



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

February 8, 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  
05000352/2016004 AND 05000353/2016004**

Dear Mr. Hanson:

On December 31, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Limerick Generating Station (LGS), Units 1 and 2. On January 13, 2017, the NRC inspectors discussed the results of this inspection with Mr. 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 two findings of very low safety significance (Green) in this report. Both of these findings involved a violation of NRC requirements. The NRC is treating these violations as a 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 LGS. In addition, if you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U. S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001 with copies to the Regional Administrator, Region I, and the NRC Resident 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:  
Inspection Report 05000352/2016004 and  
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Supplementary Information

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05000352/2016004 AND 05000353/2016004 DATED FEBRUARY 8, 2017

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**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION I**

Docket Nos.: 50-352 and 50-353

License Nos.: NPF-39, NPF-85

Report No.: 05000352/2016004 and 05000353/2016004

Licensee: Exelon Generation Company, LLC

Facility: Limerick Generating Station, Units 1 & 2

Location: Sanatoga, PA 19464

Dates: October 1, 2016 through December 31, 2016

Inspectors: S. Rutenkroger, PhD, Senior Resident Inspector  
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Approved By: Daniel L. Schroeder, Chief  
Reactor Projects Branch 4  
Division of Reactor Projects

Enclosure

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## SUMMARY

IR 05000352/2016004 and 05000353/2016004; 10/1/16 – 12/31/16; Limerick Generating Station (LGS) Units 1 and 2; Maintenance Effectiveness and Problem Identification and Resolution.

This report covered a three-month period of inspection by resident inspectors and announced baseline inspections performed by regional inspectors. The inspectors identified two non-cited violations, both of which were of very low safety significance (Green). 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 October 28, 2016. 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

- Green. The inspectors identified a Green NCV of 10 *Code of Federal Regulations* (CFR) 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," because Exelon did not demonstrate that the performance of the Unit 1 instrument air system had been effectively controlled through the performance of appropriate preventive maintenance and did not monitor against licensee-established goals in accordance with 10 CFR 50.65(a)(1). Specifically, the inspectors identified that the instrument air system reliability performance monitoring did not properly account for instrument air compressor failures such that the system exceeded the performance criteria established by Exelon's procedures. Exelon entered the issue into the corrective action program (CAP) as IR 3961244.

This issue is more than minor because it adversely affected the equipment performance attribute of the mitigating systems cornerstone to ensure the availability and reliability of systems that respond to initiating events to prevent undesirable consequences (i.e. core damage). Specifically, the instrument air system reliability performance monitoring did not accurately account for multiple functional failures that resulted in the system exceeding the performance criteria established by Exelon's procedures. Additionally, this finding was similar to example 7.d of IMC 0612, Appendix E, in that appropriate preventive maintenance under 10 CFR 50.65 (a)(2) was not demonstrated. 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 system or 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 the finding has a cross-cutting aspect in the area of Human Performance, Procedure Adherence, because Exelon's staff did not adequately implement the procedures for reliability performance criteria evaluation. Specifically, Exelon did not verify that the established performance criteria for train reliability accurately monitored the scope of the function and demonstrated the effectiveness of maintenance when performing functional failure determinations and the periodic 10 CFR 50.65(a)(3) assessment. [H.8] (Section 1R12)

- Green. A self-revealing Green NCV of LGS Units 1 and 2 technical specification 6.8.1 was identified when Exelon did not properly implement a surveillance procedure. Specifically, operators' secured cooling water to the operating 'A' control structure chilled water system (CSCWS) chiller unit which resulted in the unit automatically tripping to prevent damage. Operators subsequently restored cooling water flow in accordance with procedures. Exelon entered the issue into the corrective action program as IR 2720374.

This finding is more than minor because it is associated with the human performance attribute of the mitigating systems cornerstone to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the loss of cooling water to the 'A' CSCWS chiller unit resulted in a trip of the unit on high condenser pressure and rendered the chiller unavailable. 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 system or 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, Avoid Complacency, because operators did not recognize and plan for the possibility of mistakes and inherent risk and did not use appropriate error reduction tools. [H.12] (Section 4OA2)

**REPORT DETAILS**Summary of Plant Status

Unit 1 began the inspection period at 100 percent power and remained at or near 100 percent power for the remainder of the inspection period.

Unit 2 began the inspection period at 100 percent power and remained at or near 100 percent power 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 Conditionsa. Inspection Scope

The inspectors reviewed Exelon's readiness for the onset of seasonal cold temperatures. The review focused on the emergency diesel generators (EDGs) and the spray pond. The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), technical specifications, control room logs, and the corrective action program (CAP) to determine what temperatures or other seasonal weather could challenge these systems, and to ensure Exelon personnel had adequately prepared for these challenges. The inspectors reviewed station procedures, including Exelon's seasonal weather preparation procedure and applicable operating procedures. The inspectors performed walkdowns of the selected systems to ensure station personnel identified issues that could challenge the operability of the systems during cold weather conditions. Documents reviewed for each section of this inspection report are listed in the Attachment.

b. Findings

No findings were identified.

.2 Readiness for Impending Adverse Weather Conditionsa. Inspection Scope

The inspectors reviewed Exelon's preparations and response to the onset of severe weather, including thunderstorms, on October 30, 2016. The inspectors reviewed the implementation of adverse weather preparation procedures for this adverse weather condition and reviewed Exelon's operating logs to verify the actions taken. The inspectors walked down the EDGs, 4kV switchgear rooms, and battery rooms 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 adverse weather response with operations and work control personnel.

b. Findings

No findings were identified.



## 1R04 Equipment Alignment

### Partial System Walkdowns (71111.04 – 2 samples)

#### a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

- Unit 2 high pressure coolant injection (HPCI) while reactor core isolation cooling (RCIC) was out of service for level transmitter replacement on November 2, 2016
- Unit common 101 electrical safeguard bus supplied by the third alternate offsite power source when the normal offsite power source from the 10 electrical bus to the 101 electrical safeguard bus was not available on December 4, 2016

The inspectors selected these systems based on their risk-significance relative to the reactor safety cornerstones at the time they were inspected. The inspectors reviewed applicable operating procedures, system diagrams, the UFSAR, technical specifications, 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 CAP for resolution with the appropriate significance characterization.

#### b. Findings

No findings were identified.

## 1R05 Fire Protection

### 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 57, Unit 2 HPCI pump room, elevation 177', on October 5, 2016
- Fire area 93, Unit 1 air compressor, electrohydraulic control power unit, and turbine lube oil storage tank area rooms, elevation 217', on October 21, 2016
- Fire area 106, Unit 2 air compressor, electrohydraulic control power unit, and turbine lube oil storage tank area rooms, elevation 217', on October 21, 2016
- Fire area 25, Unit common auxiliary equipment room 542, elevation 289', on November 7, 2016
- Fire areas 122 & 123, spray pond pump structure, on December 19, 2016

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06 – 1 sample)

Internal Flooding Review

a. Inspection Scope

The inspectors reviewed the UFSAR, the site flooding analysis, and plant procedures to identify internal flooding susceptibilities for the site. The inspectors' review focused on the Unit 2 core spray pump room areas. The inspectors verified the adequacy of equipment seals located below the flood line, floor and water penetration seals, watertight door seals, common drain lines and sumps, sump pumps, level alarms, control circuits, and temporary or removable flood barriers. The inspectors assessed the adequacy of operator actions that Exelon had identified as necessary to cope with flooding in this area and also reviewed the CAP to determine if Exelon was identifying and correcting problems associated with both flood mitigation features and site procedures for responding to flooding.

b. Findings

No findings were identified.

