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

July 31, 2017

EA-17-076

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 AND EXERCISE OF ENFORCEMENT DISCRETION 05000352/2017002 AND 05000353/2017002

Dear Mr. Hanson:

On June 30, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Limerick Generating Station (LGS), Units 1 and 2. On July 14, 2017, the NRC inspectors discussed the results of this inspection with Mr. Frank Sturniolo, Plant Manager, and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented one finding of very low safety significance (Green) in this report. This finding involved a violation of NRC requirements. Further, inspectors documented a licensee-identified violation which was determined to be of very low safety significance in this report. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy.

The inspectors also reviewed Licensee Event Report 50-352/2016-003-00, which described the details associated with a reactor coolant system pressure boundary leak from the Unit 1 ‘A’ residual heat removal shutdown cooling return line check valve equalizing line. Although this constituted a violation of technical specifications involving the reactor coolant system pressure boundary, the NRC concluded that the issue was not within Exelon’s ability to foresee and correct, Exelon’s actions did not contribute to the degraded condition, and the actions taken were reasonable to address the issue. As a result, the NRC did not identify a performance deficiency. A risk evaluation was performed, and the issue was determined to be of very low safety significance (Green). Based on the results of NRC’s inspection and assessment of this issue, I have been authorized, after consultation with the Director, Office of Enforcement, and the Regional Administrator to exercise enforcement discretion in accordance with NRC’s Enforcement Policy Section 2.2.4, “Using Traditional Enforcement of Disposition Violations Identified at Power Reactors,” and Section 3.10, “Reactor Violations with No Performance Deficiencies.”

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

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

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at http://www.nrc.gov/reading-rm/adams.html and the NRC's 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 05000352/2017002
and 05000353/2017002
w/Attachment: Supplementary Information

cc w/encl: Distribution via ListServ

SUBJECT: LIMERICK GENERATING STATION – INTEGRATED INSPECTION REPORT AND EXERCISE OF ENFORCEMENT DISCRETION 05000352/2017002 AND 05000353/2017002 DATED JULY 31, 2017

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REGION I

Docket Nos.:	50-352 and 50-353
License Nos.:	NPF-39 and NPF-85
Report No.:	05000352/2017002 and 05000353/2017002
Licensee:	Exelon Generation Company, LLC
Facility:	Limerick Generating Station, Units 1 & 2
Location:	Sanatoga, PA 19464
Dates:	April 1, 2017 through June 30, 2017
Inspectors:	S. Rutenkroger, PhD, Senior Resident Inspector M. Fannon, Resident Inspector H. Anagnostopoulos, Senior Health Physicist J. Cherubini, Senior Physical Security M. Hardgrove, Project Engineer A. Turilin, Project Engineer
Approved By:	Daniel L. Schroeder, Chief Reactor Projects Branch 4 Division of Reactor Projects

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SUMMARY

IR 05000352/2017002 and 05000353/2017002; 04/01/2017 – 06/30/2017; Limerick Generating Station (LGS), Units 1 and 2; 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 non-cited violation, which was of very low safety significance (Green and/or Severity Level IV). The significance of most findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects Within Cross-Cutting Areas," dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated November 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

Cornerstone: Barrier Integrity

- Green. A self-revealing Green NCV of 10 *Code of Federal Regulations* (CFR) Part 50, Appendix B, Criterion III, "Design Control," occurred when Exelon failed to verify or check the adequacy of design of a new Unit 2 drywell unit cooler condensate flow rate monitoring system. Specifically, the design did not identify that the low conductivity of the drain fluid affected the ability of the flow elements to accurately detect drain flow. In addition to this, LGS staff did not assure adequate post modification acceptance testing in accordance with CC-AA-107-1001, "Post Modification Acceptance Testing." This inadequately designed and tested modification also resulted in a violation of technical specification (TS) 3.4.3.1, "Leakage Detection Systems," because the system was inoperable and unavailable to perform its function following the Unit 2 April 2015 refueling outage, and the TS 3.4.3.1 action statement was not met until the system was declared inoperable on December10, 2015. In response to this issue, Exelon initiated a condition report, IR 2598308, performed an apparent cause investigation, and replaced the Rosemount drywell unit cooler condensate flow rate monitoring system with a modified version of the previously used system.

  The inspectors determined that the failure to verify the adequacy of the newly installed Rosemount drywell unit cooler condensate flow rate monitoring 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 design control attribute of the barrier integrity cornerstone to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, the Unit 2 drywell unit cooler condensate flow rate monitoring system was inoperable and unavailable to perform its function as part of the reactor coolant leakage detection system following the Unit 2 April 2015 refueling outage. This issue was evaluated in accordance with IMC 0609, Appendix A, "Significance Determination Process for Findings At-Power," using Exhibit 3, "Barrier Integrity Screening Questions," Section B, "Reactor Containment." The finding was determined to be of very low safety significance (Green) because the finding did not represent an actual open pathway in the physical integrity of the reactor containment and did not involve an actual reduction in function of hydrogen igniters in the reactor containment. The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Conservative Bias, because LGS staff made inappropriate decisions based on informal vendor input and a successful implementation of the modification at another facility. [H.14] (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. 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. On May 19, 2017, operators reduced power to approximately 60 percent to perform planned quarterly valve testing and water box cleaning. Operators returned the unit to 100 percent power on May 21, 2017. The unit remained at or near 100 percent power for the remainder of the inspection period.

Unit 2 began the inspection period in end-of-cycle coastdown operations at approximately 91 percent power. On April 16, 2017, operators commenced a shutdown, from an initial power of 85 percent, for a planned refueling and maintenance outage (2R14). The station reached operational condition 5 (refueling) on April 18, 2017. Following the completion of refueling and maintenance activities, operators commenced a reactor startup on May 25, 2017. Operators returned the unit to 100 percent power on May 28, 2017. On June 21, 2017, operators reduced power to 78 percent due to a main steam line high radiation alarm. The operators returned the unit to 100 percent power on June 22, 2017, and the unit 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

1R04 Equipment Alignment

Partial System Walkdowns (71111.04 – 4 samples)

a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

- Unit common ‘A’ and ‘C’ emergency service water during ‘B’ residual heat removal service water (RHRSW) piping replacement and ‘B’ emergency core cooling system (ECCS) maintenance outage with ‘A’ shutdown cooling in service on April 18, 2017
- Unit common ‘A’ and ‘C’ RHRSW during ‘B’ RHRSW piping replacement and ‘B’ ECCS maintenance outage with ‘A’ shutdown cooling in service on April 18, 2017
- Unit 2 ‘B’ shutdown cooling on May 5, 2017
- Unit 2 reactor core isolation cooling (RCIC) during high pressure coolant injection (HPCI) testing on June 28, 2017

The inspectors selected these systems based on their risk-significance relative to the reactor safety cornerstones at the time they were inspected. The inspectors reviewed applicable operating procedures, system diagrams, the Updated Final Safety Analysis Report (UFSAR), TSs, work orders, condition reports, and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have impacted the system’s performance of its intended safety functions. The inspectors also performed field walkdowns of accessible portions of the systems to verify system components and support equipment were aligned correctly and were operable.

