UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
2100 RENAISSANCE BLVD., SUITE 100
KING OF PRUSSIA, PA 19406-2713

October 5, 2015

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

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNITS 2 and 3 – NRC COMPONENT DESIGN BASES INSPECTION REPORT 05000247/2015007 and 05000286/2015007

Dear Mr. Coyle:

On August 20, 2015, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Indian Point Nuclear Generating Units 2 and 3. The enclosed inspection report documents the inspection results, which were discussed on August 20, 2015, with you and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. In conducting the inspection, the team examined the adequacy of selected components to mitigate postulated transients, initiating events, and design basis accidents. The inspection involved field walkdowns, examination of selected procedures, calculations and records, and interviews with station personnel.

This report documents four NRC-identified findings that were of very low safety significance (Green). These findings were determined to involve violations of NRC requirements. However, because of the very low safety significance of the violations and because they were entered into your corrective action program, the NRC is treating these findings as non-cited violations (NCVs) consistent with Section 2.3.2.a of the NRC Enforcement Policy. If you contest any NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001, with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Senior Resident Inspector at Indian Point. In addition, if you disagree with the cross-cutting aspect assigned to any finding 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 Regional Administrator, Region I, and the NRC Senior Resident Inspector at Indian Point.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for the public inspection in the NRC Public Docket Room or from the Publicly Available Records component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Paul G. Krohn, Chief
Engineering Branch 2
Division of Reactor Safety

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

Enclosure:
Inspection Report 05000247/2015007 and
05000286/2015007
w/Attachment: Supplementary Information

cc w/encl.: Distribution via ListServ

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U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Docket Nos.	50-247 and 50-286
License Nos.	DPR-26 and DPR-64
Report Nos.	05000247/2015007 and 05000286/2015007
Licensee:	Entergy Nuclear Northeast (Entergy)
Facility:	Indian Point Nuclear Generating Units 2 and 3
Location:	450 Broadway, GSB Buchanan, NY 10511-0249
Inspection Period:	July 20 through August 20, 2015
Inspectors:	Joseph Schoppy, Senior Reactor Inspector Division of Reactor Safety (DRS), Team Leader Juan Ayala, Reactor Inspector, DRS Javier Brand, Reactor Inspector, DRS Michael Orr, Reactor Inspector, DRS David Werkheiser, Senior Resident Inspector Division of Reactor Projects (DRP) Gerald Nicely, NRC Electrical Contractor Matityahu Yeminy, NRC Mechanical Contractor
Approved By:	Paul G. Krohn, Chief Engineering Branch 2 Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000247/2015007 and 05000286/2015007; 7/20/15 - 8/20/15; Indian Point Nuclear Generating (Indian Point) Units 2 and 3; Component Design Bases Inspection.

The report covers the Component Design Bases Inspection conducted by a team of five NRC inspectors and two NRC contractors. Four findings of very low safety significance (Green) were identified, all of which were considered to be non-cited violations (NCVs). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process." Cross-cutting aspects associated with findings are determined using IMC 0310, "Components Within the Cross-Cutting Areas." The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 5.

NRC-Identified Findings

Cornerstone: Mitigating Systems

- Green. The team identified a finding of very low safety significance involving a non-cited violation of Title 10 of the *Code of Federal Regulations (*10 CFR) Part 50, Appendix B, Criterion III, "Design Control." Specifically, Entergy failed to verify, in design basis calculations for Unit 2, that protective device settings do not allow connected Class 1E loads to become damaged or unavailable during a design basis event: (a) under normal voltage conditions; or (b) for a sustained degraded voltage and subsequent reconnection to the emergency diesel generator concurrent with: (1) a design basis event for the degraded voltage time delay of 8.4 - 11.4 seconds, and (2) a non-accident shutdown for the degraded voltage time delay of 153 - 207 seconds. Additionally, Entergy failed to periodically test the thermal overload relays protecting safety-related motor-operated valves (MOVs) to ensure that degradation or trip setpoint drift does not affect the reliability or availability of mitigating systems when called upon to operate. After identification, Entergy entered this issue into the corrective action program, performed several additional evaluations to verify operability, declared two low pressure injection valves inoperable, and replaced fuses to restore operability to these valves.

  The performance deficiency was determined to be more than minor in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, and Appendix E, example 3j, because the engineering calculation error resulted in a condition where there was a reasonable doubt on the operability of a system. In addition, the performance deficiency was associated with the design control attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The team evaluated the finding in accordance with IMC 0609, Appendix A, The Significance Determination Process for Findings at Power, Exhibit 2 – Mitigating Systems Screening Questions, and concluded it required a detailed risk evaluation. The detailed risk evaluation was performed by a Region I senior reactor analyst (SRA) and concluded that the postulated inoperability of the two low pressure injections valves resulted in a change in core damage frequency of 1E-7/year, or very low safety significance (Green).

The finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Operating Experience, because Entergy did not systematically and effectively collect, evaluate, and implement relevant internal and external operating experience in a timely matter. Specifically, Entergy did not systematically and effectively evaluate NRC Regulatory Issue Summary 2011-12, Revision 1, Adequacy of Station Electric Distribution System Voltages. [P.5] (Section 1R21.2.1.1.b.1)

- Green. The team identified a finding of very low safety significance (Green) involving a non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” because Entergy did not verify the adequacy of their electrical design. Specifically, Entergy failed to verify, in design basis calculations and/or periodic testing, that adequate voltages would be available to all Class 1E motors, motor-operated valves (MOVs), static loads, and motor control center (MCC) control circuits and contactors powered from the 480 volt distribution system with the voltage at the 480 volt safety-related switchgear operating at the minimum degraded voltage dropout setting including tolerances. After identification, Entergy entered the issues into the corrective action program and performed several additional evaluations to verify adequate voltage to Class 1E motors, MOVs, static loads, and MCC control circuits.

  The performance deficiency was determined to be more than minor in accordance with IMC 0612, “Power Reactor Inspection Reports,” Appendix B, and Appendix E, example 3j, because the engineering calculation error resulted in a condition where there was a reasonable doubt on the operability of a system. In addition, the performance deficiency was associated with the design control attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The team 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 finding was determined to be of very low safety significance because it was a design deficiency confirmed not to result in a loss of operability.

  The finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Operating Experience, because Entergy did not systematically and effectively collect, evaluate, and implement relevant internal and external operating experience in a timely matter. Specifically, Entergy did not systematically and effectively evaluate NRC Regulatory Issue Summary 2011-12, Revision 1, Adequacy of Station Electric Distribution System Voltages. [P.5] (Section 1R21.2.1.1.b.2)

- Green. The team identified a finding of very low safety significance (Green) involving a non-cited violation of 10 CFR Part 50, Appendix B, Criterion XI, “Test Control,” because Entergy did not verify the adequacy of the safety-related battery test program. Specifically, Entergy did not adequately account for the effects of elevated temperature in the immediate vicinity of the No. 33 125 volts, direct current (Vdc) battery to ensure accurate and up-to-date determination of the battery’s expected service life, in accordance with the vendor manual. After identification, Entergy entered this issue into the corrective action program and contacted the battery vendor for additional guidance.

The performance deficiency was determined to be more than minor because it was associated with the design control attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The team 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 finding was determined to be of very low safety significance because it was a design deficiency confirmed not to result in a loss of operability.

This finding was not assigned a cross-cutting aspect because it was a historical design issue not indicative of current performance. Specifically, the associated vendor technical manual guidance was not changed within the last 3 years and there was no recent operating experience that was directly applicable to the performance deficiency. (Section 1R21.2.1.2)

- Green. The team identified a finding of very low safety significance involving a non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," because Entergy did not promptly identify and correct a condition adverse to quality. Specifically, in April 2002, Entergy initiated a corrective action condition report (CR) to evaluate and document the seismic adequacy of a 138KV transmission tower, located in close proximity to the Unit 2 emergency diesel generator (EDG) building; however, Entergy staff closed the CR without adequately evaluating and documenting the seismic qualification concern. Entergy's short-term corrective actions included initiating a corrective action CR and performing a seismic qualification evaluation.

  The team determined that the inadequate resolution of the condition adverse to quality is a performance deficiency that was within Entergy's ability to foresee and correct. The performance deficiency was determined to be more than minor in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, and Appendix E, example 3j, because the engineering calculation error resulted in a condition where there was a reasonable doubt on the operability of a system. In addition, the performance deficiency was associated with the protection against external factors (seismic) attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems (the EDGs, in particular) that respond to initiating events to prevent undesirable consequences. The team 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 finding was determined to be of very low safety significance because it was a qualification deficiency confirmed not to result in a loss of operability.

  The finding has a cross-cutting aspect in the area of Human Performance, Documentation, because Entergy did not create and maintain complete, accurate, and up-to-date documentation. Specifically, Entergy did not create and maintain complete, accurate, and up-to-date design basis documentation to ensure that an adverse seismic II/I interaction would not result in the loss of the EDG safety function following a seismic event. [H.7] (Section 1R21.2.1.3)

Other Findings

None

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Component Design Bases Inspection (IP 71111.21)

.1 Inspection Sample Selection Process

The team selected risk significant components for review using information contained in the Indian Point Nuclear Generating (Indian Point) Units 2 and 3 Probabilistic Risk Assessments (PRAs) and the U.S. Nuclear Regulatory Commission's (NRC) Standardized Plant Analysis Risk (SPAR) models for Indian Point Units 2 and 3. Additionally, the team referenced the Plant Risk Information e-Books (PRIBs) for Indian Point Units 2 and 3 in the selection of potential components for review. In general, the selection process focused on components that had a Risk Achievement Worth (RAW) factor greater than 1.3 or a Risk Reduction Worth (RRW) factor greater than 1.005. The components selected were associated with both safety-related and non-safety related systems, and included a variety of components such as pumps, tanks, diesel engines, batteries, relays, circuit breakers, and valves.

The team initially compiled a list of components based on the risk factors previously mentioned. Additionally, the team reviewed the previous component design bases inspection (CDBI) reports and excluded the majority of those components previously inspected. The team then performed a margin assessment to narrow the focus of the inspection to 22 components and 5 operating experience (OE) items. The team selected the Unit 2 and Unit 3 main steam and feedwater (FW) piping containment penetrations and an OE sample associated with containment design pressure to review for large early release frequency (LERF) implications. The team's evaluation of possible low design margin included consideration of original design issues, margin reductions due to modifications, or margin reductions identified as a result of material condition/equipment reliability issues. The assessment also included items such as failed performance test results, corrective action history, repeated maintenance, Maintenance Rule (a)(1) status, operability reviews for degraded conditions, NRC resident inspector insights, system health reports, and industry OE. Finally, consideration was also given to the uniqueness and complexity of the design and the available defense-in-depth margins.

The team performed the inspection as outlined in NRC Inspection Procedure (IP) 71111.21. This inspection included walkdowns of selected components; interviews with operators, system engineers, and design engineers; and reviews of associated design documents and calculations to assess the adequacy of the components to meet design basis, licensing basis, and risk-informed beyond design basis requirements. Summaries of the reviews performed for each component and OE sample are discussed in the subsequent sections of this report. Documents reviewed for this inspection are listed in the Attachment.

.2 Results of Detailed Reviews

.2.1 Results of Detailed Component Reviews (22 samples)

.2.1.1 Unit 2 Degraded Voltage Relays

a. Inspection Scope

The team reviewed related design basis support documentation, drawings, Technical Specifications (TSs), and the Updated Final Safety Analysis Report (UFSAR) to identify the function and capability of the 480 volt (V) vital bus loss of voltage (LOV) and degraded voltage protection scheme. The team reviewed the protective relay setting calculations for the LOV and degraded voltage relays (DVRs) and applicable time delay settings to ensure that Entergy used applicable industry standards in determining the channel uncertainty for the relay monitoring circuits which Entergy used to determine the LOV and DVR setpoints and time delays, including the TS nominal trip setpoints and allowable calibration values. The team verified that the DVR and LOV relays were set in accordance with calculations, and that associated periodic TS surveillance and calibration preventive maintenance (PM) activities were consistent with calculation assumptions, associated time delays, and setpoint accuracy calculations. The team reviewed plant/grid interfaces and requirements and the auxiliary power system load flow and voltage drop calculations to ensure that the LOV and DVR settings and time delays were appropriate and adequate to protect the 480V vital buses from a LOV or degraded voltage condition other than the normal bus voltage transients associated with a design basis event. The team evaluated selected portions of Entergy's response to NRC Generic Letter (GL) 2006-02, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power," to determine the station's interface and coordination with the transmission system operator for plant voltage requirements. The team also performed several visual non-intrusive inspections of the relay cabinets, indications, and 480V switchgear to assess the installation, configuration, material condition, and potential vulnerability to hazards.

b. Findings

1. Protection of Class 1E Loads during Normal Voltage and Sustained Degraded Voltage Conditions

Introduction. The team identified a finding of very low safety significance (Green) involving a non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," because Entergy did not verify the adequacy of their electrical design. Specifically, Entergy failed to verify, in design basis calculations for Unit 2, that protective device settings do not allow connected Class 1E loads to become damaged or unavailable: (a) under normal voltage conditions during a design basis event; or (b) for a sustained degraded voltage and subsequent reconnection to the emergency diesel generators (EDGs) concurrent with: (1) a design basis event for the degraded voltage time delay of 8.4 - 11.4 seconds; and (2) a non-accident shutdown for the degraded voltage time delay of 153 - 207 seconds. Additionally, Entergy failed to periodically test the thermal overload (TOL) relays protecting safety-related MOVs to ensure that degradation or trip setpoint drift does not affect the reliability or availability of mitigating systems when called upon to operate.

Description. In June 1977, based on industry events involving degraded offsite power systems, the NRC issued letters to all operating nuclear power plant licensees requesting that licensees install degraded voltage protection schemes (DVRs for second level of voltage protection) for the station electric power system. The NRC Letter, "Statement of Staff Positions Relative to Emergency Power Systems for Operating Reactors," Position 1c(3) stated that the allowable duration of a degraded voltage at all distribution levels shall not result in failure of safety systems or components. NRC Regulatory Issue Summary (RIS) 2011-12, Revision 1, "Adequacy of Station Electric Distribution System Voltages," states in part that "the time delay chosen should be optimized to ensure that permanently connected Class 1E loads are not damaged under sustained degraded voltage conditions (such as a sustained degraded voltage below the DVR voltage setting(s) for the duration of the time delay setting)."