1R07 Heat Sink Performance (711111.07A – 1 sample)

a. Inspection Scope

The inspectors reviewed the Unit 2 'A' residual heat removal (RHR) heat exchanger readiness and availability to perform its safety functions. The inspectors reviewed the design basis for the component and verified Exelon's commitments to NRC Generic Letter 89-13, "Service Water System Requirements Affecting Safety-Related Equipment." The inspectors reviewed the results of previous inspections of the '2A' RHR heat exchanger and similar heat exchangers. The inspectors discussed the results of the most recent inspection with engineering staff. The inspectors verified that Exelon initiated appropriate corrective actions for identified deficiencies. The inspectors also verified that the number of tubes plugged within the heat exchanger did not exceed the maximum amount allowed.

b. Findings

No findings were identified.

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

.1 Quarterly Review of Licensed Operator Regualification Testing and Training

a. Inspection Scope

The inspectors observed licensed operator simulator training scenarios on November 1, 2016. The scenarios included a reactor coolant leak into the primary containment and a reactor coolant leak into the secondary containment from the RCIC system.

The scenarios were complicated by various equipment failures and inadvertent actuations. The inspectors evaluated operator performance during the simulated events 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 technical specification 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 and Unit 2 reductions in power and associated activities on December 17, 2016. 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.

.3 Licensed Operator Requalification Program (71111.11A – 1 sample)

a. Inspection Scope

On November 21, 2016, one NRC region-based inspector conducted an in-office review of the results of the annual operating tests administered by Exelon for 2016 for Limerick Generating Station Unit 1 and Unit 2 operators. The inspection assessed whether Pass/Fail rates were consistent with the guidance of NRC Manual Chapter 0609, Appendix I, and "Operator Requalification Human Performance Significance Determination Process."

The review verified that the failure rate (individual or crew) did not exceed 20%.

- None of the 63 operators failed any section of the Annual Exam. The overall individual failure rate was 0.0%.
- None of the 10 crews failed the simulator test. The crew failure rate was 0.0%.

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 (SSC) performance and reliability. The inspectors reviewed system health reports, CAP 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 SSC was properly scoped into the maintenance rule in accordance with 10 CFR 50.65 and verified that the (a)(2) performance criteria established by Exelon staff were reasonable. As applicable, for structures, systems, and components classified as (a)(1), the inspectors assessed the adequacy of goals and corrective actions to return these structures, systems, and components to (a)(2). Additionally, the inspectors ensured that Exelon's staff was identifying and addressing common cause failures that occurred within and across maintenance rule system boundaries.

- Unit 1 'A' instrument air on December 21, 2016
- Unit 2 'A' instrument air on December 21, 2016

b. Findings

Introduction. The inspectors identified a Green NCV of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," because Exelon did not demonstrate that the performance of the Unit 1 instrument air system had been effectively controlled through the performance of appropriate preventive maintenance and did not monitor against licensee-established goals in accordance with 10 CFR 50.65(a)(1). Specifically, the inspectors identified that the instrument air system reliability performance monitoring did not properly account for instrument air compressor failures such that the system exceeded the performance criteria established by Exelon's procedures.

Description. The instrument air system provides a continuous supply of filtered, dry, and oil free air to pneumatic instruments and controls. Each unit has an instrument air system that is comprised of two redundant trains. A service air compressor is also available as a backup to both trains of instrument air compressors. The service air compressor is normally aligned to the 'A' instrument air header and can be manually realigned to the 'B' instrument air header. The system is supplied by safety-related standby onsite power and has sufficient compressed air storage such that the system's function is maintained during both normal and postulated conditions including a loss of offsite power.

In accordance with their implementing procedures, Exelon classified the instrument air system as a high safety significant system. In accordance with NRC endorsed guidance in NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and Exelon procedure, ER-AA-310, "Implementation of the Maintenance Rule," the instrument air systems are required to be monitored for both availability and reliability on a train or component level due to being classified as a high safety significant system. The performance criteria for train functional failures in a twenty-four month period is less than or equal to two.

On October 23 and November 5, 2014, the Unit 1 'A' instrument air compressor tripped while in operation (IR 2399897 and IR 2406894). At the time, Unit 1 already had two functional failures within a twenty-four month period. The two 'A' compressor trips were determined to not be functional failures based on the service air compressor being available to supply air to the 'A' header. Exelon's functional failure determination was based on the train being defined as the associated distribution header supplied by the 'A' instrument air dryer and either the 'A' instrument air compressor or the service air compressor. Similarly, Exelon defined the 'B' train as the associated distribution header supplied by the 'B' instrument air dryer and either the 'B' instrument air compressor or the service air compressor. As such, the service air compressor was credited as a common component for both trains such that failures of the 'A' and 'B' instrument air compressors were not counted as functional failures when the service air compressor was available.

The inspectors determined the use of the service air compressor to determine whether a train functional failure occurred was incorrect. The maintenance rule function for the instrument air system states "following a loss of offsite power." The instrument air compressors are powered from a safety-related source supplied by the EDGs, and the service air compressor is not. As such, the service air compressor would not be available following a loss of offsite power in order to perform the system's scoped maintenance rule function. Therefore, the two Unit 1 'A' instrument air compressor trips on October 23 and November 5, 2014, resulted in the system exceeding the reliability performance criteria and required an (a)(1) determination in accordance with Exelon procedure ER-AA-310, "Implementation of the Maintenance Rule."

Additionally, Exelon procedure ER-AA-310, "Implementation of the Maintenance Rule," defines a train as "a redundant collection of equipment that is configured and operated to serve a specific plant Maintenance Rule Function" and step 4.3.2 states to "establish performance criteria for evaluating structures, systems, and components that have been determined to be within the scope of the Maintenance Rule, to monitor the scope of the function." The train defined by Exelon did not meet the definition of a train per procedure ER-AA-310, and the scope of the function was not properly monitored. When performing functional failure determinations, Exelon procedure ER-AA-310-1004, "Maintenance Rule – Performance Monitoring," states to "determine if the condition is a maintenance rule functional failure." This is done by reviewing the function's scope to determine if the equipment would still be capable of performing that function. Additionally, Exelon procedure ER-AA-310-1007, "Maintenance Rule – Periodic (a)(3) Assessment," states to "evaluate and document established performance criteria to ensure they adequately monitor performance and the effectiveness of maintenance." The discrepancy between the function scope and the train reliability monitoring should reasonably have been identified when Exelon's staff implemented the procedures for functional failure determinations and the periodic 10 CFR 50.65(a)(3) assessments. Exelon initiated IR 3961244 to address the issue and reviewed recent performance. Exelon determined there was one additional instance of a misclassified functional failure when the Unit 2 'A' instrument air compressor tripped on September 13, 2016 (IR 2715183).

Analysis. The inspectors determined that the failure to demonstrate that the performance of the instrument air system had been effectively controlled through the performance of appropriate preventive maintenance or monitor against licensee-established goals in accordance with 10 CFR 50.65(a)(1) was within Exelon's ability to foresee and correct and should have been prevented, and therefore was a performance deficiency. This issue is more than minor because it adversely affected the equipment performance attribute of the mitigating systems cornerstone to ensure the availability and reliability of systems that respond to initiating events to prevent undesirable consequences (i.e. core damage). Specifically, the instrument air system reliability performance monitoring did not accurately account for multiple functional failures that resulted in the system exceeding the performance criteria established by Exelon's procedures, thereby reducing its reliability. Additionally, this finding was similar to example 7.d of IMC 0612, Appendix E, in that appropriate preventive maintenance under 10 CFR 50.65 (a)(2) was not demonstrated.

