



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION I
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November 2, 2017

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
05000352/2017003 AND 05000353/2017003**

Dear Mr. Hanson:

On September 30, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Limerick Generating Station (LGS), Units 1 and 2. On October 6, 2017, the NRC inspectors discussed the results of this inspection with Rick Libra, Site Vice-President 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's requirements. Further, inspectors documented a licensee-identified violation of very low safety significance in this report. 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 U.S. 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 LGS. In addition, if you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U. S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I, and the NRC Resident Inspector at LGS.

B. Hanson

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Sincerely,

/RA/

Daniel L. Schroeder, Chief
Reactor Projects Branch 4
Division of Reactor Projects

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

Enclosure:
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05000352/2017003 AND 05000353/2017003 DATED NOVEMBER 2, 2017

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos.: 50-352 and 50-353

License Nos.: NPF-39 and NPF-85

Report No.: 05000352/2017003 and 05000353/2017003

Licensee: Exelon Generation Company, LLC

Facility: Limerick Generating Station, Units 1 & 2

Location: Sanatoga, PA 19464

Dates: July 1, 2017 through September 30, 2017

Inspectors: S. Rutenkroger, PhD, Senior Resident Inspector
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Reactor Projects Branch 4
Division of Reactor Projects

Enclosure

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SUMMARY

IR 05000352/2017003 and 05000353/2017003; 07/01/2017 – 09/30/2017; Limerick Generating Station (LGS), Units 1 and 2; Equipment Alignment.

This report covered a three-month period of inspection by resident inspectors and announced baseline inspections performed by regional inspectors. The inspectors identified one non-cited violation which was of very low safety significance (Green and/or Severity Level IV). The significance of most findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process", dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects Within Cross-Cutting Areas," dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated November 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

Cornerstone: Mitigating Systems

- The inspectors identified a Green NCV of Unit 2 technical specification (TS) 3.0.4, when Exelon changed the operating condition of Unit 2 from mode 2 (startup) to mode 1 (run) with reactor core isolation cooling (RCIC) inoperable for surveillance testing. Specifically, the TS 3.7.3 limiting condition for operation (LCO) for RCIC was not met, a mode change from startup to run was made, and none of the allowances, TS 3.0.4.a, TS 3.0.4.b, or TS 3.0.4.c, were met to allow the mode change in that condition. Exelon entered this issue into the corrective action program with issue report (IR) 4057128.

The inspectors determined that the change in operating condition of LGS Unit 2 from startup to run with RCIC inoperable was reasonably within Exelon's ability to foresee and correct and should have been prevented and therefore was a performance deficiency. This finding is more than minor because it adversely affected the configuration control attribute of the mitigating systems cornerstone to ensure the availability of systems that respond to initiating events to prevent undesirable consequences (i.e. core damage). Specifically, RCIC was inoperable during the time it was required to be operable, i.e. the mode change from startup to run. Additionally, this finding was similar to example 2.g of IMC 0612, Appendix E, in that a mode change was made without all required equipment being operable. Using IMC 0609, Appendix A, Exhibit 2, the inspectors determined that this finding was of very low safety significance (Green). Specifically, the finding did not represent a loss of function and did not represent the loss of a single train for greater than technical specification allowed outage times or greater than 24 hours. The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Documentation, because with respect to TS 3/4.7.3 Exelon did not create and maintain complete and accurate documentation of the correct usage of TS 3.0.4 that was more fully explained in the applicable safety evaluation. [H.7]

Other Findings

A violation of very low safety significance that was identified by Exelon was reviewed by the inspectors. Corrective actions taken or planned by Exelon have been entered into Exelon's corrective action program. The violation and corrective action tracking number are listed in Section 4OA7 of this report.

REPORT DETAILS

Summary of Plant Status

Unit 1 began the inspection period at 100 percent power. On July 22, 2017, operators reduced power to approximately 57 percent due to removing the 'A' condensate pump from service because of bearing failure. Following repairs, operators returned the unit to 100 percent power on July 24, 2017. On August 18, 2017, operators reduced power to 28 percent in order to conduct recirculation pump single loop operation to perform proactive replacements of adjustable speed drive power cells. Following completion of the work, operators returned the unit to 100 percent power on August 21, 2017. On August 22, 2017, reactor power was reduced when the 'A' recirculation pump tripped due to a fault in an adjustable speed drive power cell, and operators further reduced power to 31 percent. Following repairs, operators returned the unit to 100 percent on August 25, 2017. The unit remained at or near 100 percent for the remainder of the inspection period.

Unit 2 began the inspection period at 100 percent power. On August 5, 2017, operators reduced power to approximately 67 percent due to a leak in the main turbine electrohydraulic control system. Following repairs, operators returned the unit to 100 percent power on August 7, 2017. The unit remained at or near 100 percent for the remainder of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01 – 2 samples)

.1 Readiness for Seasonal Extreme Weather Conditions

a. Inspection Scope

The inspectors performed a review of Exelon's preparations for the onset of seasonal high temperatures on July 13, 2017. The inspectors reviewed the implementation of adverse weather preparation procedures before the onset of and during this adverse weather condition. The inspectors walked down the emergency diesel generators and emergency service water system to ensure system availability. The inspectors verified that operator actions defined in Exelon's adverse weather procedure maintained the readiness of essential systems. The inspectors discussed readiness and staff availability for adverse weather response with operations personnel.

b. Findings

No findings were identified.

.2 Summer Readiness of Offsite and Alternating Current (AC) Power Systems

a. Inspection Scope

The inspectors performed a review of plant features and procedures for the operation and continued availability of the offsite and alternate AC power system to evaluate readiness of the systems prior to seasonal high grid loading. The inspectors reviewed Exelon's procedures affecting these areas and the communications protocols between the transmission system operator and Exelon. This review focused on changes to the established program and material condition of the offsite and alternate AC power equipment. The inspectors assessed whether Exelon established and implemented appropriate procedures and protocols to monitor and maintain availability and reliability of both the offsite AC power system and the onsite alternate AC power system. The inspectors evaluated the material condition of the associated equipment by interviewing the responsible system manager and reviewing condition reports and open work orders.

b. Findings

No findings were identified.

1R04 Equipment Alignment

.1 Partial System Walkdowns (71111.04 – 2 samples)

a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

- Unit common 'B' control enclosure chiller during 'A' control enclosure chiller emergent maintenance on July 10, 2017
- Unit 1 'A' residual heat removal (RHR) during planned 'B' RHR testing and maintenance on September 5, 2017

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

b. Findings

No findings were identified.

.2 Full System Walkdown (71111.04S – 1 sample)

a. Inspection Scope

From May 26 through September 28, 2017, the inspectors performed a complete system walkdown of accessible portions of the Unit 2 RCIC system to verify the existing equipment lineups and material condition, handling, and storage. The inspectors reviewed operating procedures, equipment check-off lists, and the UFSAR to verify the system was aligned and maintained properly. The inspectors also reviewed electrical power availability, component lubrication and equipment cooling, cable tray, hanger, and support functionality, and operability of support systems. The inspectors performed field walkdowns of accessible portions of the system to verify system components and material condition of the components and examined structures and materials to verify that there were no deficiencies. For identified degradation the inspectors confirmed the degradation was appropriately managed by the applicable aging management program. Additionally, the inspectors reviewed a sample of related condition reports and work orders to ensure Exelon appropriately evaluated and resolved any deficiencies.

b. Findings

Introduction. The inspectors identified a Green NCV of Unit 2 TS 3.0.4, when Exelon changed the operating condition of Unit 2 from mode 2 (startup) to mode 1 (run) with RCIC inoperable for surveillance testing. Specifically, the TS 3.7.3 LCO for RCIC was not met, a mode change from startup to run was made, and none of the allowances, TS 3.0.4.a, TS 3.0.4.b, or TS 3.0.4.c, were met to allow the mode change in that condition.

Description. The RCIC system is a high pressure coolant makeup system for LGS, Units 1 and 2. It is required for safe shutdown of the reactor whenever the reactor is isolated from its normal heat sink at elevated temperatures and pressures. During the Unit 2 startup on May 26, 2017, RCIC was inoperable to perform the RCIC comprehensive surveillance test, starting at 4:10 p.m. Exelon subsequently declared RCIC inoperable due to not meeting a system flow acceptable range criterion and then declared RCIC operable on May 27, 2017, at 11:40 a.m. after further engineering analysis and input. This testing was being performed to verify operability of the RCIC system coming out of the refueling outage in accordance with the requirements of TS 4.7.3.b. TS 4.7.3.b has an allowance that states the provisions of TS 4.0.4 are not applicable provided the surveillance is performed within 12 hours after reactor steam pressure is adequate to perform the test. TS 4.0.4 requires that the entry into an operating condition, i.e. mode, shall only be made when the TS LCO surveillance requirements have been met within their surveillance time interval. Once the reactor operating pressure reached 920 psig the 12 hour clock started to test RCIC. During the performance of the test the plant operational condition was changed from startup to run on May 26 at 4:37 p.m. Exelon determined the mode change was permitted by applying TS 3.0.4.c since the TS LCO for RCIC was not met solely to perform the surveillance testing in accordance with the allowance in TS 4.7.3.b which states that the provisions of TS 4.0.4 are not applicable.

