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

November 3, 2016

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

SUBJECT: LIMERICK GENERATING STATION – INTEGRATED INSPECTION REPORT 05000352/2016003 AND 05000353/2016003 AND INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) REPORT NO. 07200065/2016001

Dear Mr. Hanson:

On September 30, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Limerick Generating Station (LGS), Units 1 and 2. On October 14, 2016, the NRC inspectors discussed the results of this inspection with Mr. R. 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. The finding did not involve a violation of NRC requirements.

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.

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

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 05000352/2016003
and 05000353/2016003 w/Attachment: Supplementary Information

cc w/encl: Distribution via ListServ

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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.:	05000352/2016003 and 05000353/2016003; and 07200065/2016001
Licensee:	Exelon Generation Company, LLC
Facility:	Limerick Generating Station, Units 1 and 2
Location:	Sanatoga, PA 19464
Dates:	July 1, 2016 through September 30, 2016
Inspectors:	S. Rutenkroger, PhD, Senior Resident Inspector M. Fannon, Resident Inspector J. Nicholson, Senior Health Physicist S. Hammann, Senior Health Physicist M. Patel, Operations Engineer R. Nimitz, Senior Health Physicist S. Barber, Senior Project Engineer
Approved By:	Daniel L. Schroeder, Chief Reactor Projects Branch 4 Division of Reactor Projects

TABLE OF CONTENTS

SUMMARY

IR 05000352/2016003, 05000353/2016003, 07200065/2016001; 7/1/2016 – 9/30/16; Limerick Generating Station (LGS); Follow-Up of Events and Notices of Enforcement Discretion.

This report covered a three-month period of inspection by resident inspectors and announced baseline inspections performed by regional inspectors. The inspectors identified one finding 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 April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects Within Cross-Cutting Areas," dated December 4, 2014. All violations of Nuclear Regulatory Commission (NRC) requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated August 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

Cornerstone: Initiating Events

- Green. A self-revealing finding of very low safety significance (Green) was identified when Exelon did not implement their engineering design control procedures during the plant processing computer (PPC) modification. Specifically, Exelon did not fully address effects of the modification on other plant systems and did not establish a testing boundary that encompassed all components whose operation was altered by the modification. As a result, the PPC modification had a wiring design error that resulted in the trip of both reactor recirculation pumps (RRPs) which required a manual reactor trip of Unit 2. In response to this issue, Exelon initiated IR 2676712, investigated the cause of the trip, fixed the wiring design error, performed a root cause evaluation, and performed an extent of condition review.

  This issue is more than minor because it adversely affected the design control attribute of the initiating events cornerstone to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the PPC modification process had a wiring design error that resulted in the trip of both RRPs which required a manual reactor trip of Unit 2. The issue was evaluated in accordance with IMC 0609, Appendix A, "Significance Determination Process for Findings At-Power," using Exhibit 1, "Initiating Events Screening Questions," Section B, "Transient initiators." The finding was determined to be of very low safety significance (Green) because the finding did not cause a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition. The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Challenge the Unknown, because LGS staff did not stop when faced with uncertain conditions, and risks were not evaluated and managed before proceeding. Specifically, Exelon did not stop and reevaluate the risks and effects on plant systems when changes were made to the PPC design modification package. [H.11] (Section 4OA3)

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 (CAP). This 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 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. On September 10, 2016, operators reduced power to 70 percent for a control rod sequence exchange. Operators returned the unit to 100 percent power on September 11, 2016, 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 – 1 sample)

Readiness for Seasonal Extreme Weather Conditions

a. Inspection Scope

The inspectors reviewed Exelon's readiness for the onset of seasonal high temperatures. The review focused on the emergency diesel generators (EDGs). The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), technical specifications, control room logs, and the corrective action program 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 hot weather conditions. Documents reviewed for each section of this inspection report are listed in the Attachment.

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 1 'A' residual heat removal (RHR) while 'B' RHR was unavailable due to testing on August 4, 2016
- Unit 2 high pressure coolant injection (HPCI) while reactor core isolation cooling (RCIC) was unavailable due to planned maintenance on August 29 through 31, 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 each 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 September 12 through September 17, 2016, the inspectors performed a complete system walkdown of accessible portions of the Unit 2 core spray 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 systems were aligned and maintained properly. The inspectors also reviewed electrical power availability, component lubrication and equipment cooling, hanger and support functionality, and operability of support systems. The inspectors performed field walkdowns of accessible portions of the systems to verify as-built system configuration matched plant documentation, and that system components and support equipment remained operable. The inspectors confirmed that systems and components were aligned correctly, free from interference from temporary services or isolation boundaries, environmentally qualified, and protected from external threats. The inspectors also examined the material condition of the components for degradation and observed operating parameters of equipment 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

No findings were identified.

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 81, Unit 1 'D12' EDG and fuel oil day tank room, elevation 217', on August 17, 2016
- Fire area 55, Unit 2 'B' and 'D' RHR heat exchanger and pump rooms, elevation 177' and 201', on August 23, 2016
- Fire area 31, Unit 1 'B' and 'D' RHR heat exchanger and pump rooms, elevation 177' and 201', on September 2, 2016
- Fire areas 8 and 9, Unit 1 safeguards battery rooms, elevation 239', on September 6, 2016
- Fire areas 58 and 59, Unit 2 'B' and 'D' core spray pump rooms, elevation 177', on September 15, 2016

b. Findings

No findings were identified.

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

a. Inspection Scope

The inspectors observed a fire brigade drill scenario conducted on September 22, 2016, that involved a fire in the common turbine building elevation 239'-0" enclosure. 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 manholes '107' and '108,' which include emergency service water and residual heat removal service water (RHRSW) underground power cables. 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.

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 11, 2016. The scenarios included an earthquake with aftershocks, failure of the '1B' RRP seals, and an unisolable reactor coolant system leak. The scenarios were complicated by a loss of the '1B' RHR pump, the 'D14' EDG out of service, and high vibrations on the 'A' RHRSW pump. 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 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 a shift turnover, planned reduced power operation, control rod sequence exchange, condenser waterbox cleaning, and power ascension conducted on Unit 2 September 10, 2016 through September 11, 2016. The inspectors observed pre-shift briefings and reactivity control briefings to verify that the briefings met the criteria specified in Exelon's administrative procedures HU-AA-1211, "Pre-Job Briefings," and OP-LG-103-102-1000, "Limerick Operations Expectations." Additionally, the inspectors observed activity 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 – 3 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 CFR 50.65 and verified that the (a)(2) performance criteria established by Exelon staff was 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 staff was identifying and addressing common cause failures that occurred within and across maintenance rule system boundaries.

