



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

July 1, 2013

Mr. Michael J. Pacilio
Senior Vice President, Exelon Generation Company, LLC
President and Chief Nuclear Officer, Exelon Nuclear
4300 Winfield Rd.
Warrenville, IL 60555

**SUBJECT: LIMERICK GENERATING STATION – NRC TRIENNIAL FIRE PROTECTION
INSPECTION REPORT 05000352/2013007 AND 05000353/2013007**

Dear Mr. Pacilio:

On May 24, 2013, the U.S. Nuclear Regulatory Commission (NRC) completed a triennial fire protection inspection at your Limerick Generating Station, Units 1 and 2. The enclosed inspection report documents the inspection results, which were discussed on May 24, 2013, with Mr. David Lewis and other members of your staff.

The inspection 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 also reviewed mitigation strategies for addressing large fires and explosions.

Based on the results of this inspection, two findings of very low safety significance (Green) were identified. One of these findings was also determined to be a violation of NRC requirements. However, because of its very low safety significance, and because it was entered into your corrective action program, the NRC is treating this finding as a non-cited violation (NCV) consistent with Section 2.3.2 of the NRC Enforcement Policy. If you contest the NCV in this report, you should provide a written 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 D.C. 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement; and the NRC Senior Resident Inspector at Limerick Generating Station.

In accordance with Title 10 of the Code of Federal Regulations Part 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 Public Document Room or from the Publicly Available Records (PARS) component of the NRC's document system (ADAMS).

M. Pacilio

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Sincerely,

/RA/

John F. Rogge, Chief
Engineering Branch 3
Division of Reactor Safety

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

Enclosure:
Inspection Report No(s). 05000352/2013007
and 05000353/2013007
w/Attachment: Supplemental Information

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M. Pacilio

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos.: 50-352, 50-353

License Nos.: NPF-39, NPF-85

Report Nos.: 05000352/2013007 and 05000353/2013007

Licensee: Exelon Generation Company, LLC

Facility: Limerick Generating Station, Units 1 & 2

Location: Sanatoga, PA 19464

Dates: May 6, 2013 through May 24, 2013

Inspectors: J. Lilliendahl, Reactor Inspector (Team Leader)
C. Cahill, Senior Reactor Analyst
R. Fuhrmeister, Senior Reactor Inspector
K. Young, Senior Reactor Inspector
J. Patel, Reactor Inspector

Approved by: John F. Rogge, Chief
Engineering Branch 3
Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000352/2013007, 05000353/2013007; 05/06/2013 – 05/24/2013; Limerick Generating Station, Units 1 and 2; Triennial Fire Protection Team Inspection.

The report covered a two-week triennial fire protection team inspection by specialist inspectors. Two findings of very low significance were identified. One of these findings was determined to be a non-cited violation. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process." Cross-cutting aspects associated with findings are determined using IMC 0310, "Components Within The Cross-Cutting Areas." Findings for which the significance determination process (SDP) does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

Cornerstone: Mitigating Systems

- Green. The NRC identified a Green, Non-Cited Violation (NCV) of License Condition 2.C.(3) of the Limerick Generating Station operating license, in that Exelon did not provide adequate procedural guidance for transporting the fire brigade and equipment to the spray pond pump house. Specifically, the existing fire procedure had incorrect guidance which would have needlessly delayed the fire brigade response. In response to this issue, Exelon initiated IR 1511763 and took prompt action to revise the affected procedures.

The finding was more than minor because it negatively affected the protection against external factors (fire) attribute of the mitigating systems cornerstone as related to the objective of ensuring the reliability and availability of the Essential Service Water pumps and Residual Heat Removal Service Water pumps. The finding was determined to be of very low safety significance (Green) in accordance with Section D of Exhibit 2 in Appendix A of IMC 0609, "The Significance Determination Process for Findings at Power," because the fire brigade's response time was mitigated by other defense-in-depth elements such as: area combustible loading limits were not exceeded, installed fire detection systems were functional, and alternate means of safe shutdown were not impacted. The finding did not have a cross-cutting aspect because it was not indicative of current performance. (Section 1R05.03)

- Green. The NRC identified a Green finding for the failure to establish a preventive maintenance strategy for fire safe shutdown transfer/isolation switches in accordance with the Exelon procedure ER-AA-200, Preventive Maintenance Program. As a result, Exelon failed to ensure that the local control circuits for several 4KV breakers would be isolated from the effects of fire damage. In response to this issue, Exelon generated IR 01515025, and initiated actions to evaluate the switches and implement appropriate maintenance programs.

This finding was more than minor because it was associated with the protection against external factors (fire) attribute of the mitigating systems cornerstone and affected the

cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, by failing to establish a preventive maintenance strategy for fire safe shutdown transfer/isolation switches, Exelon did not ensure that the local control circuits for several 4KV breakers would be isolated from the effects of fire damage. The team determined that the finding was of very low safety significance (Green), based on IMC 0609, Appendix F, "Fire Protection Significance Determination Process," task number 1.3.1 because Exelon had demonstrated a reasonable expectation of functionality for these switches by recently testing comparable switches. The finding did not have a cross-cutting aspect because it was not indicative of current performance. (Section 1R05.06)

Other Findings

A violation of very low safety significance that was identified by Exelon staff 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

Background

This report presents the results of a triennial fire protection inspection conducted in accordance with NRC Inspection Procedure (IP) 71111.05T, "Fire Protection." The objective of the inspection was to assess whether Exelon Generation Company, LLC has implemented an adequate fire protection program and that post-fire safe shutdown capabilities have been established and are being properly maintained at the Limerick Generating Station. The following fire areas (FAs) and/or fire zones (FZs) were selected for detailed review based on risk insights from the Limerick Generating Station Individual Plant Examination (IPE)/Individual Plant Examination of External Events (IPEEE).

- Fire Area 19 (4kV Switchgear Compartment, Unit 2, Division 1)
- Fire Area 25 (Auxiliary Equipment Room, Common)
- Fire Area 47E (RWCU Compartments and General Equipment Area, Unit 1)
- Fire Area 85 (D22 Diesel Generator Cell)

Inspection of these areas/zones fulfills the inspection procedure requirement to inspect a minimum of three samples.

The inspection team evaluated Exelon's fire protection program (FPP) against applicable requirements which included plant Technical Specifications, Operating License Condition 2.C.(3), NRC Safety Evaluations, 10 CFR 50.48, and Branch Technical Position (BTP) Chemical Engineering Branch 9.5-1. The team also reviewed related documents that included the Updated Final Safety Analysis Report (UFSAR), Section 9.5, the fire hazards analysis (FHA), and the post-fire safe shutdown analyses.

The team also evaluated six mitigating strategies for addressing large fires and explosions as required by Operating License Condition 2.C.(21) for Unit 1, Operating License Condition 2.C.(9) for Unit 2, and 10 CFR 50.54 (hh)(2). Inspection of these strategies fulfills the inspection procedure requirement to inspect a minimum of one sample.

Specific documents reviewed by the team are listed in the attachment.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R05 Fire Protection (IP 71111.05T)

.01 Protection of Safe Shutdown Capabilities

a. Inspection Scope

The team reviewed the FHA, safe shutdown analyses and supporting drawings and documentation to verify that safe shutdown capabilities were properly protected. The team ensured that applicable separation requirements of BTP 9.5-1 and Exelon's design

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and licensing bases were maintained for the credited safe shutdown equipment and their supporting power, control and instrumentation cables. This review included an assessment of the adequacy of the selected systems for reactivity control, reactor coolant makeup, reactor heat removal, process monitoring, and associated support system functions.

b. Findings

No findings were identified.

