Limerick 1
1Q/2016 Plant Inspection Findings

Initiating Events

Mitigating Systems

Significance: G Mar 31, 2016
Identified By: Self-Revealing
Item Type: NCV Non-Cited Violation
Reactor Enclosure Recirculation System Design Change Was Not Evaluated
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.

Inspection Report# : 2016001 *(pdf)*

Significance: G Mar 31, 2016
Identified By: NRC
Item Type: NCV Non-Cited Violation
Seismic Qualification of Safety Related Battery Not Maintained
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]
Inspection Report# : 2016001 *(pdf)*

Significance: G Mar 31, 2016
Identified By: NRC
Item Type: NCV Non-Cited Violation
Inadequate Work Staging and Housekeeping Walkdowns During Pre-Outage Preparations
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]

Inspection Report# : 2016001 *(pdf)*

Significance: G Dec 31, 2015
Identified By: NRC
Item Type: NCV Non-Cited Violation
Seismic Qualification of Safety Related Block Wall Not Maintained
The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion III, Design Control, because Exelon did not properly store circuit breakers and ground trucks in accordance with established design. Specifically, Exelon personnel stored circuit breakers/ground trucks attached to concrete block walls but did not maintain required separation distances, did not evaluate the full weight of the stored equipment, and did not attach all equipment to required attachment points.

Using IMC 0609, Appendix A, Exhibit 4, the inspectors determined that this finding was of very low safety significance (Green). First, if the concrete block wall is assumed to be completely failed by the seismic event, the loss of the wall would not cause an initiating event, would not degrade two or more trains of a multi-train system or function, and would not degrade one or more trains of a system that supports a risk significant function. Second, the finding does not involve the total loss of any safety function, identified by the licensee through a PRA, IPEEE, or similar analysis, that contributes to external event initiated core damage accident sequences. Furthermore, although failure of the walls due to a seismic event would introduce potential for interaction with safety related equipment, the failure would not necessarily result in the degradation or failure of EDG systems since the associated switchgear are constructed of substantial metal cabinets and anchored to the concrete floor. As such, the inspectors, in consultation with a Senior Risk Analyst, concluded that Exhibit 4 provides a reasonable basis for screening the finding as Green.

The inspectors determined that this finding has a cross-cutting aspect in the area of Human Performance, Procedure Adherence, because equipment operators did not follow the established work instructions (posted signs). [H.8]

Inspection Report# : 2015004 *(pdf)*

Significance: G Jul 30, 2015
Identified By: NRC
Item Type: NCV Non-Cited Violation
Failure to Verify Adequacy of EDG Voltage to Start Safety Related Motors
The team identified a finding of very low safety significance involving a non-cited violation (NCV) of the 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” in that Exelon did not verify and assure in design basis calculations, that adequate voltage would be available for starting Class 1E accident mitigating motors when the safeguards buses are powered by the emergency diesel generators (EDG). Specifically, in the calculation performed to evaluate voltage available to individual motors when they are powered by the EDGs, Exelon assumed that the generator output voltage would be 4285 Volts, alternating current (Vac), rather than the minimum voltage allowed by station technical specifications (4160 Vac). Additionally, the electrical ratings of loads powered by the EDG were not adjusted for the maximum frequency allowed by station technical specifications (61.2 hertz (Hz)). As a result, the starting voltage for some of the safety-related motors would not have been acceptable under EDG generator voltage and frequency limiting conditions. In response, Exelon entered the issue into their corrective action program and performed evaluation that determined that EDG actual test results demonstrated the EDGs to be operable. The team review of the evaluation determined it to be reasonable. This finding was more than minor because it was similar to Example 3.j of NRC IMC 0612, Appendix E, and was associated with the Design Control attribute of the Mitigating