The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no deficiencies. The inspectors also reviewed whether Exelon staff had properly identified equipment issues and entered them into the corrective action program for resolution with the appropriate significance characterization.

b. Findings

No findings were identified.

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 68, Unit 2 hydraulic control units and neutron monitoring area rooms, elevation 253', on April 17, 2017
- Fire area 122, Unit common spray pond pump house, on April 18, 2017
- Fire area 53, Unit 2 drywell area, elevation 237', on April 28, 2017
- Fire area 34, Unit 1 HPCI pump room, elevation 177', on June 26, 2017
- Fire area 57, Unit 2 HPCI pump room, elevation 177', on June 26, 2017

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 1 core spray pump room areas. The review 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. It assessed the adequacy of operator actions that Exelon had identified as necessary to cope with flooding in this area and also reviewed the corrective action program 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.

1R08 In-service Inspection (71111.08 - 1 sample)

a. Inspection Scope

From April 24, 2017 to April 28, 2017, the inspectors conducted an inspection and review of Exelon staff's implementation of in-service inspection (ISI) program activities for monitoring degradation of the reactor coolant system boundary, risk significant piping and components, and containment systems during the LGS Unit 2 14th refueling outage (2R14). The sample selection for this inspection was based on the inspection procedure objectives and risk priority of those pressure retaining components in systems where degradation would result in a significant increase in risk. The inspectors observed in-process non-destructive examinations (NDE), reviewed documentation, and interviewed Exelon personnel to verify that the NDE activities performed as part of the third interval, third period, of the LGS Unit 2 ISI program were conducted in accordance with the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, 2007 Edition with 2008 and 2009 Addenda.

Non-destructive Examination and Welding Activities (IMC Section 02.01)

The inspectors performed direct observation of NDE activities in process and reviewed documentation of completed examinations listed below. Activities included review of ultrasonic testing (UT) and visual examination (VT).

The inspectors reviewed certifications of the NDE technicians performing the examinations and verified that the inspections were performed in accordance with approved NDE procedures and industry guidance. For UT activities, the inspectors also verified the calibration of equipment used to perform the examinations. The inspectors verified that the test results were reviewed and evaluated by certified Level III NDE personnel, as directed by Exelon procedures, which also met and/or exceeded applicable ASME Boiler and Pressure Vessel Code, Section XI, Mandatory Appendix VII, requirements. The inspectors further verified that the parameters used in the test were in accordance with the limitations, precautions, and prerequisites specified in the NDE test procedure.

ASME Code Required Examinations

- Direct observation of the automated phased array UT of the reactor pressure vessel shell ring No. 5 to flange weld 'AF.'

- Direct observation of the manual UT of pipe-to-elbow weld 'VRR-2RD-2A-15 SWA,' 12-inch diameter, in the reactor recirculation system.

- Direct observation of the manual phased array UT of pipe-to-pipe dissimilar metal weld 'DCA-418-1-2-SW3' in the 'D' residual heat removal system (low pressure coolant injection discharge pipe).

- The inspectors visually examined the condition of the containment liner surfaces, including both the drywell and suppression pool, at all floor elevations. Limited portions of the containment surfaces above and below each elevation were accessible for examination. The inspectors performed a documentation review of the containment VT records, and compared those to the inspector's walkdown observations.

Other Augmented, License Renewal or Industry Initiative Examinations

The inspectors sampled the remote enhanced VT records of reactor vessel internals as done under water inside the reactor vessel during in-vessel visual inspection (IVVI) activities. The inspection scope included portions of the feedwater sparger brackets, and jet pump components including the main wedges, slip joint clamps, and set screw auxiliary wedges. The inspectors reviewed the applicable portions of the IVVI procedure, reviewed a sample of digital video records, reviewed analysis process for the observations, and documentation of indications. The inspectors verified that the activities were performed in accordance with applicable examination procedures and industry guidance.

Review of Previous Indications Accepted by Evaluation

The inspectors reviewed a sample of indications identified during IVVI activities from previous refueling outages. The inspectors verified there was no change in the size of these previous indications and that they were evaluated for continued service.

Identification and Resolution of Problems (IMC Section 02.05)

The inspectors reviewed a sample of LGS Unit 2 corrective action reports, which identified NDE indications, deficiencies, and other non-conforming conditions since the previous refueling outage and during the current outage. The inspectors verified that non-conforming conditions were properly identified, characterized, and evaluated, and that corrective actions were identified and entered into the corrective action program for resolution.

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 June 5, 2017. The scenarios included a loss of a division of direct current power, a loss of isolated phase bus cooling, an inadvertent isolation of the nuclear steam supply shutoff system, and a steam line break of RCIC piping. The scenarios were complicated by a failed safety-relief valve and a failed valve in the feedwater level control system. The inspectors evaluated operator performance during the simulated event and verified completion of risk significant operator actions, including the use of abnormal and emergency operating procedures.

The inspectors assessed the clarity and effectiveness of communications, implementation of actions in response to alarms and degrading plant conditions, and the oversight and direction provided by the control room supervisor. The inspectors verified the accuracy and timeliness of the emergency classifications made by the shift manager and the TS action statements entered by the shift technical advisor. Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance problems.

b. Findings

No findings were identified.

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

a. Inspection Scope

The inspectors observed and reviewed licensed operator performance in the main control room during the performance of the Unit 2 reduction in power and shutdown and associated activities on April 16 and 17, 2017, for refueling outage 2R14. 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 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 –1 sample)

a. Inspection Scope

The inspectors reviewed the Unit 2 'D12' emergency diesel generator (EDG) 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 the 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.