.02 Passive Fire Protection

a. Inspection Scope

The team walked down accessible portions of the selected fire areas to evaluate whether the material conditions of the fire area boundaries were adequate for the fire hazards in the area. The team compared the fire area boundaries, including walls, ceilings, floors, fire doors, fire dampers, penetration seals, electrical raceway and conduit fire barriers, and redundant equipment fire barriers to design and licensing basis requirements, industry standards, and the Limerick Generating Station FPP, as approved by the NRC, to identify any potential degradation or non-conformances.

The team reviewed selected engineering evaluations, installation and repair work orders, and qualification records for a sample of penetration seals to determine whether the fill material was properly installed and whether the as-left configuration satisfied design requirements for the intended fire rating. The team also reviewed similar records for selected fire protection wraps to verify whether the material and configuration was appropriate for the required fire rating and conformed to the engineering design.

The team also reviewed recent inspection and functional test records for fire dampers, and the inspection records for penetration seals and fire barriers, to verify whether the inspection and testing was adequately conducted, the acceptance criteria were met, and any potential performance degradation was identified. In addition, the team reviewed recent test results for the Halon and fire damper functionality tests for the areas protected to verify the testing was adequately conducted, the acceptance criteria were met, and any performance degradation was identified.

b. Findings

No findings were identified.

.03 Active Fire Protection

a. Inspection Scope

The team evaluated manual and automatic fire suppression and detection systems in the selected fire areas to determine whether they were installed, tested, maintained, and

operated in accordance with NRC requirements, National Fire Protection Association (NFPA) codes of record, and the Limerick Generating Station FPP, as approved by the NRC. The team also assessed whether the suppression systems capabilities were adequate to control and/or extinguish fires associated with the hazards in the selected areas.

The team reviewed the as-built capability of the fire water supply system to verify the design and licensing basis and NFPA code of record requirements were satisfied, and to assess whether those capabilities were adequate for the hazards involved. The team reviewed the fire water system hydraulic analyses to assess the adequacy of a single fire water pump to supply the largest single hydraulic load on the fire water system plus concurrent fire hose usage. The team evaluated the fire pump performance tests to assess the adequacy of the test acceptance criteria for pump minimum discharge pressure at the required flow rate, to verify the criteria was adequate to ensure that the design basis and hydraulic analysis requirements were satisfied. The team also evaluated the underground fire loop flow tests to verify the tests adequately demonstrated that the flow distribution circuits were able to meet design basis requirements. In addition, the team reviewed recent pump and loop flow test results to verify the testing was adequately conducted, the acceptance criteria were met, and any potential performance degradation was identified.

The team reviewed initial discharge testing, design specifications, vendor requirements, modifications and engineering evaluations, and routine functional testing for the Halon suppression systems for the areas protected. The team walked down accessible portions of the Halon system, including storage tanks and supply systems, to independently assess the material condition, operational lineup, and availability of the system. The team also reviewed and walked down the associated fire fighting strategies and Halon system operating procedures.

The team walked down accessible portions of the detection and water suppression systems in the selected areas and major portions of the fire water supply system, including motor and diesel driven fire pumps, interviewed system and program engineers, and reviewed selected corrective action program (CAP) documents [Issue Reports (IRs)] to independently assess the material condition of the systems and components. In addition, the team reviewed recent test results for the fire detection and suppression systems for the selected fire areas to verify the testing was adequately conducted, the acceptance criteria were met, and any performance degradation was identified.

The team assessed the fire brigade capabilities by reviewing training, qualification, and drill critique records. The team also reviewed Limerick Generating Station's fire fighting strategies (i.e., pre-fire plans) and smoke removal plans for the selected fire areas to determine if appropriate information was provided to fire brigade members and plant operators to identify safe shutdown equipment and instrumentation, and to facilitate suppression of a fire that could impact post-fire safe shutdown capability. The team independently inspected the fire brigade equipment, including personnel protective gear (e.g., turnout gear) and smoke removal equipment, to determine operational readiness

for fire fighting. In addition, the team reviewed Limerick Generating Station's fire brigade equipment inventory and inspection procedure and recent inspection and inventory results to verify adequate equipment was available, and any potential material deficiencies were identified.

b. Findings

Introduction: The team identified a finding of very low safety significance (Green) involving a violation of License Condition 2.C.(3) of the Limerick Generating Station operating license, in that Exelon did not provide adequate procedural guidance for transporting the fire brigade and equipment to the spray pond pump house. Specifically, the existing fire procedure had incorrect guidance which would have needlessly delayed the fire brigade response.

Description: The Limerick spray pond pump house is located approximately one half mile away and uphill from the normal protected area. Although there is no specific time requirement for a fire brigade to respond to a fire in any given area, BTP 9.5-1 section C.1.a.(2) states that fires should be promptly extinguished and BTP 9.5-1 section C.3.b states that the fire brigade should have adequate manual fire fighting capability for all areas of the plant containing structures, systems, and components (SSCs) important to safety. To provide prompt and adequate firefighting capability, BTP 9.5-1 section C.2 states that "administrative controls should . . . establish procedures to . . . control actions to be taken by the fire brigade . . . including selection and transportation of fire fighting equipment to the fire location."

The team reviewed SE-8, Fire Special Event Procedure, which is used by Exelon for fighting a fire at the spray pond pump house. Exelon recognized that a vehicle was necessary to provide transportation for the fire brigade and equipment from the normal protected area to the spray pond pump house. The team noted that SE-8 directed the fire brigade to use the "Haz Mat Vehicle" to drive to the spray pond pump house. The procedure stated that the Haz Mat Vehicle is normally parked in the lower parking lot, and in the event that it is not there, three phone extensions were provided for assistance in locating the vehicle. The inspectors determined that the Haz Mat Vehicle was a sport utility vehicle capable of transporting the fire bridge, but that it had been replaced several years ago with a pickup truck that is often unavailable. The team also noted that the phone extensions that were provided would not be helpful in acquiring transportation.

The team determined that the spray pond pump house would be a challenging location for a fire based on the need for a security escort, the distance to the spray pond pump house, and the elevation to the spray pond pump house. The team also noted the spray pond pump house has high risk significance since it provides the cooling from the ultimate heat sink for both units. The spray pond pump house is divided into two redundant areas. Either of the areas is capable of providing the cooling to both units, both areas have smoke detection systems, and the areas are divided by appropriate fire barriers. The team walked down the spray pond pump house and verified the very low fire loading, proper transient combustible controls, and adequate material condition of fire barriers and fire detection systems.

The team determined that based on the location of the spray pond pump house, transportation would be required for the fire brigade and that a reliable means of transportation had not been provided. In response to this issue, Exelon initiated IR 1511763 and took prompt action to revise SE-8. The revised version of SE-8 provides instructions for obtaining one of six vehicles including locations for keys. Exelon also revised RT-6-022-911-0, Inspection of Fire Brigade Lockers, to perform future periodic verifications that the vehicles remain available and appropriate for fire brigade use.

