



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION I
2100 RENAISSANCE BOULEVARD, SUITE 100
KING OF PRUSSIA, PA 19406-2713

February 13, 2019

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

SUBJECT: LIMERICK GENERATING STATION – INTEGRATED INSPECTION REPORT
05000352/2018004 AND 05000353/2018004

Dear Mr. Hanson:

On December 31, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Limerick Generating Station, Units 1 and 2. On January 11, 2019, the NRC inspectors discussed the results of this inspection with Mr. Rick Libra, Site Vice President, and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented one finding of very low safety significance (Green) in this report. This finding involved a violation of NRC requirements. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2.a of the Enforcement Policy.

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

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

Sincerely,

/RA/

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

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

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Inspection Report 05000352/2018004 and
05000353/2018004

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05000352/2018004 AND 05000353/2018004 DATED FEBRUARY 13, 2019

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U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Numbers: 50-352 and 50-353

License Numbers: NPF-39 and NPF-85

Report Numbers: 05000352/2018004 and 05000353/2018004

Enterprise Identifier: I-2018-004-0073

Licensee: Exelon Generation Company, LLC

Facility: Limerick Generating Station, Units 1 & 2

Location: Sanatoga, PA 19464

Inspection Dates: October 1, 2018 to December 31, 2018

Inspectors: S. Rutenkroger, PhD, Senior Resident Inspector
M. Fannon, Resident Inspector
H. Anagnostopoulos, Senior Health Physicist
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P. Ott, Operations Engineer
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M. Rossi, Project Engineer

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

SUMMARY

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

List of Findings and Violations

Failure to Maintain the Design Control of the 'D23' Emergency Diesel Generator			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000353/2018004-01 Opened/Closed	H.11 – Human Performance – Challenge the Unknown	71152
A self-revealing Green non-cited violation (NCV) of Title 10 of the <i>Code of Federal Regulations</i> (10 CFR) Part 50, Appendix B, Criterion III was identified when Exelon replaced the 'D23' emergency diesel generator lube oil heater temperature switch with a new style switch on December 6, 2018. The new style switch subsequently failed on December 7, 2018, due to overheating and charring of the switch wiring when coming in contact with the cover.			

Additional Tracking Items

Type	Issue number	Title	Report Section	Status
LER	05000353/2018-001-00	HPCI Inoperability due to Discharge Check Valve Failure to Close	71153	Closed

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PLANT STATUS

Unit 1 began the inspection period at rated thermal power. On December 16, 2018, operators reduced power to 57 percent for power suppression testing. The unit was returned to rated thermal power on December 20, 2018, and remained at or near rated thermal power for the remainder of the inspection period.

Unit 2 began the inspection period at rated thermal power. On December 29, 2018, operators reduced power to 70 percent for repairs on the main turbine control valve #4. The unit was returned to rated thermal power on December 30, 2018, and remained at or near rated thermal power for the remainder of the inspection period.

INSPECTION SCOPES

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

REACTOR SAFETY

71111.01 - Adverse Weather Protection

Seasonal Extreme Weather (1 Sample)

The inspectors evaluated readiness for seasonal extreme weather conditions prior to seasonal cold temperatures.

71111.04 - Equipment Alignment

Partial Walkdown (3 Samples)

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

- (1) Unit common 'A' control room fresh air system on October 11, 2018
- (2) Unit common emergency service water system on October 19, 2018
- (3) Unit common residual heat removal service water system on October 22, 2018

Complete Walkdown (1 Sample)

The inspectors evaluated system configurations during a complete walkdown of the Unit 2 high pressure coolant injection system.

71111.05AQ - Fire Protection Annual/Quarterly

Quarterly Inspection (5 Samples)

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

- (1) Fire areas 122 and 123, Unit common spray pond pump structure, on October 19, 2018
- (2) Fire area 56, Unit 2 reactor core isolation cooling pump room, on November 15, 2018
- (3) Fire area 80, Unit 1 'D13' emergency diesel generator and fuel oil-lube oil tank room, on November 16, 2018
- (4) Fire areas 31 and 32, Unit 1 residual heat removal heat exchanger and pump rooms 203 and 204, elevation 201', on November 19, 2018
- (5) Fire areas 54 and 55, Unit 2 residual heat removal heat exchanger and pump rooms 280 and 281, elevation 201', on November 19, 2018

71111.06 - Flood Protection Measures

Internal Flooding (1 Sample)

The inspectors evaluated internal flooding mitigation protections in the Unit 2 'A' and 'C' residual heat removal pump room on December 27, 2018.

