



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION I
2100 RENAISSANCE BOULEVARD, SUITE 100
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August 9, 2018

Mr. Bryan C. Hanson
Senior Vice President, Exelon Generation Company, LLC
President and Chief Nuclear Officer, Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

**SUBJECT: LIMERICK GENERATING STATION – INTEGRATED INSPECTION REPORT
05000352/2018002 AND 05000353/2018002**

Dear Mr. Hanson:

On June 30, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Limerick Generating Station, Units 1 and 2. On July 23, 2018, the NRC inspectors discussed the results of this inspection with Mr. Frank Sturniolo, Plant Manager, and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented one finding of very low safety significance (Green) in this report. This finding involved a violation of NRC requirements. Additionally, NRC inspectors documented one Severity Level IV violation with no associated finding. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest the violations or significance of these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement; and the NRC Resident Inspector at Limerick Generating Station.

In addition, if you disagree with a cross-cutting aspect assignment, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U. S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC, 20555-0001; with copies to the Regional Administrator, Region I, and the NRC Resident Inspector at Limerick Generating Station.

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

Sincerely,

/RA/

Jonathan E. Greives, Chief
Reactor Projects Branch 4
Division of Reactor Projects

Docket Nos. 50-352 and 50-353
License Nos. NPF-39 and NPF-85

Enclosure:
Inspection Report 05000352/2018002
and 05000353/2018002

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05000352/2018002 AND 05000353/2018002 DATED AUGUST 9, 2018

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**U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report**

Docket Numbers: 50-352 and 50-353

License Numbers: NPF-39 and NPF-85

Report Numbers: 05000352/2018002 and 05000353/2018002

Enterprise Identifier: I-2018-002-0065

Licensee: Exelon Generation Company, LLC

Facility: Limerick Generating Station, Units 1 & 2

Location: Sanatoga, PA 19464

Inspection Dates: April 1, 2018 through June 30, 2018

Inspectors: S. Rutenkroger, PhD, Senior Resident Inspector
M. Henrion, Acting Resident Inspector
C. Safouri, Acting Resident Inspector
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A. Turilin, Project Engineer
H. Anagnostopoulos, Senior Health Physicist
L. Andrews, Resident Inspector
N. Floyd, Reactor Inspector
E. DiPaolo, Senior Reactor Inspector

Approved By: Jonathan E. Greives, Chief
Reactor Projects Branch 4
Division of Reactor Projects

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring Exelon's performance at Limerick Generating Station, Units 1 and 2 by conducting the baseline inspections described in this report in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/oversight.html> for more information. NRC-identified and self-revealing findings, violations, and additional items are summarized in the table below.

List of Findings and Violations

Failure to Conduct Adequate Radiation Surveys and Evaluate Potential Radiological Hazards			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Occupational Radiation Safety	Green NCV 05000352/2018002-01 Opened/Closed	H.11 - Human Performance – Challenge The Unknown	71124.01
A self-revealing Green finding and associated non-cited violation (NCV) of Title 10 of the <i>Code of Federal Regulations</i> (10 CFR) 20.1501, "Surveys and Monitoring: General," was identified when Exelon failed to perform adequate loose surface contamination surveys of the Unit 1 reactor water clean up (RWCU) isolation valve room prior to authorizing work to hang shadow shielding near the HV-051-1F017A valve and also during the conduct of the work itself. Exelon also did not identify very high levels of loose surface contamination on overhead piping and structures which surrounded the work area. This resulted in unplanned internal radiation exposures to three personnel, including a radiation protection technician (RPT) who was assigned to monitor the radiological aspects of the work.			

Unit 1 Core Spray Pump Failed to Start Resulting in Condition Prohibited by Technical Specifications			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Not Applicable	Severity Level IV NCV 05000352/2018002-02 Opened/Closed	Not Applicable	71153
The inspectors identified a Severity Level IV NCV of Unit 1 Technical Specification 3.5.1 because one core spray subsystem was inoperable from July 17, 2017, until October 5, 2017. Specifically, the Unit 1 'C' core spray pump did not start upon demand during testing and was declared inoperable because the pump's associated 4 kilovolt (kV) circuit breaker closing charging springs were not charged.			

Additional Tracking Items

Type	Issue number	Title	Report Section	Status
LER	05000352/2017-004-00 and 05000352/2017-004-01	Core Spray Pump Failed to Start Resulting in Condition Prohibited by Technical Specifications	71153	Closed

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PLANT STATUS

Unit 1 began the inspection period shutdown for a planned refueling outage. The unit was restarted on April 15, 2018, and returned to 100 percent power on April 20, 2018. On June 9, 2018, the unit was downpowered to 33 percent in single loop operation due to an equipment issue with the '1B' adjustable speed drive. The unit was returned to rated thermal power on June 11, 2018, and remained at or near rated thermal power for the remainder of the inspection period.

Unit 2 began the inspection period at rated thermal power. On May 18, 2018, the unit was downpowered to 64 percent to repair a main condenser tube leak and perform required valve testing and summer readiness activities. The unit was returned to rated thermal power on May 21, 2018, and remained at or near rated thermal power for the remainder of the inspection period.

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at <http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html>. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors also performed plant status activities described in IMC 2515, Appendix D, "Plant Status," and conducted routine reviews using IP 71152, "Problem Identification and Resolution." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess Exelon's performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

REACTOR SAFETY

71111.04 - Equipment Alignment

Partial Walkdown (4 samples)

The inspectors evaluated system configurations during partial walkdowns of the following systems/trains:

- (1) Unit 1 'A' standby gas treatment system on April 4, 2018
- (2) Unit 1 'D11' and 'D14' emergency diesel generators on April 7, 2018
- (3) Unit common '201' safeguard transformer, bus, and related switchgear on April 25, 2018
- (4) Unit 1 automatic depressurization system on April 30 through May 3, 2018

Complete Walkdown (1 sample)

The inspectors evaluated system configurations during a complete walkdown of the Unit 1 reactor core isolation cooling system.

71111.05A/Q - Fire Protection Annual/QuarterlyQuarterly Inspection (5 samples)

The inspectors evaluated fire protection program implementation in the following selected areas:

- (1) Fire area 34, Unit 1 high pressure coolant injection room, elevation 177', on May 4, 2018
- (2) Fire area 2, Unit common 13.2 kV switchgear, elevation 217', on May 11, 2018
- (3) Fire area 83, Unit 2 'D21' emergency diesel generator and fuel oil day tank room, elevation 217', on May 21, 2018
- (4) Fire areas 54 & 55, Unit 2 residual heat removal heat exchanger and pump rooms 173, 174, 280, and 281, elevations 177' and 201', on June 7, 2018
- (5) Fire area 35, Unit 1 'A' core spray pump room, elevation 177', on June 12, 2018

Annual Inspection (1 sample)

The inspectors evaluated fire brigade performance on June 12, 2018.