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 system or 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 the finding has a cross-cutting aspect in the area of Human Performance, Procedure Adherence, because Exelon's staff did not implement the procedures for reliability performance criteria evaluation. Specifically, Exelon did not verify that the established performance criteria for train reliability accurately monitored the scope of the function and demonstrated the effectiveness of maintenance when performing functional failure determinations and the periodic 10 CFR 50.65(a)(3) assessment. [H.8]

Enforcement. 10 CFR 50.65 (a)(1), requires, in part, that licensees shall monitor the performance or condition of SSCs within the scope of the rule as defined by 10 CFR 50.65 (b), against licensee-established goals, in a manner sufficient to provide reasonable assurance that such SSCs are capable of fulfilling their intended functions. 10 CFR 50.65 (a)(2) states, in part, that monitoring as specified in 10 CFR 50.65 (a)(1) is not required where it has been demonstrated that the performance or condition of an SSC is being effectively controlled through the performance of appropriate preventive maintenance, such that the SSC remains capable of performing its intended function. Contrary to the above, Exelon failed to demonstrate that the performance of the Unit 1 instrument air system had been effectively controlled through the performance of appropriate preventive maintenance and did not monitor against licensee-established goals. Specifically, the instrument air system reliability performance monitoring did not accurately account for multiple functional failures that resulted in the system exceeding the performance criteria established by Exelon's procedures which demonstrates that the performance or condition of these SSCs was not being effectively controlled through the performance of appropriate preventive maintenance and, as a result, that goal setting and monitoring was required. Exelon initiated a condition report to determine appropriate corrective actions and restore compliance.

Because this violation was of very low safety significance (Green) and Exelon entered this issue into their CAP (IR 3961244) this violation is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy. (NCV 05000352/2016004-01, Failure to Demonstrate Effective Preventive Maintenance Under 50.65(a)(2) for the Instrument Air System)

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 3 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 technical specification requirements and inspected portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met.

- Unit 1 'B' reactor enclosure recirculation system (RERS) testing on October 12, 2016
- Unit common 10 bus de-energized for the 101 bus system outage window on October 29, 2016
- Unit common 'B' main control room supply fan failure to start on November 29, 2016

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 4 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 1 RERS dampers' grease ports not all greased and current grease not properly evaluated on October 7, 2016
- Unit 2 'A' automatic depressurization system backup nitrogen bottles' retaining bar not properly secured on October 17, 2016
- Unit 2 RCIC emergent inoperability for actuation instrumentation repairs on November 3, 2016 (operator work-around)
- Unit 1 'D13' lubricating oil system temperature switches found out of calibration and not properly secured on December 7, 2016

The inspectors evaluated the technical adequacy of the operability determinations to assess whether technical specification 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 technical specifications and UFSAR to Exelon 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, such as in the case of operator workarounds (OWAs), the inspectors determined whether the measures in place would function as intended and were properly controlled by Exelon.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 – 2 samples)

Temporary Modifications

a. Inspection Scope

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

- Clearance 16-2-028-0004 – Removal of the Unit 2 main generator carbon dioxide storage tank from service.
- ECR LG 15-00437 – Temporary recorder installed to monitor selected Unit 1 balance of plant data during the plant process computer system modification installation.

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 1 'A' RERS maintenance window on October 19, 2016
- Unit common 'A' standby gas treatment system actuator overhaul on October 19, 2016
- Unit 2 division 1 safeguard battery '2A2D101' cell replacement on September 29, 2016
- Unit 2 'D22' EDG fuel oil transfer pump maintenance on November 18, 2016

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 5 samples)

a. Inspection Scope

The inspectors observed performance of surveillance tests and/or reviewed test data of selected risk-significant structures, systems, and components to assess whether test results satisfied technical specifications, 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:

- Unit 2 'D21' EDG loss of coolant accident signal and load reject testing on September 21, 2016
- MA-AA-723-330, Unit 1 'A' RHR pump motor electrical test on September 26, 2016
- ST-6-107-596-1, Unit 1 drywell floor drain sump and equipment drain tank surveillance on October 25, 2016
- Surveillance frequency interval extension for diesel generator 4kV safeguard loss of power logic system functional and outage testing completed on December 14, 2016
- ST-5-048-800-1, Unit 1 standby liquid control boron concentration analysis on December 20, 2016

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness (EP)

1EP2 Alert and Notification System Evaluation (71114.02 - 1 sample)

a. Inspection Scope

An onsite review was conducted to assess the performance, maintenance, and testing of the Limerick alert and notification system (ANS). During this inspection, the inspectors conducted a review of the ANS testing and maintenance programs. The inspectors reviewed the associated ANS procedures and the Federal Emergency Management Agency approved ANS Design Report to ensure Exelon has complied with design report commitments for system maintenance and testing. The inspection was conducted with 10 CFR 50.47(b)(5) and the related requirements of 10 CFR Part 50, Appendix E, as reference criteria.

b. Findings

No findings were identified.

1EP3 Emergency Response Organization Staffing and Augmentation System (71114.03 – 1 sample)

a. Inspection Scope

The inspectors conducted a review of the Limerick Emergency Response Organization (ERO) augmentation staffing requirements and the process for notifying and augmenting the ERO. The review was performed to verify the readiness of key Exelon staff to respond to an emergency event and to verify Exelon's ability to activate their emergency response facilities (ERF) in a timely manner. The inspectors reviewed the Limerick Emergency Plan for ERF activation and ERO staffing requirements, the ERO duty roster, applicable station procedures, augmentation test reports, the most recent drive-in drill reports, and corrective action reports related to this inspection area. The inspectors also reviewed a sample of ERO responder training records to verify training and qualifications were up to date. The inspection was conducted with 10 CFR 50.47(b)(2) and related requirements of 10 CFR Part 50, Appendix E, as reference criteria.

b. Findings

No findings were identified.

1EP4 Emergency Action Level and Emergency Plan Changes (71114.04 – 1 sample)

a. Inspection Scope

Exelon implemented various changes to the Limerick Emergency Action Levels (EALs), Emergency Plan, and Implementing Procedures. Exelon had determined that, in accordance with 10 CFR 50.54(q)(3), any change made to the EALs, Emergency Plan, and its lower-tier implementing procedures, had not resulted in any reduction in effectiveness of the Plan, and that the revised Plan continued to meet the standards in 50.47(b) and the requirements of 10 CFR 50 Appendix E.

The inspectors performed an in-office review of all EAL and Emergency Plan changes submitted by Exelon as required by 10 CFR 50.54(q)(5), including the changes to lower-tier emergency plan implementing procedures, to evaluate for any potential reductions in effectiveness of the Emergency Plan.

This review by the inspectors was not documented in an NRC Safety Evaluation Report and does not constitute formal NRC approval of the changes. Therefore, these changes remain subject to future NRC inspection in their entirety. The requirements in 10 CFR 50.54(q) were used as reference criteria.

b. Findings

No findings were identified.

1EP5 Maintenance of Emergency Preparedness (71114.05 - 1 sample)

a. Inspection Scope

The inspectors reviewed a number of activities to evaluate the efficacy of Exelon's efforts to maintain the Limerick emergency preparedness program. The inspectors reviewed: Letters of agreement with offsite agencies; the 10 CFR 50.54(q) Emergency Plan change process and practice; Exelon's maintenance of Limerick plant equipment important to EP; records of evacuation time estimate population evaluation; and provisions for, and implementation of, primary and backup ERF maintenance. The inspectors also verified Exelon's compliance at Limerick with NRC EP regulations regarding: emergency action levels for hostile action events; protective actions for on-site personnel during events; emergency declaration timeliness; ERO augmentation and alternate facility capability; evacuation time estimate updates; on-shift ERO staffing analysis; and, ANS back-up means.