The inspectors, in consultation with Office of Nuclear Reactor Regulation (NRR) staff, concluded that Exelon's determination was not correct. Specifically, TS 3.0.4 states that when an LCO is not met, entry into an operational condition shall only be made in accordance with TS 3.0.4.a, 3.0.4.b, or 3.0.4.c. The conditions for TS 3.0.4.a and 3.0.4.b were not applicable. TS 3.0.4.c states: "When an allowance is stated in the individual value, parameter, or other Specification." Limerick's TS Bases for TS 3.0.4.c state that the specification allows entry into an operational condition with the LCO not met based on a note in the specification which states specification TS 3.0.4.c is applicable and that specification TS 3.0.4.c is typically applied to specifications which describe values and parameters (e.g., Reactor Coolant Specific Activity). The NRC staff's safety evaluation on Exelon's adoption of the provisions of Industry/Technical Specification Task Force change 359, "Increase Flexibility in Mode Restraints," (ML040540817) for LGS, which changed TS 3.0.4 and added the three statements (3.0.4.a, 3.0.4.b, and 3.0.4.c), provided additional clarification. As explained in the safety evaluation, TS 3.0.4.c can only be used for TS that measure a value or parameter and not for systems or components. In addition, in order for an LCO to be able to invoke 3.0.4.c, a note within the specification needs to explicitly state that 3.0.4.c is applicable. Therefore, Exelon cannot invoke TS 3.0.4.c for TS 3/4.7.3 via TS 4.0.4 since TS 3/4.7.3 does not contain such a note explicitly stating that TS 3.0.4.c is applicable. Therefore, the mode change from startup to run was not permitted during the time the RCIC system was inoperable irrespective of the reason for the RCIC system being inoperable.

Regarding safety significance, the inspectors noted that LGS Unit 2 TS Bases and NUREG 1433, "Standard Technical Specifications General Electric Plants, BWR/4," describe that there is an increased risk associated with entering a mode with an inoperable RCIC system. Further, NUREG 1433 describes that reactor pressure is allowed to be increased to normal operating pressure before completing high pressure RCIC system surveillance testing since it is assumed there is no indication or reason to believe that RCIC is inoperable. For further screening, the inspectors considered that the high pressure coolant injection (HPCI) system was operable at the time of the mode change when RCIC was inoperable and was capable of performing the required safety function. Exelon entered this issue into the corrective action program with IR 4057128.

Analysis. The inspectors determined that the change in operating condition of LGS Unit 2 from startup to run with RCIC inoperable was reasonably within Exelon's ability to foresee and correct and should have been prevented and therefore was a performance deficiency. This finding is more than minor because it adversely affected the configuration control attribute of the mitigating systems cornerstone to ensure the availability of systems that respond to initiating events to prevent undesirable consequences (i.e. core damage). Specifically, RCIC was inoperable during the time it was required to be operable, i.e. the mode change from startup to run. Additionally, this finding was similar to example 2.g of IMC 0612, Appendix E, in that a mode change was made without all required equipment being operable.

Using IMC 0609, Appendix A, Exhibit 2, the inspectors determined that this finding was of very low safety significance (Green). Specifically, the finding did not represent a loss of function and did not represent the loss of a single train for greater than technical specification allowed outage times or greater than 24 hours.

The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Documentation, because with respect to TS 3/4.7.3 Exelon did not create and maintain complete and accurate documentation of the correct usage of TS 3.0.4 that was more fully explained in the applicable safety evaluation. [H.7]

Enforcement. LGS Unit 2 TS 3.0.4 states, in part, that when a limiting condition for operation is not met, entry into an operational condition shall only be made when the conditions of 3.0.4.a, 3.0.4.b, or 3.0.4.c are met. Contrary to this on May 26, 2017, LGS Unit 2 entered operating condition Mode 1 (run) from Mode 2 (startup) when limiting condition for operation TS 3.7.3 for RCIC was not met and none of the three conditions, 3.0.4.a, 3.0.4.b, or 3.0.4.c, were met. Because this violation was of very low safety significance (Green) and was entered into Exelon's corrective action program (IR 4057128), the violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy. (NCV 05000353/2017003-01, Operational Condition Mode Change from Startup to Run was Made with RCIC Inoperable)

1R05 Fire Protection

.1 Resident Inspector Quarterly Walkdowns (71111.05Q – 5 samples)

a. Inspection Scope

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

- Fire area 82, Unit 1 'D14' emergency diesel generator (EDG) and fuel oil day tank room, elevation 217', on July 19, 2017
- Fire area 56, Unit 2 RCIC room, elevation 177', on August 4, 2017
- Fire areas 35 and 36, Unit 1 core spray 'A' and 'C' pump rooms, elevation 177', on August 17, 2017
- Fire areas 60 and 61, Unit 2 core spray 'A' and 'C' pump rooms, elevation 177', on August 18, 2017
- Fire area 84, Unit 2 'D23' EDG and fuel oil day tank room, elevation 217', on August 30, 2017

b. Findings

No findings were identified.

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

a. Inspection Scope

The inspectors observed a fire brigade drill scenario conducted on August 31, 2017, that involved a fire in the Unit 1, reactor enclosure elevation 201' fire area 42, rooms 200 and 209. The inspectors evaluated the readiness of the plant fire brigade to fight fires. The inspectors verified that Exelon personnel identified deficiencies, openly discussed them in a self-critical manner at the debrief, and took appropriate corrective actions as required.

The inspectors evaluated the following specific attributes of the drill:

- Proper wearing of turnout gear and self-contained breathing apparatus
- Proper use and layout of fire hoses
- Employment of appropriate fire-fighting techniques
- Sufficient fire-fighting equipment brought to the scene
- Effectiveness of command and control
- Search for victims and propagation of the fire into other plant areas
- Smoke removal operations
- Utilization of pre-planned strategies
- Adherence to the pre-planned drill scenario
- Drill objectives met

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

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06 – 1 sample)

Annual Review of Cables Located in Underground Bunkers/Manholes

a. Inspection Scope

The inspectors conducted an inspection of underground bunkers/manholes subject to flooding that contain cables whose failure could affect risk-significant equipment. The inspectors reviewed records for safety related and non-safety related cables contained in manholes onsite, including manholes 103, 104, 107, and 108, which contain cables for emergency service water and residual heat removal service water. When applicable, the inspectors verified proper sump pump operation and verified level alarm circuits were set in accordance with station procedures and calculations to ensure the cables will not be submerged. The inspectors also ensured that drainage was provided and functioning properly in areas where dewatering devices were not installed.

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07T – 3 samples)

a. Inspection Scope

Based on risk ranking of safety-related heat exchangers, a review of past heat sink inspections, and recent operational experience the inspectors selected (1) the ultimate heat sink, which included the LGS emergency service water (ESW) and residual heat removal service water (RHRSW) system piping intake structure, spray network and spray pond; (2) the 'D21' EDG jacket water, intercooler, and lube oil coolers; and (3) the '2B' RHR room cooler. The inspectors compared the selected components to Exelon's commitments made in response to Generic Letter (GL) 89-13, "Service Water System Problems Affecting Safety-Related Equipment."

The inspectors verified that any potential heat exchanger deficiencies which could mask degraded performance were being identified. The inspectors reviewed the procedures for maintaining the safety function of the selected heat exchangers and determined whether the heat exchangers were effectively monitored by means of inspection, cleaning, and performance testing. The inspectors verified on a sampling basis that these activities were consistent with the EPRI NP-7552, "Heat Exchanger Performance Monitoring Guidelines," and accepted industry practices.

Heat Exchangers Directly Cooled by the Service Water System (2 samples)

The 'D21' EDG jacket water, intercooler and lube oil coolers and the '2B' RHR room cooler are directly cooled by the ESW system. The inspectors evaluated whether testing, inspection, maintenance, and monitoring of biotic-fouling and macro-fouling programs for these heat exchangers were singularly or in combination adequate to ensure proper heat transfer.

The inspectors found that Exelon staff conducted periodic heat exchanger performance testing on the 'D21' EDG jacket water, intercooler and lube oil coolers. The inspectors reviewed the test method and a sample of results to verify performance. The inspectors verified the following items:

- The test methodology was consistent with accepted industry practices, or equivalent.
- Test conditions were consistent with the selected methodology.
- Test acceptance criteria were consistent with the design basis values.
- Test results appropriately considered differences between testing conditions and design conditions.
- Frequency of testing based on trending of test results was sufficient (based on trending data) to detect degradation prior to loss of heat removal capabilities below design basis values.
- Test results considered test instrument inaccuracies and differences.

The inspectors also determined that Exelon staff conducted periodic heat exchanger inspection/cleaning of the EDG jacket water, intercooler and lube oil coolers and the RHR room cooler. The inspectors reviewed the methods and results of a sample of inspections and cleanings. The inspectors verified the following:

- Methods used to inspect and clean heat exchangers were consistent with as-found conditions identified, expected degradation trends, and industry standards.
- Inspection and cleaning activities had established acceptance criteria, and were consistent with industry standards.
- As found results were recorded, evaluated, and appropriately dispositioned such that the as-left condition is acceptable.