71111.07 - Heat Sink PerformanceHeat Sink (1 sample)

The inspectors evaluated Exelon's monitoring and maintenance of the '1A' core spray room unit cooler heat exchanger system.

71111.08 - Inservice Inspection Activities (1 sample)

The inspectors evaluated Exelon's non-destructive examination and welding activities of Unit 1 by reviewing the following activities and programs from April 2 to April 6, 2018:

(1) Volumetric Examinations

- a) Manual ultrasonic testing of main steam loop 'D' nozzle to safe-end weld, APE-1MS-LD N3D
- b) Manual ultrasonic testing of feedwater elbow-to-elbow and elbow-to-pipe welds, FWA-039 and -040
- c) Radiography testing of RWCU pipe-to-pipe welds, FW-56 and FW-58 which involved welding activities associated with a pressure boundary risk significant system

(2) Visual Examinations

- a) In-vessel visual inspection of jet pump components, top guide beams, and feedwater piping structural attachments
- b) Underwater visual inspection in the suppression pool of the core spray 'C' suction strainer and floor panels
- c) General visual examination of the drywell liner

(3) The inspectors reviewed the welding activities associated with the replacement of degraded piping on line DBB-105-01 in the RWCU system

71111.11 - Licensed Operator Requalification Program and Licensed Operator Performance

Operator Requalification (1 sample)

The inspectors observed and evaluated licensed operator simulator training scenarios on May 14, 2018.

Operator Performance (1 sample)

The inspectors observed reactor startup of Unit 1 on April 15, 2018.

71111.12 - Maintenance Effectiveness

Routine Maintenance Effectiveness (2 samples)

The inspectors evaluated the effectiveness of routine maintenance activities associated with the following equipment and/or safety significant functions:

- (1) Unit 1 high pressure coolant injection on May 3, 2018
- (2) Unit 2 high pressure coolant injection on May 3, 2018

Quality Control (2 samples)

The inspectors evaluated maintenance and quality control activities associated with the following equipment performance issues:

- (1) Unit 2 'D23' emergency diesel generator planned maintenance overhaul on February 12 to 16, 2018
- (2) Unit 1 high pressure coolant injection main pump gear end outboard mechanical seal replacement on April 30 to May 1, 2018

71111.13 - Maintenance Risk Assessments and Emergent Work Control (5 samples)

The inspectors evaluated the risk assessments for the following planned and emergent work activities:

- (1) Unit 1 'D11' 4 kV bus unavailable for planned refueling outage maintenance on April 1, 2018
- (2) Unit 1 'D11' emergency diesel generator loss of coolant accident/loss of offsite power test on April 5, 2018
- (3) Unit 1 initial plant startup from a planned refueling outage with the containment de-inerted on April 15, 2018
- (4) Unit common 'B' standby gas treatment system unavailable during testing on April 26, 2018
- (5) Unit 1 high pressure coolant injection maintenance outage from April 30 to May 2, 2018

71111.15 - Operability Determinations and Functionality Assessments (5 samples)

The inspectors evaluated the following operability determinations and functionality assessments:

- (1) Unit 1 bypass valve number two indicated opening to only 97 percent following Unit 1 main turbine trip on March 26, 2018
- (2) Unit common 'B' standby gas treatment system filter heater trip on April 4, 2018
- (3) Unit 1 reactor pressure vessel head vent flange indications on April 12, 2018
- (4) Unit 1 'C' low pressure coolant injection valve leakby during operational pressure test on April 13, 2018
- (5) Unit 1 high pressure coolant injection pump leakage from main pump gearbox end outboard seal on April 17, 2018

71111.18 - Plant Modifications (2 samples)

The inspectors evaluated the following temporary or permanent modifications:

- (1) Engineering change package 618876, Unit 1 and Unit 2 carbon dioxide system modification and abandonment
- (2) Engineering change request 1200019, Unit 1 and Unit 2 main turbine control valve and reactor protection system channel functional test procedure change

71111.19 - Post Maintenance Testing (9 samples)

The inspectors evaluated post maintenance testing for the following maintenance/repair activities:

- (1) Unit common '11-1011' service water supply check valve planned maintenance on April 2, 2018
- (2) Unit 1 'A' low pressure coolant injection outboard injection valve maintenance on April 3, 2018
- (3) Unit common 220 kV transmission lock substation testing and maintenance on April 25, 2018
- (4) Unit 1 high pressure coolant injection pump mechanical seal replacement on May 3, 2018
- (5) Unit 1 'B' residual heat removal pump motor inspection and oil change on May 8, 2018
- (6) Unit 1 'A' residual heat removal heat exchanger inlet cross-tie valve breaker cleaning and inspection on May 16, 2018
- (7) Unit 1 'A' core spray pump room unit cooler cleaning and inspection on June 14, 2018
- (8) Unit 1 high pressure coolant injection pump maintenance on April 18, 2018
- (9) Unit common '101' safeguards transformer and bus following installation of third off-site power source on June 11, 2018

71111.20 - Refueling and Other Outage Activities (1 sample)

The inspectors evaluated Unit 1 refueling outage activities from April 1 to April 18, 2018. The following portions of the inspection procedure were not performed during this period.

- (1) Outage Plan
- (2) Shutdown

71111.22 - Surveillance Testing

The inspectors evaluated the following surveillance tests:

Routine (2 samples)

- (1) ST-2-074-629-1, Unit 1 average power range monitor number 4 functional check on April 24, 2018
- (2) ST-2-088-324-2, Unit 2 remote shutdown system division '2' residual heat removal test on June 20, 2018

In-Service (4 samples)

- (1) ST-6-092-115-1, Unit 1 'D11' emergency diesel generator loss of coolant accident/loss of offsite power test on April 5, 2018
- (2) ST-6-092-312-1, Unit 1 'D12' emergency diesel generator slow start operability test run on April 23, 2018
- (3) ST-6-051-234-2, Unit 2 'D' residual heat removal pump, valve, and flow test on May 23, 2018
- (4) ST-6-092-314-1, Unit 1 'D14' emergency diesel generator slow start operability test run on June 18, 2018

RADIATION SAFETY71124.01 - Radiological Hazard Assessment and Exposure ControlsRadiological Hazard Assessment (1 sample)

The inspectors evaluated radiological hazards assessments and controls.

Instructions to Workers (1 sample)

The inspectors evaluated worker instructions.

Contamination and Radioactive Material Control (1 sample)

The inspectors evaluated contamination and radioactive material controls.