71111.11 - Licensed Operator Regualification Program and Licensed Operator Performance

Operator Regualification (1 Sample)

The inspectors observed and evaluated licensed operator regualification training on October 23, 2018.

Operator Performance (1 Sample)

The inspectors observed Unit common 'A' loop residual heat removal service water pump testing, Unit common emergency service water throttle valve flushing, and Unit 1 redundant reactivity control system restoration on December 1, 2018. The inspectors also observed Unit 1 power suppression testing on December 17, 2018.

71111.11A - Licensed Operator Regualification Program and Licensed Operator Performance (Annual)

Operator Regualification Exam Results (Annual) (1 Sample)

The inspectors reviewed and evaluated regualification examination results on December 10, 2018.

71111.12 - Maintenance Effectiveness

Routine Maintenance Effectiveness (1 Sample)

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

- (1) Unit 2 high pressure coolant injection system

71111.13 - Maintenance Risk Assessments and Emergent Work Control (4 Samples)

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

- (1) Unit 2 'D23' emergency diesel generator fuel oil storage tank cleaning and inspection on October 15, 2018
- (2) Unit 2 'A' division 1 nuclear steam supply shutoff system logic test on November 2, 2018
- (3) Unit 1 high pressure coolant injection testing on November 6, 2018
- (4) Unit 2 reactor core isolation cooling flow controller replacement on November 13, 2018

71111.15 - Operability Determinations and Functionality Assessments (6 Samples)

The inspectors evaluated the following operability determinations and functionality assessments:

- (1) Issue Report (IR) 4178994, Unit 1 'D11' emergency diesel generator speed meter fluctuations on October 1, 2018
- (2) IR 4185363, Unit 2 standby liquid control tank foreign material on October 24, 2018
- (3) IR 4183163, Unit 2 'D22' emergency diesel generator discharge coupling lube oil leak on October 25, 2018
- (4) IR 4166174, Unit 2 emergency diesel generator keepwarm system issues on October 26, 2018
- (5) IR 4192575, Unit 1 division 2 battery room low temperature on November 7, 2018
- (6) IR 4195383, Unit 1 reactor core isolation cooling pump suction valve from the condensate storage tank had a torque switch trip that was outside the allowable value during diagnostic testing on November 15, 2018

71111.19 - Post Maintenance Testing (4 Samples)

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

- (1) Unit 2 reactor core isolation cooling flow transmitter venting, filling, and alignment on October 29, 2018
- (2) Unit 2 reactor core isolation cooling maintenance outage on November 14, 2018
- (3) Unit common 'D' residual heat removal service water pump replacement on November 16, 2018
- (4) Unit 1 'D11' emergency diesel generator speed switch replacement on November 29, 2018

71111.22 - Surveillance Testing

The inspectors evaluated the following surveillance tests:

Routine (1 Sample)

- (1) ST-6-092-311-1, Unit 1 'D11' emergency diesel generator instrumented run on October 30, 2018

In-service (1 Sample)

- (1) ST-6-049-230-2, Unit 2 reactor core isolation cooling pump, valve, and flow test on November 15, 2018

71114.02 - Alert and Notification System Evaluation (1 Sample)

The inspectors evaluated the maintenance and testing of the alert and notification system from December 2016 to November 2018.

71114.03 - Emergency Response Organization Staffing and Augmentation System (1 Sample)

The inspectors conducted a review of Exelon's Emergency Response Organization (ERO) augmentation staffing requirements and the process for notifying and augmenting the ERO.

71114.04 - Emergency Action Level and Emergency Plan Changes (1 Sample)

The inspectors verified that the changes made to the emergency plan were done in accordance with 10 CFR 50.54(q)(3), and any change made to the Emergency Action Levels, Emergency Plan, and its lower-tier implementing procedures, had not resulted in any reduction in effectiveness of the Plan. This evaluation does not constitute NRC approval.

71114.05 - Maintaining Emergency Preparedness (1 Sample)

The inspectors reviewed a number of activities to evaluate the efficacy of Exelon's efforts to maintain LGS's emergency preparedness programs.

RADIATION SAFETY71124.04 - Occupational Dose AssessmentSource Term Characterization (1 Sample)

The inspectors evaluated Exelon's source term characterization.