Specifically, the inspectors reviewed the heat exchangers' performance test results, visual inspection records, photographs of the as-found and as-left conditions, heat exchanger specification sheets, heat exchanger tube eddy current test reports, and preventative maintenance activities to evaluate the structural integrity of the heat exchanger tubes and to determine whether the heat exchangers were maintained consistent with design assumptions in the heat transfer calculations associated with normal, accident, and transient conditions.

The inspectors also verified that the number of plugged tubes were within pre-established limits based on heat transfer capability and design heat transfer assumptions and were accounted for in the heat exchanger performance calculations. Finally, the inspectors determined whether Exelon staff had controls and operational limits in-place to prevent heat exchanger degradation due to excessive flow induced vibration during operation.

Limerick ESW and RHRSW Systems and Spray Pond (1 sample)

The inspectors evaluated the spray pond's ultimate heat sink function. The ESW and RHRSW systems provide cooling water flow from the spray pond to the safety related heat exchangers during design basis events. The inspectors evaluated whether potential common cause performance problems of the spray pond, RHRSW and ESW components were identified and determined whether Exelon staff had mitigated any potential failure mechanisms. Specifically, the inspectors determined whether Exelon staff was adequately monitoring heat sink performance degradation mechanisms including silt buildup, water chemistry, and system corrosion. For the spray pond the inspectors reviewed surveillance results performed to ensure adequate water inventory in the pond to meet the 30-day mission time and reviewed spray pond chemistry results to ensure that Exelon staff were properly monitoring the spray pond parameters to minimize any degradation mechanisms to downstream safety-related components.

The inspectors reviewed the system design documents, procedures, calculations, and design drawings to verify testing and surveillance requirements were consistent with the design and licensing basis. The inspectors performed walk-downs of the heat exchangers to evaluate the material condition of the heat exchangers and the associated environmental conditions. The inspectors also walked down the spray pond area to ensure pond banks were being maintained, vegetation growth was controlled and observed spray header operation to determine if the nozzle spray pattern was consistent with design assumptions.

The inspectors performed walk-downs of accessible areas of the ESW piping, spray pond pump house, ESW and RHRSW pumps, and spray pond spray network pipe. This was done to assess the structural integrity of the spray pond pump house and the ESW and RHRSW pumps and to evaluate whether deficiencies were appropriately identified and dispositioned. The inspectors also reviewed station procedures, surveillance results, a sample of non-destructive examination records, photographs, completed or planned corrective actions, and interviewed engineering personnel to assess the equipment. Finally, the inspectors reviewed operational and maintenance history, system health reports, and in-service testing results for adverse trends and to verify that the service water system functioned as designed.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program and Licensed Operator Performance (71111.11Q – 2 samples)

.1 Quarterly Review of Licensed Operator Requalification Testing and Training

a. Inspection Scope

The inspectors observed licensed operator simulator training scenarios on July 31, 2017. The scenarios included a failed reactor pressure vessel pressure transmitter, trip of both recirculation pumps, a turbine trip, and an anticipated transient without a scram. The scenarios were complicated by a trip of the 'C' RHRSW pump, the main turbine bypass valves failing closed, and an inadvertent isolation of drywell cooling and primary containment instrument gas. The inspectors evaluated operator performance during the simulated event and verified completion of risk significant operator actions, including the use of abnormal and emergency operating procedures. The inspectors assessed the clarity and effectiveness of communications, implementation of actions in response to alarms and degrading plant conditions, and the oversight and direction provided by the control room supervisor. The inspectors verified the accuracy and timeliness of the emergency classifications made by the shift manager and the TS action statements entered by the shift technical advisor. Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance problems.

b. Findings

No findings were identified.

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

a. Inspection Scope

The inspectors observed and reviewed licensed operator performance in the main control room during the performance of the Unit 1 reduction in power and associated activities on August 19, 2017. The inspectors observed infrequently performed test or evolution briefings and reactivity control briefings to verify that the briefings met the criteria specified in Exelon's Operations and Administrative Procedures. Additionally, the inspectors observed test performance to verify that procedure use, crew communications, and coordination of activities between work groups similarly met established expectations and standards.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12Q – 2 samples)a. Inspection Scope

The inspectors reviewed the samples listed below to assess the effectiveness of maintenance activities on structure, system, and component performance and reliability. The inspectors reviewed system health reports, corrective action program documents, maintenance work orders, and maintenance rule basis documents to ensure that Exelon was identifying and properly evaluating performance problems within the scope of the maintenance rule. For each sample selected, the inspectors verified that the structure, system, or component was properly scoped into the maintenance rule in accordance with 10 Code of Federal Regulations (CFR) 50.65 and verified that the (a)(2) performance criteria established by Exelon staff was reasonable. As applicable, for structures, systems, and components (SSCs) classified as (a)(1), the inspectors assessed the adequacy of goals and corrective actions to return these SSCs to (a)(2). Additionally, the inspectors ensured that Exelon staff was identifying and addressing common cause failures that occurred within and across maintenance rule system boundaries.

- Unit 1 RHR on September 25, 2017
- Unit common 'A' control enclosure chiller on September 28, 2017

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 4 samples)a. Inspection Scope

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

- Unit 1 'D14' EDG load reject test on July 25, 2017
- Unit 2 'D22' EDG planned maintenance outage on August 9, 2017
- Unit 1 RCIC maintenance outage on August 22, 2017
- Unit 2 'A' automatic depressurization system backup nitrogen bottles unavailable for valve replacement on August 30, 2017

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 5 samples)a. Inspection Scope

The inspectors reviewed operability determinations for the following degraded or non-conforming conditions based on the risk significance of the associated components and systems:

- Unit 2 jet pump #9 low differential pressure and foreign material evaluation on May 27, 2017
- Unit 1 'D12' EDG duplex strainer unable to be swapped on June 10, 2017
- Unit common 'A' control enclosure chiller operating with high condenser pressure on July 13, 2017
- Unit 2 jet pump #8 slightly lower differential pressure when compared with prior cycle operation on July 20, 2017
- Unit 2 jet pump #9 differential pressure increase and then corresponding decrease of 1.5 percent with a slight change in core thermal power on August 26, 2017

The inspectors evaluated the technical adequacy of the operability determinations to assess whether TS operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the TS and UFSAR to Exelon's evaluations to determine whether the components or systems were operable. The inspectors confirmed, where appropriate, compliance with bounding limitations associated with the evaluations. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled by Exelon.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 4 samples)a. Inspection Scope

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

- Unit common 'A' control enclosure chiller maintenance outage on July 18, 2017
- Unit 2 division 1, channel A, relay 'E21A-K13A' replacement for emergency core cooling system actuation on reactor vessel water level below Level 1 on July 28, 2017

- Unit 2 drywell atmosphere temperature recorder replacement on August 4, 2017
- Unit 2 'B' RHR pump motor oil cooler flush on September 19, 2017

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 3 samples)

a. Inspection Scope

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

- ST-2-092-321-1, Unit 1 'D11' emergency diesel generator four kilo-volt (4 kV) electrical bus undervoltage functional test on July 5, 2017
- ST-6-052-231-2, Unit 2 'A' loop core spray pump, valve, and flow test on August 9, 2017 (in-service test)
- ST-6-051-232-2, Unit 2 'B' RHR pump, valve, and flow test on August 10, 2017 (in-service test)

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill Evaluation (71114.06 – 3 samples)

Emergency Preparedness Drill Observation

a. Inspection Scope

The inspectors evaluated the conduct of routine Exelon emergency drills on August 28, September 11 and September 25, 2017, to identify any weaknesses and deficiencies in the classification, notification, and protective action recommendation development activities. The inspectors observed emergency response operations in the simulator and technical support center to determine whether the event classification, notifications, and protective action recommendations were performed in accordance with procedures. The inspectors also attended the station drill critiques to compare inspector observations with those identified by Exelon staff in order to evaluate Exelon critiques and to verify whether the Exelon staff were properly identifying weaknesses and entering them into the corrective action program.

b. Findings

No findings were identified.

2. RADIATION SAFETY

Cornerstone: Public Radiation Safety (PS)

2RS7 Radiological Environmental Monitoring Program (71124.07 – 3 samples)

a. Inspection Scope

The inspectors reviewed the Radiological Environmental Monitoring Program (REMP) to validate the effectiveness of the radioactive gaseous and liquid effluent release program and implementation of the Groundwater Protection Initiative (GPI). The inspectors used the requirements in 10 CFR 20, 40 CFR 190, 10 CFR 50 Appendix I, and the site's TSs, Offsite Dose Calculation Manual (ODCM), Nuclear Energy Institute (NEI) 07-07, and procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors reviewed: the LGS 2015 and 2016 annual radiological environmental and effluent monitoring reports, REMP program audits; ODCM changes, land use census, UFSAR, and inter-laboratory comparison program results.

Site Inspection (1 sample)

The inspectors walked down various thermoluminescent dosimeter and air and water sampling locations and reviewed associated calibration and maintenance records. The inspectors observed the sampling of various environmental media as specified in the ODCM and reviewed any anomalous environmental sampling events including assessment of any positive radioactivity results. The inspectors reviewed any changes to the ODCM. The inspectors verified the operability and calibration of the meteorological tower instruments and meteorological data readouts. The inspectors reviewed environmental sample laboratory analysis results, laboratory instrument measurement detection sensitivities; and results of the laboratory quality control program audit, and the inter- and intra-laboratory comparison program results. The inspectors reviewed the groundwater monitoring program as it applies to selected potential leaking SSCs, and 10 CFR 50.75(g) records of leaks, spills, and remediation since the previous inspection.