The team noted that, despite this guidance, Entergy did not have Unit 2 calculations to verify that connected Class 1E loads do not become damaged or unavailable: (a) under normal voltage conditions during a design basis event; or (b) for a sustained degraded voltage and subsequent reconnection to the EDGs concurrent with: 1) a design basis event for the degraded voltage time delay of 8.4 - 11.4 seconds, and 2) a non-accident shutdown for the degraded voltage time delay of 153 - 207 seconds. Specifically, Entergy did not verify that the protective devices and/or TOL relays, as applicable, would not trip on safety-related running or starting loads, such as motors and critical MOVs, during an accident under the voltage conditions described above. The team noted that Entergy did not verify that the trip setpoint of the protection devices was established with all uncertainties resolved in favor of completing the safety-related action. In addition, Entergy did not adequately evaluate control power circuits for the Class 1E accident-initiated motors and MOVs to ensure that their control circuit fuses would not fail (blow) if the starter did not have sufficient voltage to pick-up during the sustained degraded voltage delay period.

Additionally, Entergy failed to periodically test the TOL relays protecting safety-related MOVs to ensure that degradation or trip setpoint drift does not affect the reliability or availability of mitigating systems when called upon to operate. Regulatory Guide 1.106, Revision 1, "Thermal Overload Protection for Electric Motors on Motor-Operated Valves," specified methods acceptable to the NRC staff for complying with Appendix B, Criterion XI, "Test Control," with regard to the application of TOLs that are integral with the motor starter for electric motors on MOVs. These methods would ensure, in part, that the TOLs would not needlessly prevent the motor from performing its safety-related function. The guide allowed the licensee to leave the TOL in the MOV circuit continuously, provided that they were sized properly and periodically tested, in order to ensure continued functional reliability and the accuracy of the trip setpoint. Without periodic testing to determine the susceptibility to trip setpoint drift, Entergy had not verified that the applications were adequate to ensure the safety function would be met for a design basis event, which can subject the MOVs to transient voltage dips, possible stall conditions, and degraded voltage. The team identified several MOVs where the TOL setting had little or no margin for setpoint drift in order to ensure that the safety function would be met under all design basis conditions.

On August 18, 2015, Entergy initiated condition report (CR) CR IP2-2015-03688 for the sustained degraded voltage case. Entergy performed a preliminary evaluation (EC-59116) of Unit 2 safety injection (SI) actuated motors and the critical MOVs that operate during the first seconds of the accident and identified that the upstream fuses on Unit 2 MOVs 746 and 747 could potentially trip during a design basis event with a concurrent sustained degraded voltage condition. The MOVs are normally closed and have a safety function to go open during a SI to provide low pressure reactor coolant system (RCS) injection from the residual heat removal (RHR) pumps. Since Entergy no longer had reasonable assurance that the two MOVs in question would provide their associated design basis function under all conditions, operations declared both MOVs and both trains of RHR inoperable and appropriately entered TS Limiting Condition for Operation (LCO) 3.0.3 (an 8-hour shutdown action statement) on August 18, 2015. On August 18, 2015, Entergy implemented EC-59435 to replace both fuses prior to the expiration of the TS LCO. Operations were in the TS 3.0.3 LCO for approximately 48 minutes. Engineering determined that there were no protection coordination issues with the new fuses. After maintenance replaced both old fuses, operations declared both RHR trains operable.

On August 19, 2015, Entergy initiated corrective action CR IP2-2015-3725 to include a past operability review for the fuses previously installed in the MOV 746 and MOV 747 control circuits during normal voltage and sustained degraded voltage conditions. On September 9, 2015, Entergy completed their past operability evaluation, “Past Operability Review of MOV-746 and 747 with Shawmut Type A4J30 Fuses during Normal and Emergency Conditions,” Revision 1. For the normal voltage case, Entergy determined that the MOVs were operable and would have performed their safety function if called upon based on the margin to the fuse trip setting, review of MOV locked rotor current traces, review of fuse coordination plots, and historical MOV performance (including testing). The team performed an independent corrective action program (CAP) database search dating back to January 2000 and an Indian Point Unit 2 Licensee Event Report (LER) search dating back to January 1980 and found no evidence to support that either of the RHR MOV fuses in question had tripped under any plant conditions (including shutdown, event response, testing, or post-maintenance testing). Based on this historical review, an evaluation of the operability evaluation, and discussions with NRC MOV subject matter experts, the team determined that Entergy’s past operability determination for the normal voltage case was adequate.

For the sustained degraded voltage case, however, Entergy’s evaluation stated “It has also been demonstrated that while tripping of these fuses under sustained degraded voltage conditions could occur, the possibility is very remote. Sufficient barriers, e.g. Con Edison’s Real Time Contingency Analysis Program, Load Tap Changer operation, and proceduralized operator response to 480V Safeguards Bus under voltage alarms in the Central Control Room, were in place to ensure past operability of MOV-746 and 747 with the original A4J30 fuses.”

NRC IMC 0326, "Operability Determinations & Functionality Assessments for Conditions Adverse to Quality or Safety," Section C.06 states, "the use of PRA or probabilities of occurrence of accidents or external events is not consistent with the assumption that the event occurs, and is not acceptable for making operability decisions." In addition, the team noted that Position 1 of the NRC 1977 letter states that, "The operating procedures and guidelines utilized by electric utilities and their interconnected cooperative organizations minimize the probability for the above conditions to occur. However, since degradation of an offsite power system that could lead to or cause the failure of redundant safety-related electrical equipment is unacceptable, we (NRC) require the additional safety margins associated with implementation of the protective measures…." The team concluded that Entergy did not provide a sufficient technical basis for MOV-746 and 747 past operability (with the originally installed Shawmut Type A4J30 fuses) under postulated design basis accidents and concurrent degraded grid voltage conditions. The failure to ensure MOV-746 and 747 would function under all assumed design basis conditions is an NRC-identified performance deficiency.

The team noted that Entergy had missed several recent opportunities to identify and correct the above performance deficiency prior to this NRC inspection. Specifically, in April 2012, Entergy completed their internal review of NRC RIS 2011-12, Revision 1, but did not fully evaluate the issue, assess potential Entergy shortcomings relative to the guidance, and implement timely corrective actions, as appropriate. In addition, the ongoing industry discussions involving the guidance provided in NRC RIS 2011-12 and the numerous associated CDBI findings at other sites during the previous 3 years also represent missed opportunities. The team concluded that the electrical design engineering staff's awareness and application of the industry OE regarding degraded voltage calculations and assumptions during the 2015 CDBI demonstrated that the above deficiencies were indicative of current performance.

Analysis. The performance deficiency associated with this finding was that Entergy did not verify the adequacy of their design, with respect to postulated design basis events, under normal and degraded grid voltage conditions. Specifically, some protective device settings may inadvertently permit connected Class 1E loads to become damaged or unavailable. This performance deficiency was more than minor because it was similar to NRC IMC 0612, Appendix E, Examples of Minor Issues, example 3.j. Specifically, the absence of an engineering design analysis provided reasonable doubt of operability of safety-related motor-operated valves MOV-746 and 747 under normal grid voltage conditions and under postulated DBA and concurrent degraded grid voltage conditions. In addition, the finding was associated with the design control attribute of the Mitigating Systems cornerstone and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The team evaluated the finding in accordance with IMC 0609, Appendix A, The Significance Determination Process for Findings at Power, Exhibit 2 – Mitigating Systems Screening Questions. For the normal voltage case, Entergy determined that the MOVs were operable and would have performed their safety function. An independent review by the team determined that this operability assessment was adequate. However, for the degraded voltage case, the originally installed fast-acting Shawmut Type A4J30 fuses would likely actuate prior to the MOVs successfully stroking open. This condition results in the potential inoperability of both trains of low pressure injection/recirculation for longer than the TS LCO allowed outage time and requires a detailed risk evaluation (DRE).

The Region I senior reactor analyst (SRA) performed the DRE using Systems Analysis Programs for Hands-On Evaluation (SAPHIRE) Revision 8.1.2 and the SPAR Model for Indian Point Unit 2, Model Version 8.19, (limited use model, dated 8/28/15). Based upon recent generic thermo-hydraulic analyses the IP2 SPAR model was revised by Idaho National Laboratories (INL) to more accurately credit mitigation of medium break loss-of-coolant accidents (MLOCAs) using the safety injection pumps and associated high pressure recirculation piggyback functions achieved through operator action. The SRA made additional changes to the model to conservatively bound and evaluate the risk significance of this performance deficiency, including: basic events LPI-MOV-CC-746 and LPI-MOV-CC-747 were set to TRUE (failure to open); the exposure time was set at one year; and the truncation set at 1E-12. From the initial SPAR model results, only the large, medium and small break LOCA event tree sequences were considered for further evaluation because only these events would lead to a prompt SI system actuation signal and subsequent emergency bus loading of safety-related MOVs and pumps. The inclusion of small break LOCAs is conservative, in that, not all small break LOCAs would immediately result in an SI actuation signal. Accordingly, the cumulative conditional core damage probability for these LOCA sequences was calculated at 5.5E-6. To account for the consequential degraded grid voltage condition, this CCDP value was multiplied by 2E-2, consistent with a 2002 NRC Office of Research study (ML022120661) that approximated the probability of a LOOP given a LOCA has occurred. As a result, the SRA determined that the estimated increase in core damage frequency (CDF) associated with this performance deficiency is 1E-7/year or very low safety significance (Green). As previously stated, this risk significance approximation is overly conservative and considered a worst case bounding evaluation. The dominant core damage sequences involve large break LOCAs where early low pressure injection is needed, but compromised by the assumed failure to open of injection valves MOV-746 and 747.

In accordance with IMC 0609 guidance, the bounding 1E-7/year delta CDF value warrants a review for potential LERF and external events contributions. Based upon the Indian Point Unit 2 being a pressurized water reactor with a large dry containment, this Type A finding screens out for LERF consideration based upon Table 5.2 of IMC 0609, Appendix H, “Containment Integrity Significance Determination Process.” Because the conditional event sequences of interest involve loss of coolant accidents, external events coincident with or contributing to these accidents would be of extremely low probability and considered beyond the plant’s design basis. Accordingly, there is no external event contribution to core damage risk for this issue.

The finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Operating Experience, because Entergy did not systematically and effectively, collect, evaluate, and implement relevant internal and external OE in a timely matter. Specifically, Entergy did not systematically and effectively evaluate NRC RIS 2011-12, Revision 1, “Adequacy of Station Electric Distribution System Voltages.” [P.5]

Enforcement. 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. The design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculations, or by the performance of a suitable testing program. Contrary to the above, from June 1977 to August 18, 2015, Entergy failed to verify through calculational methods that the protective device settings do not allow connected Unit 2 Class 1E loads to become damaged or unavailable during a design basis event under normal and degraded voltage conditions. Entergy's short-term corrective actions included initiating CRs, performing several additional evaluations to verify operability, declaring two valves inoperable, and replacing fuses to restore operability for the two MOVs in question. Because this violation is of very low safety significance and has been entered into Entergy's CAP (CR IP2-2015-03688 and CR IP2-2015-03725), this violation is being treated as a NCV consistent with Section 2.3.2.a of the NRC Enforcement Policy. (**NCV 05000247/2015007-01, Inadequate Design Verification That Protective Device Settings Do Not Allow Connected Class 1E Loads to Become Damaged or Unavailable Under Normal and Sustained Degraded Voltage Conditions during a Design Basis Event**)

.2 Adequacy of Voltage for Safety-Related Loads at the Degraded Voltage Relay Setpoint

Introduction. The team identified a finding of very low safety significance (Green) involving a non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," because Entergy had not verified the adequacy of their electrical design. Specifically, Entergy failed to verify, in design basis calculations and/or periodic testing, that adequate voltages would be available to all Unit 2 Class 1E motors, MOVs, static loads, and MCC control circuits and contactors powered from the 480V distribution system with the voltage at the 480V safety-related switchgear operating at the minimum degraded voltage dropout setting including tolerances.

Description. In June 1977, based on industry events involving degraded offsite power systems, the NRC issued letters to all operating nuclear power plant licensees requesting that licensees install degraded voltage protection schemes (DVRs for second level of voltage protection) for the station electric power system. On December 29, 2011, the NRC issued RIS 2011-12, Revision 1, "Adequacy of Station Electric Distribution System Voltages," to clarify the NRC staff's technical position on existing regulatory requirements regarding voltage studies necessary to support the DVR setpoint.

The NRC RIS stated in part that, "Licensee voltage calculations should provide the basis for their DVR settings, ensuring safety-related equipment is supplied with adequate voltage (dependent on equipment manufacturers design requirements), based on bounding conditions for the most limiting safety-related load (in terms of voltage) in the plant." The team noted that, despite the NRC RIS guidance, Entergy did not have calculations to verify that adequate voltages would be available to all Class 1E motors, MOVs, static loads, and MCC control circuits and contactors powered from the 480V distribution system with the voltage at the 480V safety-related switchgear operating at the minimum degraded voltage dropout setting including tolerances. Entergy had calculations that evaluated the Unit 2 480V switchgear motor loads and MOVs that would be actuated at the onset of a design basis event. However, Entergy had not evaluated the remaining safety-related motors, static loads, and MOVs primarily fed from MCCs 24A, 26A, 26AA, 26B, 26BB, 26C, 27A, and 29A at the degraded voltage setpoint.

Additionally, the team noted that in 2001, an Entergy safety system self-assessment initiated a corrective action CR (CR-2001-9275) related to the DVR dropout setting to assure adequate voltage to the 120V MCC control circuits for SI components under worst case loading conditions given that some MCC contactors would need to operate at lower voltages than the vendor specified. In response to this CR, Entergy developed calculation FEX-00180-00, MCC Control Circuits Voltage Evaluations, and performed a limited sample of testing on Size 1 and 2 MCC contactors to ensure adequate voltage to operate at the degraded voltage setpoint. The team noted that calculation FEX-00180-00 also recommended additionally testing of Size 3, 4 and 5 contactors; however, Entergy did not perform periodic testing of the Size 1 and 2 contactors at the lower voltages and did not perform the recommended additional testing for the Size 3, 4, and 5 contactors.

