R15)
05000286/2016003-03	NCV	Untimely Corrective Actions to Address Degraded Automatic Voltage Regulator Cards (Section 1R22)
05000247/2016003-04	NCV	Entry into a High Radiation Area without Radiological Briefing (Section 2RS1)
05000247/2016003-05	FIN	Failure to Maintain Radiation Exposure ALARA During Unit 2 Reactor Cavity Liner Repairs (Section 2RS2)
05000247/2016003-06	NCV	Failure to Maintain Two Qualified AC Sources of Offsite Power (Section 4OA3)

Closed

05000247/2016001-06	URI	23 EDG Automatic Voltage Regulator Failure (Section 1R15)
05000247/2016001-07	URI	January 2016 Groundwater Contamination (Section 4OA5)
05000247/2016002-01	URI	CVCS Goal Monitoring Under the Maintenance Rule (Section 4OA5)
05000247/2016-005-00	LER	TS Prohibited Condition Due to a SR Never Performed for Testing the Trip of the MBFPs (Section 4OA3)
05000247/2016-006-00	LER	TS Prohibited Condition Due to Inoperable 138kV Offsite Circuits Caused by a Disconnected SI Signal to the Station Auxiliary Transformer LTC (Section 4OA3)



## LIST OF DOCUMENTS REVIEWED

### **Common Documents Used**

Indian Point Unit 2, UFSAR  
Indian Point Unit 3, UFSAR  
Indian Point Unit 2, Individual Plant Examination  
Indian Point Unit 3, Individual Plant Examination  
Indian Point Unit 2, Individual Plant Examination of External Events  
Indian Point Unit 3, Individual Plant Examination of External Events  
Indian Point Unit 2, TSs and Bases  
Indian Point Unit 3, TSs and Bases  
Indian Point Unit 2, Technical Requirements Manual  
Indian Point Unit 3, Technical Requirements Manual  
Control Room Narrative Logs  
Plan of the Day

### **Section 1R01: Adverse Weather Protection**

#### Procedures

OAP-008, Severe Weather Preparations, Revision 23

#### Condition Reports (CR-IP2-)

2016-04699

### **Section 1R04: Equipment Alignment**

#### Procedures

2-COL-4.1.1, Component Cooling Water System, Revision 26  
2-COL-21.3, Steam Generator Water Level and Auxiliary Boiler Feedwater, Revision 34  
2-COL-31.2, Gas Turbine 2, Revision 7  
2-COL-31.3, Gas Turbine 3, Revision 10  
3-SOP-EL-013, ARDG Operation, Revision 30  
COL-EL-6, ARDG, Revision 10

#### Drawings

9321-F-21213, Flow Diagram Appendix R 6.9kV EDG Fuel Oil System, Revision 6  
9321-F-21203, Flow Diagram Appendix R 6.9kV EDG Lube Oil System, Revision 2  
9321-F-21223, Flow Diagram Appendix R 6.9kV EDG Jacket Water System, Revision 3  
Drawing 304122, GT-2/3 Fuel Forwarding System, Revision 7

### **Section 1R05: Fire Protection**

#### Procedures

EN-TQ-125, Fire Brigade Drills, Revision 4

#### Condition Reports (CR-IP3-)

2016-03052

#### Miscellaneous

Transient Combustible Evaluation 16-017, Revision 1

**Section 1R11: Licensed Operator Requalification Program**Procedures

2-POP-1.2, Reactor Startup, Revision 59  
 3-AOP-ROD-1, Rod Control and Indication System Malfunctions, Revision 3  
 3-E-0, Reactor Trip or SI, Revision 6  
 3-E-3, Steam Generator Tube Rupture, Revision 4  
 EN-OP-115, Conduct of Operations, Revision 17

Condition Reports (CR-IP3-)

