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

May 12, 2016

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 05000352/2016001 AND 05000353/2016001

Dear Mr. Hanson:

On March 31, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Limerick Generating Station (LGS), Units 1 and 2. The enclosed report documents the inspection results, which were discussed on April 22, 2016 with Mr. R. Libra, Site Vice President, and other members of your staff.

NRC Inspectors examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

The inspectors documented six findings of very low safety significance (Green) in this report. All six of these findings involved violations 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.

If you contest the NCVs in this report, 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, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at LGS. In addition, if you disagree with the cross-cutting aspect assigned to any finding, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region I, and the NRC Resident Inspector at LGS.

In accordance with Title 10 of the *Code of Federal Regulations* (CFR) 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

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 05000352/2016001
and 05000353/2016001
w/Attachment: Supplementary Information

cc w/encl: Distribution via ListServ

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos.:	50-352 and 50-353
License Nos.:	NPF-39, NPF-85
Report No.:	05000352/2016001 and 05000353/2016001
Licensee:	Exelon Generation Company, LLC
Facility:	Limerick Generating Station, Units 1 & 2
Location:	Sanatoga, PA 19464
Dates:	January 1, 2016 through March 31, 2016
Inspectors:	S. Rutenkroger, PhD, Senior Resident Inspector M. Fannon, Resident Inspector J. Richmond, Senior Reactor Inspector J. Furia, Senior Health Physicist R. Nimitz, Senior Health Physicist S. Barber, Senior Project Engineer J. Schussler, Project Engineer
Approved By:	Daniel L. Schroeder, Chief Reactor Projects Branch 4 Division of Reactor Projects

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SUMMARY

IR 05000352/2016001, 05000353/2016001; 1/01/2016 – 3/31/16; Limerick Generating Station (LGS); Maintenance Effectiveness, Plant Modifications, Refueling and Other Outage Activities, Radiological Hazard Assessment and Exposure Controls, and 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 six non-cited violations (NCVs), all of which were 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 Nuclear Regulatory Commission (NRC) requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated February 4, 2015. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 5.

Cornerstone: Initiating Events

- Green. A self-revealing Green NCV of LGS Unit 2 technical specification 6.8.1 was identified because Exelon failed to maintain a plant startup procedure. Specifically, the implementing procedure for normal plant startup from hot shutdown or cold shutdown to rated power was not maintained when a modification to the Unit 2 turbine electrohydraulic control system was performed and required changes to the plant startup procedure were not identified and implemented. Exelon initiated issue report (IR) 2602637, revised the startup procedure to properly incorporate the software changes made at the factory acceptance test, validated the software changes that were made were technically correct, trained all operators on the new procedural changes, and reviewed operating procedures for extent of condition.

  This finding is more than minor because it is associated with the procedure quality attribute of the initiating events cornerstone and affected the objective to limit the likelihood of events that upset plant stability during power operations. Specifically, the procedure directed actions intended in the software for rapid reactor depressurization that resulted in a reactor trip. Using IMC 0609, "Significance Determination Process," Appendix A, Exhibit 1, "Initiating Events Screening Questions," the inspectors determined that this finding was of very low safety significance (Green) because the finding did not cause both a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition. Specifically, although the finding caused a Level 8 trip of the feedwater pumps followed by a reactor trip, the rate of water injection from the condensate pumps was sufficient when the reactor was tripped to safely shutdown and operators were able to reset the feedwater pumps. The inspectors determined that this finding has a cross-cutting in the area of Human Performance, Change Management, because leaders did not use a systematic process for implementing the modification so that nuclear safety remained the overriding priority. [H.3] (Section 4OA3)

Cornerstone: Mitigating Systems

- Green. The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion III, "Design Control," and technical specification 3.8.2, "D.C. Sources," because Exelon failed to ensure the design control measures for field changes impacting the seismic support of station batteries were commensurate with those applied to the original design requirements. Specifically, during cell replacement of the Class 1E '1A1' 125/250 volts direct current (Vdc) safeguards battery, removal of adjacent cells and restraint barriers left the battery in a state in which the seismic qualification was not maintained. Exelon initiated IR 2624349, stopped the battery cell replacement work, and performed a technical evaluation to determine the requirements to maintain the seismic qualification during the cell replacement process.

  This finding is more than minor because it adversely affected the protection against external factors (seismic) attribute of the mitigating systems cornerstone to ensure the availability and reliability of systems that respond to initiating events to prevent undesirable consequences (i.e. core damage). Specifically, during cell replacement of the Class 1E '1A1' 125/250 Vdc safeguards battery, removal of adjacent cells and restraint barriers left the battery in a state in which the seismic qualification was not maintained. In accordance with IMC 0609, Appendix A, Exhibit 4, "External Event Screening Questions," the inspectors determined that a detailed risk evaluation was required because the loss of this equipment by itself during the seismic event it was intended to mitigate would degrade one or more trains of a system that supports a risk significant function. The Region I Senior Reactor Analyst referenced the Limerick External Events Notebook to assess the potential increase in plant risk associated with this condition. As referenced in the Notebook, the initiating event frequency for the safe shutdown earthquake (SSE) is approximately 5E-4/year. Based upon the inspectors' review of operation's logs, the five battery replacement activities that occurred over the past 12 months ranged in duration from between one to six days. Assuming the seismic qualification was compromised the entire duration of these maintenance activities, the consequential increase in risk for any single event would be in the low to mid E-9 delta core damage frequency range. The dominant core damage sequences involve an SSE that results in a loss of offsite power and the subsequent failure to remove heat from containment (via the multi-train residual heat removal system and associated service water cooling trains). This estimated small increase in core damage frequency represents a condition of very low safety significance (Green). The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Avoid Complacency, because Exelon did not recognize and plan for the possibility of latent issues associated with the battery replacement process. [H.12] (Section 1R18)

- Green. The inspectors identified a Green NCV of technical specification 6.8.1 for Exelon's failure to properly control, store, and stage material in accordance with station procedures within Class I buildings during refueling outage preparation. Specifically, Exelon personnel did not secure numerous rolling carts staged in both units, did not secure welding blankets in the common pipe tunnel to prevent blocking floor drains, and did not properly build scaffolds to include engineering approval for scaffold procedure deviations. In addition, Exelon's housekeeping and material condition program did not identify and resolve these conditions through the corrective action process during a time of increased activities in the plant. Exelon restrained the carts and other rolling equipment, removed the weld blankets, and removed, reworked, and evaluated scaffolding.

This finding is more than minor because it adversely affected the protection against external factors (flood and seismic hazards) 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 loose unattended welding blankets would have blocked the pipe tunnel floor drains during an analyzed internal flooding event which would result in structural failures if not identified and corrected by operations personnel; the unrestrained carts would translate and rotate during a seismic event which could potentially impact safety related equipment and challenge the function or barrier; and the scaffold clearance and attachment issues could potentially cause impact with ductwork, cable trays, hangers, and structural supports during a seismic event. In addition, the performance deficiency is similar to the more-than-minor example described in IMC 0612, Appendix E, example 4.A, in that Exelon routinely failed to perform engineering evaluations on similar issues. Using IMC 0609, Appendix A, Exhibit 2, the inspectors determined that this finding was of very low safety significance (Green). Specifically, the finding is a deficiency affecting the design or qualification of mitigating structures, systems, and components, and the actual functions of the structures, systems, and components were maintained. The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Training, because the organization did not provide sufficient training to maintain a knowledgeable workforce with respect to proper material handling and storage, awareness of flood hazards and floor drains, and scaffolding requirements. [H.9] (Section 1R20)

Cornerstone: Barrier Integrity

- Green. A self-revealing Green NCV of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50 (10 CFR 50), Appendix B, Criterion III, "Design Control," was identified because Exelon did not properly maintain the design of the LGS Unit 1 reactor enclosure recirculation system (RERS). Specifically, Exelon replaced the Unit 1 '1A' RERS flow straightener assembly using thinner material than was originally qualified and did not evaluate the change in design. Exelon initiated IR 2563872 and implemented a temporary configuration change that removed the flow straightener assembly from the system and restored Unit 1 RERS to operability on October 5, 2015. Exelon also initiated corrective actions to install a new flow straightener assembly with correctly sized honeycomb material.

  This finding 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 (secondary containment) protect the public from radionuclide releases caused by accidents or events. Specifically, the inadequate '1A' RERS flow straightener assembly installed in 2012 resulted in degraded performance and then unplanned unavailability of '1A' RERS from October 1 to 5, 2015. Using IMC 0609, Appendix A, Exhibit 3, the inspectors determined that this finding was of very low safety significance (Green). Specifically, the degraded '1A' RERS performance and associated unavailability only represented a degradation of the radiological barrier function provided for the standby gas treatment system and screened to Green. The inspectors determined that the finding did not have cross-cutting aspect because the performance deficiency did not occur within the last three years, and the inspectors did not conclude that the primary cause of the performance deficiency represented present Exelon performance. (Section 1R12)

Cornerstone: Public and Occupational Radiation Safety

- Green. The inspectors identified a Green NCV of technical specification 6.8.1 because Exelon failed to implement procedure CY-AA-170-210, "Potentially Contaminated System Control Program," for the evaluation and control of potentially cross-contaminated systems. Specifically, Exelon did not implement CY-AA-170-210 for the evaluation and control of a potentially cross-contaminated system when samples collected from the Unit 2 service air system, a non-contaminated system, indicated the potential presence of contamination on June 16, 2015. Exelon entered this issue into the corrective action program (IR 2556568), restricted use of the service air system, conducted a 10 CFR 50.59 screening and radiological evaluation of the system, conducted bounding radiation dose analyses for both occupational workers and members of the public, conducted an extent of condition review, decontaminated the system, and subsequently modified operation of the service air system to preclude re-contamination.

  This finding is more-than-minor because it is associated with the program and process attributes of the occupational and public radiation safety cornerstones and adversely affected both cornerstone objectives to ensure adequate protection of worker and public health and safety from exposure to radioactive material. Specifically, during the time the service air system was contaminated but not recognized as such and not restricted in use, the potential existed to inadvertently contaminate workers and release radioactive material to the environment. Using IMC 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process," the inspectors determined that this finding was of very low safety significance (Green) because the finding did not involve an as low as is reasonably achievable (ALARA) issue, was not an overexposure, did not result in a substantial potential for an overexposure, and did not compromise the ability to assess dose. In addition, using IMC 0609, Appendix D, "Public Radiation Safety Significance Determination Process," the inspectors determined that the issue did not involve a substantial failure to implement the effluent release program and did not result in public doses exceeding 10 CFR 50, Appendix I or 10 CFR 20.1301 (e) and thus was of very low safety significance (Green). The inspectors determined this finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Resolution, because Exelon did not take effective corrective actions when service air system issues were identified. [P.3] (Section 4OA3)

Cornerstone: Occupational Radiation Safety

- Green. A self-revealing Green NCV of LGS Unit 1 technical specification 6.12.1 was identified involving improper entry of two workers into the Unit 1 reactor drywell on March 22, 2016. Specifically, the workers entered the drywell, an area controlled as a Locked High Radiation Area, without obtaining the required access radiological conditions briefing. Further, one of the two workers entered under the control of an RWP that did not authorize access into High Radiation Areas. Exelon initiated IR 2644005, restricted the workers from further radiological controlled area access, re-configured the access area, conducted an extent of condition and human performance review, issued a site communication, and performed a staff stand down.

  This finding is more than minor because it is associated with the programs and process attribute of the Occupational Radiation Safety cornerstone and adversely affected the cornerstone objective to ensure adequate protection of workers from radiation exposure.

In addition, this example is similar to example 6.h of IMC 0612, Appendix E. Specifically, the workers did not receive a brief and did not review surveys prior to entering a work area with radiation levels that exceeded 100 mrem/hr at 30 cm. Using IMC 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process," the inspectors determined the finding was of very low safety significance (Green) because: 1) it was not an as low as is reasonably achievable (ALARA) finding, 2) there was no overexposure, 3) there was no substantial potential for an overexposure, and 4) the ability to assess dose was not compromised. The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Procedure Adherence, because the individuals failed to follow verbal work instructions. [H.8] (Section 2RS1)

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 January 2, 2016, operators reduced power to approximately 78 percent for a control rod pattern adjustment. Operators returned the unit to 100 percent on January 3, 2016. On March 20, 2016, operators commenced a shutdown, from an initial end-of-cycle coastdown power of 87 percent, for a planned refueling and maintenance outage (1R16). The unit reached operational condition 5 (refueling) on March 22, 2016, and remained shutdown for the remainder of the inspection period.

Unit 2 began the inspection period at 100 percent power and operated at or near full power for the remainder of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01 – 1 sample)

Readiness for Impending Adverse Weather Conditions

a. Inspection Scope

The inspectors reviewed Exelon's preparations in advance of Winter Storm Jonas on January 22, 2016. The inspectors reviewed the implementation of adverse weather preparation procedures before the onset of the adverse weather conditions. The inspectors performed walkdowns of equipment that could be effected by high winds and snow accumulation including the main transformer areas and the emergency diesel generators (EDGs). The inspectors verified that operator actions defined in Exelon's adverse weather procedure maintained the readiness of essential systems. Documents reviewed for each section of this inspection report are listed in the Attachment.

b. Findings

No findings were identified.