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 4 samples)

a. Inspection Scope

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

- Unit common 'B' RHRSW piping replacement on April 19, 2017
- Unit 2 'B' ECCS maintenance outage on April 20, 2017
- Unit 2 'A' ECCS maintenance outage on May 5, 2017
- Unit 2 'N16D' nozzle plug installation on May 12, 2017

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 6 samples)

a. Inspection Scope

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

- Unit 2 spent fuel pool tell-tale liner leakage on February 8, 2017
- Unit 2 'A' and 'C' source range monitor count spikes on April 19, 2017
- Unit 2 'D24' EDG heating, ventilation, and air conditioning fan not running during 'D24' loss of coolant accident (LOCA)/loss of offsite power (LOOP) test performance during maintenance outage on April 25, 2017
- Unit 2 'D23' LOCA/ LOOP test performance procedure step not met on April 27, 2017
- Unit 2 drywell leak detection terminal box fuse clip resistances exceeded allowable limits on April 30, 2017
- Unit 2 rod position indication power supply failure on May 16, 2017

The inspectors evaluated the technical adequacy of the operability determinations to assess whether TS operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the TSs 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 – 3 samples)

.1 Temporary Modifications

a. Inspection Scope

The inspectors reviewed the temporary modification listed below to determine whether the modification 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 modification to verify that the temporary modification did not degrade the design bases, licensing bases, and performance capability of the affected systems.

- Engineering change review 429181 – Preferred Engineering 2" instrumentation plug installation for 'N16D' nozzle repair

b. Findings

No findings were identified.

.2 Permanent Modifications

a. Inspection Scope

The inspectors evaluated a modification to the nuclear pressure vessel implemented by engineering change package 619561, "N16D Nozzle Repair." 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 design change, including associated drawings and schematics of the repair location and process, the design change package, and the non-destructive examination results following weld repairs.

The inspectors evaluated the replacement of the reactor water cleanup bottom head drain valve implemented by engineering change package 619056, "Modification and Removal of Supports for the Replacement of Reactor Water Cleanup Bottom Head Drain Valve HV-044-2F100." 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 design change, including associated drawings and schematics of the valve replacement and the design change package.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 7 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 2 'C' outboard main steam isolation valve maintenance on April 25, 2017
- Unit 2 'B' residual heat removal (RHR) shutdown cooling return maintenance on April 26, 2017
- Unit 2 'B' outboard main steam isolation valve maintenance on April 28, 2017
- Unit 2 'D' outboard main steam isolation valve maintenance on April 29, 2017
- Unit 2 'A' RHR shutdown cooling return maintenance on May 5, 2017
- Unit 2 reactor water cleanup reactor pressure vessel bottom head drain motor operated valve replacement on May 5, 2017
- Unit 2 RCIC rotor replacement on May 7, 2017

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20 – 1 sample)

a. Inspection Scope

The inspectors reviewed the station's work schedule and outage risk plan for the Unit 2 maintenance and refueling outage 2R14, conducted April 17 through May 26, 2017. The inspectors reviewed Exelon's development and implementation of outage plans and schedules to verify that risk, industry experience, previous site-specific problems, and defense-in-depth were considered. During the outage, the inspectors observed portions of the shutdown and cooldown processes and monitored controls associated with the following outage activities:

- Configuration management, including maintenance of defense-in-depth, commensurate with the outage plan for the key safety functions and compliance with the applicable TSs when taking equipment out of service

- Implementation of clearance activities and confirmation that tags were properly hung and that equipment was appropriately configured to safely support the associated work or testing
- Installation and configuration of reactor coolant pressure, level, and temperature instruments to provide accurate indication and instrument error accounting
- Status and configuration of electrical systems and switchyard activities to ensure that TSs were met
- Monitoring of decay heat removal operations
- Impact of outage work on the ability of the operators to operate the spent fuel pool cooling system
- Reactor water inventory controls, including flow paths, configurations, alternative means for inventory additions, and controls to prevent inventory loss
- Activities that could affect reactivity
- Maintenance of secondary containment as required by TSs
- Refueling activities, including fuel handling and fuel receipt inspections
- Fatigue management
- Tracking of startup prerequisites, walkdown of the drywell (primary containment) to verify that debris had not been left which could block the ECCS suction strainers, and startup and ascension to full power operation
- Identification and resolution of problems related to refueling outage activities

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 6 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 TSs, the UFSAR, and Exelon procedure requirements. The inspectors verified that test acceptance criteria were clear, tests demonstrated operational readiness and were consistent with design documentation, test instrumentation had current calibrations and the range and accuracy for the application, tests were performed as written, and applicable test prerequisites were satisfied.

Upon test completion, the inspectors considered whether the test results supported that equipment was capable of performing the required safety functions. The inspectors reviewed the following surveillance tests:

- ST-2-074-642-2, Unit 2 source range and intermediate range neutron monitor pre-shutdown functional test on April 10, 2017
- ST-5-041-885-2, Unit 2 reactor coolant chemistry sample on April 12, 2017
- ST-6-092-118-2, Unit 2 ‘D24’ EDG safeguard loss of power outage testing on April 25, 2017
- ST-6-049-320-2, Unit 2 RCIC operability verification on May 26, 2017
- ST-4-LLR-031-2, Unit 2 main steam line ‘A’ isolation valves’ local leak rate testing on April 20 and 21, 2017 (containment isolation valve)
- ST-6-055-231-2, Unit 2 HPCI comprehensive surveillance test on May 27, 2017 (in-service test)

b. Findings

No findings were identified.

2. RADIATION SAFETY

Cornerstone: Occupational and Public Radiation Safety

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01 - 4 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, TSs, Regulatory Guide 8.38, and the procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors reviewed the performance indicators for the occupational exposure cornerstone, radiation protection program 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 walk-downs 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 to verify survey adequacy of any new radiological hazards for onsite workers or members of the public.

Instructions to Workers (1 sample)

The inspectors reviewed high radiation area work permit controls and use, observed containers of radioactive materials and assessed whether the containers were labeled and controlled in accordance with requirements.

The inspectors reviewed several occurrences where a worker's electronic personal dosimeter alarmed. The inspectors reviewed Exelon's evaluation of the incidents, documentation in the corrective action program, and whether compensatory dose evaluations were conducted when appropriate. The inspectors verified follow-up investigations of actual radiological conditions for unexpected radiological hazards were performed.