GPI Implementation (1 sample)

The inspectors reviewed: groundwater monitoring results; changes to the GPI program since the last inspection; anomalous results or missed groundwater samples; leakage or spill events including entries made into the decommissioning files (10 CFR 50.75(g)); evaluations of surface water discharges; and Exelon's evaluation of any positive groundwater sample results including appropriate stakeholder notifications and effluent reporting requirements.

Problem Identification and Resolution (1 sample)

The inspectors evaluated whether problems associated with the REMP were identified at an appropriate threshold and properly addressed in Exelon's corrective action program.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

40A1 Performance Indicator Verification (71151)

.1 Unplanned Scrams and Unplanned Scrams with Complications (4 samples)

a. Inspection Scope

The inspectors reviewed Exelon's submittals for the following Initiating Events Cornerstone performance indicators (PIs) for the period of July 1, 2016, through June 30, 2017.

- Unit 1 Unplanned Scrams per Critical Hours
- Unit 2 Unplanned Scrams per Critical Hours
- Unit 1 Unplanned Scrams with Complications
- Unit 2 Unplanned Scrams with Complications

To determine the accuracy of the PI data reported during those periods, inspectors used definitions and guidance contained in the NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, and NUREG-1022, "Event Report Guidelines 10 CFR 50.72 and 50.73," Revision 3. The inspectors reviewed Exelon's operator narrative logs, operability assessments, maintenance rule records, maintenance work orders, condition reports, event reports and NRC integrated inspection reports to validate the accuracy of the submittals.

b. Findings

No findings were identified.

.2 Mitigating Systems Performance Index (2 samples)

a. Inspection Scope

The inspectors reviewed Exelon's submittal of the Mitigating System Performance Index (MSPI) for Unit 1 and Unit 2 RHR for the period of July 1, 2016 through June 30, 2017. To determine the accuracy of the PI data reported during those periods, the inspectors used definitions and guidance contained in NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7. The inspectors also reviewed Exelon's operator narrative logs, condition reports, MSPI derivation reports, event reports, and NRC integrated inspection reports to validate the accuracy of the submittals.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152 – 2 samples)

.1 Routine Review of Problem Identification and Resolution Activities

a. Inspection Scope

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

b. Findings

No findings were identified.

.2 Annual Sample: Primary Containment Isolation Valve (HV-055-220) Failure to Open

a. Inspection Scope

The inspectors performed an in-depth review of Exelon's evaluation and corrective actions following the identification that primary containment isolation valve (PCIV) HV-055-220 would not open. The valve is a containment isolation valve in the high pressure safety injection systems required to close during certain design basis events. Exelon identified the failure during a quarterly timed valve stroke surveillance on January 3, 2016. The inspectors reviewed condition reports that documented the identification, evaluation, and corrective actions taken to address this problem. Specifically, the inspectors reviewed Exelon's evaluation that determined the cause of the failure; interim corrective actions that increased the open torque switch cutout set point to restore the valve to an operable condition; and final corrective actions which included replacement of the valve and surveillance test changes. In addition to a review of these documents, the inspectors interviewed engineers to determine the scope of the corrective actions performed to address the identified deficiencies.

The inspectors assessed Exelon's evaluation, extent of condition review, completed and proposed corrective actions, and the prioritization and timeliness of corrective actions to evaluate whether the actions taken by Exelon were appropriate. Specifically, inspectors evaluated whether the interim corrective actions to increase the open torque switch cutout setting and greasing the valve shaft; the determination that the higher torque value was due to a degraded packing was technically supported; and that the subsequent retesting of the valve resulted in an appropriate conclusion that the valve was restored to an operable condition until final corrective actions were performed.

The inspectors also assessed if long term corrective actions which included replacement of the valve and an extension of the surveillance testing periodicity addressed the degraded condition. The inspectors also reviewed the qualification of the replacement valve and post maintenance testing of the valve and associated piping to evaluate if the maintenance had been adequately performed and the system had been restored. Finally, the inspectors walked down the piping and valve installation to determine if the equipment and piping were installed in accordance with the work order.

b. Findings and Observations

No findings were identified.

The inspectors determined that the evaluation of the causes of the valve failure to open was adequate. The inspectors verified that applicable TS LCO action statements following the failure were entered and that the valve was restored to service prior to exceeding LCO time requirements. The inspectors also concluded that the corrective actions were reasonable and addressed interim operability concerns until final corrective actions could be completed. Finally, the inspectors concluded that final corrective actions addressed the degraded condition.

The inspectors determined that while troubleshooting, following the failure of the valve to open, Exelon staff determined that the torque on the valve shaft had significantly increased when compared to previous testing and inspection of the grease in the shaft found indications of excessive packing wear. Following a review of testing Exelon staff performed an evaluation to determine what the allowable maximum torque trip setting on the valve/motor could be and whether changing the set point would provide adequate margin to assure valve operation. The inspectors determined this evaluation provided margin and was appropriately implemented.

However, the inspectors noted that while the valve packing was in this degraded condition Exelon staff performed an evaluation that extended the valve testing interval such that a timed quarterly valve stroke test was not performed after July 2016. Additionally, Exelon staff did not complete an as found test or examination of the valve prior to the valve's replacement in the spring 2017 refueling outage. As a result, the inspectors observed Exelon staff missed an opportunity to periodically verify the adequacy of the torque switch modification to the end of the operating cycle. Notwithstanding, the inspectors concluded the issue was minor because successful quarterly stroke time tests were completed prior to July 2016 and the modification's technical basis provided reasonable assurance the valve was capable of closing as required.

Finally, the inspectors reviewed the evaluation performed by Exelon staff related to changing the TS quarterly surveillance stroke testing of the valve to a refueling outage testing periodicity. Limerick TS state that the TS surveillance periodicity for this valve is determined by the requirements of the American Society of Mechanical Engineers (ASME) O&M Code. The inspectors noted that Exelon staff's evaluation concluded the revised testing schedule met the applicable ASME Code testing requirements because the Code allowed for deferment of the quarterly test if it was not practical to exercise the valve during plant operation. The inspectors determined that Exelon's evaluation used guidance from NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," to draw this conclusion.

Although the inspectors concluded that testing could be deferred based on the NUREG guidance, the inspectors questioned the basis for a portion of the Exelon staff's assessment. Specifically, the inspectors observed that NUREG-1482 stated, in part, that if the testing could result in a plant shutdown then the testing could be deferred. Exelon's staff indicated in their evaluation that if during testing the valve internals were found to have failed they would have to shut down to fix the valve. Therefore, Exelon's staff concluded this met the guidance in the NUREG.

The inspectors reviewed this evaluation with NRC staff from NRR and determined this was not the intent for deferring a valve test. Rather, the staff guidance in NUREG-1482 was to address inadvertent plant shutdowns that could occur as a result of performing the valve testing itself (e.g. main steam isolation valve closure testing) and not that a test failure could necessitate a plant shutdown to comply with applicable TS LCOs. The inspectors concluded the issue was minor because the guidance in the NUREG does allow for the change in testing intervals if a safety function could be defeated. For the valve HV-055-220, Exelon's evaluation also stated that the failure of this valve to reopen would result in a loss of all suppression pool level indication which would prevent the automatic and manual actions described in the UFSAR related to suppression pool high level indications.

.3 Annual Sample: Fire Safe Shutdown Analysis Not Properly Considered for Emergency Service Water Spray Pond Return Flow

a. Inspection Scope

The inspectors performed an in-depth review of Exelon's corrective action program evaluation report and corrective actions associated with IR 3955705 which was written in response to the identification of LGS operating in an unanalyzed Fire Safe Shutdown (FSSD) condition on December 21, 2016.

The inspectors assessed Exelon's problem identification threshold, causal analysis, extent of condition reviews, compensatory actions, and the prioritization and timeliness of corrective actions to determine whether Exelon was appropriately identifying, characterizing, and correcting problems associated with the unanalyzed FSSD issue and whether the planned or completed corrective actions were appropriate. The inspectors compared the actions taken to the requirements of Exelon's corrective action procedures and to the approved fire protection program as described in the UFSAR. In addition, the inspectors interviewed engineering, regulatory affairs, and operations personnel to assess the effectiveness of the implemented and planned corrective actions.

b. Findings and Observations

No findings were identified.

Exelon determined the apparent cause of the unanalyzed FSSD condition was inadequate technical rigor applied to a 10 CFR 50.59 review on ESW to RHRSW return flow Motor Operated Valve (MOV) HV-011-015A performed October 2014. During performance of a routine test of the ESW system on July 29, 2014, HV-011-015A would not indicate full closed. On July 30, 2014 the valve was closed from the main control room under no flow conditions. The valve has remained in the closed position since 2014. The 10 CFR 50.59 review performed in October 2014 did not consider the FSSD impacts of HV-011-015A remaining in the closed position.