Analysis: The team determined that Exelon's failure to provide adequate procedural guidance for transporting the fire brigade and equipment to the spray pond pump house was a performance deficiency that was reasonably within Exelon's ability to foresee and prevent. The finding was more than minor because it negatively affected the protection against external factors (fire) attribute of the mitigating systems cornerstone as related to the objective of ensuring the reliability and availability of the Essential Service Water pumps and Residual Heat Removal Service Water pumps.

The finding was determined to be of very low safety significance (Green) in accordance with Section D of Exhibit 2 in Appendix A of IMC 0609, "The Significance Determination Process for Findings at Power," because the fire brigade's response time was mitigated by other defense-in-depth elements such as: area combustible loading limits were not exceeded, installed fire detection systems were functional, and alternate means of safe shutdown were not impacted.

The finding did not have a cross-cutting aspect because it was not indicative of current performance. The replacement of the Haz Mat Vehicle occurred more than three years ago.

Enforcement: License Condition 2.C.3 for Limerick Generating Station states in part that, "Exelon Generation Company shall implement and maintain in effect all provisions of the approved fire protection program as described in the Updated Final Safety Analysis Report." Appendix 9A of the UFSAR, Section 9A.3.1.1, Item 29 states that Limerick conforms to BTP 9.5-1 Section C.2. Section C.2 of BTP 9.5-1 states in part that "administrative controls should . . . establish procedures to . . . control actions to be taken by the fire brigade . . . including selection and transportation of fire fighting equipment to the fire location." Contrary to the above, until May 24, 2013, Exelon did not provide adequate procedural guidance for transporting the fire brigade and equipment to the spray pond pump house. Because the finding was of very low safety significance and has been entered into Limerick Generating Station's CAP (IR 1511763), this violation is being treated as a non-cited violation (NCV), consistent with Section 2.3.2 of the NRC Enforcement Policy. **NCV 05000352, 353/2013007-01, Inadequate Fire Brigade Transportation.**

.04 Protection From Damage From Fire Suppression Activities

a. Inspection Scope

The team walked down the selected fire areas and adjacent areas, and reviewed selected documents to determine whether redundant safe shutdown trains could be potentially damaged from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems. During the walkdowns, the team evaluated the adequacy and condition of floor drains, equipment elevations, and spray protection. Specifically, to determine whether a potential existed to damage redundant safe shutdown trains, the team evaluated whether:

- A fire in one of the selected fire areas would not release smoke, heat, or hot gases that could cause unintended activation of suppression systems in adjacent fire areas which could potentially damage all redundant safe shutdown trains; or
- A fire suppression system rupture, inadvertent actuation, or actuation due to a fire, in one of the selected fire areas, could not directly damage all redundant trains (e.g., sprinkler caused flooding of other than the locally affected train); and
- Adequate drainage was provided in areas protected by water suppression systems.

b. Findings

No findings were identified.

.05 Post-Fire Safe Shutdown Capability – Normal and Alternative

a. Inspection Scope

The team reviewed the safe shutdown analysis, operating procedures, piping and instrumentation drawings, electrical drawings, the UFSAR and other supporting documents for the selected fire areas to verify that the Exelon had properly identified the systems and components necessary to achieve and maintain safe shutdown conditions. The team assessed the adequacy of the selected systems and components for reactivity control, reactor coolant makeup, reactor heat removal, process monitoring, and support system functions. This review included verification that alternative post-fire shutdown could be performed both with and without the availability of offsite power. Plant walkdowns were also performed to verify that the plant configuration was consistent with that described in the safe shutdown and fire hazards analyses. The team verified that the systems and components credited for use during shutdown would remain free from fire damage.

The team verified that the training program for licensed and non-licensed operators included alternative shutdown capability. The team also verified that personnel required for safe shutdown using the normal or alternative shutdown systems and procedures are trained and available onsite at all times, exclusive of those assigned as fire brigade members.

The team reviewed the adequacy of procedures utilized for post-fire shutdown and performed an independent walk through of procedure steps to ensure the implementation and human factors adequacy of the procedures. The team also verified that the operators could be reasonably expected to perform specific actions within the time required to maintain plant parameters within specified limits.

Specific procedures reviewed for normal and alternative post-fire shutdown included the following:

- SE-1, Remote Shutdown;
- SE-1-1, Protected Depressurization Control (Long Term Operation);
- SE-1-2, Protected Power Source; and,
- SE-1-3, Protected Ventilation Source.

The team reviewed manual actions to ensure that they had been properly reviewed and approved and that the actions could be implemented in accordance with plant procedures in the time necessary to support the safe shutdown method for each selected fire area. The team also reviewed the periodic testing of the alternative shutdown transfer capability and instrumentation and control functions to ensure the tests are adequate to ensure the functionality of the alternative shutdown capability.

b. Findings

No findings were identified.

.06 Circuit Analysis

a. Inspection Scope

The team verified that Exelon performed a post-fire safe shutdown analysis for the selected fire areas and the analysis appropriately identified the SSCs important to achieving and maintaining safe shutdown. Additionally, the team verified that Exelon's analysis ensured that necessary electrical circuits were properly protected and that circuits that could adversely impact safe shutdown due to hot shorts or shorts to ground were identified, evaluated, and dispositioned to ensure spurious actuations would not prevent safe shutdown.

The team's review considered fire and cable attributes, cable routing, potential undesirable consequences and common power supply/bus concerns. Specific items included the credibility of the fire threat, cable insulation attributes, cable failure modes, and actuations resulting in flow diversion or loss of coolant events.

The team also reviewed cable raceway drawings and/or cable routing databases for a sample of components required for post-fire safe shutdown to verify that cables were routed as described in the safe-shutdown analysis. The team also reviewed equipment important to safe shutdown, but not part of the success path, to verify that Exelon had

taken appropriate actions in accordance with the design and licensing basis and NRC Regulatory Guide 1.189, Revision 2.

Circuit analysis was performed for the following components:

- 0BP548, ESW Pump B
- 10A11605, 4KV Breaker for D124 480V Safeguard Load Center Transformer
- 1BP202, 1B RHR Pump
- HV-51-1F004B, RHR Pump suction from suppression chamber
- HV-51-1F008, Shutdown Cooling Isolation Valve
- HV-51-2F016B, Drywell Spray Line Outboard Containment Isolation Valve
- HV-55-2F002, Steam Supply Line Inboard Containment Isolation Valve
- LI-55-141, RSP Suppression Pool Level
- PI-42-1R011, RSP Reactor Pressure Indicator

The team reviewed a sample of circuit breaker coordination studies to ensure equipment needed to conduct post-fire safe shutdown activities would not be impacted due to a lack of coordination that could result in a common power supply or common bus concern.

The team verified that the transfer of control from the control room to the alternative shutdown location(s) would not be affected by fire-induced circuit faults (e.g., by the provision of separate fuses and power supplies for alternative shutdown control circuits).

b. Findings

Introduction: The team identified a finding of very low safety significance (Green) for the failure to establish a preventive maintenance strategy for fire safe shutdown transfer/isolation switches. As a result, Exelon failed to ensure that the local control circuits for several 4KV breakers would be isolated from the effects of fire damage.

Description: Branch Technical Position BTP 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," Position C.5.b.(1)(a) states "Fire Protection features should be provided ... limiting fire damage so that: (a) One train of system necessary to achieve and maintain hot shutdown conditions from either control room or emergency control station(s) is free of fire damage." For certain fire scenarios, Exelon credits transfer/isolation switches at the 4KV safeguard buses to ensure one safe shutdown train remains free of fire damage.