1R04 Equipment Alignment

.1 Partial System Walkdowns (71111.04 – 7 samples)

a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

- Unit common 'B' control room emergency fresh air supply (CREFAS) during 'A' CREFAS planned maintenance on January 8, 2016
- Unit common 'B' standby gas treatment system (SGTS) during 'A' SGTS planned maintenance on January 19, 2016

- Unit 1 Division 2 safeguards batteries during the '1A1' battery replacement on February 9, 2016
- Unit common 'A' SGTS during 'B' SGTS planned maintenance on February 16, 2016
- Unit 2 'A' core spray (CS) loop during the Unit 2 'B' CS loop system outage window on February 25, 2016
- Unit common 'A' emergency service water (ESW) loop during the 'B' ESW loop system outage on March 9, 2016
- Unit common 'B' residual heat removal service water (RHRSW) loop while 'B' residual heat removal (RHR) loop was in shutdown cooling mode, during 'A' RHRSW loop planned maintenance on March 23, 2016

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

b. Findings

No findings were identified.

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

a. Inspection Scope

From February 5 through March 8, 2016, the inspectors performed a complete system walkdown of accessible portions of the Unit 1 and Unit 2 reactor enclosure structures and ventilation systems, to verify the existing equipment lineups and material condition, handling, and storage. The inspectors reviewed operating procedures, equipment check-off lists, and the UFSAR to verify the systems were aligned and maintained properly. The inspectors also reviewed electrical power availability, component lubrication and equipment cooling, cable tray, hanger, and support functionality, scaffolding structural and bracing adequacy, and freedom of motion for equipment such as valve actuators and steam dampers. The inspectors performed field walkdowns of accessible portions of the systems to verify system components and material condition of the components and examined structures and materials to verify that there were no deficiencies. For identified degradation the inspectors confirmed the degradation was appropriately managed by the applicable aging management program. Additionally, the inspectors reviewed a sample of related condition reports and work orders to ensure Exelon appropriately evaluated and resolved any deficiencies.

b. Findings

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 33, Unit 1 reactor core isolation cooling (RCIC) room, elevation 177', on January 6, 2016
- Fire area 81, 'D12' EDG and fuel oil-lube oil tank room, elevation 217', on February 1, 2016
- Fire area 85, 'D22' EDG and fuel oil-lube oil tank room, elevation 217', on February 2, 2016
- Fire area 83, 'D21' EDG and fuel oil-lube oil tank room, elevation 217', on March 17, 2016
- Fire area 30, Unit 1 Drywell, elevation 238', on March 31, 2016

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06 – 1 sample)

.1 Internal Flooding Review

a. Inspection Scope

The inspectors reviewed the UFSAR, the site flooding analysis, and plant procedures to assess susceptibilities involving internal flooding. The inspectors also reviewed the corrective action program to determine if Exelon identified and corrected flooding problems and whether operator actions for coping with flooding were adequate. The inspectors also focused on the common pipe tunnel to verify 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.

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 February 8, 2016. The scenarios included an anticipated transient without scram, loss of high pressure feed, and a reactor coolant system leak. The scenarios were complicated by a loss of the '11' auxiliary electrical bus, the loss of the 'D14' 4 kilovolt electrical bus, RCIC tripping on overspeed, and various issues in the CS 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 technical specification action statements entered by the shift technical advisor. Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance problems.

b. Findings

No findings were identified.

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

a. Inspection Scope

The inspectors observed and reviewed licensed operator performance in the main control room during the performance of the Unit 1 shutdown on March 20 and March 21, 2016. The inspectors observed infrequently performed test or evolution briefings and reactivity control briefings to verify that the briefings met the criteria specified in Exelon's Operations and Administrative Procedures. Additionally, the inspectors observed evolution performance to verify that procedure use, crew communications, and coordination of activities between work groups similarly met established expectations and standards.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12Q – 3 samples)

a. Inspection Scope

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

- Unit 1 reactor enclosure recirculation system through March 18, 2016
- Unit 2 reactor enclosure recirculation system through March 18, 2016
- Unit 2 RCIC through March 18, 2016

b. Findings

Introduction. A self-revealing Green NCV of 10 CFR, Appendix B, Criterion III, "Design Control," was identified because Exelon did not properly maintain the design of the LGS Unit 1 RERS. Specifically, Exelon replaced the Unit 1 '1A' RERS flow straightener assembly with a different one of a thinner material than was originally qualified and did not evaluate the change in design.

Description. RERS is a ventilation system in LGS Unit 1 and Unit 2 that recirculates and filters radioactive gases within each unit's reactor enclosure secondary containment isolation zone. RERS operates in conjunction with the standby gas treatment system and is considered as the initial cleanup system used to reduce halogen and particulate concentrations in gases potentially present in the reactor enclosure following a loss of coolant accident prior to release to the atmosphere.

On October 1, 2015, operators noted that the inlet and outlet dampers of the '1A' RERS were cycling open and closed with the system in operation in support of a planned Unit 1 reactor enclosure normal heating, ventilation, and cooling (HVAC) system outage and shut down '1A' RERS. During subsequent walkdowns of the Unit 1 reactor enclosure, operators found metallic debris under multiple HVAC registers. Exelon confirmed the debris to be from the '1A' RERS flow element straightener assembly breaking apart. Exelon performed system inspections and found a section of the flow straightener honeycomb was damaged and dislodged from the flow element frame. Exelon personnel found small pieces of the flow straightener honeycomb throughout the downstream ductwork and in the reactor enclosure. Failure of the flow element

straightener assembly resulted in impacting and blocking the pitot tubes of the flow measuring station. The disruption of the flow measurement caused inlet and outlet damper cycling resulting in pressure cycling which could have caused further damage, increasingly erratic flow controller performance, and ultimately tripping of the operating fan.

Exelon performed an apparent cause evaluation and determined that the '1A' RERS flow element straightener assembly was replaced on February 27, 2012. However, the new flow element straightener assembly was constructed of aluminum vanes that were approximately half the thickness of the original assembly. During further review, Exelon determined that the original flow element straightener assemblies were constructed and qualified using 3.6 lb/cubic foot hex cell honeycomb material. However, original design documents did not specify the required honeycomb density. Therefore, when a replacement flow straightener assembly was ordered and installed, the specification referenced standard material that by default was approximately half the original thickness than was originally used and qualified. The installation of a substandard flow straightener constituted a design change because the replacement item did not meet the same design standards as the original item nor were the differences adequately evaluated.

Exelon also determined that the work order instructions for the 2012 installation included a step that required the installer to perform a like-for-like comparison of the replacement parts as required by procedure MA-AA-716-011, "Work Execution & Closeout." Since the replacement flow straightener assembly was constructed of material reasonably identified as not being like-for-like compared to the original, Exelon determined that this step was not adequately performed.

The inspectors observed the associated maintenance activities and reviewed the apparent cause evaluation and related documentation and concluded that Exelon's determinations were reasonable and accurate. Exelon initiated IR 2563872 and implemented a temporary configuration change that removed the flow straightener assembly from the system and restored '1A' RERS to operability on October 5, 2015. Exelon also initiated corrective actions to install a new flow straightener assembly with correctly sized honeycomb material.

Analysis. The inspectors determined that the failure to properly maintain the design of the LGS Unit 1 '1A' RERS was reasonably within Exelon's ability to foresee and correct and should have been prevented and therefore was a performance deficiency. This finding is more than minor because it adversely affected the design control attribute of the barrier integrity cornerstone to provide reasonable assurance that physical design barriers (secondary containment) protect the public from radionuclide releases caused by accidents or events. Specifically, the inadequate '1A' RERS flow straightener assembly installed in 2012 resulted in degraded performance and then unplanned unavailability of '1A' RERS from October 1 to 5, 2015.

Using IMC 0609, Appendix A, Exhibit 3, the inspectors determined that this finding was of very low safety significance (Green). Specifically, the degraded '1A' RERS performance and associated unavailability only represented a degradation of the radiological barrier function provided for the standby gas treatment system and screened to Green.

The inspectors determined that the finding did not have cross-cutting aspect because the performance deficiency did not occur within the last three years, and the inspectors did not conclude that the primary cause of the performance deficiency represented present Exelon performance.

Enforcement. 10 CFR 50, Appendix B, Criterion III, requires, in part, that design changes shall be subject to design control measures commensurate with the original design and approved by the responsible organization. Contrary to this, on February 27, 2012, a design change was made which was not subject to design control measures commensurate with the original design. Specifically, Exelon replaced the Unit 1 '1A' RERS flow straightener assembly using thinner material than was originally qualified and did not evaluate the change in design. Exelon's corrective actions to restore compliance included implementing a temporary change in accordance with engineering procedures to remove the '1A' flow element straightener assembly on October 5, 2015. Because this violation was of very low safety significance (Green) and Exelon entered this issue into their corrective action program (IR 2563872), this violation is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy. **(NCV 05000352/2016001-01, Reactor Enclosure Recirculation System Design Change not Evaluated)**

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 7 samples)

a. Inspection Scope

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

- Unit common 'B' CREFAS planned testing on January 12, 2016
- Unit common 'B' ESW blank flange installation on January 16, 2016
- Unit common 'A' SGTS maintenance outage on January 19, 2016
- Unit common 'A' ESW isolation valve installation on January 27, 2016
- Unit 2 spent fuel pool heat exchangers '2B' and '2C' planned outages on February 23, 2016
- Unit common 'B' ESW planned isolation valve installation on March 7, 2016
- Unit common 'A' RHRSW planned replacement of return piping on March 22 through 29, 2016

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 RCIC vacuum breaker reverse flow test on January 1, 2016
- Unit 1 'D12' EDG number twelve cylinder firing early and at higher pressure on January 6, 2015
- Unit 2 RCIC minimum flow valve cycling on January 7, 2016
- Unit 2 'A' standby liquid control (SLC) pump flowrate in the notification range on January 13, 2016
- Unit common 'B' ESW return line leak from Unit 1 emergency core cooling system (ECCS) room coolers on January 16, 2016
- Unit common 'B' SGTS found running in standby on March 2, 2016

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

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 – 2 samples)

.1 Temporary Modifications (1 sample)

a. Inspection Scope

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

- Temporary battery cart and remaining cell seismic qualification during the '1A1' safeguards battery cell replacements on March 3, 2016

b. Findings

Introduction. The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion III, "Design Control" and technical specification 3.8.2, "D.C. Sources," because Exelon failed to ensure that design control measures for field changes impacting the seismic support of station batteries were commensurate with those applied to the original design requirements. Specifically, during cell replacement of the Class 1E '1A1' 125/250 Vdc safeguards battery, removal of adjacent cells and restraint barriers left the battery in a state in which the seismic qualification was not maintained.

Description. The '1A1' battery is part of the direct current (DC) power system used to provide electrical power to safety related loads during normal operation, shutdown, and accident scenarios. The '1A1' battery in conjunction with the '1A2' battery and their associated battery chargers make up Division 1 of the Unit 1 Class 1E DC system. There are four independent divisions for each unit. Divisions 1 and 2 provide power to the 125/250 Vdc portions of the system while Divisions 3 and 4 provide power to the 125 Vdc portion.

On February 9, 2016, the inspectors observed replacement of nine cells of the '1A1' battery in accordance with M-095-005, "Replacement of Station Battery Cells." The battery replacement was being performed in portions over a six day period. The portion the inspectors observed was on the second day of this maintenance activity. During the maintenance, temporary battery carts were connected to replace the capacity lost by the nine cells being exchanged. During the connection process, the battery was declared inoperable, and technical specification 3.8.2, action c., two hour limiting condition statement was entered.

Once the carts were connected and tested, the battery was declared operable, technical specification 3.8.2, action c., was exited, and cell replacement commenced. The nine cells were disconnected from service and removed from their location. As part of this process, the two horizontal bars that run along the length of the battery rack that restrain the battery cells in place were removed. This left the remaining eleven cells in the rack without seismic support until two shorter horizontal bars were installed to restrain the north to south movement of the remaining cells in the rack. The east to west restraint of the cells is normally maintained by tie rods between every two, three, or four cells. With cells removed from the rack, the end cell was left without an east to west restraint.

The inspectors questioned whether there was an analysis that supported the maintenance process, whether the seismic qualification was maintained during cell replacement, and whether or not the battery would remain in an operable condition during the period of time while the horizontal bars are being replaced and while the east to west side of the outermost cell is left open without restraint.

Exelon initiated IR 2624349 to document this issue, stopped the battery cell replacement work, and performed a technical evaluation to determine the requirements to maintain the seismic qualification during the cell replacement process. The technical evaluation stated that in order to maintain dynamic qualification of batteries that remain in the rack during cell replacement, the horizontal bars in the north and south direction shall be

placed in position to secure the cells that shall remain in service, and tie rods shall be installed and secured such that the last cell in the row adjacent to the cells to be replaced is captured by tie rods. Exelon determined that the evaluation and process for replacing battery cells using a temporary battery cart to maintain operability was approved July 28, 1993.

Analysis. The inspectors determined that the failure to maintain the seismic qualification of the '1A1' safeguards battery during cell replacement was reasonably within Exelon's ability to foresee and correct and should have been prevented and therefore was a performance deficiency. This finding is more than minor because it adversely affected the protection against external factors (seismic) attribute of the mitigating systems cornerstone to ensure the availability and reliability of systems that respond to initiating events to prevent undesirable consequences (i.e. core damage). Specifically, during cell replacement of the Class 1E '1A1' 125/250 Vdc safeguards battery, removal of adjacent cells and restraint barriers left the battery in a state in which the seismic qualification was not maintained.