- Unit 2 'D12' EDG on August 9, 2016
- Unit common 'B' control room emergency fresh air supply (CREFAS) dedication process quality control review on September 7, 2016
- Unit 2 4kV bus division II and IV undervoltage relays on September 15, 2016

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 5 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 probabilistic risk analyst 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 common 'A' standby gas treatment system (SGTS) maintenance outage on July 21, 2016
- Unit common 'B' reactor enclosure recirculation system (RERS) and 'B' SGTS maintenance outages on August 10, 2016
- Unit common 'B' CREFAS damper overhaul on August 16, 2016
- Unit 2 RCIC maintenance outage on August 30, 2016
- Unit common electrical bus '20' and electrical bus '201' maintenance outage on September 12, 2016

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 1 RCIC shaft gland seal leakage on August 2, 2016
- Unit 2 RCIC turbine steam admission valve cable jacket damage identified on August 2, 2016
- Unit 2 'B' RERS loss of power indication on August 14, 2016
- Unit 2 'D22' EDG air leak from the regulator of the supply air to the pressurized air operated air cooler temperature control valve on August 26, 2016
- Unit 2 safeguard bus '201' feeder breaker 'D23-BUS-02' position cell switch did not reposition when the breaker was racked out on September 17, 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'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, such as in the case of operator workarounds, 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 – 1 sample)

.1 Permanent Modifications

a. Inspection Scope

The inspectors evaluated a modification that installed reliable spent fuel pool level instrumentation that was implemented by engineering change package 2013-00414, "Spent Fuel Pool Level Instrumentation for Fukushima." The inspectors verified that the design bases, licensing bases, and performance capability of the affected systems were not degraded by the modification. In addition, the inspectors reviewed modification documents associated with the upgrade and design change, including seismic analysis, power supply routing and configuration, sensor type, equipment qualification, and equipment range and accuracy. The inspectors also reviewed emergency response procedures and interviewed engineering, operations, and emergency preparedness personnel to ensure the equipment and procedures could be reasonably performed.

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 point were performed and checked, and that results adequately demonstrated restoration of the affected safety functions.

- Unit 1 'D' RHR maintenance on July 20, 2016
- Unit 1 'D14' EDG two year overhaul maintenance on August 20, 2016
- Unit common 'B' CREFAS damper overhaul on August 21, 2016
- Unit 2 RCIC turbine maintenance on September 1, 2016

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 structures, systems, and components to assess whether test results satisfied technical specifications, the UFSAR, and Exelon's procedure requirements. The inspectors verified that test acceptance criteria were clear, tests demonstrated operational readiness and were consistent with design documentation, test instrumentation had current calibrations and the range and accuracy for the application, tests were performed as written, and applicable test prerequisites were satisfied. Upon test completion, the inspectors considered whether the test results supported that equipment was capable of performing the required safety functions. The inspectors reviewed the following surveillance tests:

- ST-6-012-231-0, Unit common 'A' RHRSW pump, valve, and flow test on July 14, 2016 (in-service test)
- ST-6-051-234-1, Unit 1 'D' RHR pump, valve, and flow test on July 20, 2016 (in-service test)
- ST-6-051-233-1, Unit 1 'C' RHR pump, valve, and flow test on September 9, 2016 (in-service test)

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill Evaluation (71114.06 – 2 samples)

Emergency Preparedness Drill Observation

a. Inspection Scope

The inspectors evaluated the conduct of routine Exelon emergency drills on July 11 and 25, 2016 to identify any weaknesses and deficiencies in the classification, notification, and protective action recommendation development activities. The inspectors observed emergency response operations in the simulator 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: Occupational and Public Radiation Safety

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

a. Inspection Scope

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

Inspection Planning

The inspectors reviewed the performance indicators for the occupational radiation safety cornerstone, radiation protection audits, and reports of operational occurrences in occupational radiation safety since the last inspection.

Radiological Hazard Assessment (1 sample)

The inspectors conducted independent radiation measurements during walkdowns of the facility and reviewed the radiological survey program; air sampling and analysis; continuous air monitor use, recent plant radiation surveys for radiological work activities, and any changes to plant operations since the last inspection.

Contamination and Radioactive Material Control (1 sample)

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

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment (71124.04 - 1 sample)

a. Inspection Scope

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

Inspection Planning

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

External Dosimetry (1 sample)

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

b. Findings

No findings were identified.

2RS5 Radiation Monitoring Instrumentation (71124.05 - 2 samples)

a. Inspection Scope

The inspectors reviewed performance in assuring the accuracy and operability of radiation monitoring instruments used to protect occupational workers. The inspectors used the requirements in 10 CFR 20, regulatory guides, applicable industry standards; and procedures required by technical specifications as criteria for determining compliance.

Inspection Planning

The inspectors reviewed the LGS Unit 1 and 2 annual effluent and environmental reports, UFSAR, Offsite Dose Calculation Manual (ODCM), radiation protection audits, records of in-service survey instrumentation, and procedures for instrument source checks and calibrations.

Walkdowns and Observations

The inspectors conducted walkdowns of plant area radiation monitors and continuous air monitors. The inspectors assessed material condition of these instruments. The inspectors checked the calibration and source check status of various portable radiation survey instruments and contamination detection monitors for personnel and equipment.

Calibration and Testing Program

The inspectors reviewed the calibration program for various instrumentation used for occupational radiological sampling and measurements. The instruments reviewed were: laboratory instrumentation (gamma spectroscopy systems nos. 3 and 4; Ludlum No. 3; Isolo No. 3; liquid scintillation detector); personnel contamination monitors (ARGOS 5A/B, GEM-5); material monitors (SAM No. 12); and portable and lapel air samplers.

Instrument Calibrator (1 sample)

The inspectors reviewed the calibration standards used for portable instrument calibrations and response checks to verify that instruments were calibrated by a facility that used National Institute of Science and Technology (NIST) traceable sources.

Calibration and Check Sources (1 sample)

The inspectors reviewed the plant waste stream characterization to assess whether the calibration sources used were representative of radioactive material associated with the plant.

Problem Identification and Resolution

The inspectors verified that problems associated with radiation monitoring instrumentation were identified at an appropriate threshold and properly addressed in Exelon's CAP.

b. Findings

No findings were identified.

Cornerstone: Public Radiation Safety

2RS6 Radioactive Gaseous and Liquid Effluent Treatment (71124.06 - 6 samples)

a. Inspection Scope

The inspectors reviewed the treatment, monitoring, and control of radioactive gaseous and liquid effluents. The inspectors used the requirements in 10 CFR 20, 10 CFR 50, Appendix I, technical specifications, ODCM, applicable industry standards, and procedures required by technical specifications as criteria for determining compliance.

Inspection Planning

The inspectors conducted in-office reviews of the LGS 2014 and 2015 annual radioactive effluent and environmental reports, radioactive effluent program documents, UFSAR, ODCM, and applicable event reports.

Walkdowns and Observations (1 sample)

The inspectors walked down the gaseous and liquid radioactive effluent monitoring and filtered ventilation systems to assess the material condition and verify proper alignment according to plant design. The inspectors also observed potential unmonitored release points and reviewed radiation monitoring system surveillance records and the routine processing and discharge of gaseous and liquid radioactive wastes.