Radiological Hazards Control and Work Coverage (1 sample)

The inspectors evaluated in-plant radiological conditions and performed independent radiation measurements during facility walk-downs and observation of radiological work activities. The inspectors assessed whether posted surveys; radiation work permits; worker radiological briefings and radiation protection job coverage; the use of continuous air monitoring, air sampling and engineering controls; and dosimetry monitoring were consistent with the present conditions.

The inspectors examined the control of highly activated or contaminated materials stored within the spent fuel pools and the posting and physical controls for selected high radiation areas, locked high radiation areas and very high radiation areas to verify conformance with the occupational performance indicator.

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

The inspectors evaluated radiation worker performance with respect to radiation protection work requirements. The inspectors evaluated radiation protection technicians in performance of radiation surveys and in providing radiological job coverage.

Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151)

.1 Safety System Functional Failures (2 samples)

a. Inspection Scope

The inspectors sampled Exelon's submittals for the Safety System Functional Failures performance indicator for both Unit 1 and Unit 2 for the period of April 1, 2016, through March 31, 2017. To determine the accuracy of the performance indicator data reported during those periods, inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, and NUREG-1022, "Event Reporting Guidelines 10 CFR 50.72 and 10 CFR 50.73." The inspectors reviewed Exelon's operator narrative logs, operability assessments, maintenance rule records, maintenance work orders, condition reports, event reports and NRC integrated inspection reports to validate the accuracy of the submittals.

b. Findings

No findings were identified.

.2 Mitigating Systems Performance Index (2 samples)

a. Inspection Scope

The inspectors reviewed Exelon's submittal of the Mitigating Systems Performance Index for the following systems for the period of April 1, 2016, through March 31, 2017:

- Unit 1 Emergency AC Power System
- Unit 2 Emergency AC Power System

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

The inspectors also reviewed Exelon's operator narrative logs, condition reports, mitigating systems performance index derivation reports, event reports, and NRC's 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 Semi-Annual Trend Review

a. Inspection Scope

The inspectors performed a semi-annual review of site issues, as required by Inspection Procedure 71152, "Problem Identification and Resolution," to identify trends that might indicate the existence of more significant safety issues. In this review, the inspectors included repetitive or closely-related issues that may have been documented by Exelon outside of the corrective action program, such as trend reports, performance indicators, major equipment problem lists, system health reports, maintenance rule assessments, and maintenance or corrective action program backlogs. The inspectors also reviewed Exelon's corrective action program database for the first and second quarters of 2017 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 Exelon's trending information to verify that Exelon personnel were appropriately evaluating and trending adverse conditions in accordance with applicable procedures.

b. Findings and Observations

No findings were identified.

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 corrective action program for resolution and appropriately prioritizing investigation reviews.

The inspectors also reviewed and assessed the adverse trend in human performance identified by Exelon that was discussed in the 2016 second quarter integrated inspection report (ML16214A219) and the 2016 fourth quarter integrated inspection report (ML17041A175). The inspectors noted additional examples in the most recent semiannual period in which Exelon personnel failed to implement appropriate human error prevention tools. For example, an EDG jacket water drain valve was inadvertently opened, a half actuation of the reactor protection system (e.g. half trip) was caused unexpectedly, core verification identified that a fuel assembly was not full seated during prior fuel movement, hydraulic control unit work was performed in which the workers performed the quality verification steps and sign-offs instead of the required quality verifier, and a trip of a reactor water cleanup pump occurred due to performing simultaneous activities. These issues in aggregate represent a continuing negative trend in technical human performance impacting configuration control. Exelon performed causal evaluations for the individual events and is working to implement site wide performance improvement plans.

The inspectors noted Exelon's continued effort to improve site performance due to these and similarly related industrial safety issues. However, the inspectors determined that overall human performance did not improve during the semi-annual period. The inspectors previously determined the diesel generator issue was a finding and was documented in the 2017 first quarter integrated inspection report (ML17131A008). The inspectors determined that the remaining issues were of minor safety significance and that Exelon's continuing actions to address the adverse 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.

.3 Annual Sample: Corrective Actions Related to Degraded Security Equipment

a. Inspection Scope

The inspectors performed an in-depth review of Exelon's evaluation and corrective actions associated with degraded security equipment. Due to the sensitive nature, the scope of this inspection is included in NRC security inspection report 05000352/2017403 and 05000353/2017403 dated July 22, 2017 (Cover Letter ML17205A057).

b. Findings and Observations

No findings were identified.

Due to the sensitive nature, the inspectors documented observations in NRC security inspection report 05000352/2017403 and 05000353/2017403.

4OA3 Follow-Up of Events and Notices of Enforcement Discretion (71153 – 3 samples)

.1 (Closed) LER (Licensee Event Report) 05000352/2016-003-00: Plant Shutdown Required by Technical Specifications Due to a Pressure Boundary Leak

a. Inspection Scope

On March 20, 2016, Limerick Unit 1 was performing a planned shutdown to support a refueling outage. The drywell leak inspection team identified a 0.5 gallons per minute reactor coolant system (RCS) pressure boundary leak on the shutdown cooling equalizing line. The apparent cause evaluation determined that the ¾ inch 'A' RHR shutdown cooling return check valve equalizing line developed a crack at the toe of the weld due to high cyclic fatigue induced by vibration from the reactor recirculation system. This check valve was previously replaced in 2006, and the equalizing line came pre-fabricated to the valve body. The affected section of the piping was replaced with a new socket weld with a 2x1 overlay to improve the pipe stability and minimize stresses. The Unit 1 'B' RHR shutdown cooling return check valve equalizing line weld was also reworked using the 2x1 weld method during the Unit 1 refueling outage in April 2016. The similar Unit 2 welds on the equalizing lines were examined and reinforced during the May 2017 refueling outage. The LER and associated evaluations and follow-up actions were reviewed for accuracy, the appropriateness of corrective actions, violations of requirements, and potential generic issues. This LER is closed.

b. Findings

Description. On March 20, 2016, Limerick Unit 1 was performing a planned shutdown to support a refueling outage. The drywell leak inspection team identified a 0.5 gallons per minute RCS pressure boundary leak on the shutdown cooling equalizing line. Additionally, Exelon determined that this leakage constituted a violation of the Unit 1, TS 3.4.3.2. "Operational Leakage" that requires the RCS leakage to be limited to no pressure boundary leakage. The condition was reported in event notification 51809 as required by 10 CFR 50.72(b)(3)(ii)(A) because it represented a degradation of a principal safety barrier.