In accordance with IMC 0609, Appendix A, Exhibit 4, "External Event Screening Questions," the inspectors determined that a detailed risk evaluation was required because the loss of this equipment by itself during the seismic event it was intended to mitigate would degrade one or more trains of a system that supports a risk significant function. The Region I Senior Reactor Analyst referenced the Limerick External Events Notebook to assess the potential increase in plant risk associated with this condition. As referenced in the Notebook, the initiating event frequency for the SSE is approximately 5E-4/year. Based upon the inspectors' review of operation's logs, the five battery replacement activities that occurred over the past 12 months ranged in duration from between one to six days. Assuming the seismic qualification was compromised the entire duration of these maintenance activities, the consequential increase in risk for any single event would be in the low to mid E-9 delta core damage frequency range. The dominate core damage sequences involve an SSE that results in a loss of offsite power and the subsequent failure to remove heat from containment (via the multi-train residual heat removal system and associated service water cooling trains). This estimated small increase in core damage frequency represents a condition of very low safety significance (Green).

The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Avoid Complacency, because Exelon did not recognize and plan for the possibility of latent issues associated with the battery replacement process. [H.12]

Enforcement. 10 CFR 50, Appendix B, Criterion III, requires, in part, that design changes, including field changes, shall be subject to design control measures commensurate with the original design and be approved by the responsible organization. Contrary to this, since July 28, 1993, a design change, including field changes, was not subject to design control measures commensurate with the original design. Specifically, the procedure used during cell replacement of safeguards batteries did not maintain the seismic qualification of the battery and was first approved for use on July 28, 1993. Additionally, Unit 1 technical specification 3.8.2, action c., requires, when a listed direct current source of power is not operable with the Unit in Mode 1, to restore the source to an operable status within 2 hours or be in hot shutdown within the next 12 hours. Contrary to this, on February 9, 2016, for the '1A1' safeguards battery, and at various

times from July 28, 1993, for the listed direct current sources, the station battery was inoperable for greater than 2 hours and the Unit was not placed in hot shutdown within the next 12 hours. Exelon's corrective actions to restore compliance included stopping the battery cell replacement work and performing a technical evaluation to determine the requirements to maintain the seismic qualification during the cell replacement process. Because this violation was of very low safety significance (Green) and was entered into Exelon's corrective action program (IR 2624349), the violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy. **(NCV 05000352/2016001-02, Seismic Qualification of Safety Related Battery not Maintained)**

.2 Permanent Modifications (1 sample)

a. Inspection Scope

The inspectors evaluated a modification to the 20 regulating transformer automatic voltage controller (AVC) implemented by engineering change package LGS 15-00307, "Replace Existing 20 Trans AVC with New Type AVC." The inspectors verified that the design bases, licensing bases, and performance capability of the affected systems were not degraded by the modification. In addition, the inspectors reviewed modification documents associated with the upgrade and design change, including replacement of the current AVC with a new digital AVC and acceptance testing. The inspectors also interviewed engineering personnel to ensure the new AVC was a suitable replacement for the previous AVC.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 8 samples)

a. Inspection Scope

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

- Unit 1 'A' RHR loop discharge piping hot tap on January 15, 2016
- Unit common 'B' ESW discharge piping return to 'A' RHRSW blank flange installation on January 16, 2016
- Unit common '20' regulating transformer AVC replacement on February 4, 2016
- Unit 1 '1A1' battery replacement on February 9, 2016
- Unit 2 'B' CS loop system outage window on February 25, 2016

- Unit 1 RCIC planned maintenance on March 2, 2016
- Unit 1 'A' shutdown cooling injection header bypass line repair on March 25, 2016
- Unit common 'A' RHRSW loop return piping replacement on March 28, 2016

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20)

a. Inspection Scope

The inspectors reviewed the station's work schedule and outage risk plan for the Unit 1 maintenance and refueling outage 1R16, that began on March 20 and continued through the end of the inspection period. 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 technical specification 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 technical specifications 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 technical specifications
- Refueling activities, including fuel handling and fuel receipt inspections
- Fatigue management
- Identification and resolution of problems related to refueling outage activities

b. Findings

Introduction. The inspectors identified a Green non-cited violation (NCV) of Unit 1 and Unit 2 technical specification 6.8.1 for Exelon's failure to properly control, store, and stage material in accordance with station procedures within Class I buildings during refueling outage preparation. Specifically, Exelon personnel did not secure numerous rolling carts staged in both units, did not secure welding blankets in the common pipe tunnel to prevent blocking floor drains, and did not properly build scaffolds to include engineering approval for scaffold procedure deviations. In addition, Exelon's

housekeeping and material condition program did not identify and resolve these conditions through the corrective action process during a time of increased activities in the plant.

Description. To prepare for the Unit 1 refueling and maintenance outage, 1R16, Exelon stored temporary material in both units and performed various preparatory activities such as staging work areas and constructing scaffolds. The inspectors assessed Exelon's preparations for 1R16 and focused on the potential for unintended interactions with equipment required during normal operation. The inspectors also reviewed Unit 2 areas.

In the common pipe tunnel with six floor drains, the inspectors identified standing water on two floor drains that indicated internal blockage on January 17, 2016, and one floor drain that was taped over on January 27, 2016. On February 5, 2016, the inspectors identified numerous welding blankets of varying sizes placed throughout the tunnel including along the length of the floor. The inspectors reviewed the internal flooding analysis for the pipe tunnel in calculation NPB-14, "Moderate Energy Line Break." The limiting flood was 119.29 cubic feet per minute with a maximum direct flood level of 17.8 feet. Although the components in the area are qualified to be submersible, the floor drain system is required in order to not fill and pressurize the tunnel in order to maintain the integrity of the pipe tunnel doors, walls, and ceiling. In addition, the analysis credits operator actions within 63 hours, with functioning floor drains, to drain the cooling tower basin and stop the leak. The inspectors noted that Exelon procedure MA-AA-716-026, "Station Housekeeping / Material Condition Program," included a provision to ensure no floatable materials in lower elevations of reactor/turbine buildings that could migrate towards floor drains. When the inspectors informed Exelon of the concern, Exelon removed the staged welding blankets and initiated IR 2624266. Exelon performed an evaluation and determined that the condition did not result in a loss of safety function. For risk screening, the inspectors considered that the floor drains were not fully blocked prior to a potential flood event such that flooding would result in alarms in the reactor water cleanup (RWCU) system that would notify operators of the flooding and permit adequate time to resolve the condition.

On February 5, 2016, the inspectors identified numerous carts not controlled or stored in accordance with LGS procedure MA-AA-716-026. The inspectors noted carts within the plant within the immediate vicinity of safety-related equipment with a single wheel restrained but three wheels unrestrained such that rotation could occur around the restrained wheel. In several cases the rotation could result in the cart striking structures or components. In addition, the inspectors found numerous additional carts throughout the plant in which a single wheel brake appeared to be engaged, but the wheel was not restrained by the brake such that the carts were wholly unrestrained. The inspectors identified thirty-six individual issues. LGS procedure MA-AA-716-026 requires all rolling equipment or furniture to be rendered immobile and unable to rotate in any direction using any of a number of listed methods. Exelon initiated IR 2622581 and moved and restrained carts in the interim to resolve immediate potential interactions with safety-related equipment. Exelon performed an evaluation and determined that the conditions did not result in a loss of safety function. For risk screening, the inspectors determined that the deficiency did not result in actual unavailability of safety-related equipment.

On March 8, 2016, the inspectors identified numerous scaffolds adjacent to safety-related equipment in the Unit 1 reactor enclosure which did not comply with the requirements in procedure MA-AA-716-026 and procedure MA-MA-796-024-1001, "Scaffolding Criteria for the Mid Atlantic Stations." In addition, the scaffolding deviations were not evaluated and approved by LGS engineering. The deficiencies were inadequate bracing, inadequate minimum clearances between scaffolding and safety-related equipment, and attachments between scaffolding and safety-related equipment. Exelon initiated IR 2637720 and removed, reworked, and properly evaluated eighteen issues. Exelon performed an evaluation and determined that the conditions did not result in a loss of safety function. For risk screening, the inspectors determined that the deficiencies could have resulted in losses of redundancy, but did not result in actual unavailability of safety-related equipment.

The inspectors noted that MA-AA-716-026 requires a station housekeeping and material condition program. The program requires random tours which are increased based on increased activity in the plant. However, the program did not identify and resolve floor drain issues, cart storage issues, and scaffold issues associated with temporary material and staged work during a time of increased activity in the plant.

Analysis. The failure to properly stage and control temporary material and identify inadequate conditions in staged work locations was a performance deficiency. This finding is more than minor because it adversely affected the protection against external factors (flood and seismic hazards) 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 loose unattended welding blankets would have blocked the pipe tunnel floor drains during an analyzed internal flooding event which would result in structural failures if not identified and corrected by operations personnel; the unrestrained carts would translate and rotate during a seismic event which could potentially impact safety related equipment and challenge the function or barrier; and the scaffold clearance and attachment issues could potentially cause impact with ductwork, cable trays, hangers, and structural supports during a seismic event. In addition, the performance deficiency is similar to the more-than-minor example described in IMC 0612, Appendix E, example 4.A, in that Exelon routinely failed to perform engineering evaluations on similar issues.

Using IMC 0609, Appendix A, Exhibit 2, the inspectors determined that this finding was of very low safety significance (Green). Specifically, the finding is a deficiency affecting the design or qualification of mitigating structures, systems, and components, and the actual functions of the structures, systems, and components were maintained.

The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Training, because the organization did not provide sufficient training to maintain a knowledgeable workforce with respect to proper material handling and storage, awareness of flood hazards and floor drains, and scaffolding requirements. [H.9]

Enforcement. Technical specification 6.8.1, requires, in part, written procedures to be established, implemented, and maintained covering applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978. Regulatory Guide 1.33, Revision 2, Appendix A, Section 1, requires administrative procedures for equipment control. Procedure MA-AA-716-026 requires that no floatable

material be located in lower elevations of the reactor/turbine buildings that could migrate towards floor drains. Procedure MA-AA-716-026 requires that rolling equipment, including carts, must be rendered immobile and unable to rotate in any direction by use of appropriate listed methods. Procedure MA-AA-716-026 requires that all station scaffold requirements be maintained and procedure MA-MA-796-024-1001 requires minimum clearances and proper attachments of scaffolding unless specifically evaluated and approved by engineering. Procedure MA-AA-716-026 requires a housekeeping and material condition program that performs walkdowns at a frequency commensurate with plant activity to identify and resolve deficiencies associated with work staging and preparation using the corrective action program. Contrary to the above, from January 17 to March 8, 2016, floor drains were blocked from internal debris, a floor drain was taped over, loose weld blankets were staged in a lower elevation which were floatable material that could migrate and block floor drains, numerous carts and other rolling equipment were not rendered immobile and unable to rotate in any direction, numerous temporary scaffolds were built without maintaining minimum clearances and with improper attachments without being approved by engineering, and the housekeeping and material condition program did not identify and resolve these deficiencies associated with work staging and preparation. Exelon removed the weld blankets, restrained the carts and other rolling equipment, and removed, reworked, and evaluated scaffolding to resolve the issues. Because this violation was of very low safety significance (Green) and Exelon entered this issue into their corrective action program (IR 2613612, IR 2617692, IR 2622581, IR 2624266, and IR 2637720) this violation is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy. **(NCV 05000352;05000353/2016001-03, Inadequate Work Staging and Housekeeping Walkdowns During Pre-Outage Preparations)**

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

- ST-6-092-316-1, ‘D12’ EDG fast start operability test run on January 5, 2016 (in-service test)
- ST-6-049-230-2, Unit 2 RCIC pump, valve, and flow test on January 7, 2016 (in-service test)
- ST-6-048-230-2, Unit 2 SLC pump, valve, and flow test on January 12, 2016 (in-service test)
- ST-6-052-234-2, Unit 2 ‘A’ loop CS pump comprehensive test on February 17, 2016 (in-service test)

- ST-4-LLR-031-1, Unit 1 'A' main steam isolation valve local leak rate testing on March 22, 2016 (containment isolation valve)
- ST-4-LLR-041-1, Unit 1 'B' main steam isolation valve local leak rate testing on March 31, 2016 (containment isolation valve)

b. Findings

No findings were identified.

2. RADIATION SAFETY

Cornerstone: Occupational and Public Radiation Safety

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01 – 5 samples)

a. Inspection Scope

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

Inspection Planning

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

Radiological Hazard Assessment

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 observed containers of radioactive materials to determine if the containers were properly labeled and controlled. The inspectors also reviewed occurrences where a worker's electronic personal dosimeter (EPD) alarmed including Exelon's evaluation of the incidents; documentation in the corrective action program; and whether compensatory dose evaluations were conducted.

Contamination and Radioactive Material Control

The inspectors observed monitoring of material leaving the radiological control area and inspected the methods and monitoring instrumentation used for control, survey, and release of that material. The inspectors selected sealed sources from inventory records to determine if the sources were accounted for and were tested for loose surface

contamination. The inspectors evaluated whether any recent transactions involving nationally tracked sources were reported in accordance with requirements.