On August 18, 2015, Entergy entered these issues into their CAP as CR IP2-2015-03702 and CR IP2-2015-03706, respectively. Entergy performed preliminary evaluations under EC-59123 and EC-59368 of the motors, MOVs, static loads, and MCC control circuits and concluded that all evaluated equipment remained operable, although five MOVs were determined to have reduced margins relative to Indian Point Unit 2's design basis DVR setpoint (operable but nonconforming). Entergy also identified that most of the motors supplied from MCCs had less than the vendor recommended running voltages. Entergy determined that all the contactors that they had previously credited using the one-time testing were acceptable without crediting the testing at the lower voltages except for two of the Size 5 contactors. Entergy determined that these two Size 5 contactors, which support the primary auxiliary building (PAB) exhaust fan and the containment building purge fans, require additional testing. Based on an independent review of Entergy's revised calculations, operability determinations for the nonconforming components, and the available margin, the team concluded that Entergy's evaluations and short-term corrective actions were adequate and provided reasonable assurance of operability pending final resolution.

The team noted that Entergy missed several recent opportunities to identify and correct the above performance deficiencies prior to the team's identification. Specifically, in April 2012, Entergy completed their internal review of NRC RIS 2011-12, Revision 1, but did not apply sufficient engineering rigor to fully evaluate the issue, assess potential Entergy shortcomings relative to the guidance, and implement timely corrective actions, as appropriate. In addition, the ongoing industry discussions involving the guidance provided in NRC RIS 2011-12 and the numerous associated CDBI findings at other sites during the previous 3 years also represent missed opportunities. The team concluded that the electrical design engineering staff's awareness and application of the industry OE regarding degraded voltage calculations and assumptions during the 2015 CDBI demonstrated that the above deficiencies were indicative of current performance.

Analysis. The performance deficiency associated with this finding was that Entergy did not verify the adequacy of their design with respect to ensuring in design basis calculations and/or periodic testing, that adequate voltages would be available to all Class 1E motors, MOVs, static loads, and MCC control circuits and contactors with the 480V safety-related switchgear operating at the minimum DVR dropout setting. The performance deficiency was determined to be more than minor in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, and Appendix E, example 3j, because the engineering calculation error resulted in a condition where there was a reasonable doubt on the operability of a system. In addition, the performance deficiency was associated with the design control attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The team 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 finding was determined to be of very low safety significance because it was a design deficiency confirmed not to result in a loss of operability.

The finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Operating Experience, because Entergy did not systematically and effectively, collect, evaluate, and implement relevant internal and external OE in a timely matter. Specifically, Entergy did not systematically and effectively evaluate NRC RIS 2011-12, Revision 1, "Adequacy of Station Electric Distribution System Voltages." [P.5]

<u>Enforcement</u>. 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires in part, that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. The design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program. Contrary to the above, from June 1977 to August 18, 2015, Entergy failed to verify the adequacy of the design to assure that adequate voltages would be available to all Unit 2 Class 1E motors, MOVs, static loads, and MCC control circuits and contactors. Entergy's short-term corrective actions included initiating corrective action CRs and performing several additional evaluations to verify adequate voltage to Class 1E motors, MOVs, static loads, and MCC control circuits. Because this violation is of very low safety significance and has been entered into Entergy's CAP (CR IP2-2015-03702 and CR IP2-2015-03706), this violation is being treated as a NCV consistent with Section 2.3.2.a of the NRC Enforcement Policy. (**NCV 05000247/2015007-02, Inadequate Design Verification That Adequate Voltages Would be Available to All Class 1E Motors, MOVs, Static Loads, and MCC Control Circuits and Contactors at the Minimum DVR Dropout Setting**)

.2.1.2 <u>No. 33 125 Volt Direct Current Battery</u>

a. <u>Inspection Scope</u>

The team inspected the Unit 3 No. 33 station battery to assess its ability to meet the design basis function of providing a reliable source of direct current (DC) power to connected loads under operating, transient, and accident conditions. The team reviewed design calculations, drawings, and plant procedures to ensure that the battery was designed and operated in accordance with the design and licensing bases. The team also reviewed battery discharge tests to determine if the results enveloped the design discharge requirements and to verify that testing was in accordance with design calculations, TSs, and industry standards; and that the results confirmed acceptable performance of the battery. The team performed walkdowns of the battery, DC buses, battery chargers, and associated distribution panels to assess the material condition, configuration control, and operating environment. The team reviewed a sample of maintenance work orders, corrective action CRs, and system health reports to assess system performance and to ensure that Entergy identified and corrected deficiencies at an appropriate threshold. Finally, the team discussed the performance, design basis, and maintenance history of the battery with the responsible design and system engineers to assess the battery's overall reliability.

b. Findings

Introduction. The team identified a finding of very low safety significance (Green) involving a non-cited violation of 10 CFR, Part 50, Appendix B, Criterion XI, "Test Control," for Entergy's failure to verify the adequacy of the safety-related battery test program. Specifically, Entergy did not adequately account for the effects of elevated temperature in the immediate vicinity of the Unit 3 No. 33 125 volts, direct current (Vdc) battery to ensure accurate and up-to-date determination of the battery's expected service life, in accordance with the vendor manual.

Description. Battery cell design assumes that for maximum battery life the batteries are located in a temperature environment of 77ºF. Battery No. 33 is located in the No. 31 EDG room, where room temperature was consistently measured between 84ºF and 91ºF, and at times even higher. Elevated temperature above the nominal 77ºF temperature cause the battery to degrade at an accelerated rate, and must be accounted for in the expected service life of the battery. Specifically, the battery vendor technical manual, Section 4.3, states in part, "Operation at higher temperature increases capacity, but reduces life approximately 50 percent for every 15F (9C) rise."

Performance testing is required every 5 years in accordance with Unit 3 TS 3.8.4.4 to verify adequate battery capacity and performance; however, Entergy performs the test every 4 years during refueling outages at Unit 3. The TSs also require more frequent testing when batteries show signs of degradation or once the battery reaches 85 percent of expected life. Entergy's Unit 3 battery testing adequately measured battery capacity and health to identify potential degradation; however, Entergy's battery testing and monitoring program did not derate the expected battery service life to account for operation at higher temperatures. Unit 3 is committed to Institute of the Electrical and Electronics Engineers (IEEE) Standard 450-1995.

The 1995 version does not contain the more recent specific requirements (IEEE 450-2002 and IEEE 450-2010) for age degradation due to elevated temperature, but industry technical guidance documents, including their specific battery vendor manual provides guidance on elevated temperature degradation. The team performed independent calculations of the thermal aging of the No. 33 battery using the formula in IEEE 450-2010, Annex H. The team calculated that the No. 33 battery's expected life had been reduced from 20 years to 12.1 years and that increased testing (every 2 years vice every 5 years based on the most recent capacity test) was required starting at 10.3 years (85 percent of expected life).

Based on this calculation, battery No. 33 reached 85 percent expected life on July 16, 2015; however, Entergy did not derate the battery's expected life and were unaware that the battery had entered the 2-year increased testing periodicity required by TS 3.8.4.4. The team noted that Entergy satisfactorily completed a modified performance test on the No. 33 battery on March 5, 2015, and that the next performance test was not required until March 2017. The team determined that the No. 33 battery remained operable based on recent test results and that Entergy had not missed any increased frequency TS-required tests to date. On August 18, 2015, Entergy documented this issue in CR IP3-2015-04366 and contacted the battery vendor for additional guidance.

Analysis. The team determined that the failure to account for elevated battery room temperature effects on the battery's expected service life was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the design control attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The team 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 finding was determined to be of very low safety significance because it was a design deficiency confirmed not to result in a loss of operability.

This finding was not assigned a cross-cutting aspect because it was a historical design issue not indicative of current performance. Specifically, the associated vendor technical manual guidance was not changed within the last 3 years and there was not recent OE that was directly applicable to the performance deficiency.

Enforcement. 10 CFR Part 50, Appendix B, Criterion XI, "Design Control," requires, in part, that a test program shall be established to assure that all testing required to demonstrate that structures, systems, and components (SSCs) will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. Contrary to the above, prior to August 18, 2015, Entergy did not establish an adequate Unit 3 test program incorporating battery service life degradation calculations for elevated temperature to ensure increased testing would be performed on station batteries when required. Entergy's short-term corrective actions included initiating a corrective action CR and contacting the battery vendor for additional guidance.

Because this violation is of very low safety significance and has been entered into Entergy's CAP (CR IP3-2015-04366), this violation is being treated as a NCV consistent with Section 2.3.2.a of the NRC Enforcement Policy. (**NCV 05000286/2015007-03, Failure to Account for Elevated Battery Room Temperature Effects on Battery Service Life**)

.2.1.3 Unit 2 Emergency Diesel Generator Fuel Oil Transfer Pumps

a. Inspection Scope

The team inspected the Unit 2 fuel oil transfer pumps (FOTPs) to evaluate whether they were capable of meeting their design basis and operational requirements to provide fuel oil to each of the three EDG fuel oil day tanks. The team reviewed the test methodology and evaluated the ability of the pumps to deliver flow rates greater than the consumption rate of the EDGs. The team evaluated the available net positive suction head (NPSH) based on the pump's location. The team performed several walkdowns of the FOTP motors, located above the fuel oil storage tank (FOST), and interviewed system and design engineers to assess the material condition, operating environment, and configuration control. Finally, the team reviewed corrective action documents and system health reports to evaluate whether there were any adverse operating trends and to assess Entergy's ability to evaluate and correct problems.

b. Findings

Introduction. The team identified a finding of very low safety significance (Green) involving a non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," because Entergy did not promptly identify and correct a condition adverse to quality. Specifically, in April 2002, Entergy initiated a corrective action CR to evaluate and document the seismic adequacy of a 138KV transmission tower, located in close proximity to the Unit 2 EDG building, but the Entergy staff closed the CR without adequately evaluating, documenting, and resolving the seismic qualification concern.

Description. During a walkdown of Unit 2 FOTP motors, the team noticed that transmission tower W was located in close proximity to the building housing all three Unit 2 EDGs. The team also noticed that transmission tower V was located in very close proximity to the opposite side of the same EDG building. The team requested the seismic analysis for both transmission towers; however, Entergy's staff could not find any associated analyses in their document management system. Engineering's related document search found a 2002 CR (CR IP2-2002-03770) created to evaluate and document the seismic adequacy of both towers. However, the team identified that on April 10, 2002, civil engineering closed the 2002 CR without adequately evaluating or documenting the condition. Entergy informed the team that they had recently contracted an independent engineering firm to provide a non-safety related evaluation of tower W titled "Tower W Overturning Assessment for FLEX Seismic and Tornado Events." The team noted that the draft calculation had undergone several recent Entergy engineering reviews and that Entergy preliminarily concluded that the interaction ratio for the tower W anchorage had very little margin. The draft calculation for tower W preliminarily determined that seismic forces govern because the forces exerted on the anchor bolts as a result of an earthquake were greater (by 31 percent) than the forces exerted on the same bolts by the assumed wind speed. Entergy could not find any documentation to support that the transmission towers were designed for a seismic event; rather, it appeared that the transmission towers were designed for high wind, not for an earthquake. Based on the very low margin on tower W, and that it appeared as if the transmission towers were originally designed for wind loading (while seismic forces were preliminarily determined to be more limiting), the team had a reasonable doubt of operability for tower V regarding its seismic adequacy. Based on the team's concerns, Entergy initiated CR IP2-2015-03721 on August 18, 2015, to scope transmission tower V into the reconstituted seismic analysis associated with transmission tower W and document the analysis in a safety-related calculation, as appropriate.

The team noted that, although the work was ongoing at the time of the inspection, that Entergy had applied sufficient engineering rigor to their seismic evaluation of transmission tower W. However, the team noted that Entergy had missed a recent opportunity to evaluate and document in an approved calculation the seismic adequacy of transmission tower V. On September 2, 2015, engineering completed calculation IP-CALC-15-00079, "Tower V Overturning Assessment for Seismic and Tornado Events," to evaluate tower V's anchorage to the concrete foundation to determine if overturning would occur during a seismic or tornado design basis event. Based on this calculation, engineering determined that tower V's anchorage to the concrete foundation would not suffer a catastrophic failure during a seismic or tornado design basis event. The team independently reviewed Entergy's calculation and determined that it adequately evaluated the seismic qualification of tower V.

<u>Analysis</u>. The team determined that the inadequate resolution of the condition adverse to quality was a performance deficiency that was within Entergy's ability to foresee and correct. Specifically, Entergy did not adequately evaluate and document the seismic adequacy of tower V. The performance deficiency was determined to be more than minor in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix E, example 3j, because the engineering calculation error resulted in a condition where there was a reasonable doubt on the operability of a system. In addition, the performance deficiency was associated with the protection against external factors (seismic) attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems (the EDGs, in particular) that respond to initiating events to prevent undesirable consequences. The team 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 finding was determined to be of very low safety significance because it was a qualification deficiency confirmed not to result in a loss of operability.

The team determined that the issue had a cross-cutting aspect in the area of Human Performance, Documentation, because station personnel did not create and maintain complete, accurate, and up-to-date documentation. Specifically, Entergy did not create and maintain complete, accurate, and up-to-date design basis documentation demonstrating that an adverse seismic II/I interaction would not result in the loss of the EDG safety function concurrent with a loss of offsite power following a seismic event. This performance deficiency was considered current performance because Entergy personnel missed a recent opportunity to identify and evaluate the concern during their post-Fukushima reviews, especially considering that they were evaluating the seismic adequacy of transmission tower W which, similar to tower V, was located in close proximity to the EDG building. [H.7]

Enforcement. 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected. Contrary to the above, since April 10, 2002, Entergy staff did not correct a condition adverse to quality regarding the seismic adequacy of a transmission tower that could potentially adversely impact the Unit 2 EDGs. Entergy's short-term corrective actions included initiating a corrective action CR and performing a seismic qualification evaluation. Because this violation is of very low safety significance and has been entered into Entergy's CAP (CR IP2-2015-03721), this violation is being treated as a NCV consistent with Section 2.3.2.a of the NRC Enforcement Policy. (**NCV 05000247/2015007-04, Less Than Adequate Corrective Actions Associated with an Evaluation of the Seismic Adequacy of a 138KV Transmission Tower Located Near the Unit 2 EDG Building**)

.2.1.4 Unit 2 Residual Heat Removal Supply from Reactor Coolant System Isolation Valve (AC-MOV-731)

a. Inspection Scope

The team inspected Unit 2 MOV AC-MOV-731 to verify that it was capable of performing its design functions. The MOV has an open function to support shutdown cooling via the RHR heat exchangers (HXs) and a closed function to support containment isolation during normal power operation. The team reviewed the UFSAR, calculations, and procedures to identify the design basis requirements of the valve. The team also reviewed accident system alignments to ensure that the MOV's operation was consistent with the design and licensing bases assumptions. The team also reviewed associated testing procedures and valve specifications to ensure consistency with design basis requirements. The team reviewed periodic verification diagnostic test results and stroke test documentation to verify that acceptance criteria were met and consistent with the design basis. Additionally, the team verified that the MOV's safety functions were maintained in accordance with NRC GL 89-10 guidance by reviewing torque switch settings, performance capability, and design margins. Finally, the team reviewed corrective action documents to verify that Entergy appropriately identified and resolved deficiencies and properly maintained the valve.

b. Findings

No findings were identified.