Radiological Hazards Control and Work Coverage (1 sample)

The inspectors evaluated radiological hazards control and work coverage.

High Radiation Area and Very High Radiation Area Controls (1 sample)

The inspectors evaluated risk-significant high radiation area and very high radiation area controls.

Radiation Worker Performance and Radiation Protection Technician Proficiency (1 sample)

The inspectors evaluated radiation worker performance and RPT proficiency.

71124.02 - Occupational As Low As Reasonably Achievable (ALARA) Planning and Controls

Implementation of ALARA and Radiological Work Controls (1 sample)

The inspectors reviewed ALARA practices and radiological work controls by reviewing the following activities:

- (1) ALARA Plan 18-009
- (2) ALARA Plan 18-011
- (3) ALARA Plan 18-025
- (4) ALARA Plan 18-035
- (5) ALARA Plan 18-036
- (6) ALARA Plan 18-043

Radiation Worker Performance (1 sample)

The inspectors evaluated radiation worker and RPT performance.

71124.03 - In-Plant Airborne Radioactivity Control and Mitigation

Engineering Controls (1 sample)

The inspectors evaluated airborne controls and monitoring.

Use of Respiratory Protection Devices (1 sample)

The inspectors evaluated respiratory protection.

Self-Contained Breathing Apparatus for Emergency Use (1 sample)

The inspectors evaluated the Exelon self-contained breathing apparatus program.

OTHER ACTIVITIES – BASELINE

71151 - Performance Indicator Verification

The inspectors verified Exelon's performance indicator submittals listed below for the period April 1, 2017, through March 31, 2018. (4 samples)

- (1) Unit 1 and Unit 2 safety system functional failures
- (2) Unit 1 and Unit 2 emergency alternating current power

71152 - Problem Identification and Resolution

Semiannual Trend Review (1 sample)

The inspectors reviewed Exelon's corrective action program for trends that might be indicative of a more significant safety issue.

Annual Follow-up of Selected Issues (2 samples)

The inspectors reviewed Exelon’s implementation of its corrective action program related to the following issues:

- (1) Issue Report (IR) 4024190, Unit 2 main steam line high radiation alarm likely due to insufficient foreign material exclusion controls
- (2) IR 4059470, Unit 1 ‘C’ core spray pump failed to start on October 5, 2017 due to circuit breaker failing to close

71153 - Follow-up of Events and Notices of Enforcement Discretion

Licensee Event Reports (1 sample)

The inspectors evaluated the following licensee event report:

- (1) Licensee Event Report 05000352/2017-004-00 and 0500352/2017-004-01, Core Spray Failed to Start Resulting in Condition Prohibited by Technical Specifications.

The circumstances surrounding this licensee event report are documented in report Section “Inspection Results.”

Personnel Performance (1 sample)

The inspectors evaluated response during the following non-routine evolution:

- (1) Unit 1 unplanned downpower to 30 percent for single loop operation on June 9, 2018, due to Unit 1 ‘B’ adjustable speed drive coolant leak on a flexible hose fitting

INSPECTION RESULTS

Failure to Conduct Adequate Radiation Surveys and Evaluate Potential Radiological Hazards			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Occupational Radiation Safety	Green NCV 05000352/2018002-01 Closed	H.11 - Human Performance – Challenge The Unknown	71124.01
<p>A self-revealing Green finding and associated NCV of 10 CFR 20.1501, “Surveys and Monitoring: General,” was identified when Exelon failed to perform adequate loose surface contamination surveys of the Unit 1 RWCU isolation valve room prior to authorizing work to hang shadow shielding near the HV-051-1F017A valve, and also during the conduct of the work itself. Exelon also did not identify very high levels of loose surface contamination on overhead piping and structures which surrounded the work area. This failure resulted in unplanned internal radiation exposures to three personnel, including an RPT who was assigned to monitor the radiological aspects of the work.</p>			
<p><u>Description:</u> The HV-44-1F040 valve (“40 valve”) in the Unit 1 RWCU isolation valve room developed a steam leak in June of 2016. The leak became more pronounced over time. This leak, from a system which is known to contain high levels of radioactive activation products, resulted in the spread of significant levels of loose surface contamination within the room.</p>			

The valve was repaired in September of 2017. The room was not decontaminated at that time due to very high area dose rates.

During the period of the steam leak, the HV-051-1F017A valve ("17 valve") developed problems in its remote operation with indication of a ground in the direct current system. Contaminated water from the 40 valve, which is located directly above the 17 valve, affected the motor actuator for the 17 valve, necessitating a repair. The repair was scheduled for the next scheduled refueling outage (1R17).

ALARA Plan 18-043 was developed to control the radiological aspects of the repair to the 17 valve motor/actuator and was approved for use on March 15, 2018. The plan identified that decontamination may be required, that surface contamination levels could approach 400 mrad/hr per 100 centimeters squared (about 20,000,000 dpm per 100 centimeters squared), and that the room was classified as "Alpha Level II." This level of loose surface contamination is radiologically significant and presents a potential for unplanned internal radiation exposure. An ALARA evaluation indicated that respiratory protection was not warranted for the planned work.

A limited decontamination was performed of the travel path from the room's entrance to the 17 valve, the immediate area around the valve, and a light fixture (at head level) near the valve, on March 27, 2018, in support of the planned repairs. A personal air sampler worn during the decontamination work showed a localized airborne radioactivity of 0.38 derived air concentration, indicating that the decontamination caused some loose surface contamination to be suspended in the air. A post-decontamination radiological survey (2018-008466) was performed to assess the conditions at the valve, and indicated maximum loose surface contamination levels of 60,000 dpm per 100 centimeters squared on the light fixture.

On March 29, 2018, radiation shielding was installed near the 17 valve as part of the ALARA plan. The crew consisted of two iron-workers and a senior RPT who was assigned to provide continuous radiological coverage of the work. Installing the shielding included hanging steel chains from structures in the overhead areas above the 17 valve, from which the shielding would then be affixed. These overhead areas had not been decontaminated and were not included in the loose surface contamination survey two days earlier. Personnel in the room were not required to wear respiratory protection.

During the work, a hanging light fixture needed to be repositioned several times. When the fixture was moved, dust was observed to fall from the light fixture. The iron-workers did not believe that the dust was a concern due to the protective clothing that they were wearing, and thus did not notify the RPT of the unexpected condition. The RPT, therefore, was not prompted to obtain additional smear samples of the dusty areas in order to assess the radiological impact.

The crew attempted to exit the radiologically controlled area after the completion of their work, and alarmed the personal contamination monitors. Follow-up assessments, including a series of whole body counts revealed unplanned internal radiation exposures at a small fraction of the annual occupational exposure limits. IR 04120372 was written to document the event, which included an event investigation by supervisory staff.