Systems Cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The team determined the finding was of very low safety significance because it was a design deficiency confirmed not to result in a loss of safety-related motor operability or functionality. The team determined this finding had a cross-cutting aspect in the area of Problem Identification and Resolution (Identification, Aspect P.1), because during a calculation revision in 2014, Exelon did not recognize that the limits of voltage and frequency allowed by the station technical specifications affected the calculation results and, therefore, did not completely and accurately identify the issue and revise the calculation in accordance with the station's corrective action program requirements.
Inspection Report# : 2015007 *(pdf)*

Significance: G Jul 30, 2015
Identified By: NRC
Item Type: NCV Non-Cited Violation
Failure to Verify Adequate Voltage Available for DC Equipment
The team identified a finding of very low safety significance involving a non-cited violation (NCV) of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," in that Exelon's design control measures did not verify the adequacy of the design regarding adequate direct current voltage (Vdc). Specifically, Exelon did not ensure that adequate voltage existed to emergency diesel generator (EDG) relays and output breaker spring charging motors. Additionally, the team determined that the overall impact to voltage drop calculations was not adequately assessed when the temporary battery cart is used. Following identification of the issue, Exelon entered it into their corrective action program and evaluated the operability of the batteries, concluding that the affected DC components would function at the current battery capacities. The team's review of the evaluation determined it to be reasonable. The finding was more than minor because it was similar to Example 3.j of NRC IMC 0612, Appendix E, and was associated with the Design Control attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The team determined the finding was of very low safety significance because it was a design deficiency affecting the safety-related batteries that did not result in the loss of operability or functionality. The team determined this finding had a cross-cutting aspect in the area of Human Performance, (Documentation, Aspect H.7) because the battery sizing calculation was revised on March 15, 2014, which provided an opportunity to identify the inaccuracies of the battery calculations.
Inspection Report# : 2015007 *(pdf)*

Significance: G Jun 30, 2015
Identified By: Self-Revealing
Item Type: NCV Non-Cited Violation
Design Requirements Not Met for Installed Instrument Gas Tubing Fitting
A self-revealing Green NCV of 10 CFR 50, Appendix B, Criterion III, "Design Control," was identified because Exelon failed to control the proper design configuration of installed plant equipment in Unit 1. Specifically, a fitting used in the safety-related primary containment instrument gas (PCIG) tubing supplying the '1C' inboard main steam isolation valve (MSIV) was not installed in accordance with the specified quality standard and this deviation was not controlled. Subsequently, the fitting failed due to high cycle fatigue and caused a reactor trip. Exelon's corrective actions included initiating condition report IR 2458005, installing approved tubing and fittings on February 24, 2015, on the '1C' inboard MSIV which maintained wall thicknesses greater than original specifications, and verifying that current maintenance practice, training, and knowledge would preclude substitution of a different style fitting without further evaluation.

This finding is more than minor because it is associated with the design control 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 inadvertent closure

of the '1C' inboard MSIV 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 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 (e.g. loss of condenser, loss of feedwater). Specifically, the finding caused the loss of one steam line to the main condenser but three steam lines remained available. The inspectors determined that the finding did not have cross-cutting aspect because the installation of the fitting that failed did not occur within the last three years, and the inspectors did not conclude that the causal factors represented present Exelon performance. (Section 4OA3)

Inspection Report# : 2015002 *(pdf)*

Barrier Integrity

Emergency Preparedness

Occupational Radiation Safety

Significance: G Mar 31, 2016
Identified By: Self-Revealing
Item Type: NCV Non-Cited Violation
Entry Into A High Radiation Area Without Radiological Briefing and Complying With The RWP
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)

Inspection Report# : 2016001 *(pdf)*

Public Radiation Safety

Security

Although the Security Cornerstone is included in the Reactor Oversight Process assessment program, the Commission has decided that specific information related to findings and performance indicators pertaining to the Security Cornerstone will not be publicly available to ensure that security information is not provided to a possible adversary. Other than the fact that a finding or performance indicator is Green or Greater-Than-Green, security related information will not be displayed on the public web page. Therefore, the cover letters to security inspection reports may be viewed.

Miscellaneous

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