.2.1.5 Main Steam and Feedwater Piping Containment Penetrations in the Unit 2 and Unit 3 Auxiliary Feedwater Buildings (2 samples)

a. Inspection Scope

The team inspected the Unit 2 and Unit 3 main steam and FW piping penetrations to verify that they were capable of performing their design basis function. Double barrier piping penetrations are provided for all piping passing through the containment. A connection to the penetration sleeve is provided to allow continuous pressurization of the compartment formed between the piping and the embedded sleeve. In the case of the main steam and FW piping penetrations, the pipe was insulated and cooling was provided to reduce the concrete temperature adjoining the embedded sleeve. Penetration cooling was provided by air-to-air HXs. The team reviewed applicable portions of the UFSAR, applicable drawings, and procedures to verify that the design basis and design assumptions were appropriately translated into design documents and procedures. The team reviewed design and operational requirements with respect to the penetrations temperature and cooling requirements and reviewed a sample of temperature and pressure trend data to verify that Entergy maintained equipment performance within acceptable limits. The team also interviewed the system and design engineers and plant operators, and performed several walkdowns of the penetrations (including taking independent temperature readings) to assess the material condition, operating environment, and configuration control.

b. Findings

No findings were identified.

.2.1.6 Service Water Pump No. 23

a. Inspection Scope

The team inspected the No. 23 service water (SW) pump to evaluate whether it was capable of meeting its design basis and operational requirements to provide cooling water to the reactor vessel under transient and postulated accident conditions. The team evaluated the ability of the SW pump to deliver the design and licensing bases flow rates to all safety-related equipment. The team evaluated the available NPSH based on the pump's location and submergence. The team reviewed monthly testing, full flow testing, and in-service test (IST) results to verify that the pump performance bounded the flow requirements in the safety analysis and to determine if Entergy had adequately evaluated the potential for pump degradation. The team performed several walkdowns of the pump, including the associated pump motor and other supporting SSCs, and interviewed system and design engineers to assess the material condition, operating environment, and configuration control.

Finally, the team reviewed corrective action documents and system health reports to evaluate whether there were any adverse operating trends and to assess Entergy's ability to evaluate and correct problems.

b. Findings

No findings were identified.

.2.1.7 Safety Injection Pump No. 23

a. Inspection Scope

The team inspected the No. 23 SI pump to verify that it was capable of performing its design basis function. The SI pumps are designed to supply high pressure borated emergency core cooling water from the refueling water storage tank (RWST) to the reactor vessel following a loss-of-coolant accident (LOCA). The team reviewed applicable portions of the UFSAR, TSs, the SI system design basis document (DBD), drawings, and procedures to verify that the design basis and design assumptions were appropriately translated into design documents and procedures. The team reviewed design and operational requirements with respect to pump flow rate, developed head, and tested system flowrate. The team reviewed a sample of surveillance test results to verify that pump performance met the acceptance criteria and that the criteria were consistent with design basis assumptions. The team reviewed pump data trends for vibration to ensure that Entergy maintained equipment performance within acceptable vibration limits. This review also included the adequacy of the pump head capacity curve for in-service testing as well as the required NPSH curve. The team also reviewed emergency operating procedures (EOPs) to verify that selected operator actions could be accomplished and were consistent with the system design assumptions.

The team reviewed motor feeder ampacity, short circuit capability, breaker amptector setting, and breaker coordination studies to assess the adequacy of the circuit protection under normal and faulted conditions and to ensure that trip setpoints would not permit the feeder breaker to trip during the pump motor's highest loading conditions. The team reviewed the calculated available motor voltage to confirm the availability and capability of the pump to perform its safety function under the most limiting conditions. The team reviewed motor control wiring diagrams to verify compliance with system operation requirements and evaluated the electrical separation to ensure that the redundancy of safety divisions was not compromised. The team also performed several walkdowns of the SI pump to assess the material condition, operating environment, and configuration control. Finally, the team reviewed a sample of associated corrective action CRs, and the latest system health report to determine if there were any adverse operating trends and to ensure that Entergy adequately identified and addressed deficiencies.

b. Findings

No findings were identified.

.2.1.8 Unit 3 Auxiliary Feedwater Flow and Cutback Controller

a. Inspection Scope

The team inspected the auxiliary feedwater (AFW) system flow and cutback control loops associated with auxiliary boiler feed pumps (ABFPs) 31, 32, and 33 to verify that the control loops were capable of performing their design basis function. The control loop is designed to provide flow monitoring and automatic cutback control essential to the ABFPs to support automatic/manual control, prevent pump run-out conditions, and maintain minimum required FW flow to the steam generators during a loss of normal FW. The team reviewed TSs, operating procedures, and the UFSAR to determine the licensing and operating basis for the system. The team reviewed the design basis and loop accuracy calculations of the control loop and supporting flow and pressure instrument loops (F-1200, 1201, 1202, 1203; P-406A/B) to verify that the setpoints and tolerances met design requirements. The team reviewed recent plant modifications implemented to update the controllers due to obsolescence to verify that Entergy maintained design requirements. The team also reviewed loop calibrations and surveillances to verify that installed plant instrument loops reflected calculated design parameters and performed as intended. The team also performed walkdowns of accessible portions of the controller racks in the central control room and instrumentation in the ABFP room with the system engineer to assess the material condition, operating environment, and configuration control. The team also reviewed a sample of AFW-related equipment PM evaluation reports, corrective action CRs, the AFW system health report, and applicable test results to determine if there were any adverse operating trends and to ensure that Entergy adequately identified and addressed any adverse conditions.

b. Findings

No findings were identified.

.2.1.9 125 Volt DC Power Panel No. 33 Incoming Circuit Breaker

a. Inspection Scope

The team inspected the Unit 3, 125 Vdc power panel No. 33 incoming circuit breaker to assess its ability to supply power to the power panel to meet design basis requirements during plant transients and accidents. Power panel No. 33 feeds major loads, such as instrument bus inverters, switchgear control circuits, and DC motors. The team reviewed design calculations, drawings, and plant procedures to ensure that the incoming breaker for power panel No. 33 was designed and operated in accordance with the design and licensing bases. The team also reviewed surveillance tests to determine if the results enveloped the design requirements. The team performed walkdowns of the accessible portion of power panel No. 33 to access the environment and material condition. The team reviewed a sample of maintenance work orders, corrective action CRs, and system health reports to assess system performance and to ensure that Entergy identified and corrected deficiencies at an appropriate threshold. Finally, the team discussed the performance, design basis, and maintenance history with the responsible system engineers to assess the overall reliability.

b. Findings

No findings were identified.

.2.1.10 Emergency Diesel Generator No. 32 (Mechanical Review)

a. Inspection Scope

The team inspected the No. 32 EDG mechanical systems to determine if they were capable of supporting their design basis functions. Specifically, the team evaluated whether the mechanical support systems for the EDG would operate as required so that the EDG could provide power to the 6A 480V electrical bus during operational transients and design basis events. The team selected the EDG engine, fuel oil system, air start system, exhaust system, lubricating oil system, and jacket water cooling system for an in-depth review. The team reviewed the UFSAR, TSs, and the system DBD to identify the design basis requirements for the systems. The team also reviewed EDG surveillance test results, equipment operator logs, and operating procedures to ensure that the mechanical support systems were operating as designed and within the vendor design limits. The team verified that Entergy performed appropriate maintenance on the EDG and support systems and directly observed portions of the No. 32 EDG engine fuel injection pump rack inspection and linkage lubrication PM on August 7, 2015. The team interviewed system engineers and mechanics to evaluate past performance and operation of the EDGs. The team performed several field walkdowns of the all three Unit 3 EDGs to assess material conditions and compared system alignments, along with local and remote EDG control switch positions. Finally, the team reviewed corrective action documents and system health reports to evaluate whether there were any adverse operating trends and to assess Entergy's ability to evaluate and correct problems.

b. Findings

No findings were identified.

.2.1.11 Safety Injection Pump No. 23 Circuit Breaker

a. Inspection Scope

The team inspected the No. 23 SI pump supply circuit breaker to verify that it was capable of performing its design function. The team reviewed PM and testing procedures to determine if the 480V safety-related breaker was maintained in accordance with industry and vendor recommendations. The team reviewed the associated breaker closure and opening control logic diagrams and the 125 Vdc voltage calculations to ensure that adequate voltage would be available for the breaker open/close coils. The team reviewed short circuit and protection/coordination calculations to ensure that the breakers and switchgear were designed and maintained within the vendor interrupting close and latch ratings, and that selective coordination was assured for operability of safety-related equipment. The team also performed several visual non-intrusive inspections of the breaker and associated 480V switchgear to assess installation, configuration, material condition, and potential vulnerability to hazards.

b. Findings

No findings were identified.

.2.1.12 Residual Heat Removal Pump No. 32

a. Inspection Scope

The team inspected the No. 32 RHR pump to evaluate whether it was capable of meeting its design basis and operational requirements to provide cooling water to the reactor vessel under transient and postulated accident conditions. The team evaluated the ability of the pump to deliver the design and licensing bases flow rates at the maximum assumed reactor vessel backpressure. The team reviewed the NPSH for the RHR pump for suction from either the RWST or the containment sump to verify that adequate NPSH margin was available at minimum water levels and maximum flow rates. The team reviewed full flow testing and IST results to verify that the pump performance bounded the flow requirements in the safety analysis and to determine if Entergy had adequately evaluated the potential for pump degradation. The team performed several walkdowns of the pump, including supporting SSCs, and interviewed system and design engineers to assess the material condition, operating environment, and configuration control. Finally, the team reviewed corrective action documents and system health reports to evaluate whether there were any adverse operating trends and to assess Entergy's ability to evaluate and correct problems.

b. Findings

No findings were identified.

.2.1.13 Emergency Diesel Generator No. 22 (Electrical Review)

a. Inspection Scope

The team inspected the No. 22 EDG to verify that it was capable of meeting its design basis requirements. The design function of the No. 22 EDG is to provide standby power to safety-related 480V buses 2A and 3A when the preferred power supply is not available. The team reviewed loading and voltage regulation calculations, including the bases for brake horsepower values used, to verify that Entergy appropriately translated design bases and design assumptions into the design calculations and procedures. The team reviewed protection/coordination and short-circuit calculations to verify that the EDG was adequately protected with properly set protective devices during the test mode and emergency operation including short-circuit capability of the output breaker under worst fault conditions. The team reviewed analyses and surveillance testing to assess EDG operation under required operating conditions. The team reviewed calculations and technical evaluations to verify that: 1) steady-state and transient loading were within design capabilities; 2) adequate voltage would be present to start and operate connected loads; and 3) operation at maximum allowed frequency would be within the design capabilities.

The team reviewed the interfaces and interlocks associated with 480V buses 2A and 3A, including voltage protection schemes that initiate connection to the EDG to verify adequacy. The team reviewed EDG loading surveillance results, system health reports, component maintenance history, and Entergy corrective action CRs to assess EDG performance and to verify that Entergy appropriately identified and resolved potential EDG degradation and/or deficiencies. The team performed several visual non-intrusive inspections of the EDG to assess the installation, configuration, material condition, and potential vulnerability to hazards.

b. Findings

No findings were identified.

.2.1.14 Emergency Diesel Generator No. 22 (Mechanical Review)

a. Inspection Scope

The team inspected the No. 22 EDG mechanical systems to determine if they were capable of supporting their design basis functions. Specifically, the team evaluated whether the mechanical support systems for the EDG would operate as required so that the EDG could provide power to the 2A and 3A 480V electrical buses during operational transients and design basis events. The team selected the EDG engine, fuel oil system, air start system, exhaust system, lubricating oil system, and jacket water cooling system for an in-depth review. The team reviewed the UFSAR, TSs, and system DBD to identify the design basis requirements for the systems. The team also reviewed EDG surveillance test results, equipment operator logs, and operating procedures to ensure that the mechanical support systems were operating as designed and within the vendor design limits. The team verified that Entergy performed appropriate maintenance on the EDG systems and observed portions of the scheduled overhaul of the No. 22 EDG engine and support systems, including selected power-pack replacements, engine-driven pump gear backlash settings, and timing of valves and fuel injection equipment. The team interviewed system engineers to evaluate past performance and operation of the EDGs. The team performed several field walkdowns of all three Unit 2 EDGs before and after their respective surveillance runs. During the walkdowns, the team assessed material conditions and compared system alignments, along with local and remote EDG control switch positions. Finally, the team reviewed the EDG system health reports as well as selected corrective action CRs to determine the overall health of the No. 22 EDG systems and to determine if Entergy properly identified and corrected EDG deficiencies.

b. Findings

No findings were identified.

.2.1.15 Unit 2 Auxiliary Feedwater Pump Room Temperature Switches

a. Inspection Scope

The team inspected the ABFP room temperature switches (TC-1112S and TC-1113S) and associated instrument loops to verify that they were capable of performing their design basis function. The temperature switches and instrument loops are designed to isolate the steam supply lines to the turbine-driven ABFP via isolation valves (PCV-1310A/B) during a postulated high-energy line break (HELB) event. The team reviewed TSs, DBDs, and the UFSAR to determine the licensing and operating basis for the system. The team reviewed the design basis and accuracy calculations for the temperature sensors and instrument loop to verify that the setpoints and tolerances met design requirements. The team reviewed plant modifications implemented to update the instruments and installation hardware to verify that Entergy maintained design requirements. The team also reviewed instrument calibrations and surveillances to verify that installed plant equipment reflected calculated design parameters. The team also performed walkdowns of the ABFP room, temperature switches, and steam isolation valves and associated instrument wiring with the system engineer to assess the material condition, operating environment, and configuration control. The team also reviewed a sample of AFW-related equipment PM evaluation reports, corrective action CRs, the AFW system health report, and applicable test results to determine if there were any adverse operating trends and to ensure that Entergy adequately identified and addressed any adverse conditions.

b. Findings

No findings were identified.