Calibration and Testing Program (1 sample)

The inspectors reviewed gaseous and liquid effluent monitor instrument calibration, functional test results, and alarm set-points based on NIST calibration traceability and ODCM specifications.

Sampling and Analyses (1 sample)

The inspectors reviewed radioactive effluent sampling activities, representative sampling requirements, compensatory measures taken during effluent discharges with inoperable effluent radiation monitoring instrumentation, the use of compensatory radioactive effluent sampling, and the results of the inter-laboratory and intra-laboratory comparison program including scaling of hard-to-detect isotopes.

Instrumentation and Equipment (1 sample)

The inspectors reviewed the methodology used to determine the radioactive effluent stack and vent flow rates to verify that the flow rates were consistent with technical specification, ODCM, and UFSAR values. The inspectors reviewed radioactive effluent discharge system surveillance test results based on technical specification acceptance criteria. The inspectors verified that high-range effluent monitors used in emergency operating procedures are calibrated and operable and have post-accident effluent sampling capability.

Dose Calculations (1 sample)

The inspectors reviewed changes in reported dose values from the previous annual radioactive effluent release reports, several liquid and gaseous radioactive waste discharge permits, the scaling method for hard-to-detect radionuclides, ODCM changes, land use census changes, public dose calculations (monthly, quarterly, annual), and records of abnormal gaseous or liquid radioactive releases.

Problem Identification and Resolution (1 sample)

The inspectors evaluated whether problems associated with the radioactive effluent monitoring and control program were identified at an appropriate threshold and properly addressed in Exelon's CAP.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 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, 2015 through June 30, 2016.

- 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 Nuclear Energy Institute (NEI) Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7. The inspectors reviewed Exelon's operator narrative logs, planning schedules, 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, 2015, through June 30, 2016. 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: Preventive Maintenance Corrective Actions Associated with a Fire in the Unit 2 HPCI Cubicle

a. Inspection Scope

The inspectors performed an in-depth review of Exelon's root cause evaluation and corrective actions associated with condition report IR 2480166 which was written in response to a fire in the auxiliary compartment of the '2DB-1-14' motor control center (MCC) cubicle for the Unit 2 HPCI vacuum tank condensate pump motor on April 5, 2015.

The inspectors assessed Exelon's problem identification threshold, cause analyses, extent of condition reviews, compensatory actions, and the prioritization and timeliness of Exelon's corrective actions to determine whether Exelon was appropriately identifying, characterizing, and correcting problems associated with this issue and whether the planned or completed corrective actions were appropriate. The inspectors compared the actions taken to the requirements of Exelon's CAP and 10 CFR 50, Appendix B. In addition, the inspectors interviewed engineering personnel to assess the effectiveness of the implemented corrective actions.

b. Findings and Observations

No findings were identified.

Exelon determined the most probable cause of the fire occurred because the '1A' timetactor failed to reposition after the designed time delay. This caused the HPCI vacuum tank condensate pump's starting resistors to overheat and burn the wiring insulation in the MCC. Exelon's root cause evaluation identified the preventive maintenance procedure for the '2DB-1-14' MCC cubicle was only being performed in one of the two compartments. The adjacent compartment with the '1A' timetactor had not been previously included in the maintenance activities.

The inspectors reviewed Exelon's corrective actions to address the failed timetactor. The inspectors determined that Exelon conducted a thorough technical review of the issue. Corrective actions for the failed timetactor included replacing the affected components from the overheating and fire damage, revising the preventive maintenance procedure to incorporate both the main and auxiliary compartments of the '2DB-1-14' cubicle, replacing timetactors for similar equipment identified during the extent of condition review, and developing a modification to replace the current style of timetactors with a new design.

The inspectors concluded that Exelon's overall response to the fire in the auxiliary compartment for the Unit 2 HPCI vacuum tank condensate pump motor was commensurate with the safety significance, was timely, and included appropriate compensatory measures.

.3 Annual Sample: Component Design Bases Inspection Follow-up

a. Inspection Scope

The inspectors performed an in-depth review of Exelon's work group evaluation, troubleshooting plans, extent-of-condition reviews, and short and long term corrective actions associated with Component Design Bases Inspection (CDBI) non-cited violation (NCV) 2015007-01, "Failure to Verify Adequacy of EDG Voltage to Start Safety-Related Motors," and NCV 2015007-02, "Failure to Verify Adequate Voltage Available for DC Equipment." The CDBI team identified that Exelon did not verify and assure in the design basis calculations, that adequate voltage would be available for starting class '1E' accident mitigating motors when the safeguards buses are powered by the EDGs. The team also identified that Exelon's design control measures did not ensure that adequate voltage existed to EDG relays and output breaker safety-related spring charging motors. This inspection focused on Exelon's problem identification, evaluation, and resolution associated with the two NCVs.

The inspectors assessed Exelon's work group evaluation, troubleshooting plans, extent-of-condition reviews, and the prioritization and timeliness of Exelon's corrective actions to determine whether Exelon was appropriately identifying, characterizing, and correcting problems associated with the two NCVs and the planned or completed corrective actions were appropriate. The inspectors compared the actions taken to the requirements of Exelon's CAP.

b. Findings and Observations

No findings were identified.

The inspectors determined that Exelon appropriately identified, characterized, and implemented corrective actions associated with the two NCVs. The inspectors noted that planned corrective actions associated with undervoltage testing of the spring charging motors were determined to require additional evaluation. The inspectors determined that Exelon's undervoltage testing methodology, based on worst case battery voltage of 105 Volts direct current (Vdc), to test the spring charging motor below the manufacturer's voltage requirement would be limited based on the maintenance testing equipment's inability to reach the recommended test value. The inspectors noted that the test set has a minimum battery charger terminal voltage of 83 Vdc, which is above the calculated worst case component voltage for the spring charging motors of 76 Vdc.

The inspectors independently screened this issue in accordance with IMC 0612, Appendix B, "Issue Screening," and IMC 0612, Appendix E, "Examples of Minor Issues," and determined that this issue was minor. Specifically, the inspectors determined that the failure to implement the corrective action had no safety impact based on the function of the equipment, the voltage difference, and the margin present in the associated calculations. Exelon generated condition report IR 2722252 in response to this issue for resolution and reevaluation of the undervoltage testing requirement of the spring charging motors.

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 resolve the two NCVs associated with the CDBI inspection.

4OA3 Follow-Up of Events and Notices of Enforcement Discretion (71153 – 2 samples)

.1 (Closed) Licensee Event Report (LER) 05000352, 353/2016-002-00: Condition Prohibited by Technical Specifications

On February 10, 2016, the Unit 1, Division 1, 125 Vdc safeguards battery was rendered inoperable due to installation of temporary seismic restraints that had not been approved for use. This issue was identified during a preventive maintenance activity to replace the battery. The investigation identified fifteen reportable events over a three year period. The issue was due to the fact that the engineering analysis did not include the impact of the battery replacement process on the seismic qualification of the battery rack. The battery cell rack support strategy was revised and a technical evaluation was performed for the seismic qualification of the battery rack during the replacement process. The battery cell replacement procedure was revised to address this issue. This issue was dispositioned as a green NCV in the first quarter LGS integrated inspection report 05000352/2016001 and 05000353/2016001 (ML16132A341). The inspectors did not identify any new issues during the review of the LER. This LER is closed.