External Dosimetry (1 Sample)

The inspectors evaluated Exelon's external dosimetry program.

Internal Dosimetry (1 Sample)

The inspectors evaluated Exelon's internal dosimetry program.

Special Dosimetric Situations (1 Sample)

The inspectors evaluated Exelon's performance for special dosimetric situations.

OTHER ACTIVITIES – BASELINE

71151 - Performance Indicator Verification

The inspectors verified Exelon's performance indicator submittals listed below for the period October 1, 2017 through September 30, 2018. (9 samples)

- (1) Unit 1 and Unit 2 cooling water
- (2) Unit 1 and Unit 2 reactor coolant system leak rate
- (3) Unit 1 and Unit 2 reactor coolant system specific activity
- (4) Alert and Notification Reliability
- (5) Drill and Exercise Performance
- (6) ERO Drill Participation

The inspectors verified Exelon's performance indicators submittals listed below for the period from December 6, 2017 through November 16, 2018. (2 Samples)

- (1) Occupational Exposure Control Effectiveness
- (2) Radiological Effluent Technical Specifications/Offsite Dose Calculation Manual
Radiological Effluent Occurrences (RETS/ODCM) Radiological Effluent Occurrences

71152 - Problem Identification and Resolution

Semiannual Trend Review (1 Sample)

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

Annual Follow-up of Selected Issues (2 Samples)

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

- (1) Emergent shutdown of the Unit 1 'D12' emergency diesel generator due to high scavenging air temperatures (IR 4081882)
- (2) Unit 1 recirculation pump adjustable speed drive (ASD) failures (IR 4168043, 4145616, 4044408)

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

Licensee Event Reports (1 Sample)

The inspectors evaluated the following licensee event reports (LERs):

- (1) LER 05000353/2018-001-00, HPCI Inoperability due to Discharge Check Valve Failure to Close (ADAMS Accession No. ML18037A914). The inspectors determined that it was not reasonable for Exelon to foresee or correct the cause discussed in the LER, and therefore no performance deficiency was identified. The inspectors also concluded that no violation of NRC requirements occurred.

INSPECTION RESULTS

Failure to Maintain the Design Control of the 'D23' Emergency Diesel Generator			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000353/2018004-01 Opened/Closed	H.11 – Human Performance – Challenge the Unknown	71152
A self-revealing Green NCV of 10 CFR Part 50, Appendix B, Criterion III was identified when Exelon replaced the 'D23' emergency diesel generator lube oil heater temperature switch with a new style switch on December 6, 2018. The new style switch subsequently failed on December 7, 2018, due to overheating and charring of the switch wiring when coming in contact with the cover.			
<p><u>Description:</u> The emergency diesel generator systems are safety-related standby emergency power systems for LGS Units 1 and 2 consisting of four diesel generator sets per unit. Each diesel generator has a lube oil heater that is used to maintain lube oil temperatures above 105 degrees Fahrenheit to ensure system operability. On December 6, 2018, Exelon replaced the lube oil heater temperature switch with a new style temperature switch under Engineering Change 619379 for the 'D23' emergency diesel generator due to a failure of the previous style switch and repeated reliability issues. After replacing the temperature switch, the lube oil heater system operated normally until an alarm was received on December 7, 2018, after approximately 24 hours of operation (IR 4201280). The alarm was caused by low lube oil temperature, subsequently measured at 103 degrees Fahrenheit, which rendered the 'D23' emergency diesel generator inoperable.</p> <p>At the time of the low lube oil temperature alarm for the 'D23' emergency diesel generator, the 'D22' emergency diesel generator was inoperable and unavailable for a similar issue with its lube oil heater temperature switch (IR 4200941). With two emergency diesel generators inoperable, Technical Specification 3.8.1.1.b 72-hour limiting condition for operation action statement was entered. The temperature switch was replaced with the new style switch, the 'D22' emergency diesel generator was declared operable, and the 72-hour action statement was exited. The unit remained in the 30 day action statement (Technical Specification 3.8.1.1.a) for one emergency diesel generator inoperable.</p> <p>Exelon performed troubleshooting and identified an uninsulated wire lug with a raised arch at the terminal block. This uninsulated wire came into contact with the cover gasket due to the lower profile design of the new switch housing. The other two wires on adjacent terminals</p>			

were installed with insulated lugs that prevented electrical contact with the cover. While the heaters were energized, current passing through the uninsulated wire resulted in heating and decomposition of the gasket. The decomposition continued and allowed current to flow through the cover to ground, which resulted in a blown fuse for the circuit. Exelon inspected the 'D22' emergency diesel generator and identified similar decomposition of the gasket. After completing troubleshooting, the 'D22' and 'D23' emergency diesel generator lube oil heater temperature switches were sequentially replaced with the previous style switches. The modification to replace these switches with the new style had not been performed on any other emergency diesel generators.