.2.1.16 Unit 2 Condensate Storage Tank and Level Instrumentation

a. Inspection Scope

The team reviewed the design, testing, inspection, and operation of the Unit 2 condensate storage tank (CST) and its associated tank level instruments to evaluate whether it could perform its design basis function as the preferred water source for the ABFPs during postulated accident conditions. The team reviewed design calculations, drawings, and vendor specifications (including tank sizing, level uncertainty analysis, and pump vortex calculations) to evaluate the adequacy and appropriateness of design assumptions and operating limits. The team interviewed engineers, and reviewed instrument test records, alarm response procedures, and operating procedures to evaluate whether maintenance and testing were adequate to ensure reliable operation, and to evaluate whether those activities were performed in accordance with regulatory requirements, industry standards, and vendor recommendations. The team also conducted several walkdowns of the tank area to assess the material condition of the CST and associated instrumentation. The team also reviewed a modification to the tank's nitrogen blanket where vacuum breakers and pressure relief valves were installed to assure that the non-safety related nitrogen supply would not over-pressurize the tank or cause a vacuum condition that could result from sealing the tank's vent. Finally, the team reviewed corrective action documents and system health reports to evaluate whether there were any adverse trends associated with the CST and to assess Entergy's ability to evaluate and correct problems.

b. Findings

No findings were identified.

.2.1.17 Service Water Pump No. 36

a. Inspection Scope

The team inspected the No. 36 SW pump to verify that it was capable of meeting its design basis requirements. The Unit 3 SW system supplies cooling water from the Hudson River (the ultimate heat sink) to various components necessary for plant safety during normal operation and under abnormal and accident conditions. The essential SW header supplies cooling water to those components required to support the injection phase of a LOCA or a loss-of-offsite power event, and the non-essential SW header supplies cooling water to the components that are not immediately required to function during these conditions. The team reviewed the UFSAR, associated design basis documents, the vendor manual, plant drawings, and procedures to identify the most limiting requirements for the SW pump. The team reviewed a sample of test results to verify that pump performance met the acceptance criteria and that the criteria were consistent with the design basis. The team also reviewed NPSH calculations to ensure that the pump could successfully operate under the most limiting conditions. The team discussed the design, operation, and corrective maintenance of the pump with the engineering staff to gain an understanding of the performance history and overall component health. The team performed several walkdowns of the SW pumps and accessible SW piping to assess the material condition, operating environment, and configuration control.

The team reviewed the pump's location and a plant modification that added an intake enclosure building surrounding the SW pump motors that were originally designed to operate outdoors. The team assessed the material condition of the enclosure's ventilation system, its safety designation, and the capability of the SW pump motors to operate in the building's ambient conditions, and the effect of ambient conditions on SW pump motor life. The team also reviewed the maintenance and operating history of the No. 36 SW pump, associated corrective action CRs, SW system health reports, and applicable test results to evaluate whether there were any adverse operating trends and to ensure that Entergy adequately identified and addressed any adverse conditions.

b. Findings

No findings were identified.

.2.1.18 Unit 3 Reactor Coolant System Pressure Transmitter PT-403

a. Inspection Scope

The team inspected RCS pressure transmitter PT-403 to verify that it was capable of performing its design basis function. The pressure transmitter is designed to provide essential wide range RCS pressure indication and inputs for low-temperature overpressure protection (LTOP) and a RCS pressure isolation valve interlock for a RHR suction valve (MOV-731). This interlock provides a safety-related auto-closure and open-permissive for MOV-731 to protect RCS integrity. The team reviewed TSs, DBDs, and the UFSAR to determine the licensing and operating basis for the system. The team reviewed the design basis and accuracy calculations for the pressure transmitter, instrument loop, and associated interlock to verify that setpoints and tolerances met design requirements. The team also reviewed instrument calibrations, instrument drift trends, and surveillances to verify that installed plant equipment reflected calculated design parameters and operated as intended. The team also reviewed Entergy's evaluation and disposition regarding NRC Information Notice (IN) 2012-16, "Preconditioning of Pressure Switches before Surveillance Testing," which was applicable to pressure transmitter PT-403's RCS isolation function during transmitter calibration. The team also performed walkdowns of accessible areas of the PAB, observing containment penetrations and associated instrument wiring, to assess the material condition, operating environment, and configuration control. The team also reviewed a sample of RCS pressure instrument surveillance tests, corrective action CRs, and the related system health reports to evaluate whether there were any adverse operating trends and to ensure that Entergy adequately identified and addressed any adverse conditions.

b. Findings

No findings were identified.

.2.1.19 Unit 2 118 Volt Bus No. 24

a. Inspection Scope

The team inspected the Unit 2, 118V bus No. 24 to assess its ability to meet design basis requirements during plant transients and accidents. Bus 24 provides stable, highly reliable and uninterruptible alternating current (AC) power for vital plant instrumentation, control circuits, and protection and safeguards actuation circuitry. The team reviewed design calculations, drawings, and plant procedures to ensure that bus No. 24 was designed and operated in accordance with the design and licensing bases. The team also reviewed surveillance tests to determine if the results enveloped the design requirements. The team performed walkdowns of bus No. 24 to access the environment and material condition. The team reviewed a sample of maintenance work orders, corrective action CRs, and system health reports to assess system performance and to ensure that Entergy identified and corrected deficiencies at an appropriate threshold.

Finally, the team discussed the performance, design basis, and maintenance history with the responsible system engineers and control room operators to assess the overall reliability.

b. Findings

No findings were identified.

.2.1.20 Unit 3 Auxiliary Feedwater Pump Minimum Flow Control Valve (AFW-FCV-1121)

a. Inspection Scope

The team inspected the Unit 3 AFW pump minimum flow control valve (FCV), AFW-FCV-1121, to assess its ability to meet design basis requirements during plant transients and accidents. The AFW pump recirculation FCVs open to provide a flow path to the CST when the motor-driven AFW pumps are operated at low flow conditions. The FCVs are 2-inch globe valves that provide throttling characteristics and are capable of being opened or closed against a maximum differential pressure of 1596 pounds per square inch differential pressure (psid). The FCVs are designed to fail closed upon loss of instrument air, allowing the required AFW flow to the steam generators. The team reviewed design calculations, drawings, and plant procedures to ensure that the FCV was designed and operated in accordance with the design and licensing bases. The team also reviewed surveillance tests to determine if the results enveloped the design requirements. The team performed walkdowns of the AFW system to access the environment and material condition of the FCV. The team reviewed a sample of maintenance work orders, corrective action CRs, and system health reports to assess system performance and to ensure that Entergy identified and corrected deficiencies at an appropriate threshold. Finally, the team discussed the performance, design basis, and maintenance history with the responsible design and system engineers to assess the overall reliability.

b. Findings

No findings were identified.

.2.1.21 Unit 2 City Water Piping

a. Inspection Scope

The team inspected the city water supply to the Unit 2 AFW system to verify that it was capable of performing its design basis function. The city water system is credited to mitigate the consequences of a plant fire (fire safe shutdown analysis) and a station blackout (SBO) event. The city water system also provides a backup water supply for the safety-related AFW system CST and fire-fighting water supply, and provides alternate cooling to several safety-related and risk significant pumps such as the charging pumps, the SI pumps, and the RHR pumps. The team also inspected and reviewed the safety-related boundary valves between the non-safety related city water system and the safety-related AFW system for the susceptibility to flooding due to a postulated failure of the non-safety city water piping.

The team interviewed the city water system engineer, licensed and non-licensed operators, and reviewed associated drawings, the UFSAR, and operating and surveillance procedures. In addition, the team walked down selected accessible portions of the city water system to independently assess Entergy's configuration control and the system's material condition. The walkdowns included the city water storage tank; an above ground inspection from the city water tank to the utility tunnel entrance to check for evidence of underground pipe leakage; the utility tunnel; the AFW pump room; and accessible city water piping in the Unit 2 PAB. The team also reviewed Entergy's planned additional long-term corrective actions under their existing and on-going utility tunnel refurbishment plan, and inspected numerous supports that Entergy had replaced in response to a prior NRC finding involving degraded city water piping supports (Ref: FIN 050000247/2009007-03, Failure to Identify Several Degraded City Water System Pipe Supports in the Utility Tunnel).

b. Findings

No findings were identified.

.2.2 Review of Industry Operating Experience and Generic Issues (5 samples)

The team reviewed selected OE issues for applicability at Indian Point Units 2 and 3. The team performed a detailed review of the OE issues listed below to verify that Entergy had appropriately assessed potential applicability to site equipment and initiated corrective actions when necessary.

.2.2.1 NRC Information Notice 2012-06: Ineffective Use of Vendor Technical Recommendations

a. Inspection Scope

The team assessed Entergy's applicability review and disposition of NRC IN 2012-06, "Ineffective Use of Vendor Technical Recommendations." The IN described the NRC's review of recent OE involving ineffective use of vendor technical recommendations indicating that many of the events potentially allowed latent failures to exist undetected and become an underlying cause of risk-significant initiating events. The team reviewed Entergy's evaluation of the potential impact of the identified issues to determine if the issues in the IN were directly applicable to Indian Point Unit 2 and Unit 3, and to verify that Entergy took appropriate corrective actions where applicable. In addition, the team performed a risked-informed sample of vendor technical recommendations associated with Unit 2 and Unit 3 Agastat relays in the EDG lubricating oil control circuit based on Calvert Cliffs related OE in February 2010.

b. Findings

No findings were identified.

.2.2.2 NRC Information Notice 2011-12: Reactor Trips Resulting from Water Intrusion into Electrical Equipment

a. Inspection Scope

The team assessed Entergy's applicability review and disposition of NRC IN 2011-12. The IN was issued to inform licensees about OE regarding recent events involving water intrusion into electrical equipment that resulted in reactor trips. In addition, the IN described the root causes and corrective actions taken to prevent recurrence. The team assessed Entergy's evaluation of the IN as it applied to Indian Point Unit 2 and Unit 3, including their review of the electrical equipment design to ensure that it remained reliable and that there were no vulnerabilities associated with possible water intrusion events. The inspection included a review of corrective action documents, interviews with electrical engineering and operations personnel, and a complete independent walkdown of all accessible Unit 2 and Unit 3 safety-related and non-safety related electrical panels, MCCs, and switchgear rooms.

b. Findings

No findings were identified.

.2.2.3 Westinghouse Nuclear Safety Advisory Letter (NSAL-11-5)

a. Inspection Scope

The team assessed Entergy's applicability review and disposition of Westinghouse Nuclear Safety Advisory Letter (NSAL) NSAL-11-5 for Indian Point Unit 2. Westinghouse issued the NSAL to inform licensees of previous analytical errors that could potentially impact the plant specific LOCA mass and energy release calculation results which were used as an input to the containment integrity response analyses. The team verified the adequacy of Entergy's evaluation of the NSAL by reviewing calculations and by interviewing engineering personnel. Specifically, the team reviewed the effect on the Unit 2 containment pressure by the new accident analysis and the LOCA response using three or four containment fan cooling units, depending on which EDGs were assumed to be operating and which one was assumed to fail (as the single active failure), to ensure that the Westinghouse analysis conservatively bounded the scenario.

b. Findings

No findings were identified.

.2.2.4 NRC Information Notice 2013-18: Refueling Water Storage Tank Degradation

a. Inspection Scope

The team assessed Entergy's applicability review and disposition of NRC IN 2013-18 for Indian Point Units 2 and 3. The IN was issued to inform licensees of potential issues that result in leakage from flaws in the RWSTs. The team evaluated the adequacy of

Entergy's evaluation of the IN by reviewing the master OE review document (WTIPC-2013-64 CA65), specific CRs, results of periodic inspections of both RWSTs, non-destructive evaluation (NDE) results, and by interviewing engineering personnel. The team also conducted walkdowns of the Unit 2 and Unit 3 RWSTs to perform an independent assessment of the material condition of the RWSTs with respect to susceptible issues stated in the IN.

b. Findings

No findings were identified.

.2.2.5 NRC Information Notice 2012-01: Seismic Consideration - Principally Issues Involving Tanks

a. Inspection Scope

The team assessed Entergy's applicability review and disposition of NRC IN 2012-01 for Indian Point Units 2 and 3. The IN was issued to inform licensees of issues regarding aligning non-seismic piping to seismically qualified tanks, mainly the RWSTs. The team evaluated the adequacy of Entergy's evaluation of the IN by reviewing the master OE review document (WTIPC-2012-00077), specific CRs for each unit, and by interviewing engineering personnel. The team conducted walkdowns of the Unit 2 and Unit 3 RWSTs and interfacing systems with the system engineer to assess the adequacy of Entergy's OE review. The team also reviewed a related Entergy LER (LER 2012-02-00), related corrective action documents, TS license amendment submittals, and NRC safety evaluations related to identified non-seismic piping aligned to each unit's RWST. The team reviewed Entergy's interim actions to address the issues identified in the IN and controls implemented to comply with any associated TS and license changes.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems (IP 71152)

a. Inspection Scope

The team reviewed a sample of problems that Entergy had previously identified and entered into the CAP. The team reviewed these issues to verify an appropriate threshold for identifying issues and to evaluate the effectiveness of corrective actions. In addition, the team reviewed CRs written on issues identified during the inspection to verify adequate problem identification and incorporation of the problem into the CAP. The specific corrective action documents that the team sampled and reviewed are listed in the Attachment.

b. Findings

No findings were identified.

4OA6 Meetings, including Exit

On August 20, 2015, the team presented the inspection results to Mr. Larry Coyle, Site Vice President, and other members of the Entergy staff. On September 17, 2015, the team discussed the results of the team's assessment of Entergy's past operability evaluation for the two low-margin MOVs (see Section 1R21.2.1.1.b.1) with Mr. Larry Coyle, Site Vice President, and other members of the Entergy staff via a telephone conference call. The team verified that no proprietary information was retained by the inspectors or documented in the report.