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; RWPs; 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 (HRAs), locked high radiation areas and very high radiation areas (VHRA) to verify conformance with the occupational performance indicator.

Risk-Significant HRA and VHRA Controls (1 sample)
The inspectors reviewed the controls and procedures for HRAs, VHRAs, and radiological transient areas in the plant.

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 performing radiation surveys and providing radiological job coverage.

Problem Identification and Resolution (1 sample)

The inspectors evaluated whether problems associated with radiation monitoring and exposure control were identified at an appropriate threshold and properly addressed in the corrective action program.

b. Findings

Introduction. A self-revealing Green NCV of LGS Unit 1 technical specification 6.12.1 was identified involving improper entry of two workers into the Unit 1 reactor drywell on March 22, 2016. Specifically, the workers entered the drywell, an area controlled as a Locked High Radiation Area, without obtaining the required access radiological conditions briefing. Further, one of the two workers erroneously entered under the control of an RWP that did not authorize access into High Radiation Areas.

Description. On March 22, 2016, two workers entered the Unit 1 drywell, an area controlled as a Locked High Radiation Area, without receiving the required access radiological briefings required by RWP 542. The workers had attended a required ALARA briefing on the morning of March 22, 2016, at which they were instructed by RP personnel that they were required to attend a High Radiation Area briefing prior to entering the drywell in order to obtain current radiological information for their planned work locations. The workers were also informed by RP personnel, at the same ALARA briefing, that they needed to enter the drywell through a personnel

turnstile and demonstrate to the access control guard stationed at the turnstile, that they had received their required briefing, as evidenced by a stamped card, and that they had also signed in on the correct RWP. The turnstile is electronically equipped to prevent access if a person attempting to access the drywell is signed on to an incorrect, unauthorized, RWP.

Notwithstanding these precautions, the workers entered the drywell on the afternoon of March 22, 2016, and had not received the required radiological condition briefings, did not enter the drywell via the entry turnstile, and did not check-in with the entry access guard. Rather, the workers erroneously entered the Unit 1 drywell via the Unit 1 drywell personnel exit point. In addition, Exelon determined that one of the two workers was not properly signed-in on RWP 542 for the job but remained signed in on RWP 1106 that did not authorize entry into High Radiation Areas. The workers exited the drywell after working for approximately twenty minutes. Upon exiting, the workers recognized that they had not entered via the entrance turnstile and self-reported the discrepancy to RP personnel.

At the time of the workers' entry, the Unit 1 drywell was being controlled as a locked HRA (i.e. an area exhibiting radiation dose rates greater than 1000 millirem/hr at 30 centimeters from the radiation sources or from any surface penetrated by the radiation). However, at the time, the drywell exhibited general radiation dose rates less than 1000 millirem/hr with a maximum accessible radiation dose rate of about 150 millirem/hr at 30 centimeters from the radiation source or from any surface penetrated by the radiation. Notwithstanding, LGS Unit 1 technical specification sections 6.12.1b and 6.12.1e, requires that entry to such areas be controlled by an RWP and that worker entries to such areas shall be made only after dose rates in the area have been established and entry personnel are knowledgeable of them.

Further, technical specification 6.8.1 requires, in part, that written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978. Regulatory Guide 1.33, 1978, recommends, in Appendix A, that procedures for access control to radiation areas including radiation work permits be established. Exelon procedure RP-AA-403, "Administration of the Radiation Work Permit Program," requires that workers comply with all the requirements of the RWP including verbal instruction given by radiation protection personnel and that workers ensure they use the correct RWP for the work activity. In this instance, neither worker complied with their RWP nor received the required briefing to become knowledgeable of the radiological conditions at their work location.

Exelon initiated IR 2644005 for this issue, restricted the workers from further radiological controlled area access, re-configured the access area, conducted an extent of condition and human performance review, issued a site communication, and performed a staff stand down. Exelon determined that the workers did not implement the verbal instructions provided by RP and that the workers entered a maximum radiation field of about 60 millirem/hr and received radiation doses of less than 10 millirem.

Analysis. The improper entry of personnel into High Radiation Areas was reasonably within Exelon's ability to foresee and correct and should have been prevented and therefore was a performance deficiency. This finding is more than minor because it is associated with the programs and process attribute of the Occupational Radiation

Safety cornerstone and adversely affected the cornerstone objective to ensure adequate protection of workers from radiation exposure. In addition, this example is similar to example 6.h of IMC 0612, Appendix E. Specifically, the workers did not receive a brief and did not review surveys prior to entering a work area with radiation levels that exceeded 100 mrem/hr at 30 cm.

Using IMC 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process," the inspectors determined the finding was of very low safety significance (Green) because: 1) it was not an as low as is reasonably achievable (ALARA) finding, 2) there was no overexposure, 3) there was no substantial potential for an overexposure, and 4) the ability to assess dose was not compromised.

The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Procedure Adherence, because the individuals failed to follow verbal work instructions. [H.8]

Enforcement. LGS Unit 1 technical specification 6.12.1 requires in sections 6.12.1b and 6.12.1e, respectively, that entry to HRAs be controlled by an RWP and that worker entries to such areas shall be made only after dose rates in the area have been established and entry personnel are knowledgeable of them. Further, LGS Unit 1 technical specification 6.8.1, requires, in part, that written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978. Regulatory Guide 1.33, 1978, recommends, in Appendix A, that procedures for access control to radiation areas including radiation work permits be established. Exelon procedure RP-AA-403 requires that workers comply with all the requirements of the RWP including verbal instruction given by radiation protection personnel and that workers ensure they use the correct RWP for their work activity. On March 22, 2016, two workers were given verbal instruction by RP personnel that they were required to attend a HRA briefing prior to entering the Unit 1 reactor drywell in order to obtain radiological conditions for their planned work locations and that the workers needed to enter the drywell through a personnel turnstile and demonstrate to the access control guard stationed at the turnstile that they had received their required briefing. Contrary to the above, on March 22, 2016, two workers entered the LGS Unit 1 drywell via the drywell exit, did not receive the technical specification and RWP required HRA access radiological controls briefing, and did not check in with the drywell access guard prior to entering the drywell. In addition, one of the two workers did not properly sign in on RWP 542 for the job but remained signed in on RWP 1106 which did not authorize entry into HRAs. Exelon's actions to restore compliance included removing the workers from the radiologically controlled area and restricting further plant access. Because this violation was of very low safety significance (Green), and Exelon entered this issue into the CAP (IR 2644005) this violation is being treated as an NCV consistent with section 2.3.2.a of the NRC Enforcement Policy. (**NCV 05000352;05000352/2016001-04, Entry into a High Radiation Area without Radiological Briefing and Complying with RWP)**

2RS2 Occupational ALARA Planning and Controls (71124.02 – 4 samples)

a. Inspection Scope

The inspectors assessed Exelon's performance with respect to maintaining occupational individual and collective radiation exposures as low as is reasonably achievable

(ALARA). The inspectors used the requirements contained in 10 CFR 20, applicable Regulatory Guides, technical specifications, and procedures required by technical specifications as criteria for determining compliance.

Inspection Planning

The inspectors conducted a review of LGS's collective dose history and trends; ongoing and planned radiological work activities; radiological source term history and trends; and ALARA dose estimating and tracking procedures.

Radiological Work Planning (1 sample)

The inspectors selected radiological work activities (ALARA Plans: 2, Scaffolding; 11, Reactor Coolant Pumps; 14, Diving; 29, Cavity; 30, Refuel Floor; 32, Dryer; 10 Control Rod Drives) based on exposure significance. For these activities, the inspectors reviewed: ALARA work activity evaluations; exposure estimates; exposure reduction requirements; results achieved (dose rate reductions, actual dose); work in progress reviews; and results achieved.

Verification of Dose Estimates and Exposure Tracking Systems

The inspectors reviewed the current annual collective dose estimate; basis methodology; and measures to track, trend, and reduce occupational doses for ongoing work activities. The inspectors evaluated the adjustment of exposure estimates, or re-planning of work.

Source Term Reduction and Control (1 sample)

The inspectors reviewed the plant radiological source term, its historical trend, plans for plant source term reduction, and contingency plans for changes in the source term as the result of changes in plant fuel performance or changes in plant primary chemistry.

The inspectors observed radiological work activities and evaluated the in-plant use of shielding and other engineering work controls based on the radiological controls and ALARA plans for those activities.

Radiation Worker Performance (1 sample)

The inspectors observed radiation worker and radiation protection technician performance during radiological work to evaluate worker ALARA performance according to specified work controls and procedures. Workers were interviewed to assess their knowledge and awareness of planned and/or implemented radiological and ALARA work controls

Problem Identification and Resolution (1 sample)

The inspectors evaluated whether problems associated with ALARA planning and controls were identified at an appropriate threshold and properly addressed in the corrective action program.

b. Findings

No findings were identified.

2RS3 In-Plant Airborne Radioactivity Control and Mitigation (71124.03 – 2 samples)

a. Inspection Scope

The inspectors reviewed the control of in-plant airborne radioactivity and the use of respiratory protection devices in these areas. The inspectors used the requirements in 10 CFR 20, Regulatory Guide 8.15, Regulatory Guide 8.25, NUREG/CR-0041, technical specifications, and procedures required by technical specifications as criteria for determining compliance.

Inspection Planning

The inspectors reviewed the UFSAR to identify ventilation and radiation monitoring systems associated with airborne radioactivity controls and respiratory protection equipment staged for emergency use. The inspectors reviewed respiratory protection program procedures and current performance indicators for unintended internal exposure incidents.

Engineering Controls (1 sample)

The inspectors reviewed operability and use of permanent and temporary ventilation systems, and the adequacy of airborne radioactivity radiation monitoring in the plant based on location, sensitivity, and alarm set-points.

Use of Respiratory Protection Devices

The inspectors reviewed the adequacy of Exelon's use of respiratory protection devices in the plant to include applicable ALARA evaluations, respiratory protection device certification, respiratory equipment storage, air quality testing records, and individual qualification records.

Problem Identification and Resolution (1 sample)

The inspectors evaluated whether problems associated with the control and mitigation of in-plant airborne radioactivity were identified at an appropriate threshold and addressed by Exelon's corrective action program.

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment (71124.04 – 3 samples)

a. Inspection Scope

The inspectors reviewed the monitoring, assessment, and reporting of occupational dose. The inspectors used the requirements in 10 CFR 20, Regulatory Guides,

technical specifications, and procedures required by technical specifications as criteria for determining compliance.

Inspection Planning

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

Source Term Characterization (1 sample)

The inspectors reviewed the plant radiation characterization (including gamma, beta, alpha, and neutron) being monitored. The inspectors verified the use of scaling factors to account for hard-to-detect radionuclides in internal dose assessments.

External Dosimetry

The inspectors reviewed: dosimetry NVLAP accreditation; onsite storage of dosimeters; the use of "correction factors" to align EPD results with NVLAP dosimetry results; dosimetry occurrence reports; and corrective action program documents for adverse trends related to external dosimetry.

Internal Dosimetry (1 sample)

The inspectors reviewed: internal dosimetry procedures; whole body counter measurement sensitivity and use; adequacy of the program for whole body count monitoring of plant radionuclides; adequacy of the program for dose assessments based on air sample monitoring and the use of respiratory protection; and internal dose assessments for any actual internal exposure.

Special Dosimetric Situations

The inspectors reviewed: worker notification of the risks of radiation exposure to the embryo/fetus; the dosimetry monitoring program for declared pregnant workers; external dose monitoring of workers in large dose rate gradient environments; and dose assessments performed since the last inspection that used multi-badging, skin dose or neutron dose assessments.

Problem Identification and Resolution (1 sample)

The inspectors evaluated whether problems associated with occupational dose assessment were identified at an appropriate threshold and properly addressed in the corrective action program.

b. Findings

No findings were identified.

2RS5 Radiation Monitoring Instrumentation (71124.05 – 2 samples)

a. Inspection Scope

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

Inspection Planning

The inspectors reviewed: LGS Unit 1 and Unit 2 annual effluent and environmental reports; UFSAR; Offsite Dose Calculation Manual; Radiation Protection (RP) audits; records of in-service survey instrumentation; and procedures for instrument source checks and calibrations.

Walk-downs and Observations

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

Calibration and Testing Program

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

Instrument Calibrator (1 sample)

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

Calibration and Check Sources (1 sample)

The inspectors reviewed the plant waste stream characterization to assess whether the calibration sources used were representative of the radiation encountered in the plant.

Problem Identification and Resolution

The inspectors verified that problems associated with radiation monitoring instrumentation were identified at an appropriate threshold and properly addressed in the corrective action program.

b. Findings

No findings were identified.

2RS8 Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation (71124.08 – 7 samples)

a. Inspection Scope

The inspectors verified the effectiveness of Exelon's programs for processing, handling, storage, and transportation of radioactive material. The inspectors used the requirements of 49 CFR 170-177; 10 CFR 20, 37, 61, and 71; applicable industry standards; Regulatory Guides, and procedures required by technical specifications as criteria for determining compliance.

Inspection Planning (1 sample)

The inspectors conducted an in-office review of the solid radioactive waste system description in the UFSAR, the process control program, and the recent radiological effluent release report for information on the types, amounts, and processing of radioactive waste disposed. The inspectors reviewed the scope of quality assurance audits performed for this area since the last inspection.