.2 (Closed) LER 05000353/2016-001-00: Manual Actuation of the Reactor Protection System

a. Inspection Scope

On June 1, 2016, Unit 2 was operating at 100 percent power with the PPC modification acceptance testing in progress. The testing directed closure of a circuit isolation switch which resulted in the trip of both RRPs. The control room supervisor entered the procedure for an unexpected change in core flow, and operators manually tripped the reactor. The cause of the RRP trips was a wiring design error which resulted in an unplanned actuation of both RRP trip relays when the circuit isolation switch was closed. Exelon submitted an LER pursuant to the requirements of 10 CFR 50.73(a)(2)(iv)(A) for a manual actuation of the reactor protection system. The inspectors identified a finding during the review of the LER. This LER is closed.

b. Findings

Introduction. A self-revealing finding of very low safety significance (Green) was identified when Exelon did not implement their engineering design control procedures during the PPC modification. Specifically, Exelon did not fully address effects of the modification on other plant systems and did not establish a testing boundary that encompassed all components whose operation was altered by the modification.

As a result, the PPC modification had a wiring design error that resulted in the trip of both RRPs which required a manual reactor scram of Unit 2.

Description. The plant processing computer modification was a planned modification to the plant monitoring system. The system is designed to monitor plant parameters. In the case of the RRPs, it monitors the current flow from the 125 Vdc balance of plant battery system through the adjustable speed drive (ASD) breakers to determine the breaker status.

On June 1, 2016, Engineering personnel were performing modification acceptance testing for the PPC modification. When the switches for the circuit that monitors the 13.2 kilovolt (kV) input breakers for the '2A' and '2B' RRP ASDs were closed, the main control room received the balance of plant battery ground trouble annunciator. This was immediately followed by simultaneous trips of both the '2A' and '2B' RRPs. The control room supervisor entered the procedure for an unexpected change in core flow, and the operators manually scrammed the reactor. The cause of the RRP trips was investigated and determined to be a wiring design error in the PPC modification.

The first design error identified during the root cause investigation was that the design package incorrectly identified the '2B' ASD breaker as being fed from the same terminal board as the '2A' ASD breaker which resulted in wiring the control logic power for the '2A' and '2B' RRP ASD 13.2 kV breakers to the same terminal board. The second design error was that on each terminal board, the neutrals for each of the signal inputs were required to be wired together to a common neutral. This was an intentional change to the non-safety digital input terminal boards, but this design solution cannot be implemented in every case. In the case of the ASD breaker control logic, the wiring together of the common neutral meant that following trip signal activation on one train of ASD, both trains of ASD would trip, since their trip coils are wired in parallel to each other. The modification improperly connected the common sides of the '2A' and '2D' balance of plant battery systems, which allowed sufficient voltage to actuate the trip coils for both 13.2kV input breakers to the '2A' and '2B' ASDs.

The original terminal boards isolated the computer from the plant circuits. The new terminal boards did not have the same feature and would require optical isolators to be installed to perform the same isolation feature. A change to the design package was made which used optical isolators on the safety related circuits only. Therefore, the non-safety related circuits associated with the RRPs did not have the isolation feature. The initial classification of the original modification was determined to be of low consequence and low probability of error. The revised design package included other changes besides reducing the use of optical isolators such as installing the modification on-line, requiring a common return for the interface of the new digital terminal boards, and regrouping computer points which could introduce inadvertent cross-tying of station batteries. The low risk classification was not re-evaluated following the changes to the design package. The removal of the isolation function from non-safety related digital inputs and regrouping of the neutrals together were not properly identified as critical parameters in accordance with CC-AA-103, "Configuration Change Control for Permanent Physical Plant Changes."

In addition, procedure CC-AA-103-1003, "Owner's Acceptance Review of External Engineering Technical Products," requires that effects on other plant systems have been addressed, and procedure CC-AA-107-1001, "Post Modification Acceptance Testing," section 4.4.3, states that the testing boundary should encompass not only the equipment

modified, but also any components whose operation may have been altered by the modification. The inspectors determined that reevaluation of the risk, understanding the impact the design changes had on plant systems, proper identification of the critical parameters, and assessment of the critical parameters would have resulted in test criteria and test steps that would have verified proper performance during modification acceptance testing without adverse plant impacts.

In response to this issue, Exelon initiated IR 2676712, investigated the cause of the trip, fixed the wiring design error, performed a root cause evaluation, and performed an extent of condition review.

Analysis. The inspectors determined that the failure to implement the design control procedures which led to a wiring design error that resulted in the trip of both RRPs and required a manual reactor trip of Unit 2 was a performance deficiency that was within Exelon's ability to foresee and correct and should have been prevented. This issue is more than minor because it adversely affected the design control attribute of the initiating events cornerstone to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the PPC modification process had a wiring design error that resulted in the trip of both RRPs which required a manual reactor trip of Unit 2.

The issue was evaluated in accordance with IMC 0609, Appendix A, "Significance Determination Process for Findings At-Power," using Exhibit 1, "Initiating Events Screening Questions," Section B, "Transient initiators." The finding was determined to be of very low safety significance (Green) because the finding did not cause both a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition.

The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Challenge the Unknown, because LGS staff did not stop when faced with uncertain conditions, and risks were not evaluated and managed before proceeding. Specifically, Exelon did not stop to reevaluate the risks and effects on plant systems when changes were made to the PPC design modification package. [H.11]

Enforcement. The inspectors did not identify a violation of regulatory requirements associated with this finding. **(FIN 05000353/2016003-01, Inadequate Design Control of Plant Processing Computer Modification)**

4OA5 Other Activities

.1 Operation of an ISFSI at Operating Plants (IP 60855 and 60855.1)

a. Inspection Scope

On July 18 to 28, 2016, the inspectors observed and evaluated Exelon's loading of Dry Storage Cask (DSC)-036, the first canister to be loaded during their independent spent fuel storage installation (ISFSI) dry cask campaign. The inspectors reviewed Exelon's activities associated with the loading of DSC-036. The inspectors verified compliance with the Certificate of Compliance, technical specifications, regulations, and station procedures.

The inspectors observed the loading of spent fuel assemblies into the DSC. The inspectors also observed DSC processing operations including: installation of the DSC inner top cover, removal of the annulus seal, installation of the automated welding system**,** welding, non-destructive weld examinations, draining, vacuum drying**,** helium backfill**,** surveying, and decontamination.