On March 30, 2018, at 1536, an additional radiological survey of the room was performed. This more comprehensive effort identified very high levels of loose surface contamination on

overhead piping in the room, including areas near the shadow-shielding work area. These ranged from about 400,000 to 2,000,000 dpm per 100 centimeters-squared.

Corrective Actions: Exelon restricted access to the area, conducted additional radiological surveys, and conducted an investigation. Exelon entered the issue into their corrective action program.

Corrective Action Reference: IR 04120372

Performance Assessment:

Performance Deficiency: 10 CFR 20.1003 defines a survey as “an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation. When appropriate, such an evaluation includes a physical survey of the location of radioactive material and measurements or calculations of levels of radiation, or concentrations or quantities of radioactive material present.”

10 CFR 20.1501 requires that each licensee make or cause to be made surveys that may be necessary for the licensee to comply with the regulations in Part 20 and that are reasonable under the circumstances to evaluate the magnitude and extent of radiation levels, concentrations or quantities of residual radioactivity, and the potential hazards of the radiation levels and residual radioactivity detected.

10 CFR 20.1701 specifies that the licensee shall use, to the extent practical, processes or other engineering controls (e.g., containment, decontamination, or ventilation) to control the concentration of radioactive material in air.

The post-decontamination radiological survey of the Unit 1 RWCU isolation valve room was necessary to adequately assess the existing radiological conditions and to subsequently demonstrate compliance with 10 CFR 20.1701. The March 27, 2018, decontamination effort and subsequent loose surface contamination survey were focused on the immediate working area around the 17 valve, but did not consider the need to access the areas in the overhead above the 17 valve to hang radiation shielding, which was the next major step in the work process.

When work to hang radiation shielding was authorized by Radiation Protection on March 29, 2018, the supervisor failed to identify that the work would include locations in which there had been no decontamination and in which loose surface contamination levels had not been assessed. Those contamination levels exceeded the discontinue work criteria of the ALARA plan as provided in item 4, “contamination level > 200,000 dpm/100cm² Post Decon.” These levels and the tight confines of the work location would also likely warrant a re-evaluation of the respiratory protection requirements as indicated in the ALARA plan item 8, “Airborne Radioactivity Mitigation,” number 3, “RP to evaluate respiratory protection on other activities based upon radiological conditions and type of work.”

During conduct of the work, in-process loose surface contamination surveys were not performed by the RPT, and the work was not paused to allow a radiological re-assessment of working conditions, when dust was seen to fall from a light fixture. This was contrary to the ALARA plan, which also included a discontinue work criteria of when “radiological conditions are not as expected.”

In addition, the RPT allowed a light fixture to be repositioned several times during the work, which was not within the authorized scope of work as provided in the pre-job briefing and was contrary to the ALARA plan, item 16, "Contingency Plans," which states "Changes in work scope: notify RPS and Rad Engineering prior to deviating from the original plan/work scope."

These failures were within Exelon's ability to foresee and correct, and should have been prevented, and therefore are performance deficiencies. The deficiencies represent multiple failed radiation protection barriers.

Screening: This finding is more than minor because it is associated with the Program & Process attribute of the Occupational Radiation Safety cornerstone and affected the cornerstone objective to ensure the adequate protection of the worker health and safety from exposure to radiation from radioactive material during routine civilian nuclear reactor operation. Specifically, loose surface contamination levels were not adequately assessed on multiple occasions, discontinue work criteria were exceeded, and work outside of the planned scope was allowed. Thus multiple radiation safety barriers were defeated as described in IMC 0612, Section 6 "Health Physics," "General Screening Criteria."

Significance: Using IMC 0609.04, "Initial Characterization of Findings," issued October 7, 2016, and IMC 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process," issued August 19, 2008, the inspection finding was not related to ALARA practices (Step 1), did not result in an overexposure (Step 5), did not represent a substantial potential for overexposure (Step 11), and did not compromise Exelon's ability to assess dose (Step 14). As a result, this finding was determined to be of very low safety significance (Green).

Cross-Cutting Aspect: This finding has a cross-cutting aspect in the area of Human Performance, Challenge the Unknown, in that Exelon did not ensure that individuals stop when faced with uncertain conditions and ensure risks are evaluated and managed before proceeding. Specifically, the RPTs involved in assessing radiological conditions and controlling work (and their supervisor) did not adequately evaluate the potential for very high levels of loose surface contamination in the RWCU isolation valve room following a significant leak and prior to working in overhead areas, and did not reassess conditions when dust fell from a light fixture. [H.11]

Enforcement:

Violation: 10 CFR 20.1003 defines a survey. 10 CFR 20.1501(a)(1) requires that each licensee make or cause to be made surveys that may be necessary for the licensee to comply with the regulations of Part 20.

Contrary to the above, on March 27 and March 29, 2018, Exelon did not perform adequate loose surface contamination surveys in the Unit 1 RWCU isolation valve room following a decontamination effort (and prior to authorizing work to hang radiation shielding), and following the observation of dust falling from a light fixture in the immediate work area. These surveys were necessary to demonstrate compliance with 10 CFR 20.1701, ALARA Plan 18-043, and its associated respiratory protection ALARA evaluation. As a result, three personnel received unplanned internal radiation exposures.

Disposition: This violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy.