The inspectors interviewed engineering personnel, reviewed the engineering change request, and reviewed the prompt investigation. The inspectors determined that the modification process (development through installation) reasonably should have identified the potential impact from the wiring and cover clearance due to the lower profile design of the new style. Walkdowns were performed in accordance with Exelon procedure CC-AA-106-1001, "Configuration Change Walkdowns," as a part of the configuration change process by engineering and maintenance personnel that identified the preference to use a lower profile terminal housing to limit interferences during installation, removal, and testing. The change to the lower profile switch configuration was not fully evaluated, and the potential issues caused by reduced clearance between the wiring and cover were not identified.

Corrective Actions: Following the failure on December 7, 2018, Exelon declared the 'D23' emergency diesel generator inoperable, performed a prompt investigation, and replaced the new switch assembly with an old style switch. Since the 'D22' emergency diesel generator also had the same switch installed for the lube oil heater system, an inspection was performed and identified similar issues with the wiring and cover clearance resulting in decomposition of the gasket. Exelon replaced the new 'D22' emergency diesel generator switch with an old style switch.

Corrective Action Reference: IR 4201280

Performance Assessment:

Performance Deficiency: The inspectors determined that the failure to ensure the design control of the emergency diesel generator lube oil heater system was maintained during the modification process was reasonably within Exelon's ability to foresee and correct and should have been prevented.

Screening: The inspectors determined the performance deficiency was more than minor because it adversely affected the Design Control attribute of the Mitigating Systems cornerstone to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the modification of the 'D23' emergency diesel generator lube oil heater temperature switch failed and resulted in the inability to maintain lube oil temperatures above the 105 degrees Fahrenheit operability limit for the emergency diesel generator to perform its technical specification required function.

Significance: The inspectors assessed the significance of the finding using IMC 0609, Attachment 4, "Initial Characterization of Findings," and IMC 0609, Appendix A, "The Significance Determination Process (SDP) for Findings at Power." The inspectors determined that the finding was of very low safety significance (Green) because the 'D23' emergency diesel generator maintained the ability to perform its probabilistic risk assessment function.

Cross-Cutting Aspect: The inspectors determined this finding has a cross-cutting aspect in the area of Human Performance, Challenge the Unknown, because Exelon personnel did not maintain a questioning attitude during the modification process up to, and including, the installation in order to identify and resolve unexpected conditions. [H.11]

Enforcement:

Violation: 10 CFR Part 50, Appendix B, Criterion III states, in part, that design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design. Contrary to this, on December 6, 2018, Exelon did not maintain the design control of the 'D23' emergency diesel generator such that a modification to the lube oil heater temperature switch failed and resulted in the inoperability of the emergency diesel generator. In addition, on December 7, 2018, Exelon performed the same modification on the 'D22' emergency diesel generator. The 'D23' and 'D22' emergency diesel generators were restored to operable status following replacement of the lube oil heater temperature switches with the previous design on December 8, 2018.

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

Observations	71152 Semiannual Trend Review
<p>The inspectors performed a semi-annual review of site issues to identify trends that might indicate the existence of more significant safety concerns. As part of this review, the inspectors included repetitive or closely-related issues documented by Exelon in the corrective action program database, trend reports, site performance indicators, major equipment problem lists, system health reports, maintenance rule assessments, and maintenance or corrective action program backlogs. The inspectors also reviewed how Exelon's corrective action program evaluated and responded to individual issues identified by the NRC inspectors during routine plant walkdowns and daily condition report reviews. The inspectors specifically reviewed and assessed one adverse trend in equipment reliability, last discussed in the 2018 second quarter integrated inspection report (ADAMS Accession No. ML18221A483).</p> <p>Regarding equipment reliability, the inspectors noted two findings documented in inspection reports during the period related to equipment reliability that were identified during reviews of LERs (ADAMS Accession No. ML18317A116 and ML18347A403). The inspectors also noted additional examples evaluated during the period that impacted operations. However, the inspectors determined the issues substantially consisted of trends in systems with appropriate actions planned by Exelon, such as the Unit 1 ASD system, emergency diesel generator keepwarm systems, and the control enclosure chiller system. The inspectors reviewed these trends and determined Exelon implemented mitigating actions and initiated planned permanent modifications to restore the systems to reliable operation. The inspectors noted Exelon's actions to improve interdepartmental communication, heighten personnel's sensitivity to recognizing degraded conditions, and increase the site's response to more proactively resolve degraded conditions. Notwithstanding this, the inspectors identified a finding associated with the modification to the emergency diesel generator keepwarm systems that is documented in this report. However, though associated with actions being taken to address reliability challenges, it was not determined to be indicative of ineffective corrective actions to address the adverse trend.</p>	