The inspectors observed radiation protection technicians as they provided job coverage for the cask loading workers. The inspectors reviewed survey data maps and radiological records from the DSC loading to confirm that radiation survey levels measured were within limits specified by the technical specifications and consistent with values specified in the UFSAR.

The inspectors performed a walk-down of the heavy haul path. The inspectors also verified that transient combustibles were not being stored on the haul path, ISFSI pad or in the vicinity of the horizontal storage modules.

The inspectors reviewed corrective action reports and the associated follow-up actions that were generated since Exelon's last loading campaign at LGS to ensure that issues were entered into the CAP, prioritized, and evaluated commensurate with their safety significance.

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

On October 14, 2016, the inspectors presented the inspection results to Mr. R. 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.

10 CFR 50.54(q)(2), "Emergency Plans," requires, in part, that a holder of a licensee under this part shall follow and maintain the effectiveness of an emergency plan that meets the requirements in Appendix E to this part, and for nuclear power reactor licensees, the planning standards of § 50.47(b). 10 CFR 50.47(b)(4) requires that a standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee. Contrary to the above, from April 25, 2016, until August 3, 2016, the spent fuel pool level emergency action level (EAL) "RG2/RS2" threshold of Limerick's Emergency Plan for a General Emergency and Site Area Emergency did not meet the requirements of Appendix E and the planning standards of 10 CFR 50.47(b). Specifically, Exelon identified that the spent fuel pool level for "RG2/RS2" threshold was 0.08 feet, and the correct threshold value was 0.8 feet. The spent fuel pool EAL threshold values for a lowering water level for an Alert and Unusual Event were correct at 10.20 feet and less than 22 feet, respectively. The normal spent fuel pool water level is over 23 feet. The inspectors evaluated this finding using IMC 0609, Appendix B, "Emergency Preparedness Significance Determination Process," Table 5.4-1.

This Table indicates, in part, that the following should be assessed as low safety significance (White): "an EAL has been rendered ineffective such that any General Emergency would not be declared for a particular off-normal event, but because of other EALs, an appropriate declaration could be made in a degraded manner (e.g. delayed)," and, "an EAL that has been rendered ineffective such that any Site Area Emergency would not be declared for a particular off-normal event." However, the inspectors confirmed that the spent fuel pool level instrumentation at LGS goes off scale at approximately 0.635 feet, and the Limerick Emergency Plan, in Addendum 3, directs any Emergency Director to assume the EAL threshold has been exceeded if the associated parameter goes off scale. In addition, the NEI recommended and NRC endorsed value for this EAL threshold would have been at nominally 0.0 feet, the level at which the fuel remains covered and actions to implement make-up water addition should no longer be deferred. Although the LGS threshold for declaration at 0.8 feet would have been exceeded, the inspectors concluded that the event would have been classified when the SFP level dropped below 0.635 feet, sufficiently above the NEI recommended level. Because the event would have been declared with margin to the actual water level needed for protection of the public, i.e. the spent fuel would still be fully covered by water at the time of the EAL declaration(s), the inspectors concluded that this performance deficiency was most similar to the Table 5.4-1 branches representing very low safety significance (Green). Exelon's corrective actions included revising EP-AA-1008, Addendum 3, with the correct spent fuel pool level EAL "RG2/RS2" threshold of 0.8 feet. Because this issue was of very low safety significance (Green) and Exelon entered the issue into the corrective action program (IR 2700440), this finding is being treated as a non-cited violation, 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
M. Herr, Director of Operations
F. Sturniolo, Director of Engineering
D. Palena, Director of Maintenance
M. Bonifanti, Director of Work Management
K. Kemper, Security Manager
R. Dickinson, Manager, Regulatory Assurance
R. Ruffe, Training Director
M. Arnosky, Operations Shift Manger
B. Bielecki, Assistant Director of Engineering
A. Briggs, Manager, Chemistry, Environmental, Radwaste
G. Budock, Regulatory Assurance Engineer
T. Carr, Senior Manager Reactor Services
J. Carter, Director, Dry Cask Storage
L. Cheung, Maintenance Planner
K. Collier, Design Engineer
J. Commiskey, ALARA Engineer
R. Dankel, NDE Oversight Inspector
T. Davis, Manager Radiological Technical Support
B. Dennis, Areva Cask Load Lead
M. DiRado, Manager, Engineering Programs
P. Dix, Radiological Engineering Manager
J. Dougherty, DSC Senior Program Manager
J. Duskin, Instrument Coordinator
W. Emberger, Task Manager
M. Felty, Leak Test Specialists
C. Gerdes, Manager, Chemistry, Environmental and Radioactive Waste
M. Gift, System Engineer
N. Harmon, Senior Technical Specialist
C. Hawkins, NDE Level III
A. Hightower, Emergency Preparedness Manager
T. Hill, Areva Welder
G. Hunsberger, Electrical Design Engineer
P. Imm, Radiological Engineering Manager
W. Jacobson, Areva Project Coordinator
M. Karasek, Snubber Program Manager
M. Kern, Radiation Protection Technician
P. Kinlaw, Areva Shift Manager
J. Kirkpatrick, Radiation Protection Supervisor
R. Kirse, Operations Floor Supervisor
N. Knauss, System Engineer
N. Lampe, EDG System Engineer
M. Lui, Electrical Design Engineer
D. Merchant, Radiation Protection Manager
D. Molteni, Manager Operations Training

Licensee Personnel

K. Moore, Main Steam Piping, Valves and ADS System Engineer
R. Nealis, Senior Environmental Chemist
J. O'Neil, Manager NDE
R. Owsley, Supervisor Fuel Handling
T. Ryan, Manager Engineering Programs
B. Strait, Leak Test Specialists
R. Termini, Manager of ISFSI Implementation and Support
T. Tonkinson, Reactor Services Site Manager
B. Trimble, Regulatory Assurance
J. Turner, I&C Supervisor
M. Weis, ISI Program Engineer
H. Weissinger, Shift Operations Superintendent
S. Williams, Areva Welder
J. Wood, Manager of ISFSI Implementation and Support
J. Zeller, Reactor Services Supervisor

LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED

Opened/Closed

05000353/2016003-01	FIN	Inadequate Design Control of Plant Processing Computer Modification (Section 4OA3.3)

Closed

05000352/2016-002-00	LER	Condition Prohibited by Technical Specifications Due to Inoperable Safeguard Batteries During Cell Replacements (Section 4OA3.2)
05000353/2016-001-00	LER	Manual Actuation of the Reactor Protection System When Critical Due to Wiring Design Error (Section 4OA3.3)

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

Procedures
GP-7.1, Summer Weather Preparation and Operation, Revision 35
WC-AA-107 Seasonal Readiness, Revision 16