Exelon evaluated the flaw and determined the cause of the RCS pressure boundary leakage was that the ¾ inch 'A' RHR shutdown cooling return check valve equalizing line developed a crack at the toe of the weld due to high cyclic fatigue induced by vibration from the reactor recirculation system.

The inspectors reviewed the LER and Exelon's apparent cause evaluation of the event. The inspectors reviewed the event information and leakage data over the previous cycle and concluded that reactor pressure boundary leakage reasonably began on an unknown date that was more than 36 hours before March 20, 2016. However, the inspectors determined that the existence of RCS pressure boundary leakage was not within Exelon's ability to foresee and correct and therefore was not a performance deficiency. In particular, the RHR shutdown cooling return check valve was replaced on the recommended periodicity, and the equalizing line that developed the crack came pre-fabricated to the valve body when replaced in 2006. For information, the inspectors screened the significance of the condition using IMC 0609, Appendix A, "The Significance Determination Process For Findings At-Power," and determined that the condition represented very low safety significance (Green) because it would not result in exceeding the RCS leak rate for a small LOCA and would not have likely affected other systems used to mitigate a LOCA.

Enforcement. TS 3.4.3.2 requires, in part, that RCS operational leakage shall be limited to no pressure boundary leakage. If pressure boundary leakage exists, the TS 3.4.3.2 limiting condition for operation action statement requires Unit 1 to be in at least hot shutdown within 12 hours and in cold shutdown within the next 24 hours. Contrary to the above, for a period that began on an unknown date that was very likely more than 36 hours before March 20, 2016, and ending on March 20, 2016, RCS pressure boundary leakage existed, and Exelon did not place Unit 1 in at least hot shutdown within 12 hours and in cold shutdown within the next 24 hours.

This issue is considered within the traditional enforcement process because there was no performance deficiency associated with the violation of NRC requirements. Inspection Manual Chapter 0612, "Power Reactor Inspection Reports", Section 03.22 states, in part, that traditional enforcement is used to disposition violations receiving enforcement discretion or violations without a performance deficiency. The NRC Enforcement Policy, Section 2.2.1 states, in part, that, whenever possible, the NRC uses risk information in assessing the safety significance of violations. Accordingly, after considering that the condition represented very low safety significance, the inspectors concluded that the violation would be best characterized as Severity Level IV under the traditional enforcement process. However, the NRC is exercising enforcement discretion (EA-17-076) in accordance with Section 3.10 of the NRC Enforcement Policy which states that the NRC may exercise discretion for violations of NRC requirements by reactor licensees for which there are no associated performance deficiencies. In reaching this decision, the NRC determined that the issue was not within the licensee's ability to foresee and correct; the licensee's actions did not contribute to the degraded condition; and the actions taken were reasonable to identify and address the condition. Furthermore, because the licensee's actions did not contribute to this violation, it will not be considered in the assessment process or the NRC's Action Matrix.

.2 (Closed) LER 05000352/2017-003-00: Condition Prohibited by Technical Specifications Due to an Inoperable Rod Position Indication System

a. Inspection Scope

On March 16, 2017, the Unit 1 main control room received a rod position indication system inoperable alarm and identified that multiple control rod position indications were inoperable due to a failed power supply. The operating crew entered the TS 3.1.3.7 limiting condition for operation action statement which directs, "with one or more control rod position indicators inoperable, within 1 hour, determine the position of the control rod by using an alternate method." Of the 83 control rods with no indication, 81 control rods indicated the expected full-in or full-out position on the full core display. A method of alternate control rod position determination was initiated for the remaining control rods that were not full-in or full-out and thus had no indication. On March 22, 2017, Exelon identified that the power supply failure rendered the full core display incapable of updating in response to a position change for the affected control rods and therefore was not a valid means to verify control rod position. The condition existed for approximately 19.5 hours until the power supply was replaced. This time was greater than the time required by TS 3.1.3.7 to determine rod position within 1 hour or be in hot shutdown within the following 12 hours. The inspectors reviewed the licensee event report dated May 22, 2017, and the associated condition reports.

b. Findings

The enforcement aspects of this event are discussed in Section 4OA7.1. This LER is closed.

.3 (Closed) LER 05000353/2015-007-00: Condition Prohibited by Technical Specifications Due to an Inoperable Reactor Coolant Leak Detection System

(Closed) LER 05000353/2015-007-01: Condition Prohibited by Technical Specifications Due to an Inoperable Reactor Coolant Leak Detection System

a. Inspection Scope

On December 10, 2015, the Unit 2 control room supervisor was notified that one method of reactor coolant leakage detection, the drywell unit coolers condensate flow rate monitoring system, was degraded. The control room supervisor declared the system inoperable and entered the applicable TS 3.4.3.1 limiting condition of operation action statement. On December 13, 2015, Unit 2 was shutdown for a planned outage to perform maintenance on the main turbine. Troubleshooting was performed on the drywell unit coolers condensate flow rate monitoring system. The troubleshooting activity could not identify the cause of the degraded system performance and Unit 2 was restarted on December 19, 2015. Exelon determined that firm evidence was present that the leak detection system was inoperable during the operating cycle for greater than 30 days and the TS 3.4.3.1 action statement was not met until the system was declared inoperable on December 10, 2015. The cause of the event was determined to be incorrect assumptions and decisions during the modification development for the recently upgraded drywell unit coolers condensate flow rate monitoring system. The inspectors identified a finding during the review of the LER. This LER and its revision are closed.

b. Findings

Introduction. A self-revealing Green NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," occurred when Exelon failed to verify or check the adequacy of design of a new Unit 2 drywell unit cooler condensate flow rate monitoring system. Specifically, the design did not identify that the low conductivity of the drain fluid affected the ability of the flow elements to accurately detect and indicate condensate drain flow. In addition, LGS staff did not assure adequate post modification acceptance test in accordance with CC-AA-107-1001, Post Modification Acceptance Testing which resulted in a violation of TS 3.4.3.1 "Leakage Detection Systems," because the system was inoperable and unavailable to perform its function following the Unit 2 April 2015 refueling outage, and the TS 3.4.3.1 action statement was not met until the system was declared inoperable on December 10, 2015.

Description. The drywell unit cooler condensate flow rate monitoring system is part of the reactor coolant leakage detection system. This system is used to monitor drywell conditions and serves as an added indicator of reactor coolant system unidentified leakage. The system also assists in identifying the location and potential sources of unidentified leakage in the drywell.