The inspectors further evaluated Exelon's ability to maintain their Limerick EP program through their identification and correction of EP weaknesses, by reviewing a sample of drill reports, actual event reports, self-assessments, 10 CFR 50.54(t) reviews, and EP-related condition reports. The inspectors reviewed a sample of EP-related condition reports initiated at Limerick from November 2014 through November 2016. The inspection was conducted with 10 CFR 50.47(b) and the related requirements of 10 CFR Part 50, Appendix E, as reference criteria.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151)

.1 Mitigating Systems Performance Index (2 samples)

a. Inspection Scope

The inspectors reviewed LGS's submittal of the Mitigating Systems Performance Index for the following systems for the period of October 1, 2015 through September 30, 2016:

- Unit 1 Cooling Water (MS10)
- Unit 2 Cooling Water (MS10)

To determine the accuracy of the performance indicator data reported during those periods, the inspectors used definitions and guidance contained in Nuclear Energy Institute (NEI) Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7.

The inspectors also reviewed LGS's operator narrative logs, condition reports, mitigating systems performance index derivation reports, event reports, and NRC integrated inspection reports to validate the accuracy of the submittals.

b. Inspection Findings

No findings were identified.

.2 Reactor Coolant System Specific Activity and Reactor Coolant System Leak Rate (4 samples)

a. Inspection Scope

The inspectors reviewed LGS' submittal for the RCS specific activity and RCS leak rate performance indicators for both Unit 1 and Unit 2 for the period of October 1, 2015 through September 30, 2016. To determine the accuracy of the performance indicator 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 RCS sample analysis and control room logs of daily measurements of RCS leakage, and compared that information to the data reported by the performance indicator.

b. Inspection Findings

No findings were identified.

.3 Emergency Preparedness Performance Indicators (3 samples)

a. Inspection Scope

The inspectors reviewed data for the following three EP Performance Indicators (PI): (1) drill and exercise performance; (2) ERO drill participation; and (3) ANS reliability. The last NRC EP inspection at Limerick was conducted in the fourth calendar quarter of 2015. Therefore, the inspectors reviewed supporting documentation from EP drills and equipment tests from the fourth calendar quarter of 2015 through the third calendar quarter of 2016 to verify the accuracy of the reported PI data. The acceptance criteria documented in NEI 99-02, "Regulatory Assessment Performance Indicator Guidelines," Revision 7, was used as reference criteria.

b. Findings

No findings were identified.

.4 Occupational Exposure Control Effectiveness (1 sample)

a. Inspection Scope

The inspectors reviewed licensee submittals for the occupational radiological occurrences PI for the third quarter of 2015 through the second quarter of 2016. The inspectors used PI definitions and guidance contained in NEI 99-02, Revision 7, to determine the accuracy of the PI data reported. The inspectors reviewed electronic personal dosimetry accumulated dose alarms, dose reports, and dose assignments for any intakes that occurred during the time period reviewed to determine if there were potentially unrecognized PI occurrences.

The inspectors conducted walkdowns of various Locked High and Very High Radiation Area entrances to determine the adequacy of the controls in place for these areas.

b. Findings

No findings were identified.

.5 Radiological Effluent TS/ODCM Radiological Effluent Occurrences (1 sample)

a. Inspection Scope

The inspectors reviewed licensee submittals for the radiological effluent TS/ODCM radiological effluent occurrences PI for the third quarter 2015 through the second quarter 2016. The inspectors used PI definitions and guidance contained in the NEI 99-02, Revision 7, to determine if the PI data was reported properly. The inspectors reviewed the public dose assessments for the PI for public radiation safety to determine if related data was accurately calculated and reported. The inspectors reviewed the CAP database to identify any potential occurrences such as unmonitored, uncontrolled, or improperly calculated effluent releases that may have impacted offsite dose. The inspectors reviewed gaseous and liquid effluent summary data and the results of associated offsite dose calculations to determine if indicator results were accurately reported.

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 CAP at an appropriate threshold, gave adequate attention to timely corrective actions, and identified and addressed adverse trends. In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the CAP and periodically attended 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 Semi-Annual Trend Review (1 sample)

### a. Inspection Scope

The inspectors performed a semi-annual review of site issues to identify trends that might indicate the existence of more significant safety concerns. As part of this review, the inspectors included repetitive or closely-related issues documented by Exelon in trend reports, site performance indicators, major equipment problem lists, system health reports, maintenance rule assessments, and maintenance or CAP backlogs.

The inspectors also reviewed Exelon's CAP database for the third and fourth quarters of 2016 to assess condition reports written in various subject areas (equipment problems, human performance issues, etc.), as well as individual issues identified during the NRCs daily condition report review (Section 4OA2.1). The inspectors reviewed the Exelon quarterly trend report for the third quarter of 2016 to verify that Exelon personnel were appropriately evaluating and trending adverse conditions in accordance with applicable procedures.

### b. Findings and Observations

The review did not reveal any new trends that could indicate a more significant safety issue. The inspectors determined that Exelon personnel were identifying issues at a low threshold and entering issues into the CAP for resolution and appropriately prioritizing investigation reviews.

The inspectors also reviewed and assessed the declining trend in human performance identified by Exelon discussed in the second quarter integrated inspection report (ML16214A219). The inspectors noted additional examples in the following semiannual period in which Exelon personnel failed to implement appropriate human error prevention tools. For example, a manual cooling water valve to an operating chiller unit was not re-opened prior to stopping the running emergency service water (ESW) pump and a cooling water valve to an air compressor unit was left closed following the completion of work. These issues in aggregate represent a continuing negative trend in configuration control performance. Exelon performed causal evaluations for the individual configuration control events and is working to implement site wide performance improvement plans. The inspectors noted that Exelon's site-wide response to the individual performance issues was elevated with increased emphasis on individual values and commitment to using human error prevention tools. The inspectors determined one of the issues was a finding. The finding is documented below. The inspectors determined that the remaining issues were of minor safety significance and that Exelon's actions to address the declining trend were appropriate.

Based on the overall results of the semi-annual trend review, the inspectors determined that Exelon was appropriately identifying and entering issues into the CAP, adequately evaluating the issues, and properly identifying adverse trends before they became more safety significant problems.

One finding was identified.

Introduction. A self-revealing NCV of very low safety significance (Green) of LGS Units 1 and 2, technical specification 6.8.1, was identified when Exelon did not properly implement a surveillance procedure. Specifically, operators secured cooling water to the operating 'A' control structure chilled water chiller which resulted in the unit automatically tripping to prevent damage.

Description. The safety-related control structure chilled water system (CSCWS) provides chilled water to maintain stipulated ambient air temperature in the control structure which includes safety-related areas, such as the control room, auxiliary equipment room, emergency switchgear compartment, battery rooms, and standby gas treatment areas. CSCWS provides chilled water during normal and design bases accident conditions.

CSCWS consists of two independent, 100% capacity, chilled water systems which include chiller units. Cooling water for the chiller condensers is provided by the service water system during normal operation. On a loss of offsite power, the cooling water supply automatically switches over to the ESW system.

On September 26, 2016, LGS operations personnel were performing diesel shutdown activities in accordance with ST-6-092-311-1, "D11 Diesel Generator Slow Start Operability Test Run." After performing the steps that shutdown the diesel, the operators reached a hold point to allow for other plant activities to complete. Upon returning, the operators failed to verify the previously completed steps and resumed at the step to stop the running ESW pump instead of the steps to re-open the service water supply valves. In addition, the step that directed the ESW pump shutdown required use of the ESW shutdown procedure, S11.2.A, "Emergency Service Water System Shutdown," in which the service water supply valves are first verified to be open. However, the personnel did not use or consult the ESW shutdown procedure and secured the operating 'A' ESW pump.