Radioactive Material Storage (1 sample)

The inspectors observed radioactive waste container storage areas and verified that Exelon had established a process for monitoring the impact of long-term storage of the waste.

Radioactive Waste System Walk-down (1 sample)

The inspectors walked down the following items and areas:

- Accessible portions of liquid and solid radioactive waste processing systems to verify current system alignment and material condition
- Abandoned in place radioactive waste processing equipment to review the controls in place to ensure protection of personnel
- Changes made to the radioactive waste processing systems since the last inspection
- Processes for transferring radioactive waste resin and/or sludge discharges into shipping/disposal containers
- Current methods and procedures for dewatering waste

Waste Characterization and Classification (1 sample)

The inspectors identified radioactive waste streams and reviewed radiochemical sample analysis results to support radioactive waste characterization. The inspectors reviewed the use of scaling factors and calculations to account for difficult-to-measure radionuclides.

Shipment Preparation (1 sample)

The inspectors reviewed the records of shipment packaging, surveying, labeling, marking, placarding, vehicle checks, emergency instructions, disposal manifest, shipping papers provided to the driver, and Exelon's verification of shipment readiness.

Shipping Records (1 sample)

The inspectors reviewed selected non-excepted package shipment records.

Identification and Resolution of Problems (1 sample)

The inspectors assessed whether problems associated with radioactive waste processing, handling, storage, and transportation, were identified at an appropriate threshold and properly addressed in Exelon's corrective action program.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151 – 6 samples)

.1 Unplanned Scrams, Unplanned Power Changes, and Unplanned Scrams with Complications (2 samples)

a. Inspection Scope

The inspectors reviewed LGS's submittals for the following Initiating Events Cornerstone performance indicators for the period of January 1 through December 31, 2015.

- Unit 1 Unplanned Power Changes
- Unit 2 Unplanned Power Changes

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. The inspectors reviewed LGS's operator narrative logs, maintenance planning schedules, condition reports, event reports, and NRC integrated inspection reports to validate the accuracy of the submittals.

b. Findings

No findings were identified.

.2 Mitigating Systems Performance Index (4 samples)

a. Inspection Scope

The inspectors reviewed LGS's submittal of the Mitigating Systems Performance Index for the following systems for the period of January 1 through December 31, 2015:

- Unit 1 Heat Removal System
- Unit 1 High Pressure Injection System
- Unit 2 Heat Removal System
- Unit 2 High Pressure Injection 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 integrated inspection reports to validate the accuracy of the submittals.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152 – 1 sample)

.1 Routine Review of Problem Identification and Resolution Activities

a. Inspection Scope

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

b. Findings

No findings were identified.

.2 Annual Sample: Review of Standby Gas Treatment System Failure (1 sample)

a. Inspection Scope

The inspectors performed an in-depth review of Exelon's evaluations and corrective actions associated with IR 2452765, "'A' SGTS Heater Not Working."

The inspectors assessed Exelon's problem identification threshold, problem analysis, extent of condition reviews, compensatory actions, and the prioritization and timeliness of corrective actions to determine whether Exelon was appropriately identifying, characterizing, and correcting problems associated with this issue and whether the planned or completed corrective actions were appropriate. The inspectors compared the actions taken to the requirements of Exelon's corrective action program and 10 CFR 50, Appendix B. The inspectors interviewed engineering and maintenance personnel to evaluate the extent of condition and assess the effectiveness of the implemented corrective actions and reasonableness of the planned corrective actions. In addition, the inspectors walked down the SGTS to independently assess material conditions.

b. Findings and Observations

No findings of significance were identified.

In February 2015, the 'A' SGTS heater failed to energize during a routine surveillance test. Exelon's investigation of the heater failure determined the likely cause to be an infant mortality failure of the heater controller, which had been installed in January 2015 (less than 30 days earlier). Exelon's extent of condition review included all controllers that had been procured in the same lot as the failed controller. In November 2015, Exelon evaluated NRC Event Notification 51303, "10 CFR Part 21 Interim Report for Potential Defect on Part No. 535-601 Moore Industries Milliamp Modules." Exelon determined that the February heater controller failure was similar to the failure mechanism described in the Part 21 Report. As a result, Exelon expanded the extent of condition review and identified additional corrective actions in IR 2580941.

The inspectors' review of selected corrective action program records did not identify any additional issues. The inspectors determined that Exelon's overall response to the issue was commensurate with the safety significance, timely, and the actions taken or planned were reasonable to resolve the problem.

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

.1 (Closed) Licensee Event Report (LER) 05000353/2015-005-00: Condition That Could Have Prevented Fulfillment of the High-Pressure Coolant Injection (HPCI) System Safety Function

On September 3, 2016, the Unit 2 Division 4 high steam flow isolation actuation instrument for the HPCI system failed. Operators declared the HPCI system inoperable and entered technical specification 3.5.1, "ECCS-Operating," action c.1, and technical specification 3.3.2, "Isolation Actuation Instrumentation," action b.1. Exelon identified heat related damage on the Division 4 HPCI steam high flow trip units. This was the result of a capacitor failure and overheating of a Rosemount 510 trip unit used for the nitrogen supply to the automatic depressurization system instrument gas located directly below the HPCI trip units. Exelon identified that the capacitor failed due to a latent manufacturing defect. Both the HPCI trip units and the automatic depressurization system instrument gas trip unit were replaced. Exelon's planned actions include replacing all Rosemount 510 trip units presently in use at LGS. This was the first failure of this nature in the life of the plant. The inspectors did not identify any new issues during the review of the licensee event report. This LER is closed.

.2 (Closed) LER 05000353/2015-008-00: Valid Automatic Actuation of the Reactor Protection System

On December 19, 2015, LGS Unit 2 was operating at 6 percent power performing a restart from planned maintenance outage 2M52. The reactor operator was increasing reactor pressure vessel pressure from 400 psig to 500 psig with the digital electrohydraulic control system using the main steam bypass valve jack (smooth pressure control method). When the sequence of steps in the operating procedure was performed, the bypass valves went full open unexpectedly. Reactor water level exceeded the +54 inch high level trip setpoint for the reactor feedwater pumps. In parallel, the reactor operator fully closed the main steam bypass valves. Given the reactor feedwater pump trip and closure of the main steam bypass valves, reactor water level decreased to +3 inches which is less than the +12.5 inch low level setpoint for the reactor protection system. The low reactor water level condition caused the actuation of the reactor protection system, i.e. a reactor scram. Exelon revised the startup procedure to ensure the main steam bypass valves open in a controlled manner when using the smooth pressure control method. The inspectors identified a finding during the review of the LER, and it is described below. This LER is closed.

a. Findings.

Introduction. A self-revealing Green NCV of Unit 2 technical specification 6.8.1 was identified because Exelon failed to adequately maintain a plant startup procedure. Specifically, the implementing procedure for normal plant startup from hot shutdown or cold shutdown to rated power was not adequately maintained when a modification to the Unit 2 turbine electrohydraulic control system was performed and required changes to the plant startup procedure were not identified and implemented.

Description. The LGS turbine generator control system is designed to maintain constant reactor pressure during normal operation and to operate the steam bypass system to maintain constant reactor pressure during startup, operational transients, and shutdown. During reactor startup and pressurization, the main steam bypass valves can be controlled via a jack which permits assigning a stroke rate and target valve position to direct bypass valve operation rather than maintaining constant reactor pressure. The bypass valve jack controls also permit rapid opening of the bypass valves to rapidly depressurize the reactor vessel during transient conditions in accordance with applicable procedures and conditions.

During Unit 2 reactor startup from maintenance outage 2M52 on December 19, 2015, reactor pressure was being raised from 400 to 500 psig in accordance with GP-2, “Normal Plant Startup.” During the performance of GP-2, Attachment 15, “Smooth Pressure Control Method,” operators actuated the bypass valve jack, and all bypass valves fully opened. The full opening of the bypass valves caused a swell of the reactor pressure vessel water level above the Level 8 (+54 inches) trip setpoint of the reactor feedwater pumps. In parallel, the operators took action to reclose the bypass valves which resulted in a shrink of the water level and subsequent automatic reactor scram on low water level (+12.5 inches). Operators were able to maintain the plant in a stable condition following the trip including resetting the reactor feedwater pumps.

Exelon performed a root cause investigation and determined that the digital modification of the electrohydraulic control system (DEHC) installed in the previous refueling outage, 2R13, was not properly implemented when it was accepted for service on May 9, 2015, upon completion of plant acceptance testing. Specifically, procedures impacted by the DEHC modification were not properly revised and validated, and software changes made at the factory acceptance test were not properly documented or evaluated. As a result, a DEHC difference between Unit 1 and Unit 2 was introduced which was not incorporated into GP-2 and not understood by the operators. As a result, when the operators implemented GP-2, Attachment 15, the steps intended to place the jack in control of bypass valves' position actuated the rapid opening for rapid depressurization. Exelon concluded the root cause of the issue was that leaders did not identify the risk associated with the modification and appropriately mitigate that risk through procedure validations.

Exelon initiated IR 2602637, revised GP-2 to properly incorporate the software changes made at the factory acceptance test, validated the software changes that were made were technically correct, trained all operators on the new procedural changes, and reviewed operating procedures for extent of condition. The inspectors reviewed the root cause investigation report, modification package, and affected procedures, interviewed engineering and operations personnel, and observed the subsequent plant startup and pressurization. The inspectors determined that Exelon's conclusions were reasonable and well-supported.

Analysis. The inspectors determined that the failure to adequately maintain a plant startup procedure was reasonably within Exelon's ability to foresee and correct and should have been prevented and therefore was a performance deficiency. This finding is more than minor because it is associated with the procedure quality attribute of the initiating events cornerstone and affected the objective to limit the likelihood of events that upset plant stability during power operations. Specifically, the procedure directed actions which resulted in a rapid reactor depressurization and a reactor trip.

Using IMC 0609, "Significance Determination Process," Appendix A, Exhibit 1, "Initiating Events Screening Questions," the inspectors determined that this finding was of very low safety significance (Green) because the finding did not cause both a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition. Specifically, although the finding caused a Level 8 trip of the feedwater pumps followed by a reactor trip, the rate of water injection from the condensate pumps was sufficient when the reactor was tripped to safely shutdown and operators were able to reset the feedwater pumps.

The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Change Management, because leaders did not use a systematic process for implementing the modification so that nuclear safety remained the overriding priority. [H.3]

Enforcement. Technical specification 6.8.1 requires, in part, written procedures to be established, implemented, and maintained covering applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978. Regulatory guide 1.33, Revision 2, Appendix A, Section 1, requires general plant operating procedures including nuclear startup, power operations, and turbine startup.

Procedure GP-2 is the implementing procedure for normal plant startup from hot shutdown or cold shutdown to rated power. Contrary to the above, procedure GP-2 was not properly maintained from when the DEHC modification was implemented and accepted on May 9, 2015 through December 19, 2015. To restore compliance, Exelon revised GP-2 to properly incorporate the software changes made at the factory acceptance test, validated the software changes that were made were technically correct, trained all operators on the new procedural changes, and reviewed operating procedures for extent of condition. Because this violation was of very low safety significance (Green) and Exelon entered this issue into their corrective action program (IR 2602637) this violation is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy. **(NCV 05000353/2016001-05, Main Turbine Digital Electrohydraulic Control System Modification Failed to Revise the Plant Startup Procedure)**

3. Plant Events

a. Inspection Scope

The inspectors conducted a review and evaluation of the identification of cross-contamination of the LGS Unit 2 service air system. The inspectors reviewed this matter with respect to requirements contained in 10 CFR 20, 10 CFR 50 Appendix I, technical specifications, the Offsite Dose Calculation Manual, and procedures required by the technical specifications.

b. Findings

Introduction. The inspectors identified a Green NCV of technical specification 6.8.1 because Exelon failed to implement procedure CY-AA-170-210, "Potentially Contaminated System Control Program," for the evaluation and control of potentially cross-contaminated systems. Specifically, Exelon did not implement CY-AA-170-210 for the evaluation and control of a potentially cross-contaminated system when samples collected from the Unit 2 service air system, a non-contaminated system, indicated the potential presence of contamination on June 16, 2015.

Description. Exelon has two service air systems at LGS; one system for each unit. The service air systems are typically isolated from each other. The LGS UFSAR states that the service air system is designed to provide compressed air to service air outlets located throughout the plant, to the refueling floor inflatable seals, to supply breathing air when workers are using air supplied respiratory protection equipment, to support hydro-pneumatic transfer of used RWCU resin from the condensate filter/demineralizers to the backwash receiver tank, and as a backup system for instrument air. Service air is supplied to the RWCU system through valves and piping rated at 125 psig and 100 degrees Fahrenheit. While the RWCU system is performing its normal clean up function, i.e. not being backwashed, and operating at higher pressure (>1000 psig), the service air system is isolated from the RWCU system by valves HV-045-2-013A and 045-2-30A for the "A" train or valves HV-045-2-013B and 045-2-30B for the "B" train. Valves HV-045-2-013A and B and piping up to the RWCU system are rated at 1290 psig and 150 degrees Fahrenheit. These isolation valves prevent back leakage of the higher

pressure RWCU system to the lower pressure service air system. The service air system also includes a drain pot with a high level alarm that annunciates in the main control room and automatically closes an additional isolation valve (HV-045-254 rated at 125 psig).