2016-02892 2016-02899

Miscellaneous

Simulator Training Scenario I3SX-LOR-SES013, Letdown Line Rupture, Main Turbine Generator Control Valve Shuts, Misaligned Rod, Steam Generator TR, Revision 4  
 Simulator Training Scenario LRQ-SES-ECA00A, Loss of 13.8/138kV (AOP-138kv-1) with Subsequent Loss of Grid and Main Generator Trip (E-0) and Loss of All AC Power (ECA-0.0, 0.1, 0.2), Following Turbine First Stage Press Instrument, PT412A, (AOP-INST-1) Failure and Loss of MCC-28, Revision 9

**Section 1R12: Maintenance Effectiveness**Procedures

EN-DC-153, Preventive Maintenance Component Classification, Revision 14  
 EN-DC-205, Maintenance Rule Monitoring, Revision 5  
 EN-LI-102, Corrective Action Program, Revision 27  
 EN-WM-100, Work Request Generation, Screening and Classification, Revision 13

Condition Reports (CR-IP3-)

2011-05686	2014-00544	2014-00700	2014-01678	2014-02338	2014-02579
2014-02661	2014-02696	2014-02753	2014-02762	2015-01751	2015-01961
2015-03009	2015-03456	2015-03522	2015-03779	2015-03838	2016-01352
2016-02339					

Miscellaneous

Maintenance Rule Action Plan – Unit 3 Reactor Protection and Controls, 07/30/2015

**Section 1R13: Maintenance Risk Assessments and Emergent Work Control**Procedures

EN-OP-119, Protected Equipment Postings, Revision 8  
 IP-SMM-WM-101, Fire Protection and Maintenance Rule (a)(4) Risk Assessment, Revision 5

Condition Reports (CR-IP3-)

2016-02267 2016-02538

Miscellaneous

Equipment Out-of-Service Risk Assessment Tool, Unit 3

**Section 1R15: Operability Determinations and Functionality Assessments**Procedures

0-IC-SI-90-142, Digital Metal Impact Monitoring System (DMIMs) Baseline Recording Using Calibrated Hammers, Revision 0  
 0-IC-SI-90-143, DMIMs Signal Conditioning Calibration, Revision 4  
 0-IC-SI-90-145, DMIMs Operational Test, Revision 3  
 2-SOP-1.9, DMIMS Operation, Revision 7  
 3-PT-V49, DMIM System Check, Revision 1  
 EN-OP-104, Operability Determination Process, Revision 11  
 RXC-B-023-A, Metal Impact Monitoring System Signal Conditioner Calibration (NSID-EIS-90-143, Revision 4), Revision 0  
 RXC-B-024-A, Metal Impact Monitoring System Operational Test (NSID-EIS-90-145, Revision 4), Revision 0

Condition Reports (CR-IP2-)

2010-03316	2010-03773	2010-04545	2010-05677	2010-07126	2010-07468
2011-01205	2011-01266	2011-03693	2012-03453	2012-04766	2012-06131
2012-07266	2013-01009	2013-02540	2014-01718	2014-02261	2014-02550
2014-02653	2014-02738	2014-05812	2014-05813	2014-05816	2016-01260
2016-01500	2016-03360	2016-03525	2016-03800	2016-03856	2016-04764
2016-05220	2016-05418	2016-05442	2016-05444	2016-05528	2016-05757

Condition Reports (CR-IP3-)

2016-01370	2016-02551	2016-02910	2016-02961	2016-03018
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Maintenance Orders/Work Orders

WO 130432	WO 130454	WO 130456	WO 130460	WO 130462	WO 446386
WO 446387	WO 446388				

Miscellaneous

Report of Defect per 10 CFR 21, Basler Electric SBSR AVR Card Solder Joints, dated September 21, 2007  
 Safety Evaluation by the Office of Nuclear Reactor Regulation Related to the Elimination of Large Primary Loop Ruptures as a Design Basis, Power Authority of the State of New York, Indian Point Nuclear Generating Unit No. 3, Docket No. 50-286, dated March 10, 1986  
 Supplement to Safety Evaluation by the Office of Nuclear Reactor Regulation Regarding Leakage Detection Capability in Elimination of Large Primary Loop Ruptures as a Design Basis, Indian Point Nuclear Generating Unit No. 3, Docket No. 50-286, dated January 30, 2002  
 Westinghouse Proprietary Letter (RIDA 16-152)