The Unit 2 drywell unit cooler condensate flow rate monitoring system was replaced with a new Rosemount system during Unit 2's April 2015 refueling outage with a reactor startup on May 4, 2015. The replacement parts for the previously installed Flow Components International (FCI) had limited stock, and a new system was installed in its place. During the modification development, decisions for the cable type, radiation hardening, and fluid conductivity were made by LGS staff based upon successful implementation of a similar modification at another Exelon site rather than using the specific environment and operating conditions at Limerick. In addition to this, LGS staff did not assure adequate post modification acceptance test in accordance with CC-AA-107-1001, "Post Modification Acceptance Testing," step 4.4.3, because they did not require either in-situ testing or flow testing using actual representative condensate as part of the modification acceptance testing. Therefore, the fluid used in testing was not representative of the low conductivity unit cooler drain flow seen during Unit 2 operations. If appropriate flow testing had been performed, then the new system's inability to detect low conductivity condensate would have been identified. LGS staff did not recognize the risks associated with simulating the unit cooler flow for acceptance testing.

On December 10, 2015, condition report IR 2598308 was written by engineering identifying that the flow transmitters were not indicating flow correctly based upon data gathered during surveillance test ST-2-087-600-2, "Reactor Coolant System Leak Detection System Drywell Unit Cooler Condensate Flow Monitor Functional Test." All six unit cooler drain flows indicated less than 0.2 gpm along with an empty pipe condition. Based on drywell floor sump instrumentation indicating approximately 0.7 gpm of unidentified leakage, at least one of the drywell unit cooler flow transmitters should have been indicating greater than 0.2 gpm. Exelon declared the system inoperable and entered the applicable TS 3.4.3.1 limiting condition of operation action statement. This action statement states "with the drywell unit coolers condensate flow rate monitoring system inoperable, and the primary containment atmosphere gaseous radioactivity monitoring system operable, perform a channel check of the primary containment atmosphere gaseous radioactivity monitoring system once per eight hours." As a result of IR 2598308, troubleshooting was planned for the upcoming maintenance outage.

On December 13, 2015, Unit 2 was shutdown for a planned maintenance outage for the main turbine. Troubleshooting at the time of the maintenance outage could not identify the cause of the degraded system. The investigation did determine that the leak detection system was inoperable during the operating cycle for greater than 30 days and the TS 3.4.3.1 action statement was not met until the system was declared inoperable on December 10, 2015.

The cause of the failure was identified during the April 2017 refueling outage. The system failed to properly indicate due to the operating environment and system configuration. The Rosemount system was not designed to detect flow accurately with low conductivity. The previously installed FCI system was capable of identifying the drain flow in the low conductivity range seen in Unit 2's environment. In response to this issue, Exelon initiated IR 2598308, performed an apparent cause investigation, and replaced the Rosemount drywell unit cooler condensate flow rate monitoring system with a modified version of the previously used FCI system. An in-situ flow test was performed on the modified version of the FCI system to verify proper operation.

Analysis. The inspectors determined that the failure to verify the adequacy of the newly installed Rosemount drywell unit cooler condensate flow rate monitoring 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 design control attribute of the barrier integrity cornerstone to provide reasonable assurance that physical design barriers protect the public from radionuclide released caused by accidents or events. Specifically, the Unit 2 drywell unit cooler condensate flow rate monitoring system was inoperable and unavailable to perform its function as part of the reactor coolant leakage detection system following the Unit 2, April 2015 refueling outage.

This issue was evaluated in accordance with IMC 0609, Appendix A, "Significance Determination Process for Findings At-Power," using Exhibit 3, "Barrier Integrity Screening Questions," Section B, "Reactor Containment." The finding was determined to be of very low safety significance (Green) because the finding did not represent an actual open pathway in the physical integrity of the reactor containment and did not involve an actual reduction in function of hydrogen igniters in the reactor containment.

The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Conservative Bias, because LGS staff did not use decision making-practices that emphasize prudent choices over those that are simply allowed. Specifically, inappropriate decisions were made based upon successful implementation of a similar modification at another Exelon site rather than using the specific environment and operating conditions at Limerick. [H.14]

Enforcement. 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculation methods, or by the performance of a suitable testing program. TS 3.4.3.1 requires, in part, that with the drywell unit coolers condensate flow rate monitoring system inoperable, and the primary containment atmosphere gaseous radioactivity monitoring system operable, perform a channel check of the primary containment atmosphere gaseous radioactivity monitoring system once per 8 hours. Contrary to the above, during system modification in the April 2015 refueling outage and prior to the April 2017 refueling outage, Exelon did not provide appropriate design control measures to verify or check the adequacy of the design of the Unit 2 drywell unit cooler condensate flow rate monitoring system to ensure that the system could properly indicate due to the low conductivity of the drain fluid. This resulted in the Unit 2 drywell unit cooler condensate flow rate monitoring system being inoperable and unavailable to perform its function. Also, the required TS 3.4.3.1 action statement to perform a channel check every 8 hours was not met from May 4, 2015, until the system was declared inoperable on December 10, 2015. In response to this issue, Exelon replaced the Rosemount drywell unit cooler condensate flow rate monitoring system with a modified version of the previously used FCI system. Because this finding is of very low safety significance (Green) and was entered into the corrective action program (IR 2598308), this violation is being treated as a NCV consistent with Section 2.3.2.a of the Enforcement Policy. **(NCV 05000353/2017002-01, Inadequate Design Control of the Drywell Unit Cooler Condensate Flow Rate Monitoring System)**

4OA6 Meetings, Including Exit

On July 14, 2017, the inspectors presented the inspection results to Mr. Frank Sturniolo, Plant Manager, 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 signification (Green) was identified by Exelon and is a violation of NRC requirements which meet the criteria of the NRC Enforcement Policy, for being dispositioned as a non-cited violation.