SUPPLEMENTAL INFORMATION
KEY POINTS OF CONTACT

Entergy Personnel
K. Alfieri, Mechanical Design Engineer
V. Bacanskas, Chief Engineer, Engineering and Technical Services
F. Bloise, Electrical Design Engineer
J. Bretti, Probabilistic Risk Assessment Engineer
J. Bridges, Nuclear Plant Operator
R. Burroni, Engineering Director
T. Chan, System Engineering Supervisor
L. Coyle, Site Vice President
G. Dahl, Licensing Specialist
J. D'Antonio, Maintenance Rule Coordinator
R. Drake, Civil Design Engineering Supervisor
E. Ginzburg, Design Engineer
R. Gioggia, AFW System Engineer
M. Haggstrom, City Water System Engineer
J. Hill, Instrumentation and Controls Engineering Manager
C. Hock, Control Room Supervisor
A. Kaczmarek, Design Engineering
J. Kaczor, Design Engineering
J. Kirkpatrick, Regulatory and Performance Improvement Director
B. Lawrence, RCS System Engineer
R. Machado, 138KV System Engineer
M. Maddalo, Design Engineering, Civil
S. Malinski, Design Engineering, Civil
A. Melody, EDG System Engineer
J. Miu, RHR and SI System Engineer
D. Musiyenko, Electrical Design Engineer
P. Pennacchio, Mechanical 1st Line Supervisor
E. Portanova, 125V DC System Engineer
J. Raffaele, Design Engineering Supervisor
I. Sinert, HVAC System Engineer
D. Sparozic, Instrument Air System Engineer
R. Tompkins, Mechanical Maintenance Superintendent
B. Ulrich, Control Room Supervisor
E. Varas, Sr. Nuclear Mechanic
D. Verdile, Sr. Nuclear Mechanic
R. Walpole, Regulatory Assurance Manager
W. Wittich, FIN Supervisor
C. Zannelli, ESF and Reactor Protection & Controls System Engineer

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

<u>Open and Closed</u>		
05000247/2015007-01	NCV	Inadequate design verification that protective device settings do not allow connected Class 1E loads to become damaged or unavailable under normal and sustained degraded voltage conditions during a design basis event. (Section 1R21.2.1.1.b.1)
05000247/2015007-02	NCV	Inadequate design verification that adequate voltages would be available to all Class 1E motors, MOVs, static loads, and MCC control circuits and contactors at the minimum DVR dropout setting. (Section 1R21.2.1.1.b.2)
05000286/2015007-03	NCV	Failure to account for elevated battery room temperature effects on battery service life. (Section 1R21.2.1.2)
05000247/2015007-04	NCV	Less than adequate corrective actions associated with an evaluation of the seismic adequacy of a 138KV transmission tower located near the Unit 2 EDG building. (Section 1R21.2.1.3)
<u>Discussed</u>		
050000247/2009007-03	FIN	Failure to Identify Several Degraded City Water System Pipe Supports in the Utility Tunnel).

LIST OF DOCUMENTS REVIEWED

<u>Calculations</u>

93-169-MD (FPX-89-03434-F), Replacement of TC-1112S, TC-1113S and Power Isolation, Revision 0
98-049, IP3 Auxiliary Feedwater System PROTO-FLO Thermal Hydraulic Model, Revision 4
6604.266-8-SW-022, Replacement Service Water Pump NPSH Evaluation, Revision 4
01004-C-001, 480V MCC Bus Degraded Voltage, Revision 2
29891-AECOM-IP-TRN-0001, Evaluation of Selected 480V SWGR and MCC Motors, Revision 0
29891-AECOM-IP-TRN-0003, Evaluation of Bus Transfer Occurring at T = 0, Revision 0
29891-AECOM-IP-TRN-0004, Evaluation of Survivability of 480V SWGR, MCC Motors and MOVs, Revision 0
C-001, No. 96C2915, NYPA-IP3 USI A-46 Outlier Resolution – Refueling Water Storage Tank RWST-31, Revision 0

CN-CRA-11-29, Indian Point Unit 2 LOCA Mass and Energy Releases and Containment Response – NSAL-11-5, Revision 0
EGE-00001-02, Class 1E Motor Min Starting Voltage and Acceleration Time, Revision 0
EGP-00110-00, Summary of Degraded Voltage Study, Revision 0
FEX-00022, 118 VAC Instrument Bus Loading and Voltage Drop Calculation for Instrument Bus 24 & 24A, Revision 2
FEX-00039, IP2 - Emergency Diesel Generator Loading Study, Revision 3
FEX-00143-01, IP2 Load Flow Analysis of the Electrical Distribution System, Revision 1
FEX-00152, EDG Generator Ratings Analysis, Revision 0
FEX-00180-00, MCC Control Circuits Voltage Evaluations, Revision 0
FEX-00203, Station Battery 21 System Calculation, Revision 0
FEX-00204, Station Battery 22 System Calculation, Revision 1
FEX-00205, Station Battery 23 System Calculation, Revision 0
FEX-00206, Station Battery 24 System Calculation, Revision 0
FFX-00104-00, Check Minimum Line Size to Allow the City Water Header to Provide Auxiliary Feedwater Pumps 800 GPM, Revision 0
FIX-00024, Condensate Storage Tank - Level Setpoints, Channel Accuracies and Corresponding Volumes, Revision 4
FIX-00143, IP2 Allowable Value Calculations, Revision 0
FPX-00079, Seismic Qualification of Supports for TC-1112S; TC-1113S; Terminal Boxes and Conduits, Revision 0
FPX-00081, Qualified Life of Temperature Switches TC-1112S; TC-1113S and TC-5213S, Revision 2
IP2-CALC-07-00143, Open Roll-Up Door to Maintain Room Temperature Less Than 130F Limit, Revision 1
IP2-CALC-07-00159, TC-112S & TC-1113S Temperature Switch Setpoint Determination, Revision 1
IP2-CALC-07-00213, Pressure and Temperature Response from High Energy Line Break Auxiliary Feedwater Pump Room, Revision 0
IP3-CALC-AFW-01801, Flow Pressure Uncertainty for AFW Pump Cut-back Control (F1200, F1201, F1202, F1203) Indication, Revision 3
IP3-CALC-AFW-01805, AFW Cut-back – Pressure Instrument Loop Uncertainty for PC-406A & PC-406B, Revision 1
IP3-CALC-ED-00362, 125 VDC System Short Circuit Calculation, Revision 1
IP3-CALC-ED-00396, 120V Vital AC Instrumentation Study Instrument Bus Short Circuit Calculations, Revision 0
IP3-CALC-ED-02563, Station Battery Hydrogen Evolution, Revision 4A
IP3-CALC-EL-00120, 125 Volt DC System Short Circuit Calculation for Battery 33, Battery Charger 33 (or 35) and Power Panel 33, Revision 2
IP3-CALC-EL-00184, 125 VDC Component Sizing, Revision 3
IP3-CALC-EL-00186, 33 Battery, Charger, Associated Panels and Cables Component Sizing and Voltage Drop Calculation, Revision 4
IP3-CALC-EL-00190, Inverter #33 System Component Sizing Analysis, Revision 1
IP3-CALC-HVAC-00200, IP3 - Battery Room No 34 Ventilation Control Building, Revision 0
IP3-CALC-HVAC-00999, IP3 Intake Structure Enclosure Loss of Ventilation Temperatures, Revision 0
IP3-CALC-SI-00725, Instrument Loop Accuracy / Setpoint Calc / RWST Level, Revision 4
IP-CALC-06-00017, Service Water System PROTO-FLO Model Expansion, Revision 1

IP-CALC-09-00201, Evaluation of Degraded City Water Supports Identified by the NRC Residents, Revision 0
IP-CALC-12-00021, 2R20 Calculation to Justify Only Four Body to Bonnet Bolts of MOV-731 during Fuel Unload, Revision 0
IP-CALC-13-00005, Postulated RWST Inventory Loss during the Reverse Osmosis Clean-up Skid Process in Accordance to 2-TAP-001-ROS due to Seismic Event, Revision 1
IP-CALC-13-00060, External Wall Thinning Evaluation for 4" Vent and 3" Equalization Line for FOST 21, 22 and 23, Revision 0
IP-CALC-15-00025, Containment Heat Removal Capability Study, Revision 0
IP-CALC-15-00041, Tower W Overturning Assessment for FLEX Seismic and Tornado, Draft
IP-CALC-15-00079, Tower V Overturning Assessment for Seismic and Tornado Events, Revision 0
IP-CALC-ED-00207, 480V Busses 2A, 3A, 5A and 6A, and EDGs 31, 32 and 33 Accident Loading, Revision 8
IP-RPT-15-00034, Bus Transfer Study Using Operating Load and Test Data, Revision 0
MDA-86-0722-A, Heating and Ventilation Requirements for IP3 Intake structure Enclosure, Revision 0
MEX-00027, Valve Thrust Calculation for MOV 730 and 731 (Weak Link) ALTRAN Calculation 92167-TR-25, Revision 3
MEX-00085, Review of SOR Qualification Test Report 9058-102 for Seismic Adequacy of Replacement Temp. Switches TC-1112S and 1113S, Revision 0
MEX-00131, Evaluation of Generic Letter 95-07 Power Operated Valves for Pressure Locking and Thermal Binding, Revision 6
MMS-00082, Analysis and Torque Limits for Motor Operated Valve 731, Revision 8
MMS-00088, Analysis of Thrust and Torque Limits for MOV 747, Revision 13
PGI-00286, Required Thrust for IP2 MOVs 730 and 731 – Copes-Vulcan Parallel Disk Gate Valves, Revision 2
PGI-00472, 480V MCC Bus Degraded Voltage, Revision 0
PGI-00473, MOV Terminal Voltage, Revision 3
PGI-00475, GL-89-10 MOV Protection -TOR Settings, Revision 2
SGX-00059-01, Safety Related 480V MCC Coordination Calculation for MCC 26A, Revision 1
SGX-00061-01, Safety Related 480V MCC Coordination Calculation for MCC 26B, Revision 1
SGX-00073-01, Bus Transfer Analysis of the IP2 Elect Distribution System, Revision 1

<u>Completed Surveillance, Performance, and Functional Tests</u>
2-PT-2Y045C, 23 SWP Full Flow Test, performed 10/24/11, 12/12/12, & 1/31/11
2-PT-10Y001, Integrated Leak Rate Test, performed 5/6/12
2-PT-M021B, Emergency Diesel Generator 22 Load Test, performed 6/9/15
2-PT-Q016, Containment Fan Cooler Unit Cooling Water Flow Test, performed 2/6/15
2-PT-Q017F, Alternate Safe Shutdown Supply Verification to 21 SIP/RHRP, performed 5/22/15
2-PT-Q026C, 23 Service Water Pump, performed 5/30/15
2-PT-Q028A, 21 Residual Heat Removal Pump, performed 4/2/15
2-PT-Q029A, 21 Safety Injection Pump Full Flow Test, performed 5/20/15
2-PT-Q029B, 22 Safety Injection Pump Full Flow Test, performed 6/17/15
2-PT-Q029C, 23 Safety Injection Pump Full Flow Test, performed 7/8/15
2-PT-R013, Safety Injection System, performed 2/28/14
2-PT-R014, Automatic Safety Injection System Electrical Load and Blackout Test, performed 2/26/14

2-PT-R029, Safety Injection Pumps Full Flow and Check Valves Test, performed 3/6/14
2-PT-R053A, RHR Valves 730, 731 Integrity, performed 3/17/14
2-PT-R080, RHR Valves 730, 731 Interlocks, performed 3/4/14
2-PT-R084B, 22 EDG 8 Hour Load Test, performed 3/10/14
2-PT-R093, Essential Service Water Header Flow Balance, dated 1/18/10 & 7/15/15
2-PT-R189B, Functional Test of 22 EDG Automatic Trips, performed 3/9/14
2-PT-V04, MOV 731 In-service Valve Tests, performed 3/5/14
2-PT-V024-DS058, Valve 730 IST Data Sheet, performed 3/4/14
2-PT-V024-DS059, Valve 731 IST Data Sheet, performed 3/4/14
2-PT-V067A, Essential Service Water Header Flow Balance, dated 12/16/14
2-PT-V072, IST Relief Valve Tests, performed 6/24/10
3-PT-24022C, 33 SI Pump - Comprehensive Pump Test, performed 8/5/15
3-PT-M021, Station Battery Surveillance, performed 5/21/15
3-PT-M079B, EDG Functional Test, performed 6/10/15
3-PT-M080, Appendix R Emergency Lighting Functional Test, performed 7/23/15
3-PT-Q001C, #33 Station Battery Surveillance, performed 8/7/14, 11/4/14, & 2/3/15
3-PT-Q083, RWST Instrumentation Check and Calibration (LC-923), performed 9/25/14
3-PT-Q092F, 36 Service Water Pump, performed 5/15/15
3-PT-Q120A, 31 Auxiliary Feedwater Pump, performed 6/16/15
3-PT-R007A, 31 & 33 ABFPS Full Flow Test, performed 2/26/15
3-PT-R034, Residual Heat Removal System Valve Interlock Test, performed 3/12/15
3-PT-R156C, Station Battery #33 Load Profile Service Test, performed 3/30/05 & 4/1/09
3-PT-R160B, 32 EDG Capacity Test, performed 3/2/15
3-PT-R172C, Station Battery #33 Modified Performance Test, performed 3/8/13 & 3/5/15
3-PT-R200, Essential Service Water Header Flow Balance, performed 3/4/15
3-PT-SA071, External Inspection of above Ground Tanks, performed 4/13/15
3-PT-V032Q, In-service Pressure Test of Safety Injection (Suction Piping), performed 8/25/14
3-PT-W019, Electrical Verification Offsite Power Sources and AC Distribution, performed 3/2/15