Within five minutes of securing the 'A' ESW pump, the 'A' CSCWS chiller unit tripped on high condenser pressure caused by overheating. The operations staff responded to the trip, declared the 'A' chiller inoperable and unavailable, and identified the cause to be a loss of cooling water. In accordance with Exelon's procedures, the operators placed the 'A' ESW pump back into service and successfully reset and restarted the 'A' CSCWS chiller unit.

Exelon initiated IR 2720374 in response to this issue and performed an apparent cause evaluation. Exelon determined that the operators perceived the evolution to be low risk which led to decisions to not utilize human performance tools. In addition, the operators incorrectly believed that following up with the required ESW shutdown procedure following pump shutdown was acceptable rather than utilizing the procedure to perform the step. The inspectors reviewed the apparent cause evaluation, discussed the event with Exelon personnel, and attended Exelon management meetings in which the issue was discussed. The inspectors determined that Exelon correctly assessed the issue.

Analysis. The inspectors determined that the failure to implement a surveillance procedure which led to the inadvertent trip of the operating 'A' CSCWS chiller unit was 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 is associated with the human performance attribute of the mitigating systems cornerstone to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the loss of cooling water to the 'A' CSCWS chiller unit resulted in a trip of the unit on high condenser pressure and rendered the chiller unavailable.

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 system or 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, Avoid Complacency, because operators did not recognize and plan for the possibility of mistakes and inherent risk and did not use appropriate error reduction tools. [H.12]

Enforcement. LGS Units 1 and 2, technical specification 6.8.1, requires, in part, written procedures to be established, implemented, and maintained covering applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978. Regulatory Guide 1.33, Revision 2, Appendix A, Section 1, requires administrative procedures for surveillance testing and equipment control of service water and cooling water systems. Procedure ST-6-092-311-1 directed stopping the 'A' ESW pump per procedure S11.2.A. Procedure S11.2.A required ensuring the flow of service water cooling to operating 'A' loop loads including chillers and unit coolers prior to securing the 'A' loop ESW pumps. Contrary to the above, on September 26, 2016, Exelon operators did not ensure the flow of service water cooling to operating 'A' loop loads prior to securing the 'A' loop ESW pumps. In accordance with Exelon's procedures, the operators restored cooling and successfully reset and restarted the 'A' CSCWS chiller unit. Because this violation was of very low safety significance (Green) and Exelon entered this issue into their CAP (IR 2720374) this violation is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy. (NCV 05000352, 05000353/2016004-02, Control Structure Chiller Unit Trip Caused by Failure to Properly Implement Procedures)

.3 Annual Sample: Emergency Diesel Generator Issues (1 sample)

a. Inspection Scope

The inspectors performed an in-depth review of Exelon's evaluations and corrective actions associated with EDG issues over the past few years which resulted in unavailability and inoperability of the EDGs. Specific issues included EDG failures to start, tubing cracking failures, a keepwarm heater failure, standby lube oil pump failure, and starting air compressor failure. To address the system's health more broadly, Exelon entered these occurrences into the CAP as condition report IR 2538760, "Trend of Emergency Diesel Generator Issues."

The inspectors assessed Exelon's problem identification threshold, extent of condition reviews, common mode failure considerations and the prioritization and timeliness of actions to evaluate whether Exelon's staff was appropriately identifying, characterizing, and correcting problems associated with the EDGs and whether the planned or completed corrective actions were appropriate and met the requirements of their CAP. The inspectors compared the actions taken to the requirements of Exelon's CAP and 10 CFR 50, Appendix B. The inspectors conducted numerous walkdowns of all eight EDGs to assess material condition and to evaluate the effectiveness of Exelon's actions with regards to the failures and prevention of recurrence. Additionally, the inspectors interviewed engineering personnel as well as system operators to assess the reasonableness of the planned and completed corrective actions.

b. Findings

No findings were identified.



The inspectors concluded that Exelon personnel appropriately identified the adverse equipment issues involving several of the EDGs or their respective auxiliary systems and properly evaluated the matters in accordance with Exelon procedures. The inspectors reviewed several relative condition reports along with a number of the corresponding corrective actions and additional documentation and concluded Exelon staff had appropriately evaluated the problems and implemented reasonable corrective actions.

The inspectors further determined Exelon's conclusions were reasonable, following their cross-functional and reliability reviews, that there did not appear to be any prominent common cause, programmatic or otherwise, to the failures. The inspectors concluded that the issues had been accurately and thoroughly documented within the CAP. The inspectors determined that Exelon performed appropriate extent-of-condition reviews, as well as, internal and external operating experience reviews to assess the potential impact on other EDG system components.

Exelon's actions regarding the issues included performing equivalency evaluations, commercial grade dedication, and developing both corrective and preventive maintenance replacement strategies for obsolete EDG starting air solenoid valves, control system function relays, and temperature switches, which accounted for the unrelated 'D22' engine failure to start, 'D23' standby lube oil pump failure to start, and starting air compressor failure. The cracked copper tubing failures were addressed through upgrade modifications using stainless steel tubing and rerouting the tubing to eliminate disconnecting and reconnecting during maintenance activities. A broken reset pushbutton for the 'D23' EDG was the cause of the lube oil keepwarm failure and was replaced. Additional actions were taken to enhance maintenance procedures regarding examination and replacement of instrumentation panel flex hoses along with some minor revisions to abbreviated run-in and overspeed trip procedures to allow multiple iterations and re-performance of overspeed trip testing, if required.

The inspectors determined that Exelon's associated technical evaluations were sufficiently thorough and were based on focused plant walkdowns, vendor/Fairbanks Morse Owner's Group guidance, sound engineering judgment, testing, and relevant operating experience. The inspectors concluded that Exelon's assigned corrective actions were aligned with the identified causal factors, reasonable, appropriately documented, and adequately tracked for completion. Based on the documents reviewed, plant walkdowns and engineer interviews, the inspectors noted that personnel identified problems and entered them into the CAP at a low threshold.

Taken collectively, the inspectors did not identify a performance deficiency that Exelon's staff could have reasonably foreseen or corrected associated with equipment problems involving the eight installed Limerick EDGs. The problems involved a failure to start, tubing cracks, a keepwarm heater and standby lube oil pump problem and starting air compressor failure. Based on the documents reviewed and discussions with engineering personnel and operators, the inspectors determined that Exelon's response to the issues were commensurate with the safety significance and that actions completed and planned were reasonable to address the probable and contributing causes of the issues involving the EDGs at LGS.

#### 4OA5 Other Activities

##### Institute of Nuclear Power Operations (INPO) Report Review

###### a. Inspection Scope

The inspectors reviewed the final report for the INPO plant assessment of LGS conducted in June 2016. The inspectors evaluated this report to ensure that NRC perspectives of Exelon performance were consistent with any issues identified during the assessment. The inspectors also reviewed this report to determine whether INPO identified any significant safety issues that required further NRC follow-up.

###### b. Findings

No findings were identified.

#### 4OA6 Meetings, Including Exit

On January 13, 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.