LER 05000352/2017-003-00 Condition Prohibited by Technical Specifications Due to an Inoperable Rod Position Indication System. TS 3.1.3.7 requires, in part, with one or more control rod position indicators inoperable, within 1 hour, determine the position of the control rod by using an alternate method, or otherwise, be in at least hot shutdown within the next 12 hours. Contrary to the above, on March 16, 2017, a power supply for the Unit 1 rod position indication system rendered position indication for 83 control rods inoperable for approximately 19.5 hours until the power supply was replaced. Exelon incorrectly used the full core display to verify control rod position for 81 of the 83 rods. The power supply failure rendered the full core display incapable of updating in response to a rod position change and was, therefore, not a valid means to determine rod position. Exelon initiated condition report IR 3988302 to document the TS violation. The inspectors evaluated the significance of this finding using IMC 0609 Appendix A, “Significance Determination Process for Findings at Power,” Exhibit 2, “Mitigating Systems Screening Questions.” The inspectors determined that this finding was of very low safety significance (Green) because the issue did not affect a single reactor protection system trip signal or the function of the other redundant trips or diverse methods of reactor shutdown, did not involve addition of positive reactivity, and did not result in mismanagement of reactivity by operators. Because this issue was of very low safety significance (Green) and Exelon entered the issue into the corrective action program (IR 3988302), this finding is being treated as a non-cited violation, consistent with Section 2.3.2.a of the NRC Enforcement Policy.

ATTACHMENT: SUPPLEMENTARY INFORMATION

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

R. Libra, Site Vice President
D. Lewis, Plant Manager
F. Sturniolo, Plant Manager / Director of Operations
J. Murphy, Director of Engineering
D. Palena, Director of Maintenance
M. Bonifanti, Director of Work Management
J. McGee, 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
J. Brady, Radiation Protection Technician
J. Holliday, Radiation Protection Technician
P. Imm, Radiation Protection Field Operations Manager
F. Jarrett, Radiation Protection Technician
J. Kirkpatrick, Radiation Protection Supervisor
D. Kramer, Maintenance Supervisor
E. Kruse, Maintenance Supervisor
D. Page, Radiation Protection Supervisor
K. Painter, Radiation Protection Supervisor
D. Sarge, Radiation Protection Technician
B. Short, Radiological Engineer
D. Strickler, Industrial Safety Representative
R. Toomey, Maintenance Supervisor
C. Hawkins, Exelon NDE Level III
J. Kan, Authorized Nuclear In-service Inspector
M. Karasek, IVVI Program Owner
J. Kramer, Site Welding Administrator
M. Weis, ISI Program Owner
J. Morgan, Project Manager

LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED

Opened/Closed

05000353/2017002-01	NCV	Inadequate Design Control of the Drywell Unit Cooler Condensate Flow Rate Monitoring System (Section 4OA3)

Closed

05000352/2016-003-00	LER	Plant Shutdown Required by Technical Specifications Due to a Pressure Boundary Leak (Section 4OA3)
05000352/2017-003-00	LER	Condition Prohibited by Technical Specifications Due to an Inoperable Rod Position Indication System (Section 4OA3)
05000353/2015-007-00,01	LER	Condition Prohibited by Technical Specifications Due to an Inoperable Reactor Coolant Leak Detection System (Section 4OA3)

LIST OF DOCUMENTS REVIEWED

Section 1R04: Equipment Alignment

Procedures
1S49.1.A (COL), Valve Alignment to Assure Availability of the RCIC System, Revision 17
OP-LG-108-103-1100, Limerick Generating Station Common Locked Valve List, Revision 11
S49.9.A, Routine Inspection of the RCIC System, Revision 29
S51.6.C, Swapping an Operating RHR Pump between RHR-SDC and RHR-ADHR, Revision 13
S51.8.B, Shutdown Cooling/Reactor Coolant Circulation Operation Startup and Shutdown, Revision 81
S51.8.L, RHR Alternate Decay Heat Removal Startup and Shutdown, Revision 22
S51.9.A, Routine Inspection of RHR System, Revision 16
S81.9.a, Routine Inspection and System Operability Check for Miscellaneous Structures HVAC Systems, Revision 32
SP-223, Replacement of ‘B’ Loop RHRSW Return Piping During 2R14, Revision 0

Section 1R05: Fire Protection

Procedures
F-R-109, Pre-Fire Plan, Unit 1 HPCI Pump Room 109, Revision 10
F-R-180, Pre-Fire Plan, Unit 2 HPCI Pump Room 180, Revision 9
F-R-473, Pre-Fire Plan, Unit 2 Drywell Area, Revision 6
F-R-475, Pre-Fire Plan, Unit 2 CRD Equipment and Neutron Monitoring Area Rooms 475, 476, 477, and 479, Revision 18
F-S-001, Pre-Fire Plan Strategy for Spray Pond Pump Structure Western Half, Revision 13

Section 1R06: Flood Protection Measures

Procedures
ARC-MCR-113 A3, 1A-1C Core Spray Pump Room Flood, Revision 2
ARC-MCR-115 A3, 1B-1D Core Spray Pump Room Flood, Revision 2
SE-4-1, Reactor Enclosure Flooding, Revision 11
SE-4, Flood, Revision 7

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

Section 1R08: In-service Inspection

Procedures
2.0-NDES-001, Nondestructive Examination Personnel Qualification and Certification, Revision 8
EPRI-DMW-PA-1, Procedure for Manual Phased Array Ultrasonic Examination of Dissimilar Metal Welds, Revision 6
ER-AA-330-009, ASME Section XI Repair/Replacement Program, Revision 13
GEH-PDI-UT-2, PDI Generic Procedure for the Ultrasonic Examination of Austenitic Pipe Welds, Revision 10
GEH-VT-204, Procedure for IVVI of BWR 4 RPV Internals, Revision 17
ISwT-PDI-AUT5, Automated Inside Surface Ultrasonic Examination of Pressure Vessel Welds using Phased Array, Revision 2
MA-LG-793-001, Visual Examination of Containment Vessels and Internals, Revision 9

Condition Reports
2551246 2648048 2648801

Maintenance Orders/Work Orders
04180943 4180760

Drawings
DCA-418-1, Spool Drawing, Revision 5
XI-DCA-418-1, Sheet 1, ISI Isometric – Reactor Building Residual Heat Removal Loop “D” Unit 2, Revision 0
XI-VRR-2RD-2A, Sheet 1, ISI Isometric – Reactor Building Reactor Recirculation Pump Discharge Loop “A” – Unit 2, Revision 1