Between June 2015 and July 2015, Exelon issued various corrective action documents to document the identification of abnormal amounts of blowdown water from service air system locations (drops) during normal maintenance and operator rounds. As part of the follow-up, Exelon analyzed samples for radionuclides. A sample was initially collected on June 24, 2015 (Unit 2, elevation 201', Area 18, "B" RHR Room, outlet of hose). The sample indicated positive for various radionuclides including Co-58, Co-60, Mn-54, and Zn-65. Short-lived radioactivity (i.e., Na-24) was also identified indicating recent reactor coolant intrusion as a likely source. These radionuclides were identified at concentrations ranging from 1.8 E-7 uCi/ml to 8.7 E-7 uCi/ml. A re-analysis of this sample was conducted and indicated an activity of 2.4-E-7 uCi/ml to 9.1 E-7 uCi/ml. However, Exelon's chemistry staff considered the sample invalid since it was obtained from a drain hose routed inside a contaminated floor drain. Exelon did not take an additional sample to confirm or refute the initial results, did not restrict use of the service air system in the interim, did not conduct an immediate safety evaluation in accordance with 10 CFR 50.59, and did not conduct a radiological evaluation to support continued operation of the service air system as a contaminated system pending further analysis. Further, Exelon did not initiate a corrective action document for the sample being positive for radionuclides even though the results indicated potential cross-contamination of the service air system by reactor coolant.

On July 21, 2015, a sample of water from the service air system (Unit 2, elevation 253', Reactor Enclosure east side) was collected and was similarly positive for radionuclides. Concentrations for this sample ranged from 2.4 E-6 uCi/ml to 1.0 E-3 uCi/ml. A corrective action document was initiated for this result (IR 2531364). Although Exelon did not take formal action to restrict use of the system, Exelon attached labels to known points with water on or about August 14, 2015.

On September 16, 2015, the inspectors identified that Exelon failed to implement procedure CY-AA-170-210 to evaluate potentially radioactively contaminated systems. The inspectors also identified that the UFSAR described that the service air and instrument air systems are included in the routine sampling program to be used for identification of cross contamination of radioactivity in clean systems. The inspectors noted that the NRC had issued various generic communications associated with detecting, controlling, and mitigating possible radioactive inter-system cross contamination of clean systems and prevention of inadvertent radioactive release and/or personnel exposure. Specifically, NRC Bulletin 80-10, "Contamination of Nonradioactive System and Resulting Potential for Unmonitored, Uncontrolled Release to Environment," discussed the need to identify systems susceptible to potential inter-system cross-contamination and implement sampling and analysis programs to detect possible cross-contamination. As a result, Exelon initiated IR 2556568. Exelon performed a work group evaluation which determined that contrary to the UFSAR description neither the service air system nor the separate instrument air system were sampled as part of the routine program.

On October 16, 2015, Exelon's sampling of a Unit 2 service air drop outside the radiological controlled area (RCA) identified elevated levels of tritium (~ 4.5 million pCi/l) at the Auxiliary Boiler Fuel Oil Transfer Building. Exelon established an event response and troubleshooting team on October 18, 2015. The team was tasked to: 1) take actions to prevent unmonitored release to the environment, 2) perform extent of condition reviews, 3) perform a System Radiological Safety Review and 10 CFR 50.59 review, and 4) develop a decontamination and long-term sampling plan to restore the system to normal use. To prevent an unmonitored release of contaminated water, the team coordinated closure and tagging of service air supply locations outside the Unit 2 RCA and later inside the Unit 2 RCA. These actions were completed on November 10, 2015.

Exelon concluded that back leakage from the 2A or 2B RWCU filter/demineralizers was the cause of the contamination of the system. Water from the RWCU system leaked through four normally closed valves (two high pressure isolation valves and two check valves), and the drain pot automatic isolation actuation valve was not functional. Exelon concluded that as the service air system was used the contaminated water migrated through the service air system both inside and outside the RCA. Exelon determined that eighteen of the sixty-seven Unit 2 service air lines within the RCA and two of the eleven Unit 2 service air lines outside the RCA were contaminated. Exelon concluded the Unit 2 service air system was susceptible to cross-contamination for an extended period of time based on historical review of corrective action documents and previous observations. Exelon sampled the similar service air system within Unit 1 and did not identify contamination.

Exelon entered this issue into the corrective action program (IR 2556568), restricted use of the service air system, conducted a 10 CFR 50.59 screening and radiological evaluation of the system, conducted bounding radiation dose analyses for both occupational workers and members of the public, conducted an extent of condition review, decontaminated the system, and subsequently modified operation of the service air system to preclude re-contamination. Exelon's bounding dose evaluations for members of the public and occupational workers determined that there was not a potential for significant radiation exposure based on samples collected. Exelon's review identified that the system had not been used to provide breathing air following identification of contamination. Exelon's apparent cause evaluation determined that station personnel did not adequately recognize the risk that service air valves failing and/or leaking could result in contamination of the service air system from the higher pressure RWCU system.

When considering cross-cutting aspects, the inspectors noted that in addition to the contaminated samples collected from the Unit 2 service air system on June 16, 2015, and July 21, 2015, Exelon previously identified indications of potential for service air system cross-contamination. In July 2013, Exelon documented four required draining activities of the service air system drain pot. The issue report included a statement that water from the RWCU system was likely getting into the service air system and that samples should be collected. However, no action was taken to evaluate the situation, no samples were collected, and the issue report was closed to "trend." In addition, in August 2013, a report documented the repeated (daily filling) of the service air drain pot. However, no corrective action report was documented. Additional examples of service air system in-leakage observations within the past three years included: 1) multiple instances of water in the service air system to RWCU drain pot indicating backflow of reactor coolant; 2) multiple instances of rusting stuck open or closed valves impacting

isolation capabilities; and 3) high pressure in service air supply lines to RWCU. The inspectors also questioned Exelon regarding the lack of action when positive sample results were first obtained on June 24, 2015. Exelon initiated IR 2646081 on March 27, 2016, to document the failure to enter the issue into the corrective action program.

Analysis. The inspectors determined that the failure to implement procedure CY-AA-170-210 for the evaluation and control of potentially cross-contaminated systems was reasonably within Exelon's ability to foresee and correct and should have been prevented and therefore was a performance deficiency. This finding is more-than-minor because it is associated with the program and process attributes of the occupational and public radiation safety cornerstones and adversely affected both cornerstone objectives to ensure adequate protection of worker and public health and safety from exposure to radioactive material. Specifically, during the time the service air system was contaminated but not recognized as such and not restricted in use, the potential existed to inadvertently contaminate workers and release radioactive material to the environment.

Using IMC 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process," the inspectors determined that this finding was of very low safety significance (Green) because the finding did not involve an as low as is reasonably achievable (ALARA) issue, was not an overexposure, did not result in a substantial potential for an overexposure, and did not compromise the ability to assess dose. In addition, using IMC 0609, Appendix D, "Public Radiation Safety Significance Determination Process," the inspectors determined that the issue did not involve a substantial failure to implement the effluent release program and did not result in public doses exceeding 10 CFR 50, Appendix I or 10 CFR 20.1301 (e) and thus was of very low safety significance (Green).

The inspectors determined this finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Resolution, because Exelon did not take effective corrective actions when service air system issues were identified. [P.3]

Enforcement. Technical specification 6.8.1 requires, in part, that written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978. Section 7 and 10 of Regulatory Guide 1.33, Revision 2, Appendix A, recommends, in part, procedures for control of radioactivity for limiting materials released to environment and limiting personnel exposure and recommends chemical and radiochemical control procedures to prescribe the nature and frequency of sampling and analyses. Exelon procedure CY-AA-170-210 requires, in part, that further use of a newly contaminated system shall be restricted until the cause of the contamination has been identified and corrected and the system has been decontaminated. CY-AA-170-210 further requires that if it is necessary to continue the operation of the contaminated system then an immediate safety evaluation of the operation of the system as a radioactive system shall be performed in accordance with the requirements of 10 CFR 50.59. Contrary to the above, Exelon did not restrict use of the Unit 2 service air system or conduct a full and complete evaluation of the potentially cross-contaminated system from June 24, 2015, to November 10, 2015, when samples collected from the Unit 2 service air system indicated likely service air system cross-contamination. Exelon's corrective actions to restore compliance included: restricted use of the Unit 2 service air system, conducted a 10 CFR 50.59 screening and radiological evaluation, conducted bounding radiation dose

analyses for members of the public and occupational workers, conducted an extent of condition review, decontaminated the system, and modified operation of the service air system to preclude re-contamination. Because this violation was of very low safety significance (Green) and was entered into Exelon's corrective action program (IR 2556568), the violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy. **(NCV 05000353/2016001-06, Failure to Implement Procedures for Control of Potentially Contaminated Clean Systems)**

4OA6 Meetings, Including Exit

On April 22, 2016, the inspectors presented the inspection results to Mr. R. Libra, Site Vice President, and other members of the LGS staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

4OA7 Licensee Identified Violations

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

From 2010 to 2014, Exelon made a total of 16 shipments of radioactive material which contained category 2 quantities of radioactive material. Exelon did not implement a transportation security plan for any of these shipments, which is contrary to the requirements of 49 CFR 172, Subpart I, "Safety and Security Plans." This performance deficiency adversely affected the Public Radiation Safety cornerstone attribute of Program and Process based on inadequate procedures associated with the transportation of radioactive materials. The finding was determined to be of very low safety significance (Green) because the transportation of radioactive material issue did not involve: (1) a radiation limit that was exceeded; (2) a breach of package during transport; (3) a certificate of compliance issue; (4) a low level burial ground nonconformance; or (5) a failure to make notifications or provide emergency information. This issue was documented in Exelon's corrective action program as IR 2490592. Corrective actions included contracting with a vendor to receive regular, prompt notifications of potentially applicable rule changes in the Federal Register.

ATTACHMENT: SUPPLEMENTARY INFORMATION

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

R. Libra, Site Vice President
D. Lewis, Plant Manager
M. Herr, Director of Operations
F. Sturniolo , Director of Engineering
D. Palena, Director of Maintenance
J. Hunter, Director of Work Management
K. Kemper, Security Manager
R. Dickinson, Manager, Regulatory Assurance
R. Ruffe, Training Director
H. Weissinger, Shift Operations Superintendent
A. Hightower, Emergency Preparedness Manager
G. Budock, Regulatory Assurance Engineer
D. Molteni, Manager Operations Training
M. DiRado, Manager, Engineering Programs
D. Merchant, Radiation Protection Manager
C. Gerdes, Manager, Chemistry, Environmental and Radioactive Waste
P. Dix, Radiological Engineering Manager
P. Imm, Radiological Engineering Manager, Environmental Rad Waste Manager
A. Briggs, Manager, Chemistry, Environmental, Radwaste
B. Bielecki, Assistant Director of Engineering
T. Fritz, System Engineer
N. Knauss, System Engineer
C. Shimer, Maintenance I&C Supervisor
M. McGill, Engineer
K. McLaughlin, Engineering Manager
J. Bendyk, Engineer
K. Gellrich, Engineer
J. Racioppo, Control Room Supervisor
N. Ruggeri, Maintenance Supervisor
J. Somers, System Engineer
J. Quinn, Senior Manager Operations Support and Services
C. Flitcraft, Contractor
R. Wehrmann, Engineer
V. Ferrizi, On-Line Manager
J. Kirkpatrick, Radiation Protection Supervisor
S. Sharik, Instrument Chemist
N. Harmon, Senior Technical Specialist
J. Duskin, Instrument Coordinator
W. Tracy, Engineering Response
T. Davis, Manager Radiological Technical Support
R. Nealis, Senior Environmental Chemist
B. Perri, ALARA Specialist
J. Bruno, ALARA Specialist
J. Murphy, Senior Management Operation Support

LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED

Opened/Closed

05000352/2016001-01	NCV	Reactor Enclosure Recirculation System Design Change not Evaluated (Section 1R12)
05000352/2016001-02	NCV	Seismic Qualification of Safety Related Battery not Maintained (Section 1R18)
05000352, 05000353/2016001-03	NCV	Inadequate Work Staging and Housekeeping Walkdowns During Pre-Outage Preparations (Section 1R20)
05000352, 05000353/2016001-04	NCV	Entry into a High Radiation Area without Radiological Briefing and Complying with the RWP (Section 2RS1)
05000353/2016001-05	NCV	Main Turbine Digital Electrohydraulic Control System Modification Failed to Revise the Plant Startup Procedure (Section 4OA3)
05000353/2016001-06	NCV	Failure to Implement Procedures for Control of Potentially Contaminated Clean Systems (Section 4OA3)

Closed

05000353/2015-005-00	LER	Condition That Could Have Prevented Fulfillment of the High Pressure Coolant Injection System Safety Function (Section 4OA3)
05000353/2015-008-00	LER	Valid Automatic Actuation of the Reactor Protection System (Section 4OA3)

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

Procedures
OP-AA-108-111-1001, Sever Weather and Natural Disaster Guidelines, Revision 13
RT-6-100-005-1, Unit 1 Diesel Generator Trace Operability Test
RT-6-100-005-2, Unit 2 Diesel Generator Trace Operability Test
SE-9, Preparation for Sever Weather, Revision 38
SE-14, Snow, Revision 20