During a review of planned plant modifications by the corporate fire protection program manager on December 21, 2016, it was noted that the FSSD analysis described in Chapter 9A of the UFSAR credits both RHRSW return flow paths for the 'A' ESW system for a postulated fire in either the 'D13' or 'D23' 4 kV switchgear rooms. With the clearance applied to HV-011-015A, the secondary ESW to RHRSW return flow path was isolated. With only one of two return flow paths available, a single spurious fire induced valve operation could result in not having a return flow path for the 'A' ESW loop and no cooling water flow to the EDGs supplied by the 'A' ESW loop. Therefore, Fire Area 12 for the Unit 1, 'D13' 4 kV switchgear room, and Fire Area 18 for the Unit 2, 'D23' 4 kV switchgear room were in noncompliance with the FSSD analysis.

Upon discovery of the unanalyzed FSSD condition in December, 2016, Exelon promptly entered the issue into the corrective action program as IR 3955705 and made an Emergency Notification System 8 hour report, per the requirements of 10 CFR 50.72(b)(3)(ii)(B) for an unanalyzed condition. Fire watches were immediately stationed in Fire Areas 12 and 18 as a compensatory action. In addition, a comprehensive 10 CFR 50.59 review was performed to understand the impact of the ESW system remaining in the current off normal alignment.

The inspectors reviewed corrective actions completed and planned as a result of the unanalyzed FSSD issue which included revision of the Fire Safe Shutdown Guides for Fire Area 12 and Fire Area 18 to include installation of a jumper to provide direct current power to Safety Relief Valves (SRVs) from switchgear that is not affected by fire damage. Installation of this jumper would allow both LGS units to maintain hot shutdown conditions and transition from hot shutdown conditions to cold shutdown conditions during the 72 hours assumed to restore offsite power to the station. In addition, the Exelon corporate clearance and tagging procedure was revised to add additional language to the section describing standards for temporary plant modifications and associated 10 CFR 50.59 reviews. The station procedure for review of the clearances was revised to identify clearances that should be evaluated as temporary plant modifications, and ensure they have not exceeded the authorized installation time. Training was also provided to licensed operators at the station concerning the specifics of this issue. The inspectors noted that the planned corrective action for repairing ESW MOV HV-011-15A is scheduled for the next refueling outage (1R17) in April 2018. Engineering change (EC) package EC 618592 requires senior management review and approval for extension of this corrective action.

The inspectors reviewed Exelon's extent of condition activities for this issue which included evaluating all station clearances that have been applied for greater than 90 days to determine if the clearance has exceeded the allowed installation time and if effected equipment should be controlled under the temporary modification process. In addition, Exelon reviewed all station clearances that have been applied for greater than 90 days to determine if the equipment had any unrecognized FSSD functions. No further issues were identified as a result of Exelon's extent of condition reviews. The inspectors determined Exelon's overall response to the issue was commensurate with the safety significance, was timely, and the actions taken and planned were reasonable to prevent recurrence.

Exelon submitted a Licensee Event Report (LER) concerning this issue on February 20, 2017. This LER is discussed in Section 4OA3 of this inspection report. The significance and enforcement aspect of this issue are discussed in Section 4OA7 of this inspection report.

40A3 Follow-Up of Events and Notices of Enforcement Discretion (71153 – 2 samples)

.1 Plant Events

a. Inspection Scope

The inspectors reviewed and/or observed plant parameters, reviewed personnel performance, and evaluated performance of mitigating systems for the Unit 1 'A' recirculation pump trip on August 22, 2017. The inspectors communicated the plant events to appropriate regional personnel, and compared the event details with criteria contained in IMC 0309, "Reactive Inspection Decision Basis for Reactors," for consideration of potential reactive inspection activities. As applicable, the inspectors verified that Exelon made appropriate emergency classification assessments and properly reported the event in accordance with 10 CFR Parts 50.72 and 50.73. The inspectors reviewed Exelon follow-up actions related to the events to assure that Exelon implemented appropriate corrective actions commensurate with their safety significance.

b. Findings

No findings were identified.

.2 (Closed) Licensee Event Report (LER) 05000352, 05000353/2017-002-00: Unanalyzed Fire Safe Shutdown Condition

On December 21, 2016, while both LGS Unit 1 and Unit 2 were operating at 100 percent power, a review of planned station modifications was conducted in which Exelon identified an unanalyzed Fire Safe Shutdown condition involving MOV HV-011-015A, an ESW to RHRSW return flow valve. With this MOV de-energized in the closed position, a postulated fire in the 'D13' or 'D23' 4 kV switchgear rooms could result in loss of a return flow path for the 'A' loop of ESW, which in turn, would result in overheating and inoperability of any EDGs that have their cooling flow aligned to the 'A' ESW loop. The normal station lineup would consist of ESW cooling water for four EDGs aligned to the 'A' ESW loop and four EDGs aligned to the 'B' ESW loop.

Specifically, Exelon identified that Fire Area 12, Unit 1 'D13' 4 kV switchgear room, and Fire Area 18, Unit 2 'D23' 4 kV switchgear room were not in compliance with the Unit 1 and Unit 2 UFSAR specified FSSD analysis with HV-011-015A shut, since the FSSD analysis credits both ESW to RHRSW return flow paths. With only one of the two RHRSW return paths available, a single spurious fire induced valve operation could result in not having a return flow path for the 'A' ESW loop. Exelon determined the apparent cause of the unanalyzed FSSD condition was an inadequate 10 CFR 50.59 review performed in October 2014, which did not consider FSSD impacts of the valve.

Exelon submitted LER 05000352, 05000353/2017-002-00 on February 20, 2017, to report this event in accordance with 10 CFR 50.73(a)(2)(ii)(B) as an unanalyzed condition that significantly degraded plant safety. Exelon entered this issue into the corrective action program as IR 3955705 and implemented compensatory measures in the affected fire areas pending final resolution of the issue. Exelon completed an engineering evaluation of the issue and developed a design change (EC 617611) to perform a complete 10 CFR 50.59 review of the current ESW system alignment and plan future repairs to HV-011-015A.

The inspectors reviewed this LER, the reportability criteria for this LER, the apparent cause analysis associated with this LER, and interviewed Exelon staff. The significance and enforcement aspect of this issue are discussed in Section 4OA7 of this inspection report. LER 05000352, 05000353/2017-002-00 is closed.

4OA6 Meetings, Including Exit

On October 6, 2017, the inspectors presented the inspection results to Mr. Rick Libra, Site Vice-President, and other members of the LGS staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

4OA7 Licensee-Identified Violations

The following violation of very low safety significance (Green) was identified by Exelon and is a violation of NRC requirements which meets the criteria of the NRC Enforcement Policy for being dispositioned as a non-cited violation.

LGS Unit 1 Renewed Facility Operating License, NPF-39, and LGS Unit 2 Renewed Facility Operating License, NPF-85, License Condition 2.C.(3) requires, in part, that Exelon Generation Company shall implement and maintain all provisions of the approved Fire Protection Program as described in the UFSAR. LGS Unit 1 and Unit 2 UFSAR Chapter 9A requires compliance with Branch Technical Position, Chemical Engineering Branch 9.5-1, guideline C.5.b(1), to limit fire damage so that one train of systems necessary to achieve and maintain cold shutdown conditions from either the control room or emergency control station can be repaired within 72 hours. Contrary to the above, from July 2014 to December 2016, an unanalyzed condition existed in which an abnormal ESW system alignment placed two Fire Areas in noncompliance with the FSSD analysis described in the UFSAR. Specifically, in July 2014, ESW to RHRSW flow return valve, HV-011-015A was de-energized and tagged closed following ESW system testing. With only one RHRSW return path available to the 'A' ESW loop, a postulated fire in Fire Area 12 or Fire Area 18 could cause a single spurious valve operation of either spray pond bypass valves HV-012-031A or HV-012-031C, when the ESW system is aligned in the spray pond winter bypass mode.

This condition would result in no return flow path for the 'A' loop of ESW, which would in turn result in loss of cooling water to EDGs aligned to the 'A' ESW cooling loop. The affected EDGs would be inoperable until the ESW system could be realigned to provide cooling water flow. This condition coupled with a loss of offsite power assumed in FSSD analysis would result in a loss of power to SRVs needed to transition both LGS units from hot shutdown conditions to cold shutdown conditions. Following the depletion of station batteries after 4 hours, until offsite power is assumed to be restored after 72 hours, direct current power would be lost to SRVs that are necessary to reduce plant pressure low enough to place the shutdown cooling system into service and establish cold shutdown plant temperatures. The failure to have a cold shutdown repair that could be implemented within 72 hours in accordance with the FSSD analysis described in the UFSAR, was a performance deficiency.

The performance deficiency was more than minor because it was associated with the protection against external factors (fire) attribute of the mitigating systems cornerstone and it adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The inspectors determined that the finding was of very low safety significance (Green), based on IMC 0609, Appendix F, "Fire Protection Significance Determination Process, Attachment 1, Part 1: Fire Protection Significance Determination Process Phase 1 Worksheet", dated September 2013. The finding screened to Green based upon task 1.3.1 screening question A, since the inspectors determined that for conditions evaluated by Appendix F the reactors were able to reach and maintain hot shutdown. Specifically, LGS Units 1 and 2 would have been able to achieve and maintain hot shutdown during the period the unanalyzed condition existed. This would have been accomplished by using HPCI and SRVs for pressure and level control. Both units would have been capable of maintaining hot shutdown conditions with postulated fire damage until offsite power could be restored. Because this issue was of very low safety significance (Green) and Exelon entered the issue into the corrective action program as IR 3955705, this finding is being treated as a licensee identified NCV, consistent with Section 2.3.2.a of the Enforcement Policy.