Unit 1 Core Spray Pump Failed to Start Resulting in Condition Prohibited by Technical Specifications			
Cornerstone	Severity	Cross-Cutting Aspect	Report Section
Not Applicable	Severity Level IV NCV 05000352/2018002-02 Closed	Not Applicable	71153
<p>The inspectors identified a Severity Level IV NCV of Unit 1 Technical Specification 3.5.1 because one core spray subsystem was inoperable from July 17, 2017, until October 5, 2017. Specifically, the Unit 1 'C' core spray pump did not start upon demand during testing and was declared inoperable because the pump's associated circuit breaker closing charging springs were not charged.</p>			
<p><u>Description:</u> On October 5, 2017, the Unit 1 'C' core spray pump failed to start during surveillance testing due to the associated circuit breaker failing to close. An initial investigation identified that the switch contact inside the circuit breaker control device which energizes the breaker's closing springs charging motor became dislodged. With the switch contact unable to maintain the circuit, the charging motor did not energize long enough to fully charge the closing springs during the breaker's previous closing operation. This condition existed since the last time the Unit 1 'C' core spray pump was in service on July 17, 2017, until the discovery on October 5, 2017. This issue constituted a violation of Technical Specification 3.5.1, "Emergency Core Cooling System – Operating," because the pump was out-of-service for greater than the allowed outage time of 7 days. This issue was reported to the NRC in Licensee Event Report 05000352/2017-004-00, dated December 4, 2017, and supplemented by Licensee Event Report 05000352/2017-004-01, dated March 13, 2018.</p> <p>Failure analysis of the control device identified that the cause of the switch contact becoming dislodged was due to arcing and welding of the switch contact eventually resulting in displacement of the switch contact. The most probable cause of the initial degradation that eventually led to arcing and welding was due to undervoltage testing of the closing springs charging motor. This testing was performed during periodic circuit breaker inspections and overhauls. The test subjects the control device switch contacts and charging springs motor to lower than normal voltage which results in higher than normal current. The circuit breaker was last overhauled and subjected to undervoltage testing in June 2014. The circuit breaker was operated a minimum of 9 times between June 2014 and the discovery of the failure in October 2017. There was no evidence of degraded performance in the breaker closing springs charging motor circuit prior to failure. The inspectors noted that there were no previous circuit breaker control device failures at Limerick due to switch contact issues. Also, a review of industry and vendor operating experience did not reveal any similar failures of switch contacts displacing due to arcing and welding.</p> <p>Corrective Actions: Immediate corrective action was taken to replace the associated 4 kV circuit breaker control device and return the Unit 1 'C' core spray pump to an operable status. An extent-of-condition review was performed to verify that the charging spring indicators for the site's 2.3 kV, 4 kV, and 13.2 kV switchgear circuit breakers showed that the charging springs were charged. Exelon revised maintenance procedures to conduct the charging motor undervoltage test prior to disassembly of the control device during circuit breaker overhauls so that the associated electrical contacts on the switch will be inspected for damage/overheating following the test.</p> <p>Corrective Action Reference: IR 4059470</p>			

Performance Assessment: The inspectors determined that the failure of the Unit 1 'C' core spray pump to start on October 5, 2017, was not within Exelon's ability to foresee and prevent. As a result, no performance deficiency was identified. Therefore, this violation will not be considered in the assessment process or the NRC's Action Matrix.

Enforcement: This issue is considered within the traditional enforcement process because there was no performance deficiency associated with the violation of NRC requirements and the Reactor Oversight Process' significance determination process does not specifically consider violations without performance deficiencies in its assessment of licensee performance. Therefore, it is necessary to address this violation using traditional enforcement to adequately deter non-compliance.

Violation: Technical Specification 3.5.1, "Emergency Core Cooling System – Operating," requires in part, that emergency core cooling systems shall be operable with the core spray system consisting of two subsystems with each subsystem comprised of two operable core spray pumps and an OPERABLE flow path capable of taking suction from the suppression chamber and transferring the water through the spray sparger to the reactor vessel. If there is one core spray subsystem inoperable, provided that at least two low pressure coolant injection subsystems are operable, Technical Specification 3.5.1 limiting condition for operation action statement requires restoring the inoperable core spray subsystem to operable status within 7 days or be in at least Hot Shutdown within the next 12 hours and in Cold Shutdown within the next 24 hours.

Contrary to the above, from July 17, 2017, until October 5, 2017, one Unit 1 core spray subsystem was inoperable, and Exelon did not restore the core spray subsystem to operable status within 7 days, and did not place Unit 1 in at least Hot shutdown within 12 hours or in Cold Shutdown within 24 hours. Specifically, the Unit 1 'C' core spray pump did not start upon demand during testing and was declared inoperable because the pump's associated circuit breaker closing charging springs were not charged.

Severity/Significance: The NRC Enforcement Policy, Section 2.2.1 states, in part, that, whenever possible, the NRC uses risk information in assessing the safety significance of violations. The inspectors evaluated the issue using IMC 0609.04, "Initial Characterization of Finding," and IMC 0609, Appendix A, Exhibit 2, "Mitigating Systems Screening Questions." The inspectors determined that the issue required a detailed risk evaluation because the failure of the Unit 1 'C' core spray pump to start on October 5, 2017, represented an actual loss of function of at least a single train for greater than its technical specification allowed outage time. A Region I senior reactor analyst completed the detailed risk evaluation and estimated the increase in core damage frequency associated with this issue to be below E-7/year or of very low safety significance (Green). To perform the detailed risk evaluation to gather insights on safety significance, the senior reactor analyst used the Systems Analysis Programs for Hands-On Evaluation (SAPHIRE) Revision 8.1.6, Standardized Plant Analysis Risk Model, version 8.50 for Limerick Generating Station Unit 1. The inspectors determined that the issue is of very low safety significance and concluded that the violation would be best characterized as Severity Level IV.

Enforcement Action: The violation is being treated as an NCV consistent with Section 2.3.2 of the Enforcement Policy.

Observations:	71152 Semiannual Trend Review
<p>The inspectors reviewed and assessed two adverse trends in human performance and equipment reliability, last discussed in the 2017 fourth quarter integrated inspection report (ADAMS Accession No. ML18032A569). The inspectors reviewed Exelon's continued actions, issues, and indicators related to improving human performance and determined that Exelon's efforts were sufficiently effective and sustained to not warrant continued focus by the inspectors.</p> <p>Regarding equipment reliability, the inspectors noted a number of additional examples evaluated during the period that impacted operations: diesel generator elevated combustion air temperature, pump seal failures, diesel generator auto-start logic circuit issue, isolation valve failure, control enclosure chiller trips, and adjustable speed drive coolant leakage. The inspectors documented two findings in the 2018 first quarter integrated inspection report (ADAMS Accession No. ML18131A015) related to equipment reliability. Further inspection will be performed during subsequent licensee event report reviews and/or during other baseline inspection samples focusing on equipment reliability. Otherwise, during this inspection, the inspectors did not identify a new performance deficiency or violation and/or determined that the issues were of minor safety significance. The inspectors noted a related issue identified by Exelon regarding unplanned entries into technical specification limiting conditions for operation and discussed the trend with Exelon personnel. The inspectors concluded that a continued inspection focus on equipment reliability is warranted and discussed Exelon's continued actions to improve equipment reliability which included challenging repair scheduling for critical components, resolving long-standing and/or repetitive equipment problems, and focusing efforts to improve reliability of systems critical to station safety and reliability.</p> <p>Based on the overall results of the semi-annual trend review, the inspectors did not identify additional trends not recognized by Exelon and determined that Exelon was appropriately identifying and entering issues into the corrective action program, adequately evaluating the issues, and properly identifying adverse trends before they became more safety significant problems.</p>	