### **ATTACHMENT: SUPPLEMENTARY INFORMATION**

**SUPPLEMENTARY INFORMATION****KEY POINTS OF CONTACT**Licensee Personnel

R. Libra, Site Vice President  
 D. Lewis, Plant Manager  
 M. Herr, Assistant Plant Manager  
 F. Sturniolo, Director of Operations  
 J. Murphy, Director of Engineering  
 D. Palena, Director of Maintenance  
 M. Bonifanti, Director of Work Management  
 S. Desimone, Acting Security Manager  
 R. Dickinson, Manager, Regulatory Assurance  
 K. Kemper, Training Director  
 C. Giambrone, Shift Operations Superintendent  
 A. Hightower, Emergency Preparedness Manager  
 G. Budock, Regulatory Assurance Engineer  
 D. Merchant, Radiation Protection Manager  
 C. Gerdes, Manager, Chemistry, Environmental and Radioactive Waste  
 J. Mercurio, Licensed Operator Requalification Training Lead  
 T. Fritz, System Manager  
 E. Kriner, Electrical Equipment Component Specialist  
 N. Lampe, Systems Manager  
 T. Manley, Equipment Operator  
 T. Webb, Equipment Operator  
 T. Steffel, System Manager  
 M. Trexler, Maintenance Rule Coordinator  
 T. Hightower, Emergency Preparedness Manager  
 J. Blose, Chemistry Technician  
 M. Arnosky, Operations Shift Manager  
 J. Harkins, Operations Shift Manager  
 W. Pulford, Operations Shift Supervisor  
 R. Kirse, Operations Shift Supervisor  
 J. Brown, Operations Shift Supervisor  
 J. Heidelbaigh, Operations Reactor Operator  
 R. Supersano, Operations Reactor Operator  
 K. Corey, Operations Reactor Operator  
 G. Miles, Operations Reactor Operator

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

05000352/2016004-01	NCV	Failure to Demonstrate Effective Preventive Maintenance Under 50.65(a)(2) for the Instrument Air System (Section 1R12)
05000352, 05000353/2016004-02	NCV	Control Structure Chiller Unit Trip Caused by Failure to Properly Implement Procedures (Section 4OA2)

## LIST OF DOCUMENTS REVIEWED

### Section 1R01: Adverse Weather Protection

#### Procedures

ER-AA-600-1023, PARAGON Model Capability, Revision 7  
GP-7, Cold Weather Preparation and Operation, Revision 52  
MA-AA-716-026, Station Housekeeping / Material Condition Program, Revision 15  
OP-AA-108-111-1001, Severe Weather and Natural Disaster Guidelines, Revision 15  
SE-14, Snow, Revision 21  
SE-9, Preparation for Severe Weather, Revision 42  
WC-AA-107, Seasonal Readiness, Revision 17

#### Condition Reports

2617084

#### Maintenance Orders/Work Orders

R1335096

#### Miscellaneous

Certification of 2016-2017 Winter Readiness

### Section 1R04: Equipment Alignment

#### Procedures

2S55.1.A (COL), Equipment Alignment for Automatic Operation of HPCI System, Revision 19  
S55.9.A, Routine Inspection of HPCI System, Revision 43  
ST-6-107-594-1, Weekly Surveillance Log, Revision 80  
ST-6-107-594-2, Weekly Surveillance Log, Revision 68

#### Condition Reports:

3948871

### Section 1R05: Fire Protection

#### Procedures

F-A-540, Pre-Fire Plan, Common Remote Shutdown Room 540, Revision 11  
F-A-542, Pre-Fire Plan, Common Auxiliary Equipment Room 542, Revision 12  
F-R-180, Pre-Fire Plan, HPCI Pump Room 180, Revision 9  
F-S-001, Pre-Fire Plan, Spray Pond Pump Structure Western Half, Revision 13  
F-S-002, Pre-Fire Plan, Spray Pond Pump Structure Eastern Half, Revision 11  
F-T-328, Pre-Fire Plan, Unit 1 Air Compressor, EHC Power Unit, and Turbine Lube Oil Storage Tank Rooms, Revision 6  
F-T-357, Pre-Fire Plan, Unit 2 Air Compressor, EHC Power Unit, and Turbine Lube Oil Storage Tank Rooms, Revision 5  
OP-MA-201-007, Fire Protection System Impairment Control, Revision 6  
S22.8.G, Alignment of Halon Equipment and Fire Detectors in the Remote Shutdown and Auxiliary Equipment Rooms Following an Alarm, Revision 10

#### Condition Reports:

2737481

Section 1R06: Flood Protection Measures

Procedures

ARC-MCR-213 A3, 2A-2C Core Spray Pump Room Flood, Revision 2  
ARC-MCR-215 A3, 2B-2D Core Spray Pump Room Flood, Revision 2  
SE-4, Flood, Revision 7  
SE-4-1, Reactor Enclosure Flooding, Revision 11

Miscellaneous

Report M-003, Summary of Requirements for Flooding Prevention Relative to LGS Units 1 and 2, Revision 4

Section 1R07: Heat Sink Performance

Procedures

ER-AA-340, GL 89-13 Program Implementing Procedure, Revision 7  
ER-AA-340-1002, Service Water Heat Exchanger Inspection Guide, Revision 6  
RT-1-012-390-0, RHR Heat Exchanger Heat Transfer Performance Test, Revision 11  
RT-2-012-390-2, 2A RHR Heat Exchanger Heat Transfer Test, Revision 9

Condition Reports

2734687

Maintenance Orders/Work Orders

R0921870    R1087960    R1102581

Miscellaneous

RHR IST Bases Document  
RHR Maintenance Rule System Bases Document

Section 1R11: Licensed Operator Regualification Program

Procedures

E-1FB, Loss of Division II Safeguard 125/250V DC Bus 1FB, Revision 15  
GP-5, Steady State Operations, Revision 181  
OP-AA-103-102, Watch-Standing Practices, Revision 16  
OP-AA-104-101, Communications, Revision 3  
S92.2.N, Shutdown of the Diesel Generators, Revision 34  
ST-6-001-660-2, Main Turbine CIV, Stop Valve RPS & EOC-RPT Channel Functional Test While Online, Revision 59  
T-101, RPV Control, Revision 23  
T-103, Secondary Containment Control, Revision 23  
T-112, Emergency Blowdown, Revision 15

Condition Reports

3954253  
3954282

Section 1R12: Maintenance EffectivenessProcedures

ARC-MCR-118 A2, Service Air Low Press, Revision 1  
 ER-AA-310, Implementation of the Maintenance Rule, Revision 9  
 ER-AA-310-1003, Maintenance Rule – Performance Criteria Selection, Revision 5  
 ER-AA-310-1004, Maintenance Rule – Performance Monitoring, Revision 13  
 ER-AA-310-1007, Maintenance Rule – Periodic (a)(3) Assessment, Revision 4  
 ON-119, Loss of Instrument Air, Revision 29  
 S15.0.B, Cross connect Unit 1 and Unit 2 Service Air Systems, Revision 7  
 S15.3.C, Response to Loss of Service Air for Refuel Floor Inflatable Seals, Revision 18

Condition Reports

1144697	1426043	1533093	2399897	2406894	2419740
2421975	2435417	2436257	2458009	2470790	2517874
2529337	2538445	2556492	2557681	2566567	2575862
2580385	2605468	2611234	2612138	2615843	2623359
2635516	2635953	2644438	2652425	2709766	2715183
2724017	2726056	2726788			

Miscellaneous

Instrument Air Maintenance Rule System Basis Document  
 Instrument Air System Health Reports  
 L-S-18, Instrument Air and Nitrogen Systems, Revision 15  
 March 2014 Periodic (a)(3) Assessment  
 March 2016 Periodic (a)(3) Assessment