ATTACHMENT: SUPPLEMENTARY INFORMATION

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

R. Libra, Site Vice President
D. Lewis, Plant Manager
F. Sturniolo, Plant Manager
M. Bonifanti, Director of Operations
K. Kemper, Director of Site Training
J. Murphy, Director of Engineering
D. Palena, Director of Site Work Management
D. Turek, Director of Maintenance
R. Dickinson, Manager, Regulatory Assurance
A. Hightower, Emergency Preparedness Manager
J. McGee, Security Manager
M. Arnosky, On-Line Work Management Manager
J. Berg, System Engineering
M. Bonanno, Shift Manager
A. Briggs, Manger, Chemistry Programs
J. Brittain, Fire Protection Program Engineer
G. Budock, Regulatory Assurance Engineer
G. Curtin, Design Engineering (Engineering Support Team)
J. Davies, Normandeau Associates Sample Technician
A. Davis, Manager, Radiation Protection Technical Support
B. Devine, Maintenance Manager
A. DiGiovanni, MOV Engineer
D. Fillman, Manager, Normandeau Associates REMP
M. Floria, Fire Safe Shutdown Engineer
T. Fritz, System Manager
C. Gerdes, Manager, Chemistry, Environmental and Radioactive Waste
C. Giambrone, Shift Operations Superintendent
R. Heath, Senior Reactor Operator
N. Knauss, Systems Engineer
E. Kriner, Electrical Equipment Component Specialist
N. Lampe, Systems Manager
W. Levis, Manager, Engineering
L. Lynch, Regulatory Assurance
D. Merchant, Radiation Protection Manager
J. Mercurio, Licensed Operator Requalification Training Lead
H. Miller, Shipping Specialist
J. Mittura, Fire Safe Shutdown Engineer (Electrical)
D. Molteni, Senior Manager Operations Support and Services
B. Nealis, Senior Environmental Chemist
C. Pragman, Exelon Corporate Fire Protection Program Engineer
K. Strausser, Shift Manager
W. Tracey, Engineering
J. Weaver, Shift Manager

LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATEDOpened/Closed

05000353/2017003	NCV	Operational Condition Mode Change from Startup to Run was Made with RCIC Inoperable (Section 1R04)
05000352, 05000353/2017-002-00	LER	Unanalyzed Fire Safe Shutdown Condition (Section 4OA3)

LIST OF DOCUMENTS REVIEWED**Section 1R01: Adverse Weather Protection**Procedures

E-5, Grid Emergency, Revision 23
 GP-7.1, Summer Weather Preparation and Operation, Revision 36
 OP-AA-108-107, Switchyard Control, Revision 4
 OP-AA-108-107-1001, Station Response to Grid Capacity Conditions, Revision 7
 OP-AA-108-107-1002, Interface Procedure Between COMED/PECO and Exelon Generation (Nuclear Power) for Transmission Operations, Revision 10
 SE-9, Preparation for Severe Weather, Revision 43
 SE-9-8, Preparation for Excess Hot Weather, Revision 0
 WC-AA-107 Seasonal Readiness, Revision 18
 WC-AA-8000, Interface Procedure between CCOMED/PECO and Exelon Generation (Nuclear Power) for Construction and Maintenance, Revision 9

Condition Reports

3987875	3997471	3998804	4015485	4016664	4021624
4025303	4028893	4029764			

Maintenance Orders/Work Orders

4320342

Miscellaneous

Operations Narrative Logs

Section 1R04: Equipment AlignmentProcedures

S49.4.A, Draining of RCIC Steam Line, Revision 10
 S78.6.A, Swapping of the Control Enclosure HVAC System Loops and Control Enclosure Chilled Water Loops, Revision 33
 S90.1.A, Start Up of the Control Enclosure Chilled Water System, Revision 56
 ST-6-049-230-2, RCIC Pump, Valve and Flow Test, Revision 83
 ST-6-049-230-2, RCIC Pump, Valve and Flow Test, Revision 83A
 ST-6-049-231-2, RCIC Pump Comprehensive Test, Revision 10
 ST-6-049-320-2, RCIC Operability Verification, Revision 28
 ST-6-051-231-1, A RHR Pump, Valve and Flow Test, Revision 88

Condition Reports:

3974809	3979107	4010110	4015433	4015577	4054731
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Maintenance Orders/Work Orders

4282223	4284359	4646454	4654308
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Section 1R05: Fire Protection

Procedures

F-D-311D, Pre-Fire Plan, D14 Diesel Generator and Fuel Oil-Lube Oil Tank Rooms 311D and 312D, Revision 9
 F-D-315C, Pre-Fire Plan, D23 Diesel Generator and Fuel Oil-Lube Oil Tank Rooms 315C and 316C, Revision 10
 F-R-110, Pre-Fire Plan, Unit 1 Core Spray Pump Room A, Revision 8
 F-R-113, Pre-Fire Plan, Unit 1 Core Spray Pump Room C, Revision 8
 F-R-179, Pre-Fire Plan, Unit 2 RCIC Pump Room A, Revision 8
 F-R-185, Pre-Fire Plan, Unit 1 Core Spray Pump Room C, Revision 5
 F-R-188, Pre-Fire Plan, Unit 1 Core Spray Pump Room A, Revision 5
 F-R-200, Pre-Fire Plan, Unit 1 Safeguard System Access Area Rooms 200 and 209 (EI 201), Revision 10
 OP-AA-201-003, Fire Drill Performance, Revision 16

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Fire Drill Scenario No.: F-R-200, Unit 1, Safeguard System Access Area Rooms 200 and 209 (EI 201'), Fire Area 42, August 30, 2017

Section 1R06: Flood Protection Measures

Procedures

EP-AA-112-200, TSC Activation and Operation, Revision 10
 EP-AA-112-200-F-20, Limerick TSC Ventilation Lineup, Revision A
 EP-AA-120, Emergency Plan Administration, Revision 20
 EP-AA-120-F-05, Event Review Checklist, Revision E
 SE-4, Flood, Revision 7

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2719156	2719274	2725372	3989995	3989997	3989998
3990000	3990005	3990007	3990009	4046391	4053100
4053152	4053227	4053400	4055862		

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ECR 10-00461, Safety Related Electrical Manhole Drainage System, Revision 2

Section 1R07: Heat Sink Performance

Procedures

10CFR50.55a Relief Request 13R-23 – Proposed Alternative in Accordance with 10 CFR 50.55a(g)(5)(iii) – Inservice Inspection Impracticality – Revision 0
 CY-LG-120-1102, Outside Chemistry/NPDES Related Sampling and Analysis Schedule, Revision 44
 LM-0225, Performance Curves for Emergency Diesel Generator Heat Exchangers to Support USNRC Generic Letter 89-13, Revision 0
 M-389, Piping and Mechanical Spray Pond Pump House Sections, Revision 21

M-390, Piping and Mechanical Spray Pond Pump House Plan, Revision 14
 OPE-11-003, Missed ASME Inspections on ESW and RHRSW Pump Supports, Revision 5
 RT-1-011-390-0, ESW Room Cooler Heat transfer Performance Calculation Test, performed 12/4/15
 RT-1-011-875-0, ESW and RHRSW Cumulative Leakage Determination, performed 5/5/17
 RT-1-092-390-0, EDG Heat Exchanger Transfer Performance Computation Test, performed 6/9/11
 VTD 316535-01, DG Lube Oil Cooler, DG Jacket Water Heat Exchanger, dated 6/10/93
 2A-G501 EDG HX Inspection Checklist, performed 11/16/15
 RT-2-011-391-2, 2BV210 RHR Room Cooler Air to Water Heat Transfer Test, performed 12/5/15
 Limerick Generating Station, Spray Pond Parameters, dated 7/17/17
 ST-1-012-901-0, Spray Pond Structural Inspection, performed 8/26/15
 WO R1136444, Perform Eddy Current Testing on D21 D/G, dated 11/4/15

Condition Reports

0984841	1237451	1409697	1538675	1582725	1651386
1691672	2113462	2425805	2546872	2585422	2617001
2623322	2701321				

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GP-5 Appendix 2, Reactor Maneuvering without Shutdown, Revision 97
 GP-5, Steady State Operations, Revision 188
 OP-AA-103-102, Watch-Standing Practices, Revision 16
 OP-AA-104-101, Communications, Revision 3

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4643718	4659747	4665744
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4043439	4043728	4043775
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Simulator Evaluation Guide 7003E, Revision 2

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Procedures

ST-6-090-230-0, Control Enclosure Chilled Waer Pump Valve and Flow Test, Revision 37

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2523182	2597855	2624620	2624621	2624624	2624627
2624632	2624636	2624640	2656461	2664530	2639140
2725405	3992482	4022724	4022735	2668772	2720374
4029717	4029860	4031071	4033396		