Miscellaneous
1500166.301, Limerick Generating Station, Unit 2, Core Shroud Weld Flaw Evaluation ISwT Project 17-01-0403 Report, 2017 Inservice Examination of the Reactor Pressure Vessel at Limerick Unit 2 Generating Station Li2R14, April 29, 2017
ER-LG-330-1001, Limerick Generating Station Units 1&2 ISI Program Plan, Revision 13
IWE and IWL Visual Examination NDE Report 4.2.1.1, Dated April 17, 2017 (WO425969801)
IWE and IWL Visual Examination NDE Report 4.2.1.2, Dated April 17, 2017 (WO425969801)
IWE and IWL Visual Examination NDE Report 4.2.1.3, Dated April 17, 2017 (WO425969820)
IWE and IWL Visual Examination NDE Report 4.2.1.4, Dated April 17, 2017 (WO425969820)
IWE and IWL Visual Examination NDE Report 4.2.1.5, Dated April 17, 2017 (WO425969801)
UT-17-030, UT Data Sheet for VRR-2RD-2A-15-SWA, dated April 26, 2017
UT-PA-005, 006, 007 and 008, UT Data Sheets for DCA-418-1-2 SW3, dated April 27, 2017

Section 1R11: Licensed Operator Requalification Program

Procedures
E-1FB, Loss of Division II Safeguard 125/250V DC Bus 1FB, Revision 15
GP-3, Normal Plant Shutdown, Revision 162
GP-4, Rapid Plant Shutdown To Hot Shutdown, Revision 33
ON-101, Loss of Isolated Phase Bus Cooling, Revision 18
T-101, RPV Control Flow Chart, Revision 23
T-103, Secondary Containment Control Flow Chart, Revision 23
T-112, Emergency Blowdown Flow Chart, Revision 15

Miscellaneous
Simulator Evaluation Guide 3007E, Revision 1

Section 1R12: Maintenance Effectiveness

Condition Reports

3985268	3985269	3985320	3986750	3991942	3997924
4012136	4018860	4019148	4020591	4020967	4020972
4021268	4022485	4023887			

Miscellaneous
Unit 1 Emergency Diesel Generator System Health Reports

Section 1R13: Maintenance Risk Assessments and Emergent Work Control

Procedures
M-041-314, 2” Instrumentation Nozzle Plug Installation/Removal, Revision 0
MA-AA-716-004 Attachment 2, Focused Troubleshooting, Revision 15
MA-AA-716-004, Conduct of Troubleshooting, Revision 14
OP-AA-108-117, Protected Equipment Program, Revision 14
OP-AA-108-117, Protected Equipment Program, Revision 4
OP-LG-108-1000, Limerick Protected Equipment Program, Revision 5
OP-LG-108-117-1000, Limerick Protected Equipment Program, Revision 5
WC-AA-101-1006, On-Line Risk Management and Assessment, Revision 2

Condition Reports
3999361
4007992

Work Orders
4636950

Drawings
8031-M-42, P&ID Nuclear Boiler Vessel Instrumentation, Revision 21
BA-6, RPV Scan Limitation Drawing, Revision 1

Miscellaneous
Operations Protected Equipment Log 4/18/2017 and 4/19/2017
Operations Protected Equipment Log 4/18/2017 thru 4/20/2017
Operations Protected Equipment Log 5/11/2017 and 5/12/2017

Section 1R15: Operability Determinations and Functionality Assessments

Procedures
ER-AA-300-130, License Renewal Fuse Holders Program, Revision 2
IC-11-00122, Cleaning, Examination, and Resistance Check of the Fluid Components Inc. Linear Flow Elements and Calibration of the Fluid Components Inc. Flow Transmitters, Revision 13
MA-AA-716-004 Attachment 2, Focused Troubleshooting, Revision 15
MA-AA-716-004, Conduct of Troubleshooting, Revision 14
OP-AA-108-115-1002, Supplemental Consideration for On-Shift Immediate Operability Determinations (CM-1), Revision 3
RT-6-053-490-2, Determination of Fuel Pool Tell-Tale Liner Drain Leakage, Revision 1
ST-6-092-117-2, D23 Diesel Generator 4 KV SFGD Loss of Power LSF/SAA and Outage Testing, Revision 31

Condition Reports

1609874	2461965	2600107	2601870	3971826	3999897
4000228	4000643	4000703	4001123	4001253	4001429
4002539	4003917	4004577	4011371	4011457	4011613
4011745					

Work Orders
4250046
4288834

Drawings
E-697, Schematic Diagram Drywell Air Cooler Condensate Drain Flow Monitoring Unit 1, 2, and Common, Revision 2

Miscellaneous
AD-AA-101-F-10, Temporary Procedure Change – Site Approval Form, Temp Change # 17-0114-2, Revision 1
Operations Narrative Logs
WC-AA-1111, Test Results Evaluation Form, Revision 5

Section 1R18: Plant Modifications

Procedures
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4287599 4287599

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4633090

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GP-3 Appendix 1, Establishing Cold Shutdown, Revision 60
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3999833	3999859	3999897	3999897	4000181	4000181
4000208	4000228	4000228	4000601	4000602	4000643
4000643	4000703	4000703	4000714	4000718	4000720
4000953	4000958	4001058	4001123	4001123	4001163
4001165	4001206	4001253	4001253	4001422	4001429
4001429	4001441	4001468	4001627	4002074	4002109
4002327	4002539	4002902	4003467	4003467	4003473
4003473	4003663	4003680	4003917	4004092	4004092
4004364	4004364	4004430	4004577	4004744	4004746
4005145	4005145	4005419	4005419	4005790	4005928
4005928	4006361	4006429	4007253	4007253	4007483
4007643	4007643	4007992	4008205	4008429	4008800
4008880	4009333	4009390	4010110		

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3996139
4287599

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3984524 3989914 3990006 3992193 3992838 3993749

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Radiation Work Permit LG-0-17-00513
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3972142 3972145 3972146 3986305 3990124 3991524
3993396 3995337 3999734 3999747 4002902 4004744
4004746 4006361 4007253 4009333 4010141 4010367
4016295 4017510

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Miscellaneous
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LIST OF ACRONYMS

ASME	American Society of Mechanical Engineers
CFR	*Code of Federal Regulations*
ECCS	emergency core cooling system
EDG	emergency diesel generator
FCI	Flow Components International
HPCI	high pressure coolant injection
IMC	Inspection Manual Chapter
ISI	in-service inspection
IVVI	In-Vessel Visual Inspection
LER	licensee event report
LGS	Limerick Generating Station
LOCA	loss of coolant accident
LOOP	loss of offsite power
NCV	non-cited violation
NDE	non-destructive examination
NRC	Nuclear Regulatory Commission
RCIC	reactor core isolation cooling
RCS	reactor coolant system
RHR	residual heat removal
RHRSW	residual heat removal service water
SDC	shutdown cooling
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
UT	ultrasonic testing
VT	visual examination