The inspectors noted that in the event of fire in the Auxiliary Equipment Room, breakers for 4KV safeguard bus D12 are locally operated at the 4KV bus as directed by procedure 1FSSG-3025, "Fire Safe Shutdown Guide Fire Area 025." Alignment for local operations of these breakers is accomplished via transfer/isolation switches. The team requested the maintenance history for transfer/isolation switch 129-11605/CSL at the 4KV breaker in D12 which provides power to the D124 safeguard load center. The D124 safeguard load center is credited with providing power for support equipment for the Residual Heat Removal system during a fire in the Auxiliary Equipment Room. The team determined that this switch was not in a maintenance program and had not been tested since

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original installation. The inspectors also verified that this switch was not operated or tested as part of routine breaker maintenance. Exelon performed an initial extent of condition review and determined that the fire safe shutdown transfer/isolation switches at Limerick are in maintenance programs with the exception of six switches located at 4KV buses.

ER-AA-200, Preventive Maintenance Program, requires plant SSCs to be maintained at an appropriate state of reliability based on risk significance. This is accomplished by establishing component classifications, developing Performance Centered Maintenance templates that provide standardized generic preventive maintenance tasks and frequencies, and developing maintenance strategies. According to ER-AA-200, the regulatory consequence of a potential failure of the fire safe shutdown transfer/isolation switches requires that a maintenance strategy be developed for these switches. Because these switches were not in the maintenance program, there was no maintenance strategy developed for them so no periodic testing was assigned to the switches. By not testing these switches, there are failure mechanisms that are not monitored, such as a deck of contacts failing to rotate properly.

In response to this issue, Exelon generated IR 01515025, and initiated actions to evaluate the switches and implement appropriate maintenance programs. Based on recent modifications to two emergency diesel generator (EDG) output breakers which successfully tested switches of the same design and age, Exelon determined that there was a reasonable expectation of functionality for the remaining six switches. The inspectors reviewed Exelon's initial extent of condition and functionality determination and agreed with the conclusions.

Analysis: The failure to establish a preventive maintenance strategy for safe shutdown transfer/isolation switches was a performance deficiency that was reasonably within Exelon's ability to foresee and prevent. Specifically, Exelon failed to meet the requirements of its Preventive Maintenance Program as documented in procedure ER-AA-200. This performance deficiency was more than minor because it was associated with the protection against external factors (fire) attribute of the mitigating systems cornerstone and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, by failing to establish a preventive maintenance strategy for fire safe shutdown transfer/isolation switches, Exelon did not ensure that the local control circuits for several 4KV breakers would be isolated from the effects of fire damage. The team determined that the finding was of very low safety significance (Green) based on IMC 0609, Appendix F, "Fire Protection Significance Determination Process," task number 1.3.1 because Exelon had demonstrated a reasonable expectation of functionality for these switches by recently testing comparable switches.

The finding did not have a cross-cutting aspect because it was not indicative of current performance. The failure to assign a maintenance strategy to these switches occurred more than three years ago.

Enforcement: This finding does not involve enforcement action because no violation of a regulatory requirement was identified. Exelon entered this performance deficiency into the CAP (IR 01515025). Because this finding does not involve a violation and is of very low safety significance (Green), it is identified as **FIN 05000352, 353/2013007-02, Failure to Establish Preventive Maintenance for Safe Shutdown Transfer/Isolation Switches.**

.07 Communications

a. Inspection Scope

The team reviewed safe shutdown procedures, the safe shutdown analysis, and associated documents to verify an adequate method of communications would be available to plant operators following a fire. During this review the team considered the effects of ambient noise levels, clarity of reception, reliability, and coverage patterns. The team also inspected the designated emergency storage lockers to verify the availability of portable radios for the fire brigade and for plant operators. The team also verified that communications equipment such as repeaters and transmitters would not be affected by a fire.

b. Findings

No findings were identified.

.08 Emergency Lighting

a. Inspection Scope

The team observed the placement and coverage area of eight-hour emergency lights throughout the selected fire areas to evaluate their adequacy for illuminating access and egress pathways and any equipment requiring local operation or instrumentation monitoring for post-fire safe shutdown. The team also verified that the battery power supplies were rated for at least an eight-hour capacity. Preventive maintenance procedures, the vendor manual, completed surveillance tests, and battery replacement practices were also reviewed to verify that the emergency lighting was being maintained consistent with the manufacturer's recommendations and in a manner that would ensure reliable operation.

b. Findings

No findings were identified.

.09 Cold Shutdown Repairs

a. Inspection Scope

The team verified that Exelon had dedicated repair procedures, equipment, and materials to accomplish repairs of components required for cold shutdown which might be damaged by the fire to ensure cold shutdown could be achieved within the time frames specified in their design and licensing bases. The team verified that the repair equipment, components, tools, and materials (e.g., pre-cut cables with prepared attachment lugs) were available and accessible on site.

b. Findings

No findings were identified.

.10 Compensatory Measures

a. Inspection Scope

The team verified that compensatory measures were in place for out-of-service, degraded or inoperable fire protection and post-fire safe shutdown equipment, systems, or features (e.g., detection and suppression systems and equipment, passive fire barriers, or pumps, valves or electrical devices providing safe shutdown functions or capabilities). The team also verified that the short term compensatory measures compensated for the degraded function or feature until appropriate corrective action could be taken and that Exelon was effective in returning the equipment to service in a reasonable period of time.

b. Findings

No findings were identified.

.11 Fire Protection Program Changes

a. Inspection Scope

The team reviewed recent changes to the approved fire protection program to verify that the changes did not constitute an adverse effect on the ability to safely shutdown.

b. Findings

No findings were identified.

.12 Control of Transient Combustibles and Ignition Sources

a. Inspection Scope

The team reviewed Exelon's procedures and programs for the control of ignition sources and transient combustibles to assess their effectiveness in preventing fires and in controlling combustible loading within limits established in the FHA. A sample of hot work and transient combustible control permits were also reviewed. The team performed plant walkdowns to verify that transient combustibles and ignition sources were being implemented in accordance with the administrative controls.

b. Findings

No findings were identified.

.13 Large Fires and Explosions Mitigation Strategies

a. Inspection Scope

The team conducted a review of selected mitigation strategies intended to maintain or restore core cooling, containment integrity, and spent fuel pool cooling capabilities under the circumstances associated with the loss of large areas of the plant due to explosions and/or fires. The team assessed whether Exelon continued to meet the requirements of 10 CFR 50.54(hh)(2). The team reviewed the following mitigation strategies:

- TSG-4.1, Attachment 1, Internal Spent Fuel Pool Makeup Strategy;
- TSG-4.1, Attachment 2, External Spent Fuel Pool Makeup Strategy;
- TSG-4.1, Attachment 3, Spent Fuel Pool Spray Cooling Strategy;
- TSG-4.1, Attachment 4, External Spent Fuel Pool Spray Cooling Strategy;
- TSG-4.1, Attachment 8, Local Operation of RCIC without DC Div 1 and Div 3 DC Power; and
- TSG-4.1, Attachment 10, Alternate Source of DC Power Using Portable Cart (00-G973).