**Section 1R18: Plant Modifications**Procedures

EN-DC-112, Engineering Change Request Process, Revision 8  
 EN-DC-115, Engineering Change Process, Revision 18  
 EN-DC-136, Temporary Modifications, Revision 12  
 EN-DC-136, Temporary Modifications, Revision 13  
 EN-LI-100, Process Applicability Determination, Revision 18

Condition Reports (CR-IP2-)

2016-05311

Condition Reports (CR-IP3-)

2016-02937

Maintenance Orders/Work Orders

WO 00454240-02    WO 00454240-03    WO 52713002

Miscellaneous

Engineering Change (EC) 66780, Temporary Modification to Install Jumpers in Order to Maintain Bus 5A Interlocking

EC 65773, Replace ARDG Battery Charger

Relay Circuit While Relay 62-2/5A Is Replaced

MCENPC23, Battery Charger User's Manual, Revision 2.2

Temp Mod No. 66349, Temp Modification to Preserve Structural Integrity of Battery 23 Cell Jar No. 4

TMCN 66790, Clarification for Connection of Temp Jumpers to Maintain Daisy chain

TMCN 66801, Alternate Connection Point for One of Temp Jumpers to Maintain Daisy chain

**Section 1R19: Post-Maintenance Testing**

Procedures

2-PT-Q030A, 21 Component Cooling Water Pump, Revision 19

3-GNR-028-ELC, ARDG 4-Year Inspection, Revision 8

3-GNR-036-ELC, ARDG Semi-Annual Inspection, Revision 8

3-PT-M66, Appendix R Diesel Battery Inspection, Revision 21

3-PT-Q139, ARDG Functional Test, Revision 1

Condition Reports (CR-IP2-)

2016-05742    2016-05777    2016-05795

Maintenance Orders/Work Orders

WO 00311837    WO 445129    WO 456276    WO 52509887

WO 52516076    WO 52680382    WO 52713002

Miscellaneous

EC 65773, Replace ARDG Battery Charger

**Section 1R22: Surveillance Testing**

Procedures

2-PT-Q034, 22 Auxiliary Feed Pump, Revision 30

3-PT-M079A, 31 EDG Functional Test, Revision 51

3-PT-Q062A, 31 Charging Pump Operability Test, Revision 17

3-PT-Q98C, Steam Line Pressure Functional Test – Channel III, Revision 8

Condition Reports (CR-IP3-)

2016-02881

Maintenance Orders/Work Orders

WO 00446386      WO 52699018      WO 52699700

Miscellaneous

3-PT-Q062A, 31 Charging Pump Operability Test, completed August 24, 2016  
IP3-CALC-ESS-00276, Instrument Loop Accuracy/Setpoint Calculation – Steam Line Pressure (Low) and Steam Line Delta P (High), Revision 2  
MB-2007-01, Potential for Solder Joint Cracks on Basler SBSR AVR Cards and Technical Manual Addendum TM-2007-01, dated November 5, 2007

**Section 1EP6: Drill Evaluation**

Condition Reports (CR-IP3-)

2016-02892    2016-02894    2016-02895    2016-02899

Miscellaneous

Drill Scenario

**Section 2RS2: Occupational ALARA Planning and Controls**

Condition Reports (CR-IP2-)

2016-02502    2016-02528    2016-02548

Miscellaneous

Indian Point 2 Refueling Outage 22 ALARA Report  
ALARA Committee Meeting Minutes for: March 29, 2016, April 5, 2016, April 6, 2016, April 8, 2016, April 12, 2016, May 2, 2016, and June 14, 2016

**Section 2RS4: Occupational Dose Assessment**

Procedures

EN-RP-204, Special Monitoring Requirements, Revision 10  
EN-RP-204-01, Effective Dose Equivalent Monitoring, Revision 0  
EN-RP-205, Prenatal Monitoring, Revision 3  
EN-RP-207, Planned Special Exposures, Revision 3  
EN-RP-314, Passive Monitoring Sensitivity Tests, Revision 0