Based on the overall results of the semi-annual trend review, the inspectors did not identify additional trends not being resolved by Exelon and determined that Exelon was appropriately identifying and entering issues into the corrective action program, adequately evaluating the issues, and properly resolving adverse trends before they became more safety significant problems.

Observations	71152 Annual Follow-Up of Selected Issues
<u>Emergent shutdown of the Unit 1 'D12' emergency diesel generator due to high scavenging air temperatures (IR 4081882)</u>	
<p>The inspectors reviewed Exelon's subsequent actions after the Unit 1 'D12' emergency diesel generator was declared inoperable due to high scavenging air temperatures. The inspectors reviewed Exelon's cause evaluation, operability determination, problem analysis, extent-of-condition reviews, operating experience reviews, and corrective actions to determine whether Exelon was appropriately identifying, characterizing, and correcting problems associated with this issue and whether the planned corrective actions were appropriate. The inspectors evaluated the actions taken to the requirements of Exelon's corrective action program and 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action."</p> <p>The inspectors determined that Exelon identified and implemented corrective actions for each identified deficiency commensurate with their safety significance. In addition, Exelon has implemented revised procedures and communications to site personnel, engaged industry with operating experience, and has performed an effectiveness review to ensure the timeliness and adequacy of corrective measures. Exelon is also continuing additional monitoring of the system for subsequent issues and evaluating potential changes to training requirements based on events.</p>	

Observations	71152 Annual Follow-up of Selected Issues
<u>Unit 1 recirculation pump adjustable speed drive (ASD) failures (IR 4168043, 4145616, 4044408)</u>	
<p>The ASD provides variable speed control for a reactor recirculation pump. The ASD is a solid state, digital based system that replaced a mechanical, analog based motor-generator set that previously provided the same function. There is one ASD for each reactor recirculation pump for a total of two ASDs on Unit 1 and two ASDs on Unit 2. Failure of one ASD results in a loss of a reactor recirculation pump and a power reduction for the unit. Failure of two ASDs results in loss of both reactor recirculation pumps, and a reactor shutdown. The reactor recirculation system is a non-safety-related system on both LGS units. ASDs were first installed at LGS on Unit 1 in the 2012 refueling outage and on Unit 2 in the 2013 refueling outage. Since that time, there have been no significant failures on the Unit 2 ASDs and 3 significant failures on the Unit 1 ASDs as follows.</p> <p>In August 2017, the Unit 1 'A' recirculation pump tripped due to an arc fault in the 'b4' power cell. This resulted in single loop operation and reactor power reduction to 36%. The cause of the arc fault was determined to be tin whiskering in the internal metal bus plane of the power cell. As a result of this event, LGS replaced all 24 power cells for the Unit 1 ASDs with power cells containing nickel plated buses in the 2018 refueling outage. Replacement power cells with nickel plated buses have been procured and staged for installation for the Unit 2 ASDs, and Exelon has work orders prepared for installation of the power cells at the next available forced outage or refueling outage.</p>	

In June 2018, a leak developed in the supply coolant hose for the 'a1' power cell on Unit 1 'B' ASD. The Unit 1 'B' recirculation pump was secured in order to repair the leak, resulting in single loop operation and a manual reactor power reduction to 31%. The coolant hose was sent to Exelon power labs for failure analysis. The failure mechanism was determined to be stress corrosion cracking of a brass fitting on the end of the hose. As a result of this event, corrective actions are planned for the next Unit 1 and Unit 2 refueling outages as follows. A sampling of power cell and heat exchanger hoses will be selected for disassembly and inspection for evidence of cracking, and containment devices will be installed over the power cell and heat exchanger coolant hoses to direct any leaks away from electrical components.