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4640373	4313289	4660916	4654358
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8031-M-90, P&ID Control Structure Chilled Water (Common), Sheet 1, Revision 25

8031-M-90, P&ID Control Structure Chilled Water (Common), Sheet 2, Revision 22

SIM-M-51, P&ID Residual Heat Removal System, Revision A

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Unit 0, Control Enclosure Chilled Water (CECW) System Basis Document

Unit 0, Control Enclosure Chilled Water System Health Report

Unit 1 Residual Heat Removal Maintenance Rule System Basis Document

Unit 1 Residual Heat Removal System Health Report

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ER-AA-600-1042, On-Line Risk Management, Revision 10

OP-LG-108-117-1000, Limerick Protected Equipment Program, Revision 6

ST-6-092-324-1, D14 Diesel Generator LOCA/Load Reject Testing and Fast Start Operability
Test Run, Revision 27

WC-AA-101-1006, On-Line Risk Management and Assessment, Revision 2

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Operations Protected Equipment Log 8/22/17

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OP-AA-108-111 Attachment 1, Adverse Condition Monitoring and Contingency Plan, Revision 10

ST-6-043-320-2, Daily Jet Pump Operability Verification for Two Recirculation Loop Operation,
Revision 33ST-6-043-320-2, Daily Jet Pump Operability Verification for Two Recirculation Loop Operation,
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ST-6-043-320-2, Unit 2 Daily Jet Pump Operability Test, Revision 34

ST-6-051-231-2, A RHR Pump, Valve, and Flow Test, Revision 75

ST-6-051-232-2, B RHR Pump, Valve, and Flow Test, Revision 73

ST-6-051-233-2, C RHR Pump, Valve, and Flow Test, Revision 57

ST-6-051-234-2, D RHR Pump, Valve, and Flow Test, Revision 56

ST-6-052-231-2, A Loop Core Spray Pump, Valve, and Flow Test, Revision 58

ST-6-052-232-2, B Loop Core Spray Pump, Valve, and Flow Test, Revision 59

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I0008234	4015736	4019875	4031071	4046098
4015576	4015738	4019976	4033396	
4015735	4015857	4020448	4034122	

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4286987	4604495	4613598	4627919	4629530
4636996	4637004	4644775	4650434	4660916

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8031-M-08, Sheet 3, Condensate & Refueling Water Storage (Unit 2), Revision 14
 8031-M-1-B11-D233-C-1.3, Jet Pump, 2/12/1979
 8031-M-41, Sheet 4, Nuclear Boiler (Unit 2), Revision 43
 8031-M-41, Sheet 5, Nuclear Boiler (Unit 2), Revision 31
 8031-M-41, Sheet 6, Nuclear Boiler (Unit 2) Revision 55
 8031-M-42, Sheet 3, Nuclear Boiler Vessel Instrumentation (Unit 2), Revision 21
 8031-M-42, Sheet 4, Nuclear Boiler Vessel Instrumentation (Unit 2), Revision 12
 8031-M-42, Sheet 6, Nuclear Boiler Vessel Instrumentation (Unit 2), Revision 0
 8031-M-43, Sheet 3, Reactor Recirculation Pump (Unit 2), Revision 26
 8031-M-43, Sheet 4, Reactor Recirculation Pump (Unit 2), Revision 14
 8031-M-44, Sheet 3, Reactor Water Clean-Up (Unit 2), Revision 49
 8031-M-44, Sheet 4, Reactor Water Clean-Up (Unit 2), Revision 50
 8031-M-45, Sheet 2, Clean Up Filter Demineralizer (Unit 2), Revision 12
 8031-M-49, Sheet 2, Reactor Core Isolation Cooling (Unit 2), Revision 48
 8031-M-51, Sheet 5, Residual Heat Removal (Unit 2), Revision 31
 8031-M-51, Sheet 6, Residual Heat Removal (Unit 2), Revision 23
 8031-M-51, Sheet 7, Residual Heat Removal (Unit 2), Revision 21
 8031-M-51, Sheet 8, Residual Heat Removal (Unit 2), Revision 28
 8031-M-52, Sheet 3, Core Spray (Unit 2), Revision 20
 8031-M-52, Sheet 4, Core Spray (Unit 2), Revision 18
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 8031-M-53, Sheet 4, Fuel Pool Cooling & Cleanup (Unit 2), Revision 17
 8031-M-55, Sheet 2, High Pressure Coolant Injection (Unit 2), Revision 57
 B11-D233-C-002, Sheet 1, Diffuser, Revision 0
 B11-D233-C-003, Sheet 1, Inlet – Mixer, Revision 0
 G-080-VC-00368, Sheet 1, Jet Pump – Restrainer Bracket, Revision 1

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004N3273, Phase 1A Limerick Unit 2 Jet Pump Number 9 Flow Blockage SLO and TLO
 Evaluation – 180 days, Revision 1
 EC 6204407
 GE Services Information Letter SIL No. 330, GE BWR/6 Jet Pump Inlet Mixer Ejection,
 Supplement 2
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 GE-NE-0000-003-0247-1, Jet Pump Riser to Yoke Weld Flaw Evaluation at Limerick Generating
 Station Unit 1, Revision 0
 GENE-B13-01920-023-1, Limerick Unit 1 Jet Pump Flow Mismatch Vibration Evaluation, 3/1998
 INR Li214 IVVI-17-09-R1 Jet Pump WD-1 New Wear Indication Notification Report
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 INR Li2R14 IVVI-17-05-R1 Jet Pump 01-01 RS-9 Indication Notification Report
 INR Li2R14 IVVI-17-08 Jet Pump Plates Indication Notification Report
 INR Li2R14 IVVI-17-11 Jet Pump Slip Joint Clamp Indication Notification Report
 INR Li2R14 IVVI-17-12 Jet Pumps 1-10 Wedges & Aux Wedges Indication Notification Report
 Jet Pump Beam Bolt Inspection History
 Jet Pump Performance Data
 Lim-2-2017-0278, U2 Jet Pump #9 Low dP ODM, Revision 0
 Limerick 1 Jet Pump 1 and 2 Flow Imbalance Evaluation at 100% Core Flow GE Design Record
 File: B13-01920-023, 2/13/1998

Limerick 1 Jet Pump 1 and 2 Flow Imbalance Evaluation, dated 19 March 1998
 Limerick Generating Station, Unit 1 Information Supporting Evaluation of Jet Pump Flow Imbalance, 3/16/1998
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 PECO Issue Report I0008234
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 TODI-LGS-DBR0029664, U2 JP #9 Single Loop Operation, Revision 0
 Unit 1 Jet Pump #2 Flow Anomaly PORC Presentation, 2/13/1998

Section 1R19: Post-Maintenance Testing

Procedures

S51.8.K, RHR Full Flow Test and Suppression Pool Level Control, Revision 26
 ST-2-042-665-2, ECCS, RCIC, and NSSSS – Reactor Level and Pressure, Div 1 Channels A and J (Core Spray, LPCI, ADS, RCIC, and D/G) Functional Test (LIS-42-2N691A, LS-42-2N692A, LS-42-2N693A, PIS-42-2N694A, PIS-42-2N690A, PIS-42-2N690J), Revision 11
 ST-2-088-401-2, Remote Shutdown/Accident Monitoring Drywell Temperature and Suppression Chamber Temperature Calibration, Revision 9

Condition Reports

4020785 4029717 4029860 4031071 4033396 4036471
 4038954

Maintenance Orders/Work Orders

4169805 4320927 4640373 4660916 4668502

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Procedures

ST-2-092-321-1, 4KV Emergency D11 Bus Undervoltage Channel/Functional Test, Revision 27
 ST-6-051-232-2, B RHR Pump, Valve, and Flow Test, Revision 73
 ST-6-052-231-2, A Loop Core Spray Pump, Valve, and Flow Test, Revision 58
 ST-6-052-232-2, B Loop Core Spray Pump, Valve, and Flow Test, Revision 59
 ST-6-107-200-0, IST Valve Stroke Surveillance Log, Revision 29

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4028740

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4604495 4613598 4624876 4627919 4629530 4636996
 4637004

Section 2RS7: Radiological Environmental Monitoring Program

Procedures

CY-AA-170-000, Radioactive Effluent and Environmental Monitoring Programs, Revision 006
 CY-AA-170-100, Radiological Environmental Monitoring Program, Revision 002
 CY-AA-170-1000, Radiological Environmental Monitoring Program and Meteorological Program Implementation, Revision 009
 CY-AA-170-1100, Quality Assurance for Radiological Monitoring Programs, Revision 003
 CY-AA-170-300, Offsite Dose Calculation Manual Administration, Revision 002
 CY-AA-170-3100, Offsite Dose Calculation Manual Revisions, Revision 006