Observations: IR 4024190	71152 Annual Follow-up of Selected Issues
<p>The inspectors reviewed the IR which documented Exelon's corrective actions to address the Unit 2 main steam line high radiation alarm that occurred on June 21, 2018. Because of a lack of an apparent cause, Exelon's initial evaluation identified and eliminated a number of likely causes, but did include the possibility of the introduction of foreign material as a potential cause. Their evaluation also considered the extent of condition and cause, potential generic implications and common cause, and previous occurrences. The corrective actions were classified and prioritized in accordance with Exelon's corrective action program guidance, and the inspectors concluded that Exelon's corrective actions were implemented commensurate with the safety impact of the cause, and were appropriately focused to correct the problem. Exelon implemented enhanced foreign material exclusion controls during the current refueling outage and the inspectors observed their implementation during field walkdowns. No additional issues were identified.</p>	

Observations: IR 4059470	71152 Annual Follow-up of Selected Issues
<p>The inspectors reviewed IR 4059470 which documented Exelon's actions regarding the Unit 1 'C' core spray pump failing to start during surveillance testing on October 5, 2017, due to the pump's circuit breaker failing to close. The description of the event, corrective actions, and enforcement aspects of this event are documented in the finding above.</p>	
<p>The inspectors identified that although the failure of the circuit breaker to close was classified as a critical component failure by the station ownership committee, the critical component clock was not reset as expected by ER-AA-1200, "Critical Component Failure Clock." The inspectors noted that the critical component clock is used only as an equipment reliability indicator and site awareness tool and, therefore, not resetting the clock for the event was considered a minor issue.</p>	
<p>Exelon performed a work group evaluation for the issue. This is the lowest level of review specified by corrective action program procedures. The corrective action program procedural guidance for events involving a critical component failure or requiring the submittal of a licensee event report to the NRC recommended the performance of at least a corrective action program evaluation which is a higher level of investigation than a work group evaluation. Work group evaluations are allowed if the cause of the failure is known and if proper approvals are obtained. The initial site investigation determined the failure to be due to a deformed control device switch contact which led to the switch contact being dislodged inside the control device. Based on the cause of the failure presumed to be determined in the initial investigation, proper approvals were obtained to perform a work group evaluation versus a corrective action program evaluation. The control device was sent to a failure analysis laboratory for review. The laboratory analysis determined that the cause of the failure to be associated with welding of the switch contacts eventually resulting in the switch displacing. The final work group evaluation concluded that the "most probable cause" of the initial degradation that eventually led to arcing and welding was due to undervoltage testing of the closing springs charging motor. The undervoltage testing subjects the switch contacts to higher than normal current which Exelon believed resulted in the initial degradation of the switch contact.</p>	
<p>The inspectors questioned why the investigation class was not upgraded to a corrective action program evaluation when the laboratory failure analysis identified a cause of the failure that was different than the initial investigation of the work group evaluation. In addition, the final work group evaluation only determined undervoltage testing was the "most probable cause" of the initial degradation which led to the failure. Because the cause could not be definitively determined, Exelon should have performed a corrective action program evaluation. However, the inspectors concluded that the actions ultimately taken by Exelon were adequate and not upgrading the investigation class after receiving the laboratory failure analysis was a minor issue. This was based on the revisions and additional actions added to the work group evaluation (e.g., performance of a risk assessment) following two reviews of IR 4059470 by the management review committee and one review by the plant operations review committee.</p>	
<p>The inspectors' observed an action taken outside of the corrective action process that should have been established as an action in IR 4059470. Following the failure, operations management issued Operations Standing Order 17-14, "Operations Expectations for 4 Kilo-Volt Equipment Starts," to perform checks to observe closing spring indicators on 4 kV circuit breakers following breaker operation. The standing order was not added as an action item in IR 4059470 even though it was issued as a compensatory measure for the issue. The</p>	

standing order was intended to stay in place until applicable operations procedures were revised to include direction to perform these inspections routinely following breaker operation. Based on further review of the issue, the action to revise the operations procedures was canceled in IR 4059470 on March 1, 2018. The inspectors noted that as of May 16, 2018, Standing Order 17-14 was still active and operations management was unaware that the action item to revise the procedures had been canceled. The inspectors concluded that issuing the standing order outside of the corrective action program process was a minor issue because there were no potential adverse consequences as a result of continuing to perform the checks.

Exelon acknowledged the inspectors' observations discussed above and entered the issues into the corrective action program as IR 4140088.

EXIT MEETINGS AND DEBRIEFS

Unless otherwise noted, no proprietary information was retained by the inspectors or documented in this report.

- On July 23, 2018, the inspectors presented the inspection results to Mr. Frank Sturniolo, Plant Manager, and other members of the Exelon staff.

THIRD PARTY REVIEWS

Inspectors reviewed Institute of Nuclear Power Operations reports that were issued during the inspection period.

DOCUMENTS REVIEWED**71111.04**Procedures

0S78.1.D, Valve Alignment for Normal Operation of Standby Gas Treatment Room Ventilation, Revision 5
 1S50.1.A (COL), Equipment Alignment of the ADS and Main Steam Relief Valves for Normal Operation, Revision 7
 1S76.1.C, Equipment Alignment of Standby Gas Treatment System Reactor Enclosure Air Recirculation System for Automatic Initiation, Revision 12
 1S92.1.N (COL-1), Equipment Alignment for 1A Diesel Generator Operation, Revision 34
 1S92.1.N (COL-4), Equipment Alignment for 1D Diesel Generator Operation, Revision 31

Condition Reports

4122755

Work Orders

4768620-02

Drawings

E-484, Reactor Enclosure SGTS Filter Electrical Heaters Common, Revision 21
 M-0078, Control Enclosure PI&D, Sheet 4, Revision 22

71111.04SProcedures

1S49.1.A (COL), Valve Alignment to Assure Availability of the RCIC System, Revision 17
 MA-716-230-1001, Oil Analysis Interpretation Guideline, Revision 20
 MA-AA-716-230, Predictive Maintenance Program, Revision 11
 S52.1.C, Operation of Safeguard Piping Fill System, Revision 11
 ST-6-049-230-1, RCIC Pump, Valve and Flow Test, Revision 90
 ST-6-052-760-1, Safeguard Piping Fill Quarterly Valve Test, Revision 20

Condition Reports

2653613	2656660	2697980	3956044	4078992	4086156
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71111.05Procedures

CC-AA-211, Fire Protection Program, Revision 8
 F-A-336, Pre-Fire Plan, Fire Area 2 13.2KV Switchgear Room 336 (Elev. 217'), Revision 15
 F-A-361, Pre-Fire Plan, Fire Area 6, Unit 2, Class 1E Battery Room 361 (Elev. 217'), Revision 7
 F-D-315A, D21 Diesel Generator and Fuel Oil – Lube Oil Tank Room, Rooms 315A and 316A (El 217), Revision 9
 F-R-109, Pre-Fire Plan, Unit 1 HPCI Pump Room 109, Revision 10
 F-R-110, Pre-Fire Plan, Unit 1 Core Spray Pump Room A, Revision 8
 F-R-173, Unit 2, A and C RHR Heat Exchanger and Pump Rooms 173 and 280 (EL 177 and 201), Revision 6
 F-R-174, Unit 2, B and D RHR Heat Exchanger and Pump Rooms 174 and 281 (EL 177 and 201), Revision 6