The team's review included: a detailed assessment of the procedural guidance; a walkdown of the strategy with trained operators to assess the feasibility of the strategy and operator familiarity; maintenance and surveillance testing of all designated strategy equipment; and an inventory check of strategy equipment to ensure the appropriateness of equipment storage and availability. The team also evaluated the adequacy of corrective actions associated with issues identified during previous inspections in this area.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES [OA]

4OA2 Identification and Resolution of Problems

.01 Corrective Actions for Fire Protection Deficiencies

a. Inspection Scope

The team reviewed a sample of condition reports associated with fire protection program and post-fire safe shutdown issues to determine whether Limerick Generating Station was appropriately identifying, characterizing, and correcting problems in these areas, and to assess whether the planned or completed corrective actions were appropriate. The condition reports reviewed are listed in the attachment.

b. Findings

No findings were identified.

4OA3 Follow-up of Events and Notices of Enforcement Discretion (71153 – 1 Sample)

.1 (Closed) Licensee Event Report (LER) 05000352/2012-009-00: Unanalyzed Condition Due to a Fire Safe Shutdown Analysis Error

On October 3, 2012, Limerick Unit 2 identified that a D22 EDG output breaker control cable could fail due to postulated fire damage in fire area 67W. The D22 EDG is credited for fire safe shutdown (FSSD) in area 67W. This event was caused by an error during the FSSD Analysis in 1985. An hourly fire watch was performed for this area until the EDG output breaker was rewired on November 3, 2012.

The enforcement aspects of this issue are discussed in Section 4OA7. The inspectors did not identify any other issues during the review of the LER. This LER is closed.

4OA6 Meetings, Including Exit

Exit Meeting Summary

The team presented their preliminary inspection results to Mr. D. Lewis, Plant Manager, and other members of the site staff at an exit meeting on May 24, 2013. No proprietary information was included in this inspection report.

4OA7 Licensee-Identified Violations

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

- License Condition 2.C.(3) for Limerick Generating Station Unit 1 and Unit 2 states that, “Exelon Nuclear shall implement and maintain in effect all provisions of the approved Fire Protection Program as described in the UFSAR.” Appendix 9A, Section 9A.3.1.1, Item 72 states, “Fire damage should be limited so that one train of systems necessary to achieve and maintain hot shutdown conditions . . . is free of fire damage.” Contrary to the above, until November 3, 2012, the D22 output breaker control circuit would potentially be damaged by a fire in area 67W and the D22 output breaker was credited for safe shutdown in area 67W. Exelon entered this issue into the CAP (IR 1422043). The issue was more than minor because it was associated with the protection against external events (fire) attribute of the mitigating systems cornerstone and it 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 that the finding was of very low safety significance (Green), based on IMC 0609, Appendix F, “Fire Protection Significance Determination Process (SDP),” Phase 2 screening, task number 2.3.5 because the cable was routed in conduit predominately through a transient combustible free zone. Additionally, the cable was not routed near a credible fire ignition source in the fire area.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

D. Lewis, Plant Manager
J. Brittian, Fire Protection Engineer
F. Burzynski, Site Fire Marshall
M. DiRado, Manager of Engineering Programs
B. Gulbrandson, Plant Equipment Operator
R. Harding, Regulatory Assurance
C. Pragman, Corporate Fire Protection Engineer
M. Taylor, Corporate Fire Protection Engineer
C. Shimer, ERIN PRA Engineer
L. Stanford, Operator Training Instructor
J. Thoryk, Fire Protection System Engineer

NRC

J. Rogge, Chief, Engineering Branch 3, Division of Reactor Safety
C. Cahill, Senior Reactor Analyst, Division of Reactor Safety
E. DiPaolo, Senior Resident Inspector Site Name, Insert

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000352,353/2013007-01	NCV	Inadequate Fire Brigade Transportation (Section 1R05.03)
05000352,353/2013007-02	NCV	Failure to Establish Preventive Maintenance for Safe Shutdown Transfer/Isolation Switches (Section 1R05.06)

LIST OF DOCUMENTS REVIEWED

Fire Protection Licensing Documents

Technical Requirements Manual, Unit 1, Rev. 28
Technical Requirements Manual, Unit 2, Rev. 27
Limerick Generating Station Units 1 and 2 Fire Protection Evaluation Report, Rev. 4
NUREG-0991, SER, Supplement No. 2, Limerick Generating Station, Unit 1 and 2
NUREG-0991, SER, Supplement No. 4, Limerick Generating Station, Unit 1 and 2
NUREG-0991, SER, Supplement No. 8, Limerick Generating Station, Unit 1 and 2
UFSAR Sections 3.3, 3.5, 9.4.6, 9.5.1, 9.5.2, Appendix 9A
Unit 1 Technical Specifications, through Amendment 199
Unit 2 Technical Specifications, through Amendment 160

Design Basis Documents

L-S-51, Fire Protection System, Rev. 6
L-T-10, Fire Safe Shutdown, Rev. 11

Design Changes

LG-10-00424, Fire Protection Document Inconsistencies, Rev. 0
LG-12-00425, EDG Output Breaker Routed through Credited Fire Area, Rev. 0

Calculations/Engineering Evaluation Reports

6900E.21, Multiple High Impedance Fault Study, Rev. 14
6900E.23, Safeguard 208/120V AC Panel Circuit Breaker Coordination, Rev. 1
A1361986, Review of ELU Battery Replacement Options, ELU Recovery Plan, 11/6/07
A1483451, Create New ELU Battery Replacement PM, 2/19/09
A-E90-VC-00001, Sheet 1, Containment Overpressurization Evaluation, Rev. 0
F-0SC-198-00052, 748-14, Metal Clad Fire Wall Penetration Barrier Fire Testing, Rev. 4
F-0SC-198-00060, 1064-10, Silicone Foam Fire Barriers in Gypsum Board Stud Partitions,
Dated 6/20/79
LEAF-0003, IPEEE Fire Risk Operator Actions, Rev. 1
LEAF-0039, Qualification of 3 Hour Fire Barrier System 47-03 in Accordance with GL 86-10,
Supplement 1, Rev. 0
LF-0011, Hose Station Hydraulic Analysis, Rev. 1
LF-0016-019, Fire Area 019 Fire Safe Shutdown Analysis, Rev. 3
LF-0016-025, Fire Area 025 Fire Safe Shutdown Analysis, Rev. 3
LF-0016-047E, Fire Area 047E Fire Safe Shutdown Analysis, Rev. 1
LF-0016-085, Fire Area 085 Fire Safe Shutdown Analysis, Rev. 1
M-22-05, Fire Protection Piping Pressure Losses, Rev. 3
M-22-09, Fire Protection Hydraulic Calculation, Rev. 3
NE-0355, Specification for MSO Assessment at Limerick Generating Station, Rev. 0
NE-294, Specification for Post-Fire Safe Shutdown Program Requirements at Limerick
Generating Station, Rev. 4

RT-6-022-253-0, Test Results Evaluation Backup Diesel Driven Fire Pump (10-P402)
Characteristic Curve Test, Rev. 14