Miscellaneous
Operations Narrative Logs

Section 1R04: Equipment Alignment

Procedures
1S51.1.A, Equipment Alignment for Automatic Operation of the RHR System in the LPCI Mode-"A" Subsystem, Revision 21
2S52.1.A (COL-1), Equipment Alignment for Core Spray Loop 'A' Operation, Revision 8
2S52.1.A (COL-2), Equipment Alignment for Core Spray Loop 'B' Operation, Revision 8
2S55.1.A (COL), Equipment Alignment for Automatic Operation of HPCI System, Revision 19
S52.1.A, Core Spray Setup for Service Operation, Revision 44
S52.9.A, Routine Inspection of the Core Spray System, Revision 19
S55.9.A, Routine Inspection of HPCI System, Revision 43
ST-6-052-231-2, A Loop Core Spray Pump, Valve, and Flow Test, Revision 56
ST-6-052-232-2, B Loop Core Spray Pump, Valve, and Flow Test, Revision 57

Condition Reports

2416730	2485613	2485740	2517601	2550621	2596426
2619807	2642026	2675023	2681816	2683274	2690284
2695733	2704684	2705628			

Section 1R05: Fire Protection

Procedures
F-A-425, Pre-Fire Plan, Unit 1 Class 1E Battery Room 425, Revision 13
F-A-436, Pre-Fire Plan, Unit 1 Class 1E Battery Room 436, Revision 11
F-D-311B, Pre-Fire Plan, D12 Diesel Generator and Fuel Oil-Lube Oil Tank Rooms 311B and 312B, Revision 9
F-R-103, Pre-Fire Plan, Unit 1 B and D RHR Heat Exchanger and Pump Rooms, Revision 8
F-R-174, Pre-Fire Plan, Unit 2 B and D RHR Heat Exchanger and Pump Rooms, Revision 6
F-R-181, Pre-Fire Plan, Unit 2 Core Spray Pump Room B, Revision 8
F-R-184, Pre-Fire Plan, Unit 2 Core Spray Pump Room D, Revision 6
F-T-335, Limerick Generating Station Pre-Fire Plan F-T-335 (Fire Area 113), Revision 15
OP-AA-201-003, Fire Drill Performance, Revision 15

Condition Reports
2719052

Section 1R06: Flood Protection Measures

Procedures
SE-4, Flood, Revision 7

Condition Reports

2407969	2639119	2639133	2639162	2639172	2699185
2699192	2699193	2699198			

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

Section 1R11: Licensed Operator Requalification Program

Procedures
GP-2, Normal Plant Startup, Revision 163
GP-5, Steady State Operations, Revision 180
HU-AA-1211, Pre-Job Briefings, Revision 11
OP-AA-300, Reactivity Management, Revision 10
OP-LG-103-102-1000, Limerick Operations Expectations, Revision 70
OP-LG-112-101-F-17, Reactivity Management SRO Shift Turnover Checklist, Revision 3
OT-101, High Drywell Pressure, Revision 36
SE-5, Earthquake, Revision 38
T-101, RPV Control Flow Chart, Revision 22
T-103, Secondary Containment Control Flow Chart, Revision 23

Miscellaneous
Simulator Evaluation Guide 9062E, Revision 1

Section 1R12: Maintenance Effectiveness

Procedures
MA-AA-716-001, Quality Material/Components Control, Revision 8
NO-LG-100, Quality Verification Program, Revision 4
SM-AA-3019, Parts Quality Process, Revision 2

Condition Reports

1552457	1558118	1629940	2390905	2430722	2432718
2518484	2524240	2537370	2539277	2549673	2605390
2662925	2662927	2674817	2689692	2691514	2700404
2704781	2705333	2706052	2706138		

Maintenance Orders/Work Orders

A1493543	R0981567	R1182802	R1305948	R1356086	R1356980

Miscellaneous
Clearance #16000834
ECR 16-00276

Section 1R13: Maintenance Risk Assessments and Emergent Work Control

Procedures
OP-AA-108-117, Protected Equipment Program, Revision 4
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, Revision 23

Condition Reports

2695018	2703079

Maintenance Orders/Work Orders

R0981567	R1182802	R1305948

Miscellaneous
Clearance #16000834
Operations Protected Equipment Log 7/19, 7/20, and 7/21/2016
Operations Protected Equipment Log 8/9 and 8/10/2016
Operations Protected Equipment Log 8/15 and 8/16/2016
Operations Protected Equipment Log 8/29 and 8/30/2016
Operations Protected Equipment Log 9/12/2016

Section 1R15: Operability Determinations and Functionality Assessments

Procedures
OP-AA-108-115, Operability Determinations, Revision 17
OP-AA-108-115-1002, Supplemental Consideration for On-Shift Immediate Operability Determinations, Revision 3
ST-6-049-230-1, RCIC Pump, Valve, and Flow Test, Revision 82
IC-11-0025, Preventive Maintenance of Non-Critical Instrumentation on EDG 2BG501, Revision 15

Condition Reports
2697980 2699833 2699901 2703079 2704250 2704319
2709308 2716837

Maintenance Orders/Work Orders
A2056282

Drawings
E-160, Sheet 1, Safeguard Buses – 101 & 201 Safeguard Bus Feeder Breakers, 4 kV – 1 & 2 Units, Revision 29
E-160, Sheet 2, Safeguard Buses – 101 & 201 Safeguard Bus Feeder Breakers, 4 kV – 1 & 2 Units, Revision 16
E-160, Sheet 3, Safeguard Buses – 101 & 201 Safeguard Bus Feeder Breakers, 4 kV – 1 & 2 Units, Revision 25
E-160, Sheet 4, Safeguard Buses – 101 & 201 Safeguard Bus Feeder Breakers, 4 kV – 1 & 2 Units, Revision 13
E-160, Sheet 5, Safeguard Buses – 101 & 201 Safeguard Bus Feeder Breakers, 4 kV – 1 & 2 Units, Revision 8
M-0020, Sheet 6, P & I Diagram Fuel & Diesel Oil Storage Transfer (Starting Air System Unit 1), Revision 52

Miscellaneous
Colt Industries Operating Corp Experimental Dept. Day Log #800-12, 6/24/1980
LM-0287, HPCI and RCIC Barometric Condenser Calculations
LM-0400, HPCI and RCIC Room Temperature Response Calculations
M-1-E41-C002-K-001, Limerick HPCI Terry Turbine Manual

Section 1R18: Plant Modifications

Procedures
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
EP-AA-1008, Radiological Emergency Plan Annex for Limerick Generating Station, Revision 29

Condition Reports:
2700440

Work Order
C0256284

Miscellaneous
ECR LG 13-00414, Spent Fuel Pool Level Instrumentation for Fukushima, Revision 3
EP-EAL-1008, Criteria for Choosing spent Fuel Pool Level 3 and Level 2 EAL Threshold Values for Limerick Station, Revision 0