Section 1R04: Equipment Alignment

Procedures
0S78.1.D (COL), Valve Alignment for Normal Operation of Standby Gas Treatment Room Ventilation, Revision 5
0S78.1.D (COL), Valve Alignment for Normal Operation of Standby Gas Treatment Room Ventilation, Revision 5
1S11.1.A (COL-1), Equipment Alignment of Emergency Service Water Loop "A" System, Revision 62
2S11.1.A (COL-1), Equipment Alignment of Emergency Service Water Loop "A" System, Revision 45
2S52.1.A (COL-1), Equipment Alignment for Core Spray Loop 'A' Operation, Revision 7
M-095-005, Replacement of Station Battery Cells, Revision 5
ON-121, Loss of Shutdown Cooling, Revision 30
RT-6-051-705-1 "RHR Shutdown Cooling Suction Leak Inspection" Revision 2
S51.8.B, Shutdown Cooling/Reactor Coolant Circulation Operation Start-up and Shutdown, Revision 79
S52.1.A, Core Spray Setup for Service Operation, Revision 43
S52.9.A, Routine Inspection of the Core Spray System, Revision 18
S76.1.C, SGTS and RERS Setup for Automatic Initiation, Revision 14
S76.1.C, SGTS and RERS Setup for Automatic Initiation, Revision 14
S95.9.A, Routine Inspection of Station Batteries and Chargers, Revision 18
ST-4-LLR-141, B RHR Shutdown Cooling Return, Revision 18
ST-6-012-234-0, B Loop RHRSW Pump Comprehensive Test, Revision 5
ST-6-078-302-0, B CREFAS Monthly Operability Test, Revision 21

Condition Reports:
1178994 2381515 2523951 2542176 2585085 2586222

Drawings
DWG 8031-M-12, "Residual Heat Removal Service Water (common), Revision 62
DWG 8031-M-51, "P&ID Residual Heat Removal (Unit 1), Revision 64
DWG 012-01 Training, RHR Service Water, Revision 3
E-33, Single Line Meter and Relay Diagram 125/250Vdc System Unit 1, Revision 45
E-92, Schematic Meter and Relay Diagram 125/250Vdc, Revision 31

Miscellaneous
Clearance #15001126

Section 1R04S: Full System Walkdown

Procedures
1GP-9 I(COL-4), Alignment of the Reactor Enclosure Air Locks, Revision 3
1S76.1.B(COL03), Equipment Alignment of the Reactor Enclosure Steam Flooding Dampers for Normal Operation, Revision 4
1S76.1.B(COL04), Equipment Alignment of the Reactor Enclosure Air Supply Fans, Exhaust Fans and Equipment Compartment Fans for Normal Operation, Revision 12
ER-AA-450, Structures Monitoring, Revision 5
MA-AA-716-026, Station Housekeeping/Material Condition Program, Revision 14
MA-AA-716-027, Industrial General Material Handling and Storage, Revision 1
MA-AA-796-024, Scaffold Installation, Inspection, and Removal, Revision 10
MA-MA-796-024-1001, Scaffolding Criteria for the Mid Atlantic Stations, Revision 8

RT-6-000-591-0, Inspection of Controlled Material Storage Cabinets, Revision 16
S76.1.B, Startup of Reactor Enclosure HVAC, Revision 65
S76.2.C, Defeat of Reactor Enclosure HVAC Supply Dampers Swap to Winter Mode, Revision 2
S76.6.A, Swapping Reactor Enclosure HVAC Equipment, Revision 14
S76.6.B, Control of Reactor Enclosure HVAC Heating Steam, Revision 6
ST-6-076-360-1, Rx Encl Sec Cntmt Integrity Verification, Revision 38

Condition Reports:

2613712	2614339	2616869	2620702	2622581	2624266
2624768	2625832	2630605	2632946	2635512	2636561
2636759	2637657	2637720	2639585	2639587	

Work Orders

C0258385	R1286198	R1288638	R1292156	C0260101	C0175974
C0258015	C0257967	C0260003			

Section 1R05: Fire Protection

Procedures
1FSSG-3083, Fire Area 083 Fire Guide Diesel Generator Cell 2A (El. 217'-0"), Revision 2
F-D-311B, Pre-Fire Plan, D12 Diesel Generator and Fuel Oil-Lube Oil Tank Room, Revision 9
F-D-315A, Pre-Fire Plan, D21 Diesel Generator and Fuel Oil-Lube Oil Tank Room, Rooms 315A and 316A (El 217), Revision 9
F-D-315B, Pre-Fire Plan, D22 Diesel Generator and Fuel Oil-Lube Oil Tank Room, Revision 10
F-R-108, Pre-Fire Plan, Unit 1 RCIC Pump Room A, Revision 10
F-R-400, Pre-Fire Plan, Unit 1 Drywell Area Room 400, Revision 9
OP-MA-201-007, Fire Protection System Impairment Control, Revision 6

Condition Reports:
2641196 2641904

Section 1R06: Flood Protection Measures

Procedures
MA-AA-716-026, Station Housekeeping / Material Condition Program, Revision 14

Condition Reports:
2613462 2613612 2617692 2624266

Drawings
8031-M-11, P&ID Emergency Service Water (Unit 1, Unit 2 and Common), Revision 84
M-508, Plumbing and Drainage Turbine Building No. 1 Floor Plan El. 217'-0", Revision 31
M-523, Plumbing and Drainage Turbine Building No. 2 Floor Plan El. 217'-0", Revision 26

Miscellaneous
M-002, Moderate Energy Pipe Break/Moderate Energy Line Break Analysis Report, Revision 4
M-003, Summary of Requirements for Flooding Prevention Relative to Units 1 and 2, Revision 4
NPB-14, Moderate Energy Line Break, Revision 5

Section 1R11: Licensed Operator Requalification Program

Procedures
OP-AA-103-102, Watch-Standing Practices, Revision 14
OP-AA-104-101, Communications, Revision 3
GP-3, Normal Plant Shutdown, Revision 158
GP 3, Appendix 1, Establishing Cold Shutdown, Revision 56
GP 3, Appendix 3, Preparation for Primary Containment Access and Refueling, Revision 28

Section 1R12: Maintenance Effectiveness

Procedures
ER-AA-310, Implementation of the Maintenance Rule, Revision 9
ER-AA-310-1001, Maintenance Rule – Scoping, Revision 4
ER-AA-310-1004, Maintenance Rule – Performance Monitoring, Revision 13
ER-AA-310-1005, Maintenance Rule – Dispositioning Between a(1) and (a)(2), Revision 7
MA-AA-716-011, Work Execution and Closeout, Revision 21
MA-AA-716-011, Work Execution and Closeout, Revision 21

Condition Reports:

1686743	1686743	1691686	1691686	2421589	2421589
2452950	2457394	2457394	2473856	2473859	2473941
2496830	2496857	2549524	2549531	2561409	2561409
2563872	2563872	2564052	2564052	2572083	2572129
2581849	2581849	2584350	2584350	2584886	2584886
2609083	2609270	2609966	2627263	2627263	2634146
2634149					

Work Orders

C0226215	C0226215	C0237922	C0258966	C0258966

Drawings
8031-M-76, Sheet 5, P&ID Reactor Enclosure and Refueling Area HVAC (Unit 1 and Common), Revision 41
E-470, Sheet 1, Schematic Diagram Reactor Enclosure Air Recirculation Fan & Auxiliary Control 1 & 2 Units, Revision 29
E-470, Sheet 2, Schematic Diagram 1A Reactor Enclosure Air Recirculation Fan & Auxiliary Control Unit 1, Revision 25
E-470, Sheet 2A, Schematic Diagram 1B Reactor Enclosure Air Recirculation Fan & Auxiliary Control Unit 1, Revision 2
E-686, Sheet 17, Schematic Diagram HVAC Miscellaneous Safeguard Instrumentation 1 & 2 Units & Common, Revision 3
M-76FD, Sheet 4, Functional Description Reactor Enclosure – HVAC, Revision 9

Miscellaneous

8031-M-171, Specification for Environmental Qualification Service Conditions for the Limerick Generating Station Units 1 & 2, Revision 3
ASME N511, In-Service Testing of Nuclear Air Treatment, Heating, Ventilating, and Air-Conditioning Systems, 2007

ASME N511, In-Service Testing of Nuclear Air Treatment, Heating, Ventilating, and Air-Conditioning Systems, 2007
IEEE Std 338, IEE Standard for Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems, 2012
IEEE Std 338, IEE Standard for Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems, 2012
LG-PRA-005.02, RCIC System Notebook
LM-0646, Re-analysis of Loss of Coolant Accident (LOCA) Using Alternative Source Terms, Revision 0
L-S-39, RCIC Design Basis Document
M-76-48, Reactor Enclosure Post LOCA Relative Humidity Transient Analysis, Revision 2
RCIC 4Q2015 System Health Report
RCIC Maintenance Rule System Basis Document
Regulatory guide 1.118, Periodic Testing of Electric Power and Protection Systems, Revision 3
Regulatory guide 1.118, Periodic Testing of Electric Power and Protection Systems, Revision 3
Regulatory Guide 1.52, Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants, Revision 2
Regulatory Guide 1.52, Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants, Revision 4
Regulatory Guide 1.52, Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants, Revision 2
Regulatory Guide 1.52, Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants, Revision 4

Section 1R13: Maintenance Risk Assessments and Emergent Work Control

Procedures
ER-AA-600-1023, PARAGON Model Capability, Revision 6
ER-AA-600-1042, On-Line Risk Management, Revision 10
ON-125, Loss of Fuel Pool Cooling, Revision 14
OP-AA-108-117, Protected Equipment Program, Revision 4
OP-AA-108-117, Protected Equipment Program, Revision 4
OU-LG-104, Limerick Generating Station Shutdown Safety Management Program, Revision 15
RT-1-053-850-0, Heat Transfer Capability of Fuel Pool Cooling Systems, Revision 6
RT-6-053-990-0, Determination of Fuel Pool Time to 200 Degrees on Loss of Cooling, Revision 6
S53.0.C, Connecting Fuel Storage Pool(s) to Cask Storage Pit Including Cross Connecting Fuel Storage Pools, Revision 21
S53.1.A, Startup and Temperature Control of Fuel Pool Cooling System, Revision 32
SP-221, Replacement of 'A' Loop RHRSW Return Piping During 1R16, Revision 1
ST-4-078-732-0, B CREFAS Charcoal Absorber-HEPA Filter Test, Revision 6
ST-4-078-802-0, B CREFAS Charcoal Analysis, Revision 6
WC-AA-101, Online Work Control Process, Revision 26
WC-AA-101-1006, On-Line Risk Management and Assessment, Revision 1
WC-AA-104, Integrated Risk Management, Revision 23

Condition Reports:
2637120 2645617 2645907

Work Order
1284755-01B C0258849 R1161754 R1286522

Drawings
8031-M-11, P&ID Emergency Service Water (Unit 1, Unit 2 and Common), Revision 84

Miscellaneous
2R13 Decay Heat Load Report, 2/11/2015
LG-CRM-012, PARAGON Update – Model Revisions Yf – OL SFDTs for FPC & FP MU, Revision 0
Operations Protected Equipment Log 1/16/2016
Operations Protected Equipment Log 1/19/2016
Operations Protected Equipment Log 1/27/2016

Section 1R15: Operability Determinations and Functionality Assessments

Procedures
OP-AA-108-115, Operability Determinations, Revision 16
OP-AA-108-115-1002, Supplemental Consideration for On-Shift Immediate Operability Determinations, Revision 3
ST-4-049-952-2, RCIC Vacuum Breaker Test, Revision 9
ST-6-048-230-2, SLC, Pump, Valve, and Flow Test, Revision 46
ST-6-048-231-2, SLC Pump Comprehensive Test, Revision 4
T-260, Reactor Pressure Vessel Depressurization/Venting, Revision 18
T-305, Local Operation of RCIC without DC Power, Revision 1

Condition Reports
1463431 1463447 2608665 2609083 2612034
2613462 2634146 2634149 2634712

Miscellaneous
ECR 01-00170
ECR 16-00010
LG-PRA-005.02, RCIC System Notebook
L-S-39, RCIC Design Basis Document
SGTS Maintenance Rule System Basis Document
U2 SLC Pump Performance History

Work Orders
R1323712 R1335309

Drawings
8031-M-11, P&ID Emergency Service Water (Unit 1, Unit 2 and Common), Revision 84

Miscellaneous
BOP-UT-16-003, FW-50 12” Pipe @ 45 Degree Elbow, Leak Location with House Clamp, 1/17/16

Section 1R18: Plant Modifications

Procedures
M-095-005, Replacement of Station Battery Cells, Revision 5
M-097-007, Maintenance of Battery Rack and Cells, Revision 1

Condition Reports
1531869 2408927 2415740 2511847 2599756 2619334
2624349

Maintenance Orders/Work Orders
A1985416

Miscellaneous
ECR 15-00307
EWR A0673118
LS-105, Revision 1
Technical Evaluation 2624349-02, Revision 0