Safe and Alternate Shutdown Component Information Sheet, Component ID 0BP548
Safe and Alternate Shutdown Component Information Sheet, Component ID 1BP202
Safe and Alternate Shutdown Component Information Sheet, Component ID HV-51-1F004B
Safe and Alternate Shutdown Component Information Sheet, Component ID HV-51-1F008
Safe and Alternate Shutdown Component Information Sheet, Component ID HV-51-2F016B
Safe and Alternate Shutdown Component Information Sheet, Component ID HV-55-2F002
Safe and Alternate Shutdown Component Information Sheet, Component ID LI-55-141
Safe and Alternate Shutdown Component Information Sheet, Component ID PI-42-1R011

Procedures

CC-AA-209, Fire Protection Program Configuration Change Review, Rev. 3
CC-AA-211, Fire Protection Program, Rev. 4
CC-AA-211-1001, Generic Letter 86-10 Evaluations, Rev. 0
ER-AA-200, Preventive Maintenance Program, Rev. 0
M-C-700-231, ITE (Brown Boveri) K-Line Static Circuit Breaker Calibration, Rev. 9
M-C-700-232, Testing and Control of 600 Volt Class Molded Case Circuit Breakers and
Setpoints, Rev. 16
OP-AA-201-001, Fire Marshal Tours, Rev. 5
OP-AA-201-002, Fire Event Reports, Rev. 5
OP-AA-201-003, Fire Drill Performance, Rev. 12
OP-AA-201-004, Fire Prevention for Hot Work, Rev. 9
OP-AA-201-005, Fire Brigade Qualification, Rev. 8
OP-AA-201-006, Control of Temporary Heat Sources, Rev. 5
OP-AA-201-008, Pre-Fire Plan Manual, Rev. 3
OP-AA-201-009, Control of Transient Combustible Material, Rev. 11
OP-AA-201-011, 1011, Fire Marshal Certification Process, Rev. 1
RT-5-022-801, Backup Diesel Driven Fire Pump (10P402) Fuel Analysis, Rev. 8
RT-6-000-900-0, Inspection Of Safe Shutdown Equipment, Rev. 30
RT-6-022-911-0, Inspection of Fire Brigade Lockers, Rev. 11
RT-6-022-994-0, Verification of Operator Qualifications (Fire Brigade), Rev. 18
S20.10.B, Ordering & Accepting Delivery Fuel Oil, Rev. 24
ST-5-022-800-0, FSWS Diesel Driven Fire Pump Fuel Analysis, Rev. 8
SY-LG-1016, Limerick Watch Standing Practices, Rev. 0

Operations Procedures

1FSSG-3019, Fire Area 019 Fire Guide, Rev. 2
1FSSG-3025, Fire Area 025 Fire Guide, Rev. 16
1FSSG-3047E, Fire Area 047E Fire Guide, Rev. 19
1FSSG-3085, Fire Area 085 Fire Guide, Rev. 0
2FSSG-2035, Fire Area 025 Fire Guide, Rev. 15
2FSSG-3019, Fire Area 019 Fire Guide, Rev. 6
2FSSG-3047E, Fire Area 047E Fire Guide, Rev. 6
2FSSG-3085, Fire Area 085 Fire Guide, Rev. 4

ARC-MCR-00 H6L, Spray Pond Pump Structure, Rev. 2
ARC-MCR-006 J3L, CONT EL 289 PGCC I, Rev. 6
S88.1.A, Remote Shutdown Panel Controls, Rev. 21
SE-1, Remote Shutdown, Rev. 68
SE-1-1, Protected Depressurization Control (Long Term Operation), Rev. 13
SE-1-2, Protected Power Source, Rev. 12
SE-1-3, Protected Ventilation Source, Rev. 15
SE-8, Fire, Rev. 47
SE-8, Fire, Rev. 48

Operating Experience Evaluations

AR00534749, IN 2006-22 ULSD Fuel for Small Diesel & Auxiliary Boiler Usage, Dated 12/22/06
AR00547835, OPEX Evaluation for IN 2006-22, Dated 11/23/06
AR00898494, IN 2009-02 Biodiesel Impact on Diesel Engine Performance, Dated 6/23/09
AR01001039, IN 2009-29, Potential Failure of Water Supply Pumps to Automatically Start Due to a Fire, Dated 2/3/10
AR01018785, Limerick Fire Pump Controller OPEX Review NRC IN 2009-29, Dated 1/20/10
IR00827817, OPEX Evaluation for NRC Information Regarding Biodiesel Fuel for Fleet, Dated 5/29/09

Large Fires and Explosions Mitigation Strategies Documents

ON-125, Loss of Fuel Pool Cooling, Rev. 12
SE-23, Security Threat, Rev. 23
TSG-4.1, Attachment 1, Internal Spent Fuel Pool Makeup Strategy, Rev. 13
TSG-4.1, Attachment 2, External Spent Fuel Pool Makeup Strategy, Rev. 13
TSG-4.1, Attachment 3, Spent Fuel Pool Spray Cooling Strategy, Rev. 13
TSG-4.1, Attachment 4, External Spent Fuel Pool Spray Cooling Strategy, Rev. 13
TSG-4.1, Attachment 8, Local Operation of RCIC without DC Div 1 and Div 3 DC Power, Rev. 13
TSG-4.1, Attachment 10, Alternate Source of DC Power Using Portable Cart (00-G973), Rev. 13
TSG-4.1, Limerick Generating Station Operational Contingency Guidelines, Rev. 13
TSG-4.2, Extreme Damage Mitigation Guideline for Loss of a Large Area of the Plant, Rev. 3

Completed Tests/Surveillances

1P-13.5, Fire Protection-Halon System (Pre-operational Test), Completed 10/22/84
2P-13.5, Fire Protection-Halon System (Pre-operational Test), Completed 1/15/88
RT-6-000-900-0, Inspection of Safe Shutdown Equipment, completed February 2, 2013
RT-6-022-252-0, Backup Diesel Driven Fire Pump (10-P402) Flow Test, Rev. 22, Completed 3/1/13, 3/23/13
RT-6-022-253-0, Backup Diesel Driven Fire Pump (10-P402) Characteristic Curve Test, Rev. 14, Completed 3/12/10, 10/7/11
RT-6-022-911-0, Inspection of Fire Brigade Locker, Rev. 10, Completed 1/18/13
RT-6-108-300-0, Fire Safe Shutdown Emergency Lighting Unit (ELU) Operability Verification, Rev. 18, Completed 12/21/12

RT-6-108-300-1, Fire Safe Shutdown Emergency Lighting Unit (ELU) Operability Verification, Rev. 19, Completed 2/6/13

RT-6-108-300-2, Fire Safe Shutdown Emergency Lighting Unit (ELU) Operability Verification, Rev. 19, Completed 1/28/13

ST-2-022-323-0, Halon System Operability Verification for RSP Area, Rev. 6, Completed 3/7/13

ST-2-022-323-1, Halon System Operability Verification for U1 Auxiliary Equipment Room, Rev. 5, Completed 10/15/11

ST-2-022-323-2, Halon System Flow Operability Verification for U2 Auxiliary Equipment Room, Rev. 5, Completed 10/15/11

ST-2-022-601-2, Fire Detection-Fire Detection Instrumentation Channel Functional Test & Supervisory Circuit Operability Test, Zones 7, 10A, 10B, 11, 16, 17, 18, and 19, Rev. 12, Completed 8/16/12

ST-2-022-611-1, Fire Detection-Smoke Detection Instrumentation Channel Functional Test & Supervisory Circuit Operability Test, Zone 47A, Rev. 23, Completed 5/19/11