Section 1R19: Post-Maintenance Testing

Procedures
M-093-004, 480 VAC MCC Breaker Assembly and Cubicle Maintenance, Revision 12
M-300-014, Operational Analysis of Motors for Maintenance Recommendations, Revision 4
M-400-001, Repacking of Q and Non-Q Listed Valves, Revision 3
M-400-014, Type 1 Anchor/Darling Bolted Bonnet Swing Check Valve Maintenance, Revision 7
M-C-700-232, Testing and Control of 600 Volt Class Molded Case Circuit Breakers, Revision 16
ST-2-092-324-1, 4kV Emergency D14 Bus Undervoltage Channel/Functional Test, Revision 28
ST-6-049-230-2, RCIC Pump, Valve, and Flow Test, Revision 77
ST-6-051-234-1, D RHR Pump, Valve, and Flow Test, Revision 68
ST-6-092-314-1, D14 Diesel Generator Slow Start Operability Test Run, Revision 100
ST-6-107-200-0, IST Valve Stroke Surveillance Log, Revision 28

Condition Reports

2704478	2704781	2704907	2705256	2705333	2706052
2706138	2709955	2711443			

Maintenance Orders/Work Orders

C0259675	C0260717	C0260740	C0261390	C0261464	R0904877
R0905396	R0981567	R1022344	R1075441	R1075650	R1106197
R1121924	R1174706	R1182802	R1251638	R1258248	R1258311
R1263275	R1305948	R1309603	R1343086	R1349565	

Procedures
M-400-079, Paul Munroe Electro-Hydraulic Butterfly Valve Rebuild, Revision 11

Miscellaneous
Clearance #16000744
Clearance #16000834
Clearance #16000864
Clearance #16000865
Clearance #16000866
Clearance #16000986
ECR 15-00210
ECR 16-00276

Section 1R22: Surveillance Testing

Procedures
ST-6-012-231-0, A Loop RHRSW Pump, Valve, and Flow Test, Revision 68
ST-6-051-234-1, D RHR Pump, Valve, and Flow Test, Revision 68
ST-6-107-200-0, IST Valve Stroke Surveillance Log, Revision 28

Condition Reports
2692873

Maintenance Orders/Work Orders
R1246995 R1349565

Section 1EP6: Drill Evaluation

Condition Reports
2692085

Section 2RS01: Access Control to Radiologically Significant Areas

Procedures
RP-AA-403, Administration of the Radiation Work Permit Program, Revision 8
RP-AA-460, Controls for High and Locked High Radiation Areas, Revision 28
RP-AA-800, Control, Inventory, and Leak Testing of Radioactive Sources, Revision 7
RP-AA-8001, Nationally Tracked Sources, Revision 2
ST-0-107-493-0, Periodic By-product Material Leak test and Inventory, Revision 16

Miscellaneous
Contamination Control – Personnel Contamination Data
Dose Records
Dosimetry Performance Testing Data
NRC Form 748
Outage Radiation Protection Outage Report
Performance Indicator Summary Data
Personnel Exposure Investigations
Radiological Survey Data
Source Term Assessment

Section 2RS04: Occupational Dose Assessment

Procedures
RP-AA-203-1001, Personnel Exposure Investigation, Revision 7
RP-AA-210, Dosimetry Issue Usage and Control, Revision 25
RP-AA-210-1001, Dosimetry Logs and Forms, Revision 9
RP-AA-210-1001, Neutron Dose Estimation (Neutron/Gamma Ration Method) , Revision 9
RP-AA-216, Dose Assessment for Contaminated Wounds, Revision 0
RP-AA-300-1002, Electron Capture Isotope Control, Revision 4

Miscellaneous
EPD/OSL Discrepancy Reports
Exposure Control and Dose Records
General Source Term Data
NVLAP testing Certification
Personnel Contamination Event Logs
Personnel Intake Investigations
RWP Dose Limit vs Dose sustained report

Section 2RSO6: Radioactive Gaseous and Liquid Effluent Treatment

Procedures
CY-AA-110-200, Sampling, Revision 12
CY-AA-130-200, Quality Control, Revision 12
CY-AA-130-201, Radiochemistry Quality Control, Revision 4
CY-AA-130-201-F-02, Regulatory Position for Regulatory Guide 4.15, Revision 1, Revision 0
CY-AA-130-3000, Gamma Isotopic Review, Revision 4
CY-AA-160-100, Analytic Results, Revision 4
CY-AA-170-000, Radioactive Effluent and Environmental Monitoring Program, Revision 6
CY-AA-170-210, Potentially Contaminated System Control, Revision 1
CY-AA-170-2150, PCSC Program Implementation Guidelines, Revision 2
CY-LG-120-110, Chemistry Sampling and Analysis, Revision 15
CY-LG-120-340, Sampling of Service Air and Instrument Air, Revision 0
CY-LG-130-006, Determination of Tritium in Water, Revision 2
CY-LG-130-009, Determination of Gaseous Effluent Rad Monitor Set-points, Revision 3
CY-LG-130-022, Determination of Liquid Effluent Flowrate, Revision 2
CY-LG-130-101, Analysis of Off-gas Samples, Revision 4
CY-LG-130-1320, Packard 2900 TR Liquid Scintillation Counter, Revision 0
CY-LG-130-400, Chemistry Sampling and Analysis Team, Revision 10
CY-LG-130-409, Preparation and Radio-assay of Liquid samples, Revision 0
CY-LG-130-420, Sample Preparation and Handling of Highly radioactive Particulate Filter and Iodine Cartridge, Revision 1
CY-LG-170-201, Sampling of Noble Gas, Tritium, Iodine and Particulate at the GE Gaseous Effluent Radiation Monitors, Revision 8
CY-LG-170-202, Sampling of Noble Gas, Tritium, Iodine and Particulate at the GA Gaseous Effluent Radiation Monitors, Revision 17
CY-LG-170-202, Sampling of Noble Gas, Tritium, Iodine and Particulate at the GA Gaseous Effluent Radiation Monitors, Revision 17
EN-LG-408-4160, RGPP Reference material for Limerick, Revision 5
Hot Shop (Calibration, Functional Test) (ST-2-026-645-0, Revision 14; ST-2-082-600-0, Revision 16)
Liquid Rad Waste (Calibration, Source Checking, Testing, Flow, Dilution) (ST-2-063-600-0, Revision 19; ST-2-063-400-0, Revision 21; ST-063-601, Revision 11; ST-2-009-600, Revision 22, ST-6-061-590-0, Revision 17)
LS-AA-1110, Reportable Event, Revision 23
LS-AA-2150, Revision5, Monthly Data Elements for NRC RETS/ODCM Radiological Effluent Occurrence
North Stack (Calibration, Functional Testing, Flows)(ST-2-026-414-0, Revision 22; ST-026-414-0, Revision 22; ST-2-026-440-0, Revision 17)
RHR Service Water (calibration, Functional Testing Source Checking)(ST-2-026-594-1, Revision 30; ST-2-012-409-0, Revision 23;ST-2-012-605-0, Revision 8; ST-6-012-402-0)