In August 2018, an uninterruptable power supply (UPS) failure occurred on the Unit 1 'A' ASD and caused the recirculation pump to automatically runback to 28% speed. This resulted in a manual reactor power reduction to 32%. As a result of this event, failure analysis was performed by the supply vendor of the UPS which determined two circuit cards had failed in a manner that was not deemed plausible by the vendor. As a result, Exelon continues to evaluate solutions to this failure.

The inspectors noted that the ASD system has been scoped into the maintenance rule since original installation, and that the Unit 1 ASDs were appropriately moved into a(1) status in September 2018, following the three significant failures described above. The reliability performance criteria for the system to return to a(2) status is no unplanned reactor power changes greater than 20% in the 12 month period following completion of planned corrective actions. The inspectors determined that corrective actions taken and planned are reasonable, timely, and commensurate with the safety significance of the issue.

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

- On January 11, 2019, the inspectors presented the quarterly integrated inspection results to Mr. Rick Libra, Site Vice President, and other members of the Exelon staff.

THIRD PARTY REVIEWS

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

DOCUMENTS REVIEWED**71114.04**Miscellaneous

Evaluation 17-68, EP-AA-1000, Exelon Nuclear Standardized Radiological Emergency Plan,
Revision 29

71114.05Procedures

EP-AA-1000, Exelon Nuclear Standardized Radiological Emergency Plan, Revision 29
EP-AA-1008, Exelon Nuclear Radiological Emergency Plan Annex for Limerick Generating
Station, Revision 30

71152Procedures

OT-104, Unexpected / Unexplained Positive or Negative Reactivity Insertion, Revision 56
OT-112, Unexpected / Unexplained Change in Core Flow, Revision 59
PI-AA-125, Corrective Action Program (CAP) Procedure, Revision 6
PI-AA-125-1003, Corrective Action Program Evaluation Manual, Revision 4
S.43.1.F, Responding to Alarms at ASD HMI, Revision 4
S.43.8.F, Unit 1 Adjustable Speed Drive, Runback UPS Operation, Revision 0
S.43.8.F, Unit 2 Adjustable Speed Drive, Runback UPS Operation, Revision 0
S92.9.N, Routine Inspection of the Diesel Generators, Revision 73
ST-6-092-112-1, D12 Diesel Generator 24 Hour Endurance Test, Revision 39
ST-6-092-322-1, D12 Diesel Generator LOCA/Load Reject Testing and Fast Start Operability
Test Run, Revision 30
Temporary Procedure Change 17-0305-1
Temporary Procedure Change 17-0323-1

Condition Reports

4020972	4133876	4148177	4160975	4166177	4183163
4021268	4134063	4150473	4160976	4166690	4180366
4044408	4135378	4150687	4163928	4166263	4184570
4044613	4138517	4151972	4164099	4167604	4184725
4081882	4140885	4154318	4164464	4168136	4188572
4081907	4141042	4154379	4166740	4166738	4190560
4082335	4141257	4154414	4166743	4170168	4189992
4083987	4141279	4155154	4166744	4173191	4190614
4084040	4141283	4155315	4166745	4173171	4191872
4084043	4143573	4155343	4168043	4177545	4193458
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4092404	4144866	4157093	4181540	4179096	4196956
4099289	4145616	4157170	4184778	4178980	4196957
4100187	4145776	4157772	4195250	4178984	4196958
4124183	4147127	4158171	4164597	4178987	4198316
4124674	4147134	4159137	4165589	4178989	4198633
4125208	4147137	4160972	4166119	4178998	4200177
4125416	4147140	4160974	4166174	4181413	4199902

4200941 4201280 4201364

Maintenance Orders/Work Orders

4665744 4777106 4780170 4794531

Miscellaneous

Adjustable Speed Drive PCM Template, dated 7/16/18

Limerick Generating Station Unit 1 Technical Requirements Manual, Revision 64

Limerick Generating Station Unit 1 Technical Specifications, revised through Amendment 231

Limerick Generating Station Unit 2 Technical Requirements Manual, Revision 63

Limerick Generating Station Unit 2 Technical Specifications, revised through Amendment 194

Limerick Generating Station Updated Final Safety Analysis Report, Revision 19

L-S-19, Design Basis Document for Recirculation System, Limerick Generating System
Units 1 & 2, Revision 11

Root Cause Investigation Report RCR 04081882-15

71153

Condition Reports

2496668 4082181

Work Orders

4722137