OP-AA-201-009, Control of Transient Combustible Material, Revision 20
 OP-LG-201-008, Limerick Generating Station Fire Protection (F) Pre-Fire Plan Strategies,
 Revision 5

71111.05A

Procedures

F-R-284, Pre-Fire-Plan, Unit 2 Reactor Enclosure Cooling Water Heat Exchanger Area Rooms
 284 and 286 (EL 201), Revision 7
 OP-AA-201-003, Fire Drill Performance, Revision 16
 ST-6-022-551-0, Fire Drill, Revision 13

Condition Reports:

4084529

Miscellaneous

Fire Drill Scenario No.: F-R-284, Unit 2, Reactor Enclosure Cooling Water Heat Exchanger Area
 Rooms 284 and 286 (EL 201), June 12, 2018
 OP-AA-201-003 Attachment 1, Fire Drill Record, completed June, 12 2018

71111.07

Procedures

M-200-037, Q Listed HVAC Heating & Cooling Coil Clean/Flush, Revision 10
 RP-LG-350-1006, Hydrolasing, Revision 1
 RT-2-011-394-1, 1EV211 Core Spray Room Cooler Air to Water Heat Transfer Test,
 Revision 10

Work Orders

4309052

71111.08

Procedures

100-RT-001, Radiographic Examination in Accordance with ASME Section V, Article 2,
 Revision 13
 GEH-PDI-UT-1, PDI Generic Procedure for the Ultrasonic Examination of Ferritic Welds,
 Revision 12
 GEH-UT-311, Procedure for Manual Ultrasonic Examination of Nozzle Inner Radius, Bore and
 Selected Nozzle to Vessel Regions, Revision 19
 WPS 1-1-GTSM-PWHT, Welding Procedure Specification for P1 to P1 Manual GTAW and
 SMAW Welds, Revision 2

Condition Reports

4122585

Work Orders

4179424

Miscellaneous

ER-LG-330-1001, ISI Program Plan Fourth Ten-Year Inservice Inspection Interval, Revision 15

UT-18-017, UT Examination Report for APE-1MS-LD N3D (Summary No. LIM-1-602760), dated April 4, 2018
 VT Examination Report for Suppression Pool Internal Surfaces, dated April 4, 2018
 UT-18-011, UT Examination Report for FWA-039 (Summary No. LIM-1-233390), dated April 4, 2018
 UT-18-012, UT Examination Report for FWA-040 (Summary No. LIM-1-233400), dated April 4, 2018
 RT Examination Report for FW-56 on Line DBB-105-1, dated April 2, 2018
 RT Examination Report for FW-58 on Line DBB-105-1, dated April 2, 2018

71111.11

Procedures

GP-2, Normal Plant Startup, Revision 172

71111.12

Procedures

ER-AA-310-1002, Maintenance Rule Functions – Safety Significance Classification, Revision 3
 ER-AA-310-1003, Maintenance Rule – Performance Criteria Selection, Revision 5
 ER-AA-310-1004, Maintenance Rule – Performance Monitoring, Revision 14
 ER-AA-310-1005, Maintenance Rule – Dispositioning Between (a)(1) and (a)(2), Revision 7
 M-056-001, Replacement of Mechanical Seals on the High Pressure Coolant Injection Main Pump – P204, Revision 1
 OP-LG-108-117-1000, Limerick Protected Equipment Program, Revision 6
 SM-AA-300-1001, Procurement Engineering Process and Responsibilities, Revision 23

Condition Reports

2652839	2653173	2681816	2682469	2683662	2686466
2686469	2690284	2695292	2697334	2704684	2705628
2713214	2718916	2718965	2718986	2719515	2725822
2727759	3948230	3951442	3952680	3953586	3983220
4001894	4002391	4015662	4123699	4127144	4127674
4136634					

Work Orders

4308237 4773946

Miscellaneous

A/R A0733443, O-ring, F/Basket Strainer on Diesel Fuel Oil system, 4/7/93
 Eval: 114-38109, EDG Gasket Material – Evaluate Alternate, 1/25/13
 INSP NO: 0101903
 PEEVAL 211748, Commercial Grade Dedication Plan for KTN-R-10 Fuse, Revision 1
 Ref. No.: 114-38070, Gasket, Crankcase, 7/27/89
 Ref. No.: 11592850, Gaskets, Manifolds, 5/16/90

71111.13

Procedures

ER-AA-600-1042, On-Line Risk Management, Revision 10
 OP-AA-108-117, Protected Equipment Program, Revision 5

OP-LG-108-117-1000, Limerick Protected Equipment Program, Revision 6
 ST-2-072-107-1, Div II Reactor Enclosure BOP Isolation LSF/SAA and RERS, SGTS Test,
 Revision 16
 ST-6-092-115-1, D11 Diesel Generator 4KV SFGD Loss of Power LSF/SAA and Outage
 Testing, Revision 25
 WC-AA-101-1006, On-Line Risk Management and Assessment, Revision 2

Miscellaneous

Operations Protected Equipment Log 4/5/18

71111.15

Procedures

NRC IN 2017-003, Anchor Darling Double Disk Gate Valve Wedge Pin and Stem-Disc
 OT-102, Reactor High Pressure, Revision 27
 S57.1.C, Drywell Purge Fan Operation, Revision 8
 ST-6-001-761-1, Main Turbine Bypass Valve Exercising, Revision 30

Condition Reports

0412345 1175540 2590938 4119016 4122755 4126091
 4127674

Work Orders

4768620

Drawings

E-484, Reactor Enclosure SGTS Filter Electrical Heaters Common, Revision 21
 M-0076, Reactor Enclosure and Refueling Area HVAC, Sheet 6, Revision 33
 M-0078, Control Enclosure PI&D, Sheet 4, Revision 22

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Procedures

8031-M-0022, Sheet 6, Fire Protection (Unit 1, Unit 2 and Common), Revision 24
 8031-M-0028, Sheet 1, Generator H₂ Cooling and CO₂ Purge (Unit 1 and Common), Revision
 41
 8031-M-0028, Sheet 2, Generator H₂ Cooling and CO₂ Purge (Unit 2), Revision 23
 CC-AA-211, Fire Protection Program, Revision 8
 L-S-51, Fire Protection System, Revision 7
 LS-AA-104, Exelon 50.59 Review Process, Revision 10
 LS-AA-104-1001, 50.59 Review Coversheet Form, Revision 4
 PPC-LGS-1, Preparedness, Prevention and Contingency Plan for Limerick Generating Station,
 Revision 3
 ST-6-001-766-1, Main Turbine Control Valve Exercise & RPS Channel Functional Test, OPCON
 4, 5, Revision 19, 20 and 21