RI-5-000-573-0, Radiochemistry Duplicate Sample, Revision 1
South Stack (Calibration, Functional testing, flows)(ST-2-026-442-2, Revision 8; ST-2-026-605-2, Revision 18)
ST-072-106-1, unit 1 Refuel Floor Isolation test, Revision 16
ST-2-072-106-1, BOP SBGTS Isolation Test, Revision 16
ST-4-076-102-0, BSBGTS Heater Differential Pressure, Revision 2
ST-4-076-322-0, B SBGTS Charcoal/Adsorber/HEPA test, Revision 13
ST-4-076-801-0, A SBGTS Charcoal Analysis, Revision 6
ST-4-076-802, B SBGTS Charcoal Analysis, Revision 6
ST-5-026-571-0, Service Water/RHR Service water Effluent Line Inop Monitor or Alarm, Revision 13
ST-5-076-815-1, Unit 1 South Stack Weekly Iodine and particulate Analysis, Revision 20
ST-6-076-380-0, Secondary Containment Flow Balance, Revision 10
TQ-AA-224-FO20, Intra-Lab Quality Control
TSTF Adjusted Filter Efficiency
Wide Range Monitor (Calibration, Functional test, Flows, Logic)(ST-2-026-438-0, Revision 28; ST-2-026-626-0, Revision 30; ST-026-438-0, Revision 27)

Miscellaneous
Calibration and check records
Chemistry Audit NOSA-LIM-16-04,
General source term data
Ground water analysis results
Land Use Census 2015
Limerick 2015 Annual Effluent and Environmental Reports
Limerick Aerial Survey
Limerick Station Offsite Dose Calculation Manual, (Revision 28 and various revisions)
Limerick Unit 1 2014-2015 Alpha Assessment
Meteorological Data
NUPIC Audits (Landauer, Mirion, Environmental Inc,, Teledyne Brown)
Public dose calculations
Radioactive Material Release permits
Radiological Survey Data
Sample analysis results including compensatory
Self-Assessment RGPP June 2013

Section 4OA1: Performance Indicator Verification

Procedures
CY-AA-170-210, Potentially Contaminated System Control Program, Revision 1
LS-AA-2150, Monthly Data Elements for NRC RETS/ODCM Radiological Effluent Occurrence, Revision 5
LS-AA-2200, Mitigating System Performance Index Data Acquisition and Reporting, Revision 5
NEI 99-02, Regulatory Assessment Performance Indicator Guideline, Revision 7
RT-5-104-800, Tritium Analysis of Non-Contaminated Systems, Revision 7

Condition Reports
2602637 2676712

Miscellaneous
Offsite Dose Calculation Manual, Revision 28
Operations Narrative Logs
MSPI Data

Section 4OA2: Problem Identification and Resolution

Procedures
IC-11-02002, EDG Voltage Regulators, Revision 19
M-095-002, 250 VDC Westinghouse Magnetic Starter Maintenance, Revision 6
M-200-002, 2.3 kV and 4 kV Power Circuit Breaker Overhaul, Revision 9
PI-AA-120, Issue Identification and Screening Process, Revision 6
S92.1.O, Local and Remote Manual Startup of a Diesel Generator, Revision 57
ST-6-092-317-2, D23 Diesel Generator Fast Start Operability Test Run, Revision 56

Condition Reports

2702632*	2722252*	2480166	2513735	2525662	2525692
2526231	2526233	2555360	2555361	2645977	2679684

Maintenance Orders/Work Orders
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Calculations

6380E.07, Diesel Generator Loading (Steady State), Revision 14
6380E.08, Diesel Generator Voltage Regulation Study, Revision 6

Miscellaneous
ECR 16-00154
Event Notification #50956
Unit 2 LER 2015-001-00

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

Procedures
CC-AA-103, Configuration Change Control for Permanent Physical Plant Changes, Revision 28
CC-AA-103-1003, Owner's Acceptance Review of External Engineering Technical Products, Revision 12
CC-AA-107, Configuration Change Acceptance Testing Criteria, Revision 9
CC-AA-107-1001, Post Modification Acceptance Criteria, Revision 5
CC-AA-309, Control of Design Analyses, Revision 11
HU-AA-1212, Technical Task Risk/Rigor Assessment, Pre-Job Brief, Independent Third Party Reviews, and Post-Job Review, Revision 7
M-095-005, Replacement of Station Battery Cells, Revision 5

Condition Reports
2624349 2676712

Maintenance Orders/Work Orders
R1310102

Miscellaneous
ECR 13-00310
Technical Evaluation 2624349-02, Revision 0

Section 4OA5: Other Activities

Procedures
OU-LG-626, Fuel Loading/Unloading of a Dry Shielded Canister, Revision 1
OU-LG-630, ISFSI Pad and Component Annual Inspection, Revision 0
OU-LG-640, Preparation for an Independent Spent Fuel Storage Campaign, Revision 1
OU-LG-641, Transport and Loading of Transfer Cask and Dry Shielded Canister, Revision 7
OU-LG-643, Transport of Loaded Transfer Cask and Dry Shielded Canister to Transfer
OU-LG-645, MMC Dry Shielded Canister Welding, Vacuum Drying, and Helium Fill, Revision 7
RP-AA-401, Attachment 2, Limerick ALARA Plan 2016-101
ST-4-114-360-0, Revision 9
Trailer, to ISFSI, and Alignment/Insertion into the Horizontal Storage Module, Revision 5

Condition Reports

2519212	2531490	2531573	2532672	2547790	2547847
2680740	2687752	2693969	2694602	2694615	2694621
2694993	2695721	2697358			

Miscellaneous
Attachment A, Technical Specifications, Transnuclear, Inc., Standardized NUHOMS Horizontal Modular Storage System, Certificate of Compliance No. 1004, Amendment No. 10, Docket 72-1004
Limerick Generating Station 10 CFR 72.212 Evaluation Report, Revision 9 February 2016
Work Order C0261315 2016 ISFSI Campaign Load 1st Canister

LIST OF ACRONYMS

ASD	adjustable speed drive
CAP	corrective action program
CDBI	Component Design Bases Inspection
CFR	*Code of Federal Regulations*
CREFAS	control room emergency fresh air supply
DSC	dry storage cask
EAL	emergency action level
EDG	emergency diesel generator
HPCI	high pressure coolant injection
IMC	Inspection Manual Chapter
ISFSI	independent spent fuel storage installation
kV	kilovolt
LER	licensee event report
LGS	Limerick Generating Station
MCC	motor control center
MSPI	mitigating system performance index
NCV	non-cited violation
NEI	Nuclear Energy Institute
NIST	National Institute of Science and Technology
NRC	Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
ODCM	offsite dose calculation manual
PI	performance indicators
PPC	plant processing computer
RCIC	reactor core isolation cooling
RERS	reactor enclosure recirculation system
RHR	residual heat removal
RHRSW	residual heat removal service water
RP	radiation protection
RRP	reactor recirculation pump
SGTS	standby gas treatment system
TS	technical specifications
UFSAR	updated final safety analysis report
Vdc	volts direct current