Section 1R13: Maintenance Risk Assessments and Emergent Work ControlProcedures

OP-AA-108-117, Protected Equipment Program, Revision 4  
 OP-AA-108-117, Protected Equipment Program, Revision 4  
 OP-LG-108-117-1000, Limerick Protected Equipment Program, Revision 5  
 OP-LG-108-117-1000, Limerick Protected Equipment Program, Revision 5  
 WC-AA-101, Online Work Control Process, Revision 26  
 WC-AA-101-1006, On-Line Risk Management and Assessment, Revision 2  
 WC-LG-101-1001, Guideline for the Performance of On Line Work / On Line System Outages,  
 Revision 23

Condition Reports:

3943194  
 3946803

Drawings

8031-QAD-M-78, QAD Control Enclosure HVAC (Common), Revision 22

Miscellaneous

Clearance #16001246  
 IR 1058657 A03, Evaluation of CREFAS and MCR HVAC Maintenance Rule Unavailability,  
 11/15/10

LG-PRA-005.21, Miscellaneous Ventilation (HVAC) System Notebook, Revision 1  
 LG-PRA-013, Limerick Generating Station Probabilistic Risk Assessment Summary Notebook,  
 Revision 3  
 Operations Protected Equipment Log 10/12/2016  
 Operations Protected Equipment Log 10/28 and 10/29/2016

### Section 1R15: Operability Determinations and Functionality Assessments

#### Procedures

ARC-BOP-1CC514 B1, Lube Oil Keepwarm Fail, Revision 2  
 MA-LG-716-1015, Grease/Lubrication Guidelines, Revision 0  
 S59.6.A, Replacing PCIG/ADS Nitrogen Backup Bottles and Pressure Control Valve  
 Adjustment, Revision 6  
 S59.6.A, Replacing PCIG/ADS Nitrogen Backup Bottles and Pressure Control Valve  
 Adjustment, Revision 7  
 S59.6.A, Replacing PCIG/ADS Nitrogen Backup Bottles and Pressure Control Valve  
 Adjustment, Revision 8  
 ST-2-042-504-2, ECCS and RCIC Reactor Level Calibration and Loop Checks, Revision 10  
 ST-2-042-630-2, RCIC Reactor Vessel Water Level Channel A Functional Test, Revision 7  
 ST-6-076-200-1, Rx Encl Sec Cntmt Auto Isln Vlv Timing Test, Revision 16

#### Condition Reports

0255289	0498244	0708836	0801717	0801727	0811351
1116158	1239219	1239222	1324527	1324529	1344251
1344256	1352623	1394912	1425907	1457031	1557321
1609270	1609908	1616421	1670350	2404108	2437079
2461141	2601446	2638181	2678509	2678511	2679412
2708267	2725605	2725607	2725610	2725611	2729044
2734588	2737610	2741418	2742146	3950002	3950014
3950468	3955583				

#### Maintenance Orders/Work Orders

4257727	A2065102	C0253419	C0263388	L0050176	R1252948
R1256721	R1286765	R1325086	R1346924		

#### Miscellaneous

L-S-18, Instrument Air and Nitrogen Systems, Revision 15  
 L-S-31, Automatic Depressurization System, Revision 4  
 M-59-07, ADS Valve Seismic I Gas Supply Nitrogen Bottles Required, Revision 0

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S28.5.A, Generator Purging: H<sub>2</sub> to CO<sub>2</sub>, Revision 17  
 S28.5.D, Generator Purging – CO<sub>2</sub> to H<sub>2</sub>, Revision 34

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2048269  
 2648063  
 2733247

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Clearance 16-2-028-0004, Removal of the Main Generator CO2 Storage Tank from Service,  
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IC-11-00366, Calibration of Love Controls Model 106 Converter Isolator, Revision 0

IC-C-11-04067, Testing and/or Replacement of Agastat Relays, Revision 12

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M-400-052, Removal, Overhaul, Environmental Qualification, and Maintenance of Model NH91  
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M-600-005, PM for Model NH91 and NH95 ITT Actuators, Revision 15

MA-AA-716-100, Maintenance Alterations Process, Revision 12

MA-AA-723-301, Periodic Inspection of Limitorque Motor Operated Valves, Revision 12

M-C-700-223, Meggering of Large Motors, Revision 2

ST-6-020-232-2, D22 Diesel Generator Fuel Oil Transfer Pump, Valve and Flow Test,  
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ST-6-076-200-1, Reactor Enclosure Containment Auto Isolation Valve Timing Test, Revision 16

ST-6-076-250-1, Standby Gas Treatment System and RERS Flow Test, Revision 48

ST-6-092-312-2, D22 Diesel Generator Slow Start Operability Test Run, Revision 85

ST-6-095-905-2, Unit 2 Safeguard Battery Weekly Inspection, Revision 21

ST-6-095-911-2, Div I 125/250 VDC 2A1D101/2A2D101 Safeguard Battery Quarterly Inspection,  
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1208612	2533559	2697265	2721054	2729330
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R1294706	R1326288	R1353016	R1356918	R1356935	R1361852

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A1379723

Clearance #16001182

Clearance #16001184

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CY-LG-130-314, Analysis of Boron by Mannitol, Revision 2

ER-AA-2008, Mitigating Systems Performance Index (MSPI) Monitoring and Margin Evaluation,  
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ER-AA-425, Implementation of the Technical Specification Surveillance Frequency Control  
Program, Revision 1

ER-AA-425-1000, Selecting a Candidate to Be Evaluated for a Proposed Surveillance Test  
Interval (STI) Change, Revision 1



ER-AA-425-1001, Surveillance Test Interval (STI) Evaluation Form, Revision 1  
 ER-AA-425-1002, Engineering Evaluation of Proposed Surveillance Test Interval Changes, Revision 1  
 ER-AA-425-1003, Surveillance Frequency Control Program – Integrated Decision making Panel (IDP) Roles and Responsibility, Revision 1  
 ER-AA-425-1004, Implementing an Approved Surveillance Frequency Change, Revision 1  
 ER-AA-425-1005, Monitoring the Effects of Changes to the Surveillance Frequency Control Program (SFCP), Revision 1  
 ER-AA-600-1012, Risk Management Documentation, Revision 13  
 ER-AA-600-1051, Risk Assessment of Surveillance Test Frequency Changes, Revision 1  
 MA-AA-723-330, Electrical Testing of AC Motors Using Baker Instrument Advanced Winding Analyzer, Revision 4  
 ST-5-048-800-1, SBLC Sodium Pentaborate Concentration Analysis, Revision 37  
 ST-6-092-115-1, D11 Diesel Generator 4 KV SFGD Loss of Power LSF-SAA and outage Testing, Revision 22  
 ST-6-092-115-2, D21 Diesel Generator 4 KV SFGD Loss of Power LSF-SAA and outage Testing, Revision 18  
 ST-6-092-116-1, D12 Diesel Generator 4 KV SFGD Loss of Power LSF-SAA and outage Testing, Revision 20  
 ST-6-092-116-2, D22 Diesel Generator 4 KV SFGD Loss of Power LSF-SAA and outage Testing, Revision 22  
 ST-6-092-117-1, D13 Diesel Generator 4 KV SFGD Loss of Power LSF-SAA and outage Testing, Revision 20  
 ST-6-092-117-2, D23 Diesel Generator 4 KV SFGD Loss of Power LSF-SAA and outage Testing, Revision 26  
 ST-6-092-118-1, D14 Diesel Generator 4 KV SFGD Loss of Power LSF-SAA and outage Testing, Revision 22  
 ST-6-092-118-2, D24 Diesel Generator 4 KV SFGD Loss of Power LSF-SAA and outage Testing, Revision 20  
 ST-6-092-321-2, D21 Diesel Generator LOCA/Load Reject Testing and Fast Start Operability Test Run, Revision 23  
 ST-6-107-596-1, Drywell Floor Drain Sump/Equipment Drain Tank Surveillance Log/Opcon 1,2,3, Revision 28