Section 1R19: Post-Maintenance Testing

Procedures
M-095-005, Replacement of Station Battery Cells, Revision 5
S12.4.F, Drain, Fill and Vent the RHRSW Side of the 1A RHR Heat Exchanger, Revision 8
S49.1.D, RCIC System Full Flow Functional Test and Turbine Oil Priming, Revision 42
SP-222, 20 Transformer Automatic Voltage Regulator Testing, Revision 0
ST-4-095-901-1, Division 1 1A1D101 Visual Inspection Cell to Cell and Terminal Tightness and Resistance Check, Revision 6
ST-6-095-911-1, Div 1 125/250 Vdc 1A1D101/1A2D101 Safeguard Battery Quarterly Inspection, Revision 41
ST-6-107-200-0, IST Valve Stroke Surveillance Log, Revision 28
ST-LLR-131-1, "A" RHR Shutdown Cooling Return, Revision 18

Condition Reports
2613462 2619334 2624349 2642852 2643640 2646325
2646392 2646411 2646993

Maintenance Orders/Work Orders
C0215863 C0250345 C0255037 C0255038 C0256462 C0258033
C0258121 C0258344 C0258700 C0259224 C0259277 C0259303
C0260933 R1101522 R1101523 R1276721 R1310102

Drawings
8031-M-11, P&ID Emergency Service Water (Unit 1, Unit 2 and Common), Revision 84
8031-M-51, P&ID Residual Heat Removal, Revision 66
N-00E-304-00001, 12-900 Testable Check Valve with Air Cylinder Limit Switches, Revision 004

Miscellaneous
Clearance #15001129
Clearance #16000126
ECR 10-00482
ECR 15-00307

Section 1R20: Refueling and Other Outage Activities

Procedures
GP-3, Normal Plant Shutdown, Revision 158
GP 3, Appendix 1, Establishing Cold Shutdown, Revision 56
LS-AA-119, Fatigue Management and Work Hour Limits, Revision 12
NF-AA-330-1001, Core Verification Guidelines, Revision 11
ON-121, Loss of Shutdown Cooling, Revision 30
OP-AA-103-102, Watch-Standing Practices, Revision 14
OP-AA-104-101, Communications, Revision 3
OP-AA-108-117, Protected Equipment Program, Revision 4
OP-AA-108-117-1001, Spent Fuel Storage Pools Heat-Up Rate with Loss of Normal Cooling, Revision 00
OP-MA-109-101, Clearance and Tagging, Revision 20
OU-AA-103, Shutdown Safety Management Program, Revision 15
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 79
S51.8.L, RHR Alternate Decay Heat Removal Startup and Shutdown, Revision 21

Condition Reports

2638143	2642852	2646325	2643640	2646392	2646411
2646443	2646993	2648392	2649436	2649639	2649933
2653383	2656433				

Miscellaneous
Clearance #15000960
Clearance #15001437
Limerick Generating Station Shutdown Safety Plan

Section 1R22: Surveillance Testing

Procedures
ST-4-LLR-031-1, Main Steam Line “A”, Revision 13
ST-4-LLR-041-1, Main Steam Line “B”, Revision 12
ST-4-LLR-051-1, Main Steam Line “C”, Revision 12
ST-4-LLR-061-1, Main Steam Line “D”, Revision 13
ST-6-048-230-2, SLC, Pump, Valve, and Flow Test, Revision 46
ST-6-048-231-2, SLC Pump Comprehensive Test, Revision 4
ST-6-049-230-2, RCIC, Pump, Valve and Flow Test, Revision 75
ST-6-052-234-2, ‘A’ Loop Core Spray Pump Comprehensive Test, Revision 3
ST-6-092-316-1, D12 Diesel Generator Fast Start Operability Test Run, Revision 53

Condition Reports

2607984	2608000	2608015	2609083	2609270	2612034

Maintenance Orders/Work Orders
R1269914

Section 2RS01: Access Control to Radiologically Significant Areas

Procedures:
CY-AA-170-210, Potentially Contaminated System Control, Revision 1
LGS-14-001, 2013 Annual Isotopic Mix Analysis, Revision 0
RP-AA-224, CEDE Dose Tracking Using Air Samples, Revision 1
RP-AA-300-1002, Electron Capture Isotope Control, Revision 4
RP-AA-403, Administration of the Radiation Work Permit Program, Revision 8
RP-AA-460, Controls for High and Locked High Radiation Areas, Revision 28
RP-AA-503, Unconditional Release Survey Method, Revision 8
RP-AA-503, Unconditional Release Survey Method, Revision 10
RP-AA-700-1208, Operation of Shepard Model 89 Calibrator, Revision 2
RP-LG-300-101, and 14, Routine Survey Program and Documentation, Revision 13
RT-0-100-460-0, High Radiation and Locked High Radiation Door Preventative Maintenance, Revision 7
RT-5-104-800, Tritium Analysis of Non-Contaminated Systems, Revision 7

Miscellaneous:
Analysis (Passive Monitoring- PM-7)
Audits; NOSCPA LG-14-07-07, NOSCPA LG-14-07-03
Contamination Control – Personnel Contamination Data
Dose Records
Dosimetry Performance Testing Data
NVLAP Certification Information (Code 100518-0)
Outage Radiation Protection Outage Report
Performance Indicator Summary Data
Personnel Exposure Investigations
Radiological Survey Data
Source Term assessment

Section 2RS02: Occupational ALARA Planning and Controls

Procedures:
CY-AB-120, BWR Shutdown Chemistry, Revision 11
CY-AB-120-130, BWR Shutdown Chemistry, Revision 10
CY-AB-120-130-F-01, Outage Chemistry Plan, Revision 0
CY-LG-120-1101, Primary Chemistry Sampling and Analysis Scheduling, Revision 31
CY-LG-120-1301, Outage Cobalt Limits, Revision 8
OU-AA-101, Refuel Outage Management, Revision 22
RP-AA-700-1208, Operation of the Shepard Model 89 Calibrator, Revision 2
RP-AB-461, Access Controls during Irradiated Core Component Movement, Revision 0
RP-AB-F-04, Access Controls during Irradiated Component Movement at Limerick, Revision 0

Miscellaneous:
ALARA Contingency Plans
ALARA Plans including control rod drive unlatching ALARA plans, estimates and decision analyses
Check-in Assessment (AR 1608967)
CRUD Burst Response Plan
Outage Chemistry Plan

Radiation Protection Outage Checklist
Radiological Risk Management Matrix
Shutdown Chemistry Plan
Source Term Control Plans and Actions

Section 2RS03: In-plant Airborne Radioactivity Control and Mitigation

Procedures:
RP-AA-130-201, Radiochemistry Quality Control, Revision 3
RP-AA-224., CEDE Dose Tracking Using Lapel Air Samplers, Revision 1
RP-LG-300-101, Routine Survey Program and Documentation, Revision 13 and 14
RP-LG-825-101, Breathing Air Analysis, Revision 9

Miscellaneous:
Airborne Radioactivity Intake Assessments
Respirator Certification, Novo 2000
Respirator Qualification Records (training, medial certification)

Section 2RS04: Occupational Dose Assessment

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

Documents:
Analysis 95-15, Passive Monitoring
EPD/OSL Discrepancy Reports
Exposure Control and Dose Records
General Source Term Data
NVLAP testing Certification In-light
Personnel Contamination Event Logs
Personnel Intake Investigations

Section 2RS05: Radiation Instrumentation

Procedures:
CY-AA-130-201, Radiochemistry Quality Control, Revision 3
CY-AA-130-320, Packard 2900 TR/3100 TR Liquid Scintillation Counter, Revision 3
LGS-11-006, Canberra Argos Plant Mix Gamma Sensitivity, Revision 0
LGS-14-001, 2013 Annual Isotopic Mix Analysis, Revision 0
RP-AA-400-1009, Remote Monitoring System, Revision 2
RP-AA-405, Operation of the Remote Acquisition and Display System (RADS) , Revision 3
RP-AA-700-1001, Operation of MGP WRM2 Dive Telemetry, Revision 1
RP-AA-700-1208, Operation of the Shepard Model 89 Calibrator, Revision 2
RP-AA-700-1239, Operation and Calibration of the Model SAM-12 Small Article Monitor, Revision 2
RP-AA-700-1240, Operation of the Canberra ARGOS 5 Personnel Contamination Monitor, Revision 5

RP-AA-700-1246, Operation of Air Samplers, Revision 3
RP-AA-700-1249, Operation of Ludlum Model 3 with GM Frisker Probe, Revision 2
RP-AA-700-1401, Operation and Calibration of the Eberline Model PM-7 Personnel Contamination Monitor, Revision 2
RP-AA-1010, Attachment 1, Justification of Small Article Monitor (SAM) Alarm Set-point, Revision 0

Miscellaneous:
1R15 Outage Radiation Protection Outage Report
Audits; NOSCPA LG-14-07-07, NOSCPA LG-14-07-03
Calibration Records: EDs: 906307, 906059, 90289, 916946; ARGOS 336017; Lapel Air sampler- 12559; GM Frisker- 285728; ISOLO-2
Contamination Control – Personnel Contamination Data
Limerick Unit 1 2014-2015 Alpha Assessment
Offsite Dose Calculation Manual, Revision 26
Radiological Survey Data

Section 2RS8: Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation

Procedures
RP-602-1003, Radioactive Material/Waste Shipments Transported Via Rail, Revision 1
RP-AA-600, Radioactive Material/Waste Shipments, Revision 14
RP-AA-6001, Transportation Accident Response, Revision 2
RP-AA-600-1001, Exclusive Use and Emergency Response Information, Revision 9
RP-AA-600-1002, Highway Route Controlled Quantity/Advanced Notification for Radioactive/Waste Shipments, Revision 5
RP-AA-600-1003, Radioactive Waste Shipments to Barnwell and the Defense Consolidation Facility (DCF), Revision 9
RP-AA-600-1004, Radioactive Waste Shipments to Energy Solution's Clive Utah Disposal Site Containerized Waste Facility, Revision 12
RP-AA-600-1005, Radioactive Material and Non Disposal Site Waste Shipments, Rev 18
RP-AA-600-1006, Shipment of Category 1 Quantities of Radioactive Material or Waste (Category 1 RAMQC), Revision 11
RP-AA-600-1007, Radioactive Waste Shipments to Energy Solution's Clive Utah Disposal Facility Bulk Waste Facility (BWF), Revision 7
RP-AA-600-1008, Radioactive Waste Shipments to Waste Control Specialists (WCS) Disposal Facility, Revision 4
RP-AA-600-1009, Shipment of Category 2 Quantities of Radioactive Material or Waste (Category 2 RAMQC), Revision 2
RP-AA-600-1010, Use and Operation of WMG Software for Creating Containers, Samples, Waste Streams and Waste Types, Revision 2
RP-AA-600-1011, Use and Operation of WMG Software for Gross Gamma Characterization and Generation of Shipping Paperwork, Revision 4
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RP-AA-600-1014, Use and Operation of WMG Software Filter Module, Revision 2
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RP-AA-605, 10 CFR 61 Program, Revision 6
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1696832	2386876	2399966	2434940	2449570	2517489
2538749	2543725	2612596	2612600	2613239	2614049
2614055	2614057	2614062	2614065	2614069	2614095

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Section 4OA1: Performance Indicator Verification

Procedures
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LS-AA-2200, Mitigating System Performance Index Data Acquisition and Reporting, Revision 5
NEI 99-02, Regulatory Assessment Performance Indicator Guideline, Revision 7
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Section 4OA2: Problem Identification and Resolution

Procedures
IC-11-00351, Calibration of STS 535 Process Controller, Revision 4
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1426115	1430678	1463447	1478247	1686743	1691566
2381510	2452765	2486691	2487344	2575472	2580941
2584863					

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E-482 Sht. 3, SGTS Filter & Valves Schematic, Revision 16
E-484, SGTS Filter Electrical Heater Schematic, Revision 21
E-686 Sht. 7, HVAC Instrumentation Schematic, Revision 13
M-76 Sht. 6, SGTS P&ID, Revision 33

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R1107788

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

Procedures

CY-AA-170-210, Potentially Contaminated System Control Program, Revision 1
GP-2, Normal Plant Startup, Revision 159
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N-00E-317-0100, Sheet 24, Software Requirements Specification for the Interface of the Unit 2 Digital EHC System to the Plant Monitoring System at Limerick Generating Station, Revision 0
Offsite Dose Calculation Manual, Revision 26
Rosemount Trip Unit PCM Template

LIST OF ACRONYMS

AC	alternating current
ADAMS	Agencywide Documents Access and Management System
ALARA	as low as reasonably achievable
AVC	automatic voltage controller
CFR	*Code of Federal Regulations*
CREFAS	control room emergency fresh air supply
CS	core spray
DC	direct current
DEHC	digital electrohydraulic control
ECCS	emergency core cooling system
EDG	emergency diesel generator
EPD	electronic personal dosimeter
ESW	emergency service water
HPCI	high-pressure coolant injection
HRA	high radiation area
IMC	Inspection Manual Chapter
IR	issue report
LER	licensee event report
LGS	Limerick Generating Station
NCV	non-cited violation
NRC	Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
PD	performance deficiency
RCIC	reactor core isolation cooling
RERS	reactor enclosure recirculation system
RHR	residual heat removal
RHRSW	residual heat removal service water
RP	radiation protection
RWCU	reactor water clean-up
RWP	radiation work permit
SGTS	standby gas treatment system
SLC	standby liquid control
SSE	safe shutdown earthquake
TS	technical specification
UFSAR	Updated Final Safety Analysis Report
Vdc	volts direct current
VHRA	very high radiation area