ER1, Annual Land Use Survey for Exelon Nuclear's Limerick Generating Station, Revision 9
 ER24, Collection of Precipitation Samples for Radiological Analysis, Revision 1
 ER5, Collection of Water Samples for Radiological Analysis, Revision 13
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 ER7, Collection of Sediment Samples for Radiological Analysis, Revision 9
 ER8, Collection of Air Particulate and Air Iodine Samples for Radiological Analysis, Revision 18
 ER9, Collection/Exchange of Field Dosimeters for Radiological Analysis, Revision 10
 P1009, Meteorological Monitoring Program Equipment Servicing and Data Recovery
 Procedures Manual, Revision 30, dated July 2017
 RP-AA-228, 10 CFR 50.75(g) and 10 CFR 72.30(f) Documentation Requirements, Revision 2
 ST-5-036-801-0, Calibration of Primary Meteorological Sensors, Revision 004
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10 CFR 50.75(g) Record for Cooling Tower Blow-Down Line Tritium Spill, approved on 6/25/12
 Air Particulate Monitoring System Component Change Report, Normandeau Associates,
 dated 6/12/17
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 and 2, 4/2016
 Annual Radiological Environmental Operating Report, Limerick Generating Station Units 1
 and 2, 4/2017
 Assessment, NEI Peer, NEI Groundwater Protection Initiative, dated 2/9/15
 Audit, NUPIC, Eckert & Ziegler Analytics, No. 24255, 5/4/16
 Audit, NUPIC, Environmental Inc., No. 24367, 5/19/17
 Audit, NUPIC, Mirion Technologies Inc., No. 24128, 4/15/16
 Audit, NUPIC, Teledyne Brown Engineering Environmental Services, No. 24191, 7/8/16
 Change Summary Matrix for ODCM, Revision 28
 Component Level Logic Trees (decision-making flow charts) for system evaluation under the
 CY-LG-170-301, "Offsite Dose Calculation Manual", Revision 29
 EN-LG-408-4160, "RGPP Reference Material for Limerick Generating Station", Revision 5
 Environmental Assessment FMEA Component Risk Evaluation Template, dated 8/25/17
 Graphs, tritium results in groundwater monitoring wells, for 2016 and 2017.
 Groundwater Protection Initiative, Revision 1, dated 3/8/06.
 Hydrogeologic Investigation Report, Limerick Generating Station, Conestoga-Rovers &
 Associates, Revision 1, December 2014
 Land Use Survey, Limerick Generating Station 2015 [2016], Normandeau Associates,
 11/25/2016
 Land Use Survey, Limerick Generating Station 2015, Normandeau Associates, 11/25/15
 Limerick Generating Station, Units 1 and 2 – Onsite Disposal of Contaminated Material
 Pursuant to 10 CFR 20.2002 Supplemental Information, U.S. Nuclear Regulatory
 Commission, dated 2/14/97 (and all associated submittals by the licensee)
 Limerick Nuclear Power Plant Wind Rose Charts, 1/1/16 to 12/31/16
 Memorandum, study to evaluate PVC conduits to replace the "bird house" type of TLD housing,
 PECO Mechanical Engineering Division, 10/2/1979
 REMP Program Deviation/Error Table, Limerick Generating Station, Normandeau Associates,
 dated 11/2/16
 Restricted-Flow Orifice Field Calibration Check, Normandeau Associates, dated 7/20/17 and
 7/24/17 (with associated certificates of calibration)
 Updated Final Safety Analysis Report, Revision 18

Condition Reports

2050667	2223429	2553430	2553443	2553447	2569647
2572439	2591445	2602418	2627211	2676089	2676511
2678811	2684233	2684242	2691280	2692113	2705688
2739024	4029617	4031795	4037366	4040424	

Work Order

1355796	1355797	4328449	4328650
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Section 4OA1: Performance Indicator Verification

Procedures

LS-AA-2200, Mitigating System Performance Index Data Acquisition and Reporting, Revision 5
 NEI 99-02, Regulatory Assessment Performance Indicator Guideline, Revision 7

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Section 4OA2: Problem Identification and Resolution

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- 1FSSG-3012, Fire Area 12 Fire Guide, Unit 1 Emergency Aux Switchgear Rm D13 (Unit 1 only), Revision 8
- 1FSSG-3018, Fire Area 18 Fire Guide, Unit 2 Emergency Aux Switchgear Rm D23 (Unit 1 only), Revision 2
- 2FSSG-3012, Fire Area 12 Fire Guide, Unit 1 Emergency Aux Switchgear Rm D13 (Unit 2 only), Revision 8
- 2FSSG-3018, Fire Area 18 Fire Guide, Unit 2 Emergency Aux Switchgear Rm D23 (Unit 2 only), Revision 2
- OP-LG-108-115-1000, SRO Operability Determination Aid, Revision 4
- OP-MA-109-101, Clearance and Tagging, Revision 22
- PI-AA-120, Issue Identification and Screening Process, Revision 7
- PI-AA-125, Corrective Action Program (CAP) Procedure, Revision 5
- PI-AA-125-1001, Root Cause Analysis Manual, Revision 3
- PI-AA-125-1003, Corrective Action Program Evaluation Manual, Revision 4
- RT-2-011-253-0, ESW Loop "A" D/P and Flow Data Collection, Revision 31
- RT-6-000-991-0, Review of Clearance Process, Revision 16
- ST-6-055-200-2, HPCI Valve Test, Revision 55
- ST-6-055-200-2, HPCI Valve Test, Revision 56

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1259330	3955705	3969936	3970051	2608064
1686851	3966934	3969977	2607129	2608090

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LG20145043, ESW 'A' Discharge to Spray Pond/Cooling Tower (HV-011-015A), Revision 0
 LG2017S006, De-energize HV-011-015A (closed) and HV-011-011A (open) due to HV-011-015A inoperability, Revision 0

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CAPER, "ESW return MOV HV-11-15A FSSD Issue", dated 2/3/17
 EC 617611, Evaluate FSSD Repair Action with HV-011-015A in the Closed Position, Revision 0
 ACD-3160-5072, Rockwell Edward Forged Steel Univalve and Globe Stop, dated 5/3/78
 eESOM Operations Logs, dated 1/3/16
 ER-AA-302-1001, MOV Rising Stem Motor Operated Valve Thrust and Torque Sizing and Set-up Window Determination Methodology, Revision 10
 ER-LG-321-1002, Refueling Outage Justification 55-ROJ-3, Revision 1
 HV-055-220 MIDACALC Results, Revision 5
 LGS 1 & 2, IST BASES 3rdTenYr Interval 2-18-10 dated 2/12/10
 SME-D9, Rockwell-Edward Forged Steel Valves Sales Manual, dated 6/7/80
 SP-HCB-229-E4, Suppression Pool Level Instrumentation, Revision 2
 SP-HCB-229-E5, Suppression Pool Level Instrumentation, Revision 2
 ST-6-055-200-2, HPCI Valve Test, performed 1/3/16, 4/19/16, and 6/14/16
 Valve Packing Datasheet: HV-050-1F046, Revision 0

Work Orders

04179361	04250738	C0204510	C0259734	C0260207
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Section 4OA3: Follow-up of Events and Notices of Enforcement Discretion

Procedures

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 GP-5 Appendix 3, Rapid Power Reduction Without Shutdown Hard Card, Revision 67
 OT-104, Unexpected/Unexplained Positive or Negative Reactivity Insertion, Revision 53
 OT-112, Unexpected/Unexplained Change in Core Flow, Revision 58
 ST-6-043-391-1, Reactor Recirculation Single Loop Operation Temperature and Flow Check, Revision 11

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1686851	3955705	4044408	4044916	4045634
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Calculations

LF-0016-012, Fire Area 12 Fire Safe Shutdown Analysis, Revision 1
 LF-0016-018, Fire Area 18 Fire Safe Shutdown Analysis, Revision 0

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M-0011, Sheet 1, P&ID Emergency Service Water, Revision 87
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 M-0011, Sheet 2, P&ID Emergency Service Water, Revision 52
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 E-0324, Sheet 2, Schematic Diagram ESW Discharge to RHRSW MOVs, Revision 11
 E-0324, Sheet 3, Schematic Diagram ESW Discharge to RHRSW MOVs, Revision 15

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4180064

4643718

4665744

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EC 618592, HV-011-015A ESW Return Valve Temporary Configuration Change Package
(TCCP), Revision 0

F-A-428, Fire Area 18, Unit 2 D23 Emergency 4KV Switchgear Room 428, Revision 10

F-A-434, Fire Area 12, Unit 1 D13 Emergency 4KV Switchgear Room 434, Revision 12

Operations Narrative Logs

LIST OF ACRONYMS

AC	alternating current
ASME	American Society of Mechanical Engineers
CFR	<i>Code of Federal Regulations</i>
EC	Engineering change
EDGs	Emergency Diesel Generators
ESW	Emergency Service Water
FSSD	Fire Safe Shutdown Condition
GPI	Groundwater Protection Initiative
GL	Generic Letter
HPCI	High Pressure Coolant Injection
IMC	Inspection Manual Chapter
IR	issue report
kV	kilo-Volt
LCO	limiting condition for operation
LER	licensee event report
LGS	Limerick Generating Station
MOV	Motor Operated Valve
MSPI	Mitigating System Performance Index
NCV	non-cited violation
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
ODCM	Offsite Dose Calculation manual
PCIV	Primary Containment Isolation Valve
PI	Performance Indicator
REMP	Radiological Environmental Monitoring Program
RHR	residual heat removal
RHRSW	Residual Heat Removal Service Water
RCIC	reactor core isolation cooling
SRVs	Safety Relief Valves
SSC	structures, systems, and components
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report