ST-2-022-615-0, Fire Detection Instrumentation Channel Functional Test, FA 25, Rev. 11, Completed 9/8/11

ST-2-022-616-0, Fire Detection-Smoke Detection Instrumentation Channel Functional Test, FA 25, Rev. 14, Completed 11/20/12

ST-2-022-617-1, Fire Detection-Smoke Detection Instrumentation Channel Functional Test, FA 25, Rev. 17, Completed 3/8/13

ST-2-022-618-2, Fire Detection-Smoke Detection Instrumentation Channel Functional Test, FA 25, Rev. 17, Completed 8/30/11

ST-2-022-621-2, Fire Detection-Fire Detection Instrumentation Channel Functional Test & Supervisory Circuit Operability Test, Zone 85, Rev. 14, Completed 11/15/12

ST-2-022-625-2, Fire Detection-Fire Detection Flame Detector Functional Test, Zone 85, Rev. 0, Completed 2/26/13

ST-2-022-633-1, Fire Detection-Smoke Detection Instrumentation Channel Functional Test, Zones 47B, 47C, 47D, Rev. 16, Completed 1/10/11

ST-2-022-648-1, Fire Detection-Heat Detection Instrumentation Channel Functional Test & Supervisory Circuit Operability Test, Zones 47A, Rev. 15, Completed 2/3/12

ST-2-022-651-1, Fire Detection-Smoke Detection Instrumentation Channel Functional Test & Supervisory Circuit Operability Test, FA 25, Rev. 11, Completed 3/4/13

ST-2-022-651-2, Fire Detection-Smoke Detection Instrumentation Channel Functional Test & Supervisory Circuit Operability Test, FA 25, Rev. 10, Completed 2/28/13

ST-2-088-324-1, Remote Shutdown System Division 2 RHR Operability Test, Completed 4/11/12

ST-4-022-353-0, Remote Shutdown Panel Room Halon System Main Cylinder Inventory, Rev. 5, Completed 1/16/13

ST-4-022-353-1, Unit 1 Main Bank Halon System Inventory, Rev. 7, Completed 12/6/12

ST-4-022-353-2, Unit 2 Main Bank Halon System Inventory, Rev. 6, Completed 12/5/12

ST-4-022-920-1, Fire Rated Assembly Inspection, Rev. 4, Completed 3/11/12

ST-4-022-922-0, Unit 0 & 1 TRM Fire Rated Penetration Seal Sample Visual Inspection, Rev. 4, Completed 12/19-20/11, 3/20/12, and 4/22/12

ST-4-022-922-0, Unit 0 & 1 TRM Fire Rated Penetration Seal Sample Visual Inspection, Rev. 4, Completed 12/11/12

ST-4-022-922-0, Unit 0 & 1 TRM Fire Rated Penetration Seal Sample Visual Inspection, Rev. 4, Completed 1/8/13

ST-6-022-250-0, Underground Fire Main Flow Test, Rev. 7, Completed 12/28/10, 2/5/12

ST-6-022-251-0, Motor Driven Fire Pump Flow Test, Rev. 22, Completed 2/28/13, 3/19/13
ST-6-022-252-0, Diesel Driven Fire Pump Flow Test, Rev. 31, Completed 3/8/13, 3/23/13
ST-6-022-253-0, Diesel Driven Fire Pump Characteristic Curve Test, Rev. 10, Completed 7/13/12
ST-6-022-253-0A, Diesel Driven Fire Pump Characteristic Curve Test, Rev. 9, Completed 1/4/11,
3/27/12
ST-6-022-254-0, Motor Driven Fire Pump Characteristic Curve Test, Rev. 6, Completed 8/21/10,
3/28/12
ST-6-022-600-0, Fire Suppression Water System (FSWS) Flush, Rev. 14, Completed 9/25/11,
11/12/12
ST-6-088-301-1, Suppression Pool Spray Remote Shutdown System Valve Test, Completed
10/2/12
ST-6-088-321-1, Remote Shutdown System D11 Safeguard Breaker Operability Test, Completed
2/29/12
ST-6-088-322-1, Remote Shutdown System D12 Safeguard Breaker Operability Test, Completed
3/9/12
ST-6-088-323-2, Remote Shutdown System D23 Safeguard Breaker Operability Test, Completed
4/2/13

Quality Assurance Audits and Self Assessments

Focus Area Self-Assessment, Limerick Triennial Fire Protection Preparatory (AR 1451904)
Self-Assessment, Dated 3/6/13
NOSA-LIM-10-10(AR1101369), Fire Protection Audit Report Dated 9/23/10
NOSA-LIM-11-13(AR1270792), Fire Protection Increased Frequency Audit Report, Dated
10/21/11
NOSA-LIM-12-10(AR1400690), Fire Protection Audit Report Dated 10/11/12

System Health Reports

Fire Protection, Unit 00, Common Unit, 1stQ13
Fire Protection, Unit 00, Common Unit, 4thQ12
Fire Protection, Unit 1, 1stQ13
Fire Protection, Unit 1, 4thQ12
Fire Protection, Unit 2, 1stQ13
Fire Protection, Unit 2, 4thQ12
Fire Protection/Fire Safe Shutdown Program, 1stQ13
Fire Protection/Fire Safe Shutdown Program, 4thQ12

Drawings and Wiring Diagrams

737-D-VC-00042, Shts. 1–38, 1 Hour Darmatt KM-1, Barrier 47-03 Arrangement, Rev. 0
8031-FSC-198-19-3, Penetration Seal Typical Installation, Penetration thru Fire Wall Less than
Prescribed Seal Thickness, Rev. 4L
8031-FSC-198-22-8, Penetration Seal Typical Installation, Cable Tray thru Fire Barrier, Rev. 6
8031-FSC-198-3485-3, Penetration Seal Design-441-E019, Rev. 2
8031-FSC-198-3486-4, Penetration Seal Design-441-E021, Rev. 3
8031-M-1-C61-1050-E-001, Sht. 1, Remote Shutdown System, Rev. 65