<u>Completed Preventive Maintenance, Calibrations, and Inspections</u>
0-PFM-110, Relief Valve Bench Test, 32 EDG Starting Air Receivers, performed 5/8/08
2-PI-SA002, Atmospheric Tanks (External Inspection, WO 52596942), performed 5/20/15
2-PC-R53, Auxiliary Feedwater Pump Room Environmental Qualified Temperature Switches, performed 11/18/14
3-IC-PC-I-P-406A, Auxiliary Boiler Feed Pump No. 31 Discharge Pressure, performed 2/27/15
3-IC-PC-I-P-406B, Auxiliary Boiler Feed Pump No. 33 Discharge Pressure, performed 2/26/15
3-PC-R51A, Saturation Margin Monitoring System XMTRS Check & Cal (PT-402/403), performed 3/6/15
IP2-VT-14-019, 21 RWST 10YR Internal Tank Inspection Report, dated 3/10/14
IP3-UT-15-029, UT Erosion/Corrosion Examination, dated 3/12/15
IP-RPT-09-00069, IP3 ASME Section XI, IWL Concrete Inspection for 2009, Revision 0
IP-RPT-09-00089, RWST Suction Test RPT, dated 12/29/08
IP-RPT-10-00027, IP2 ASME Section XI, IWL Concrete Inspection for 2010, Revision 0
IP-RPT-11-00040, Inspection Report (Third Cycle) for the Utility Tunnel, Revision 0
IP-RPT-13-00051, Maintenance Rule Structural Monitoring Inspection Report (Fourth Cycle) for the Refueling Water Storage Tank Foundation, dated 8/30/13
PFM-97, Station Battery Inter-Cell Resistance Check, performed 3/31/09

S. T. Hudson Engineers, Inc. Report, Service Water Unit No. 3 Scanning Sonar Inspection, Summary of Quarters 2, 3, 4, 2014 and Quarters 1, 2, 2015, dated 6/30/15
TIPMC11 / 52031136, 31 RWST 10YR Internal Tank Inspection Report, dated 4/25/11
TST-PI-3Y46, IP2 TS ISI RWST & SI Pump Suction (WO 52468341), performed 11/4/14

Corrective Action Condition Reports (CRs)

IP2-2000-08832
IP2-2001-12323
IP2-2002-03770
IP2-2002-07918
IP2-2006-03040
IP2-2006-06850
IP2-2007-00463
IP2-2008-01629
IP2-2009-01950
IP2-2009-02567
IP2-2009-02850
IP2-2009-03046
IP2-2009-03301
IP2-2009-03888
IP2-2010-01734
IP2-2010-03219
IP2-2011-00029
IP2-2011-00677
IP2-2011-03909
IP2-2012-00457
IP2-2012-00822
IP2-2012-00898
IP2-2012-01095
IP2-2012-01467
IP2-2012-01498
IP2-2012-01733
IP2-2012-01734
IP2-2012-01811
IP2-2012-01950
IP2-2012-01990
IP2-2012-02660
IP2-2012-02696
IP2-2012-03224
IP2-2012-03792
IP2-2012-04568
IP2-2012-04699
IP2-2012-05089
IP2-2012-05297
IP2-2012-05406
IP2-2012-06152
IP2-2012-06383
IP2-2012-06646
IP2-2012-07190
IP2-2012-07192
IP2-2012-07226
IP2-2013-00233
IP2-2013-00710
IP2-2013-01439
IP2-2013-01907
IP2-2013-01960
IP2-2013-02313
IP2-2013-02375
IP2-2013-02975
IP2-2013-03182
IP2-2013-03749
IP2-2013-03767
IP2-2013-03770
IP2-2013-03982
IP2-2013-04205
IP2-2013-04780
IP2-2013-04849
IP2-2013-04851
IP2-2013-04852
IP2-2014-01187
IP2-2014-01574
IP2-2014-01741
IP2-2014-02076
IP2-2014-02097
IP2-2014-02288
IP2-2014-02608
IP2-2014-03064
IP2-2014-04059
IP2-2014-04624
IP2-2014-04676
IP2-2014-04918
IP2-2014-04944
IP2-2014-05097
IP2-2014-05347
IP2-2014-05782
IP2-2014-05832
IP2-2014-06659
IP2-2015-00016
IP2-2015-00203
IP2-2015-00254
IP2-2015-00511
IP2-2015-02860
IP2-2015-02861
IP2-2015-02972
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IP2-2015-03134
IP2-2015-03138*
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IP2-2015-03185*
IP2-2015-03192*
IP2-2015-03193*
IP2-2015-03257
IP2-2015-03330
IP2-2015-03363
IP2-2015-03368
IP2-2015-03370
IP2-2015-03375
IP2-2015-03400*
IP2-2015-03407
IP2-2015-03422
IP2-2015-03424*
IP2-2015-03441
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IP2-2015-03451*
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IP2-2015-03490
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IP2-2015-03672*
IP2-2015-03686*
IP2-2015-03688*
IP2-2015-03696*
IP2-2015-03699*
IP2-2015-03702*
IP2-2015-03706*
IP2-2015-03710
IP2-2015-03717
IP2-2015-03721*
IP2-2015-03725*
IP2-2015-03732*
IP2-2015-04068*
IP3-2003-04717
IP3-2003-04779
IP3-2003-04964
IP3-2003-05032
IP3-2003-05854
IP3-2006-02347
IP3-2007-03086
IP3-2007-03299
IP3-2007-03957
IP3-2009-04025
IP3-2010-03088
IP3-2011-02230
IP3-2011-05686
IP3-2012-00229
IP3-2012-00358
IP3-2012-00485
IP3-2012-00718
IP3-2012-01014
IP3-2012-01097
IP3-2012-01293
IP3-2012-01310
IP3-2012-01796
IP3-2012-03992
IP3-2013-02990
IP3-2013-03166
IP3-2013-03682
IP3-2013-04216
IP3-2013-04487
IP3-2013-04502
IP3-2013-04776

IP3-2013-04780	IP3-2015-00885	IP3-2015-03912	IP3-2015-04209*
IP3-2014-00544	IP3-2015-00899	IP3-2015-03969*	IP3-2015-04223*
IP3-2014-00853	IP3-2015-01208	IP3-2015-03973	IP3-2015-04228*
IP3-2014-01364	IP3-2015-01339	IP3-2015-03984*	IP3-2015-04231*
IP3-2014-01474	IP3-2015-01462	IP3-2015-03985*	IP3-2015-04249*
IP3-2014-02101	IP3-2015-02290	IP3-2015-03993	IP3-2015-04299*
IP3-2014-02207	IP3-2015-02291	IP3-2015-04017*	IP3-2015-04336
IP3-2014-02466	IP3-2015-02972	IP3-2015-04036*	IP3-2015-04347
IP3-2014-02552	IP3-2015-03520	IP3-2015-04066*	IP3-2015-04349*
IP3-2014-02579	IP3-2015-03535	IP3-2015-04084*	IP3-2015-04356*
IP3-2014-27532	IP3-2015-03753	IP3-2015-04135	IP3-2015-04357*
IP3-2015-00609	IP3-2015-03770	IP3-2015-04145	IP3-2015-04366*
IP3-2015-00721	IP3-2015-03791	IP3-2015-04184	IP3-2015-04397*
IP3-2015-00884	IP3-2015-03827	IP3-2015-04186	IP3-2015-04720

* CR written as a result of this inspection

<u>Design & Licensing Bases</u>

IP-00-345, IP2-HHSI JCO with Stronger than Previously Analyzed 23 HHSI Pump, Revision 0
IP2-480V DBD, Design Basis Document for 480V Electrical System, Revision 2
IP2-AFW DBD, IP2 Design Basis Document for Auxiliary Feedwater System, Revision 2
IP2-CISS/HPCS DBD, Design Basis Document for Hot Penetration Cooling System, Revision 1
IP2-EDG DBD, Design Basis Document for Emergency Diesel Generator System, Revision 2
IP2 Memorandum, Review of IP2 Susceptibility of Safety Related Equipment and Systems to Flooding from Failure of Non-Seismic Systems Outside Containment, dated 12/18/80
IP2-RHR/SIS DBD, Design Basis Document for Residual Heat Removal / Safety Injection System, Revision 2
IP3-DBD-301, IP3 Design Basis Document for Residual Heat Removal System (RHRS), Revision 4
IP3-DBD-303, IP3 Design Basis Document for Auxiliary Feedwater System, Revision 5
IP3-DBD-304, Design Basis Document for Service Water System (SWS), Revision 4
IP3-DBD-307, Design Basis Document for 125V DC Electrical Distribution System, Revision 3
IP3-DBD-315, Design Basis Document for Heating, Ventilation, and Air Conditioning Systems, Revision 3
IP3 DBD-316, Design Basis Document for Containment Integrity Systems, Revision 3
IP3-DBD-324, Design Basis Document for Emergency Diesel Generators and Appendix R Diesel Generator, Revision 2
IP3 Maintenance Rule Basis Document City Water System, Revision 2
Letter NRC to Entergy, Indian Point Nuclear Generating Station No. 2 - Issuance of Amendment Regarding Revisions to the Containment Analysis Licensing Basis, dated 7/16/14
LR-LAR-2010-00140 (Licensing Request Tracking Item)
NL-06-043, Response to NRC Generic Letter 2006-02, dated 4/03/06
NL-07-020, Response to RAI Regarding GL 2006-02, dated 1/31/07
NL-12-090, Proposed License Amendment Regarding Connection of Non Seismic Purification Line to RWST - IP3, dated 8/14/12

NL-13-015, Proposed License Amendment Regarding Connection of Non Seismic Boric Acid Recovery System to the RWST - IP2, dated 4/13/13

NL-77-A20, Letter from Consolidated Edison to NRC Regarding Effects of Degraded Grid Voltage on Plant Operations, dated 3/31/77

NL-77-A53, Letter from Consolidated Edison to NRC Regarding Effects of Degraded Grid Voltage on Plant Operations, dated 8/29/77

NL-79-B41, Letter from Consolidated Edison to NRC Regarding Adequacy of Station Electric Distribution System Voltages, dated 10/16/79

NL-80-A04, Letter from Consolidated Edison to NRC Regarding Degraded Grid Voltage and Adequacy of Station Electric Distribution System Voltages, dated 4/28/80

NRC Generic Letter (GL) 2006-02, Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power, dated 2/1/06

NRC IP2 TS License Amendment 273 and Safety Evaluation, dated 12/20/13

NRC IP3 TS License Amendment 250 and Safety Evaluation, dated 2/22/13

NRR Letter to Consolidated Edison Company of New York, Response to NRC Bulletin 88-04, Potential Safety Related Pump Loss, dated 9/21/89

NRR Letter to Consolidated Edison Company of New York, Safety Evaluation Report: Susceptibility of Safety-Related Systems to Flooding from Failure of Non-Category I Systems for Indian Point Nuclear Stations Unit 2, dated 12/18/80

NRR Letter to New York Power Authority, Response to NRC Bulletin 88-04, Potential Safety Related Pump Loss, dated 7/13/88

PD-76-154, Letter from Consolidated Edison to NRC Regarding Effects of Degraded Grid Voltage on Plant Operations, dated 9/24/76

PD-76-299, Letter from Consolidated Edison to NRC Regarding Effects of Degraded Grid Voltage on Plant Operations, dated 12/17/76

Westinghouse Letter to IP2, Indian Point Unit 2 LOCA M&E and Containment Analysis for Failure of DG21, dated 10/4/12

Drawings

025D13801, Schematic for 250-AMP Battery Charger, 125 VDC, Revision 7
617F644, Unit 3 480V One Line Diagram, Revision 36
9321-2017, Flow Diagram Main Steam, Revision 84
9321-F-2019-116, Flow Diagram Boiler Feed Water, Revision 0
9321-F-2028, Flow Diagram, Jacket Water to Diesel Generators, Revision 37
9321-F-2029, Flow Diagram, Starting Air to Diesel Generators, Revision 52
9321-F-2030, Flow Diagram, Fuel Oil to Diesel Generators, Revision 40
9321-F-2033, Service and Cooling Water River Water and Fresh water, Revision 81
9321-F-2722, Service Water System Steam Supply Plant, Revision 126
9321-F-2735, Flow Diagram SI System, Revision 0
9321-F-20183, Flow Diagram Condensate & Boiler Feed Pump Suction, Revision 64
9321-F-20283, Flow Diagram, Jacket Water to Diesel Generators, Revision 25
9321-F-20293, Flow Diagram, Starting Air to Diesel Generators, Revision 34
9321-F-20303, Flow Diagram, Fuel Oil to Diesel Generators, Revision 30
9321-F-21193, Flow Diagram, Lube Oil to Diesel Generators, Revision 11
9321-F-22503, Diesel Generator Building General Arrangement Plan, Revision 7
9321-F-27203, Auxiliary Coolant System Inside containment, Revision 29
9321-F-27213, Flow Diagram Air Cooling System for Hot Penetration, Revision 11

9321-F-27513, Auxiliary Coolant System, Revision 31
9321-F-30083, Unit 3 Single Line Diagram DC System, Revision 61
9321-F-32043, Wiring Diagram 125 VDC Power Panels 31, 32, 33 & 34, 120VAC Distribution Panels 31 & 32, Revision 49
9321-F-40573, Flow Diagram, Auxiliary Steam Supply and Condensate Return System, Revision 27
9321-H-41025, Control Building 4th Battery & Inverter Battery Exhaust System, Revision 2
9321-LD-72123 Sh.9, Aux FW Flow to Steam Generator #31 Loop F-1200 Diagram, Revision 2
9321-LD-72123 Sh.10, Aux FW Flow to Steam Generator #32 Loop F-1201 Diagram, Revision 2
9321-LD-72123 Sh.11, Aux FW Flow to Steam Generator #33 Loop F-1202 Diagram, Revision 2
9321-LD-72123 Sh.12, Aux FW Flow to Steam Generator #34 Loop F-1203 Diagram, Revision 2
250907, Unit 2 Station Electrical One Line Diagram, Revision 35
A207698, Flow Diagram, Lube Oil for Diesel Generators No. 21, 22 and 23, Revision 26
IP2-SOD-005, ECCS System, Revision 5
IP2-SOD-009, Reactor Coolant System, Revision 2
IP2-SOD-012, Auxiliary Feed System, Revision 2
IP2-SOD-013, Feedwater System, Revision 2
IP2-SOD-030, RPS Trips and Permissives, Revision 2
IP2-SOD-031, ESF Setpoints, Revision 2
IP2-SOD-033, ESF Notes, Revision 3
IP2-SOD-037, AC Power Distribution - 120V, Revision 1
IP2-SOD-038, AC Power Distribution - 480V, Revision 2
IP3V-439-1506, AC Motor Frame 509UPH Outline Weather Proof Type II, Revision 2
IPEC-SOD-02, AC Power Distribution - 138kV, Revision 0