Condition Reports

4029080 4126850

Miscellaneous

EC 618876, LGS U1 and U2 Carbon Dioxide System Modification and Abandonment, Revision 2
 LG-2017S029, 50.59 Screening for LGS U1 and U2 Carbon Dioxide System Modification and Abandonment, Revision 0
 ECR 1200019 and ECR 1200024, Electro-Hydraulic Control (EHC) System Upgrades, Revision 3

71111.19

Procedures

M-056-001, Replacement of Mechanical Seals on the High Pressure Coolant Injection Main Pump – P204, Revision 0
 M-056-004, Overhaul of the High Pressure Coolant Injection Main Pump – P204, Revision 3
 M-200-037, Q Listed HVAC Heating & Cooling Coil Clean/Flush, Revision 10
 RP-LG-350-1006, Hydrolasing, Revision 1
 RT-6-051-206-1, 1C RHR-SDC Crosstie Valve Test, Revision 5
 S12.1.A, RHR Service Water System Dual Loop Startup Hard Card, Revision 2
 S12.2.A, Shutdown of RHR Service Water Pumps and System, Revision 35
 S51.5.A, Flushing of the RHR System Heat Exchanger Tube Side with Demineralized Water, Revision 25
 S51.8.A Appendix 1, Placing RHR SP Cooling in Service During a Plant Event, Revision 2
 S55.1.A, Normal HPCI Line-up for Automatic Operation, Revision 37
 S55.1.D Appendix 1, Starting HPCI for Pressure Control During a Plant Event, Revision 0
 S55.3.A, HPCI Fill and Vent, Revision 36
 S55.9.A, Routine Inspection of HPCI System, Revision 43
 S93.0.C, 480 VAC Safeguard MCC Compartment Installation, Revision 35
 ST-6-011-231-0, A Loop ESW Pump, Valve & Flow Test, Revision 75
 ST-6-051-202-1, A LOOP RHR Cold Shutdown Valve Test, Revision 22
 ST-6-051-232-1, B RHR Pump, Valve, and Flow Test, Revision 87
 ST-6-055-230-1, HPCI Pump, Valve and Flow Test, Revision 86
 ST-6-107-594-1, Weekly Surveillance Log, Revision 84
 ST-6-107-594-2, Weekly Surveillance Log, Revision 73

Condition Reports

4127674 4145984 4146145

Work Orders

4239418	4240873	4267351	4309052	4309629	4313481
4614983	4710009	4728774	4747597	4758920	4763312
4763312	4767181	4773946	4773946		

Drawings

06KPX883678, Sheet 1, HPCI Pump, Revision D

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Procedures

ST-2-074-629-1, Functional Check of Average Power Range Monitor 4 (APRM 4), Revision 17
 ST-2-088-324-2, Remote Shutdown System Div 2 RHR Operability Test, Revision 7
 ST-6-051-234-2, D RHR Pump, Valve and Flow Test, Revision 58

ST-6-092-115-1, D11 Diesel Generator 4KV SFGD Loss of Power LSF/SAA and Outage Testing, Revision 25

ST-6-092-312-1, D12 Diesel Generator Slow Start Operability Test Run, Revision 103

ST-6-092-314-1, D14 Diesel Generator Slow Start Operability Test Run, Revision 104

Condition Reports

4149666

Work Order

4266199 4324924 4325189 4761182 4325189

Drawings

M-071-00048 Sheet 1, Schematic Engine Control D11 Diesel Generator, Revision 30

71124.01

Procedures

HU-AA-101, Human Performance Tools and Verification Practices, Revision 9

HU-AA-1211, Pre-Job Briefings, Revision 11

NISP-RP-002, Radiation and Contamination Surveys, Revision 0

NISP-RP-003, Radiological Air Sampling, Revision 0

RP-AA-300, Radiological Survey Program, Revision 16

RP-AA-301, Radiological Air Sampling Program, Revision 11

RP-AA-401, Operational ALARA Planning and Controls, Revision 23

RP-AA-441, TEDE ALARA Evaluation, Revision 9

Miscellaneous

ALARA Briefing / Attendance Form, RP-AA-401 Attachment 3, for ALARA Plan 18-043, dated 3/27/2018 at 1030 and 3/28/2018 at 2000

ALARA Plan 18-043

AR04120372

Radiation Work Permit LG-0-18-00625, Revision 0

Radiological Survey 2018-003677

Radiological Survey 2018-008466

Radiological Survey 2018-008547

Radiological Survey 2018-008552

Radiological Survey 2018-008594

Radiological Survey 2018-008690

TEDE ALARA Screening and Evaluation for plan 18-043

71151

Procedures

LS-AA-2200, Emergency AC Power Function, Attachment 5 data (April 2017 through April 2018)

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Procedures

ER-AA-1200, Critical Component Failure Clock, Revision 12

M-200-002, 2.3 KV and 4 KV Power Circuit Breaker Overhaul, Revision 10

M-200-011, 13.2 KY and 2.3 KV Switchgear Maintenance, Revision 4

MA-AA-716-004, Revision 15

MA-AA-716-008, Foreign Material Exclusion Program, Revision 13

PI-AA-120, Issue Identification and Screening Process, Revision 8

PI-AA-125, Corrective Action Program Procedure, Revision 8

PI-AA-125-1003, Corrective Action Program Evaluation Manual, Revision 4

Condition Reports

2722252	4024190	4118994	4119397	4121951	4122429
4122755	4122806	4123146	4123855	4124233	4126850
4127674	4127870	4133876	4133876	4135378	4140085
4141279	4141283				

Miscellaneous

ECAPE 4024190-14

Equipment Operator Initial Training, Module LEOT0229, AC Circuit Breakers, Revision 007

LIM-0-2018-0099, 4 Kilo-Volt Breaker Springs Failure Risk Assessment, dated 04/25/2018

LIM-60226, Failure Analysis of a Contact Assembly, dated 12/18/2017

Non-Conformance Report 94-00009, Calculation LE-069 Inadequate Voltage at 4 KV
Switchgear Spring Charging Motor, dated 2/19/1994

Operations Standing Order 17-14, Operations Expectations for 4 Kilo-Volt Equipment Starts,
dated 12/20/2017

71153

Procedures

GP-5 Appendix 2, Rx Maneuvering Without Shutdown, Revision 102

Condition Reports

4145616	4145647	4145655	4145666	4145776	4146236
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