Condition Reports:

0610142	0874599	0894133	0964673	1049144	1093526
1160684	1204897	1223277	1238109	1313897	1439669
1496725	1583879	1607235	1669143	2388672	2542598
2640307	2684737				

Maintenance Orders/Work Orders

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 R1304679  
 R1363170

Miscellaneous

Baker Results Summary Log, 1A-P202 RHR, 9/26/2016  
 Boron Concentration Analysis Results Table  
 LG-15-001, Surveillance Test Interval Evaluation Form, Revision 0  
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Section 1EP2: Alert and Notification System Evaluation

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 EP-AA-1008, Exelon Nuclear Standardized Radiological Emergency Plan Annex for  
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 EP-AA-121-1004, Exelon East ANS Preventive Maintenance Program, Revision 9

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Alert Notification System Preventive Maintenance Checklist  
 Design Report, Limerick Generating Station Public Alert and Notification System, Revision 1  
 Limerick Generating Station ANS test and maintenance records, December 2015-  
 November 2016

Section 1EP3: Emergency Response Organization Staffing and Augmentation System

Procedures

EP-AA-1000, Exelon Nuclear Standardized Radiological Emergency Plan, Revision 28  
 EP-AA-1008, Addendum 1, Limerick Generating Station On-Shift Staffing Technical Basis,  
 Revision 0  
 EP-AA-1008, Exelon Nuclear Standardized Radiological Emergency Plan Annex for  
 Limerick Generating Station, Revision 29  
 EP-AA-112, ERO/ERF Activation and Operation, Revision 18  
 EP-AA-121-1001, Automated Call-Out System Maintenance, Revision 7  
 EP-AA-122, Drill and Exercise Program, Revision 18  
 EP-AA-122-100-F-13, Call-In Drill Checklist, Revision 2

Miscellaneous

Limerick ERO Augmentation Drill Reports, for quarterly drills conducted  
 January 2015-September 2016  
 Limerick ERO Roster, 11/28/16  
 TQ-AA-113, ERO Training and Qualification, Revision 30

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EP-AA-1008, Addendum 3, Emergency Action Levels for Limerick Generating Station,  
 Revision 1  
 EP-AA-1008, Addendum 3, Emergency Action Levels for Limerick Generating Station,  
 Revision 2

Section 1EP5: Maintenance of Emergency Preparedness

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2480263	2480598	2482858	2483280	2589186	2589222
2589227	2694254	2702604			

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EP-AA-1000, Exelon Nuclear Standardized Radiological Emergency Plan, Revision 28  
EP-AA-1008, Exelon Nuclear Standardized Radiological Emergency Plan Annex for  
Limerick Generating Station, Revision 29  
EP-AA-120-1001, 10 CFR 50.54(q) Change Evaluation, Revision 7  
EP-AA-120-1004, Emergency Preparedness Advisory Committee, Revision 2  
EP-AA-121, Emergency Response Facilities and Equipment Readiness, Revision 15  
EP-AA-121-F-08, Limerick EP Equipment Matrix, Revision 1

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Check-In Self-Assessment, NRC Emergency Preparedness Baseline Inspection, AR 1624327  
Emergency Preparedness Audit Report, NOSA-LIM-15-03, Limerick Generating Station,  
Emergency Preparedness Audit Report, NOSA-LIM-16-03, Limerick Generating Station,  
KLD TR-791, Limerick Generating Station 2015 Population Update Analysis, Revision 0  
KLD TR-851, Limerick Generating Station 2016 Population Update Analysis, Revision 0  
Letters of Agreement between Exelon Limerick and: Pennsylvania Emergency Management  
Agency; Goodwill Ambulance Service; Linfield Fire Company; Limerick Fire Company;  
Einstein Medical Center Montgomery; Pottstown Memorial Medical Center;  
Trappe Fire Company Ambulance; Limerick Airport; and, Phoenixville Service Building  
Limerick Generating Station 4/5/2015 Alert Declaration Report, 4/23/15  
Limerick Quarterly EP Drill Reports, April 2015 – September 2016

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LS-AA-2200, Mitigating System Performance Index Data Acquisition and Reporting, Revision 5  
NEI 99-02, Regulatory Assessment Performance Indicator Guideline, Revision 7  
EP-AA-125-1001, EP Performance Indicator Guidance, Revision 10

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ERO Drill Participation PI data, October 2015 – September 2016  
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Operations Narrative Logs  
Operations Narrative Logs  
RCS Leak Rate Data  
RCS Specific Activity Data from October 2015 – October 2016  
RHRSW and ESW MSPI

Section 4OA2: Problem Identification and Resolution

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M-020-002, LGS Fairbanks Morse Opposed Piston Diesel Engine Examination and  
General Maintenance, Revision 13  
PI-AA-120, Issue Report Level and Class Criteria (Attachment 2), Revision 6  
PI-AA-125, Corrective Action Program Procedure, Revision 2

RT-6-092-311-2, D21 Diesel Generator Run-In, Revision 24  
 RT-6-092-315-2, D21 Diesel Generator Abbreviated Run-In, Revision 14  
 ST-2-020-400-1, Electrical Power Systems 1AG501 Diesel Generator Critical and Non-Critical  
 Instruments Calibration/Functional Test, Revision 33  
 ST-2-020-400-2, Electrical Power Systems 2AG501 Diesel Generator Critical and Non-Critical  
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 ST-6-092-311-1, D11 Diesel Generator Slow Start Operability Test Run, Revision 99  
 ST-6-092-311-1, D11 Diesel Generator Slow Start Operability Test Run, Revision 100  
 ST-6-092-312-1, D12 Diesel Generator Slow Start Operability Test Run, Revision 100  
 S11.2.A, Emergency Service Water System Shutdown, Revision 30  
 S92.9.N, Routine Inspection of the Diesel Generators, Revision 71

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M-071-00049, Sht. 4, Jacket Water System, Revision 17  
 8031-M-20, Sht. 4, P&I Diagram, Fuel and Diesel Oil Storage and Transfer  
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1474143	2437079	2534144	2538760	2679380	2679387
2680484	2686345	2686461	2691497	2691499	2691505
2691507	2691557	2693901	2700944	2703079	2704250
2704541	2706666	2719854	2719949	2720306	2720374
2720399	2720400	2720401	2722441	2724552	2725405
2725605	2725607	2725610	2725611	2726945	2726986
2730726	2732231	2732233	2741188	2741418	2742104
3951996					

Work Orders

R1265658

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ECR LG 15-00210, ECR for EDG Stainless Steel Tubing Upgrade (Unit 1), Revision 3  
 ECR LG 15-00213, ECR for EDG Stainless Steel Tubing Upgrade (Unit 2), Revision 3

**LIST OF ACRONYMS**

ANS	alert and notification system
CAP	corrective action program
CFR	Code of Federal Regulations
CSCWS	control structure chilled water system
EAL	emergency action level
EDG	emergency diesel generator
EP	emergency preparedness
ERF	emergency response facility
ERO	emergency response organization
ESW	emergency service water
HPCI	high pressure coolant injection
IMC	Inspection Manual Chapter
INPO	Institute of Nuclear Power Operations
LER	licensee event report
LGS	Limerick Generating Station
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
OWA	operator workaround
PI	performance indicator
RCIC	reactor core isolation cooling
RERS	reactor enclosure recirculation system
RHR	residual heat removal
SSC	structures, systems, or components
UFSAR	updated final safety analysis report