Miscellaneous

NVLAP Personnel Dosimetry Performance Testing for Landauer, Inc., 2016

**Section 4OA1: Performance Indicator Verification**

Procedures

EN-LI-114, Regulatory Performance Indicator Process, Revision 7

**Section 4OA2: Problem Identification and Resolution**

Procedures

EN-LI-102, CAP, Revision 27  
CEP-NDE-0255, Radiographic Examination for ASME Welds and Components, ASME Section XI, Revision 8  
CEP-NDE-0404, (PDI UT-1) Manual Ultrasonic Testing of Ferritic Piping Welds (ASME XI), Revision 5

Welding Procedure Specification, 134 F42 MN-GTAW, Manual Gas Tungsten Arc Welding,  
Revision 0

Condition Reports (CR-IP2)

2015-05755 2016-03818 2016-04085 2016-05358 2016-05503

Condition Reports (CR-IP3)

2015-05136 2016-01113

Maintenance Orders/Work Orders

WO 431643 WO 447966

Miscellaneous

Engineering Standard – Pipe Wall Thinning Structural Evaluation, Revision 0  
Indian Point Energy Center NRC Generic Letter 89-13 SW Program, Revision 6  
SW System Health Reports, IP Unit 2 and IP Unit 3, Second Quarter 2016

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

Procedures

2-PT-V024-DS060, Valve BFD-2-21 IST Data Sheet, Revision 10

Condition Reports (CR-IP2-)

2015-05459 2016-02247

Drawings

9321-3140 Sheet 12, Boiler Feed Pump No. 22 Turbine Trip and Reset, Revision 34  
IP2\_SOD\_013, Feedwater System, Revision 2

Miscellaneous

LER 05000247/2016-005-00, TS Prohibited Condition Due to a Surveillance Requirement Never  
Performed for Testing the Trip of the MBFP  
LER 05000247/2016-006-00, TS Prohibited Condition Due to Inoperable 138kV Offsite Circuits  
Caused by a Disconnected SI Signal to the Station Auxiliary Transformer LTC

**Section 4OA5: Other Activities**

Condition Reports (CR-IP2-)

2016-00264 2016-00266 2016-00564 2016-04559 2016-05060

Miscellaneous

Root Cause Evaluation for CR-IP2-2016-00564

**LIST OF ACRONYMS**

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ABFP	auxiliary boiler feedwater pump
AC	alternating current
ALARA	as low as is reasonably achievable
ARDG	Appendix R diesel generator
AVR	automatic voltage regulator
CAP	corrective action program
CCW	component cooling water
CR	condition report
CVCS	chemical and volume control system
DRE	detailed risk evaluation
EDG	emergency diesel generator
FSB	Fuel Storage Building
HP	health physics
HRA	high radiation area
ICCDP	incremental conditional core damage probability
IMC	Inspection Manual Chapter
kV	kilovolt
LCO	limiting condition of operation
LER	licensee event report
LOOP	loss of offsite power
LTC	load tap changer
MBFP	main boiler feedwater pump
NCV	non-cited violation
NOV	notice of violation
NPO	nuclear plant operator
NVLAP	National Voluntary Laboratory Accreditation Program
NRC	Nuclear Regulatory Commission, U.S.
OOS	out of service
PAB	primary auxiliary building
PFP	pre-fire plan
PORV	power operated relief valve
RCA	radiologically controlled area
RG	regulatory guide
RMA	risk mitigating action
RO	reverse osmosis
RWP	radiation work permit
SAT	station auxiliary transformer
SI	safety injection
SPAR	standardized plant analysis risk
SR	surveillance requirement
SRA	senior reactor analyst
SSC	structure, system, and component
SW	service water
TS	technical specification
UAT	unit auxiliary transformer
UFSAR	updated final safety analysis report
URI	unresolved item
WO	work order