Engineering Evaluations
CN-SEE-03-54, Evaluation of IP2 HHSI ECCS Cold Leg Injection Phase, Revision 2
DCP-02-2-005, 50.59 Screen for SAT Load Tap Changer - SI Mod, Revision 0
EC 8222, Setpoint Change for Auxiliary Boiler Feedwater Pump Room Temperature Switches, TC-1112S & TC-1113S, Revision 0
EC 14175, Evaluation of IP3 Motor Driven AFW Flow Imbalance (150 gpm), Revision 0
EC 23014, Child EC for Replacement of PC-406A from Foxboro to NUS IAW EC 5000039251 / DC 97-3-439, Revision 2
EC 23043, Child EC for Replacement of PC-406B from Foxboro to NUS IAW EC 5000039251 / DC 97-3-439, Revision 2
EC 40103, Modify Degraded Stand Alone Vent on Top of 31 Fuel Oil Storage Tank, Revision 0
EC 47003, Evaluate Wall Thinning Condition of FOST Vent, Equalizing and Fill Line in the Pit, dated 1/13/14
EC-47159, TEMP MOD to Preserve Structural Integrity of Battery 33 Cell 14, Revision 0
EC 52601, Evaluate Acceptability of Safety Related Equipment Located in the IP3 ABFP Room for HELB Conditions, Revision 0
EC 52604, Impact of a High Energy Line Break (HELB) in the Auxiliary Boiler Feed Pump (ABFP) Room on Safety Related SSCs Located within the Room, Revision 0

EC 53776, Replacement of HELB Roll-Up Door in ABFP Building, dated 12/31/14
ECR 5000042812 / IP3-07-11468, RWST Level Switch Replacement, Revision 1
ER 03-3-107, IP3-03-20457, Modify N2 Backup Supply System for AFWS Valves and Turbine Speed Controller, Revision 1
IP-RPT-13-00001, IP2 Component Cooling Water System Analysis Project, Revision 0

LO-WTIPC-2012-00077 CA51/65/66, NRC-IN-2012-16 Preconditioning of Pressure Switches before Surveillance Testing, dated 6/13/13
LO-WTIPC-2013-00064 CA65, NRC-IN-2013-18 Refueling Water Storage Tank Degradation, dated 10/13/13
Modification 86-03-138-IS, Intake Structure Enclosure, Revision 0
Past Operability Review of MOV-746 and 747 with Shawmut Type A4J30 Fuses during Normal and Emergency Conditions, Revision 1
Safety Evaluation Number 92-210-MD, CST Bladder Removal and Tank Sealing, dated 10/1/92

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00169629	00380680	52032602	52515622	52621522
00203506	00381075	52361943	52534606	52623023
00203507	00406442	52428591	52536475	52626776
00237821	00408251	52431427	52543091	52628180
00270806	51229728	52432412	52604313	52630440
00318554	51229729	52436254	52609756	52632143
00361076	51290815	52441026	52613166	52635891
00362045	51482843	52468341	52614338	
00365019	51554810	52500001	52620117	
00366503	52031136	52500715	52620263	

Miscellaneous

2-RND-ROV, EDG Fuel Oil Tank Level Rover Rounds, dated 7/19/15 - 7/22/15
32 EDG Day Tank Level and Storage Tank Level Daily Log Sheet, 4/29/15 through 5/13/15
Con Edison Memorandum Safety Assessment System Impact, dated 8/6/92
DC 97-03-439 MULT, Replace Foxboro Controllers with NUS Controllers, Revision 0
Environmental Qualification Records for IP2 AFWP Room Components, dated 8/3/15
IP2 and IP3 Hot Penetration Logs
IP2 In-service Testing Program Basis Data Sheets - Valves, RHR Pumps Suction from Loop 22 Hot Leg, Revision 0
IP2, IST Program Basis Data for 22 SI Pump Discharge Check Valve, dated 3/8/07
IP2, IST Program Basis Data for 23 SI Pump, dated 1/16/13
IP2 Plant Status Report, dated 8/3/15
NL-12-044, LER 2012-002-00, TS Prohibited Condition Due to Exceeding the Allowed Completion Time for an Inoperable Refueling Water Storage Tank during Connection to Purification System, IP3, dated 4/13/12
NRC Inspection Manual Chapter 0326, Operability Determinations & Functionality Assessments for Conditions Adverse to Quality or Safety, dated 1/31/14
PM Template, EN - Battery - Flooded Lead Acid - Lead Calcium/Antimony, dated 10/23/14
Settings Sheet – S2/AF1 & S2/AF3 Amptector, dated 8/3/15
Special Log 2-11-86, 23 EDG FOST Sounding, dated 9/6/12
Special Log 2-12-95, 21 & 22 EDG FOST Sounding, dated 9/20/12
Special Log 2-13-111, 21 EDG FOST Sounding, dated 11/12/13

Normal and Special (Abnormal) Operations Procedures

2-AOP-138kV-1, Loss of Power to 6.9kV Bus 5 & 6, Revision 10
2-AOP-CCW-1, Loss of CCW, Revision 2
2-AOP-SSD-1, Control Room Inaccessibility Safe Shutdown Control, Revision 22
2-ARP-003, Diesel Generator, Revision 9
2-ECA-0.0, Loss of All AC Power, Revision 13
2-OSP-10.1.1, Support Procedure – Safety Injection Accumulators and Refueling Water Storage Tank Operation, Revision 19
2-SOP-4.2.1, Residual Heat Removal System Operation, Revision 66
2-SOP-27.3.1.2, 22 Emergency Diesel Generator Manual Operation, Revision 26
2-SOP-27.6, Unit 2 Appendix R Diesel Generator Operation, Revision 12
2-SOP-AFW-002, AFW System Support Procedure, Revision 2
2-SOP-ESP-001, Local Equipment and Contingency Actions, Revision 10
2-SOP-HPC-001, Hot Penetration Cooling System Operation, Revision 2
3-AOP-RHR-1, Loss of RHR, Revision 11
3-ARP-049, Panel Local - Intake Structure, Revision 7
3-SOP-AFW-001, Auxiliary Feedwater System Operation, Revision 9
3-SOP-AFW-002, Auxiliary Feedwater System Support Procedure, Revision 4
3-SOP-EL-001, Diesel Generator Operation, Revision 49
3-SOP-EL-003, Battery Charger and 125 Volt DC System Operations, Revision 42
3-SOP-EL-004A, Electric Motor Operation, Revision 9
3-SOP-EL-009, Filling the Diesel Fuel Oil Storage Tanks, Revision 22
3-SOP-HPC-001, Hot Penetration Cooling System Operation, Revision 2

3-SOP-RCS-017, Reactor Vessel Vacuum Refill and Mansell Level Monitoring System Operation, Revision 13
3-SOP-RHR-001, Residual Heat Removal System, Revision 46
3-SOP-RW-005, Service Water System Operation, Revision 37
3-SOP-SI-003, Recirculation and/or Purification of the Refueling Water Storage Tank, Revision 1

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NRC Bulletin 88-04, Potential Safety-Related Pump Loss, Revision 0
NRC Event Notification No. 44592, Power Supplies Manufactured with Unauthorized Capacitor Delivered to H.B. Robinson, dated 10/23/08
NRC Information Notice 87-40: Backseating Valves Routinely to Prevent Packing Leakage, dated 8/31/87
NRC Information Notice 2012-16: Preconditioning of Pressure Switches before Surveillance Testing, dated 8/29/12
NRC Information Notice 2013-05, Battery Expected Life and Its Potential Impact on Surveillance Requirements, dated 3/19/13
NRC Information Notice 2013-18: Refueling Water Storage Tank Degradation, dated 9/13/13
NRC Regulatory Issue Summary 2011-12, Revision 1, Adequacy of Station Electric Distribution System Voltages, dated 12/29/11
NUS (Scientech) Technical Bulletin Volume 31, Regarding Ensign Power Supplies, dated March 2010
OE-2012-000358, NRC IN 2012-06, Ineffective Use of Vendor Technical Recommendations, dated 9/04/12
OE Evaluations: LO-IP3LO-2011-00170, LO-WTIPC-2012-00077-CA-013, LO-WTIPC-2013-00064-CA-017, and OE-NOE-2007-00398
Response to NRC Bulletin 88-04, Potential Safety-Related Pump Loss, dated 7/7/88
Westinghouse Nuclear Safety Advisory Letter (NSAL-11-5), Westinghouse LOCA Mass and Energy Release Calculation Issues, dated 7/25/11

Procedures
0-EDG-407-ELC, Emergency and Appendix R Diesel Generator Engine Analysis/Inspection, Revision 7
0-PNL-401-ELC, Distribution Panel and Breaker Inspection Maintenance, Revision 5
0-VLV-429-VSR, Safety/Relief Valve Testing, Revision 0
2-BRK-016-ELC, Westinghouse Model DB-75 Breaker PM, Revision 9
2-BRK-022-ELC, Westinghouse Model DB-50 Breaker PM, Revision 17
2-MCC-001-ELC, Westinghouse 480V MCC Preventive Maintenance, Revision 7
2-PC-R58-2A, 480V Undervoltage Relay Calibration for Bus 2A, Revision 0
2-PT-R014, Automatic Safety Injection System Electrical Load and Blackout Test, Revision 25
3-IC-PC-I-F-1135S, Auxiliary Boiler Feed Pump No. 31 Recirculation Flow Control, Revision 12
3-IC-PC-I-P-406A, Auxiliary Boiler Feed Pump No. 31 Discharge Pressure, Revision 15
3-IC-PC-I-P-406B, Auxiliary Boiler Feed Pump No. 33 Discharge Pressure, Revision 16
3-PC-R51A, Saturation Monitoring System Transmitter, Revision 1
3-PT-10Y001, Integrated Leak Rate Test, Revision 1
3-PT-CS004, Low HD INJ, Accum & RHR Lvl Test, Revision 21
3-PT-Q092F, 36 Service Water Pump, Revision 19

3-PT-R090F, Local Operation of 34, 35 and 36 Service Water Pumps, Revision 4
3-PT-Q001C, #33 Station Battery Surveillance, Revision 10
3-PT-Q120A, 31 Auxiliary Feedwater Pump, Revision 16
3-PT-R007A, 31 & 33 ABFPS Full Flow Test, Revision 20
3-PT-R156C, Station Battery #33 Load Profile Service Test, Revision 17
3-PT-R160B, 32 EDG Capacity Test, Revision 15
3-PT-R172C, Station Battery #33 Modified Performance Test, Revision 10
3-PT-R189B, Functional Test of 32 EDG Automatic Trips, Revision 2
3-PT-W001, Emergency Diesel Support Systems Inspection, Revision 41
3-PT-W013, Station Battery Visual Inspection, Revision 24
3-PT-W020, Electrical Verification - Inverters and DC Distribution in Modes 1 to 4, Revision 15
EN-LI-102, Corrective Action Program, Revision 24
ENN-DC-112, Replacement of 118V AC Instrument Buses 21 and 24, Revision 0
ENN-EE-S-002-IP, Sizing of Thermal Overload Relays, Revision 0
ENN-EE-S-008-IP, Electrical Cable Installation Standard, Revision 6
IP-SMM-OP-104, Offsite Power Continuous Monitoring and Notification, Revision 13
OAP-115, Operations Commitments and Policy Details, Revision 22
PFM-82, BCT-2000 Battery Test Computer Calibration, Revision 5
VSR-P-019-A, Maintenance of 8 inch Pressure/Vacuum Relief, Revision 3

Risk and Margin Management
IP2 Margin Issue Database, dated 1/15/15
IP2-RPT-09-00026-E6, Risk Informed System Notebook (AFW), Revision 0
IP3 Margin Issue Database, dated 1/15/15
IP-RPT-09-00026-E26, Risk Informed System Notebook (City Water System), Revision 0

System Health Reports, System Walkdowns, & Trending
22 EDG Fuel Oil Bulk Tank Sample Analysis, performed 11/14/14, 2/4/15, and 4/29/15
23 SI Pump Oil Analysis Trend Data
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LIST OF ACRONYMS

ABFP	Auxiliary Boiler Feed Pump
AC	Alternating Current
ADAMS	Agencywide Documents Access and Management System
AFW	Auxiliary Feed Water
CAP	Corrective Action Program
CDBI	Component Design Bases Inspection
CDF	Core Damage Frequency
CFR	Code of Federal Regulations
CR	Condition Report
CST	Condensate Storage Tank
DBD	Design Basis Document
DC	Direct Current
DG	Diesel Generator
DRE	Detailed Risk Evaluation
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
DVR	Degraded Voltage Relay
EDG	Emergency Diesel Generator
EOP	Emergency Operating Procedure
FCV	Flow Control Valve
FOST	Fuel Oil Storage Tank
FOTP	Fuel Oil Transfer Pump
FW	Feedwater
GL	Generic Letter
HELB	High Energy Line Break
HX	Heat Exchanger
IMC	Inspection Manual Chapter
IN	Information Notice
INL	Idaho National Laboratories
IP	Inspection Procedure
IST	In-Service Test
LCO	Limiting Condition for Operation
LER	Licensee Event Report
LERF	Large Early Release Frequency
LOCA	Loss-of-Coolant Accident
LOV	Loss of Voltage
LTOP	Low-Temperature Overpressure Protection
MCC	Motor Control Center
MLOCA	Medium Break Loss-of-Coolant Accident
MOV	Motor Operated Valve
NCV	Non-cited Violation\
NDE	Non-Destructive Evaluation
NPSH	Net Positive Suction Head
NRC	Nuclear Regulatory Commission
NSAL	Nuclear Safety Advisory Letter

OE	Operating Experience
PAB	Primary Auxiliary Building
PM	Preventive Maintenance
PRA	Probabilistic Risk Assessment
PRIB	Plant Risk Information Book
psid	Pounds per Square Inch Differential
RAW	Risk Achievement Worth
RCS	Reactor Coolant System
RHR	Residual Heat Removal
RIS	Regulatory Information Summary
RRW	Risk Reduction Worth
RWST	Refueling Water Storage Tank
SAPHIRE	Systems Analyst Programs for Hands-on Evaluation
SBO	Station Blackout
SDP	Significance Determination Process
SI	Safety Injection
SPAR	Standardized Plant Analysis Risk
SRA	Senior Reactor Analyst
SSC	Structure, System, and Component
SSE	Safe Shutdown Earthquake
SW	Service Water
TOL	Thermal Overload
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
V	Volt
VAC	Volts, Alternating Current
vdc	Volts, Direct Current