8031-M-1-C61-1050-E-002, Sht. 2, Remote Shutdown System, Rev. 40
 8031-M-1-C61-1050-E-003, Sht. 3, Remote Shutdown System, Rev. 51
 8031-M-1-C61-1050-E-006, Sht. 6, Remote Shutdown System, Rev. 31
 8031-M-1-C61-1050-E-007, Sht. 7, Remote Shutdown System, Rev. 21
 8031-M-1-C61-1050-E-010, Sht. 10, Remote Shutdown System, Rev. 19
 8031-M-1-C61-1050-E-011, Sht. 11, Remote Shutdown System, Rev. 24
 8031-NE-75-1, Sht. 53 & 54, Penetration Seal Typical Installation, Penetrating item Thru fire Wall
 Less Than Prescribed Seal Thickness, Rev. 0
 A-307, Sht. 2, Air/Steam/Fire & Water Boundaries, Floor Plan EL. 217'-0", Unit 2, Rev. 12
 A-308, Sht. 2, Air/Steam/Fire & Water Boundaries, Floor Plan EL. 253'-0", Unit 2, Rev. 3
 A-309, Sht. 1, Air/Steam/Fire & Water Boundaries, Floor Plan EL. 283'-0" & 269'-0", U1, Rev. 20
 A-309, Sht. 2, Air/Steam/Fire & Water Boundaries, Floor Plan EL. 283'-0" & 269'-0", U2, Rev. 5
 E-1, Sht. 1, Single Line Diagram Station, Rev. 28
 E11-1040-E-064, Sht. 1, HV-051-1F004B 1B RHR Pump Suction PCIV Suction B, Rev. 0
 E11-1040-E-066, Sht. 1, HV-051-1F006B 1B RHR PP Clg Suct Vlv Suction B, Rev. 0
 E11-1040-E-070, Sht. 1, HV-051-1F024B 1B RHR PP Full flow Test Return Vlv, Rev. 0
 E11-1040-E-072, Sht. 1, HV-051-1F027B 1B RHR Supp Pool Spray Line PCIV, Rev. 1
 E11-1040-E-080, Sht. 1, Elementary Diagram HV-051-2F016B, Rev. 0
 E-1417, Sht. 1, LGS Raceway Encapsulation List, Rev. 1
 E-15, Sht. 1, Single Line Meter & Relay Diagram 4 KV Safeguard Power System Unit 1, Rev. 30
 E-16, Sht. 1, Single Line Meter & Relay Diagram 4 KV Safeguard Power System Unit 2, Rev. 26
 E-163, Sht. 1, Schematic Diagram Safeguard L.C. XFMR Bkrs., 4KV – 1 & 2 Units, Rev. 18
 E-163, Sht. 2, Schematic Diagram Safeguard L.C. XFMR Bkrs., 4KV – 1 & 2 Units, Rev. 3
 E-164, Sht. 3, Schematic Diagram Safeguard Buses D11, D12, D13, D14, D21, D22, D23 & D24
 Generator Bkrs 4KV – 1 & 2 Units, Rev. 9
 E-30, Sht. 3, Single Line Diagram Instrumentation AC System Unit 1, Rev. 26
 E-321, Sht. 1, Schematic Diagram Emergency Service Water Pumps, Rev. 14
 E-321, Sht. 3, Schematic Diagram Emergency Service Water Pumps, Rev. 19
 E-33, Sht. 1, Single Line Meter & Relay Diagram 125/250VDC System Unit 1, Rev. 45
 E-33, Sht. 2, Single Line Meter & Relay Diagram 125/250VDC System Unit 1, Rev. 46
 E-360, Sht. 1, Schematic Diagram RHR Pumps 1 & 2 Units, Rev. 20
 E-360, Sht. 4, Schematic Diagram RHR Pumps 1 & 2 Units, Rev. 17
 E-649, Sht. 3, Schematic Diagram Safety System Annunciator Auxiliary Relay Circuits, Rev. 23
 E-684, Sht. 1, NSSS Systems Miscellaneous Instrumentation – 1 & 2 Units, Rev. 27
 FSSA-3000, Sht. 3, Fire Safe Shutdown Area, 217'-0", Rev. 0
 FSSA-3000, Sht. 4, Fire Safe Shutdown Area, 239'-0", 269'-0", 253'-0", 254'-0", Rev. 0
 FSSA-3000, Sht. 5, Fire Safe Shutdown Area, 269'-0" & 283'-0", Rev. 0
 FSSA-3000, Sht. 9, Diesel Generator Enclosure 217'-0", Rev. 0
 M-1-B21-1090-E-017, Sht. 1, Elementary Diagram Nuclear Steam Supply Shutoff Sys, Rev. 33
 M-1-B21-1090-E-018, Sht. 2, Elementary Diagram Nuclear Steam Supply Shutoff Sys, Rev. 3
 M-1-E11-1040-E-007, Sht. 1, Elementary Diagram Residual Heat Removal System, Rev. 29
 M-1-E11-1040-E-021, Sht. 1, Elementary Diagram Residual Heat Removal System, Rev. 21
 M-1-E11-1040-E-039, Sht. 1, Elementary Diagram Residual Heat Removal System, Rev. 10
 M-1-E11-1040-E-051, Sht. 1, Elementary Diagram Residual Heat Removal System, Rev. 16
 M-1-E41-1040-E-017, Sht. 1, Elementary Diagram HPCI System, Rev. 24
 M-1-E41-1040-E-019, Sht. 1, Elementary Diagram HPCI System, Rev. 18
 M-1-E41-1040-E-022, Sht. 1, Elementary Diagram HPCI System, Rev. 8

M-1-E41-1040-E-026, Sht. 2, Elementary Diagram HPCI System, Rev. 3
M-602, Sht. 2, Control Room Arrangement El. 269'-0", Rev. 19
M-603, Sht. 2, Auxiliary Equipment Room Arrangement El. 289'-0", Rev. 9
M-888, Sht. 83, Loop Diagram Suppression Pool Level, Rev. 0

Piping and Instrumentation Diagrams

8031-C-11, Sht. 1, Yardwork, Fire System, Rev. 50
8031-C-11, Sht. 2, Yardwork, Fire System, Rev. 3
8031-M-11, Sht. 1, Emergency Service Water, Rev. 73
8031-M-12, Sht. 1, Residual Heat Removal Service Water, Rev. 74
8031-M-22, Sht. 1, Fire Protection, Unit 1, Unit 2 and Common, Rev. 68
8031-M-22, Sht. 10, Fire Protection, Unit 1, Unit 2 and Common, Rev. 62
8031-M-22, Sht. 4, Fire Protection, Unit 2, Rev. 67
8031-M-22, Sht. 5, Fire Protection, Unit 1, Unit 2 and Common, Rev. 64
8031-M-22, Sht. 7, Fire Protection (Halon), Unit 1, Unit 2 and Common, Rev. 19
8031-M-22, Sht. 9, Fire Protection (Backup), Unit 1 and Common, Rev. 68
8031-M-42, Sht. 1, Nuclear Boiler Vessel Instrumentation, Rev. 41
8031-M-51, Sht. 1, Residual Heat Removal Unit 1, Rev. 65
8031-M-51, Sht. 2, Residual Heat Removal Unit 1, Rev. 66
8031-M-51, Sht. 3, Residual Heat Removal Unit 1, Rev. 67
8031-M-51, Sht. 4, Residual Heat Removal Unit 1, Rev. 66
8031-M-51, Sht. 7, Residual Heat Removal Unit 2, Rev. 21
8031-M-55, Sht. 1, High Pressure Coolant Injection Unit 1, Rev. 58
8031-M-55, Sht. 2, High Pressure Coolant Injection Unit 2, Rev. 57

Vendor Manuals

Emergency Lighting Unit, Exide Lightguard, Models B200, B200OT
Emergency Lighting Unit, Exide Lightguard, Series F100, F100RT, F100OT, & Upgrades

Pre-Fire Plans

F-A-429, Common, Unit 2 D21 Emergency 4kV Switchgear Room 429, Rev. 10
F-A-542, Common, Auxiliary Equipment Room, Rev. 11
F-D-315A, D21 Diesel Generator and Fuel Oil/Lube Oil Tank, Rooms 315A & 316A, Rev. 7
F-D-315B, D22 Diesel Generator and Fuel Oil-Lube Oil Tank, Rooms 315B & 316B, Rev. 8
F-R-500, Unit 1, SBLC & General Equipment Areas, RWCU Compartments FPCW Area, & Main
Steam Tunnel, Rooms 500 - 511, Rev. 16
F-S-001, Pre-Fire Plan Strategy for Spray Pond Pump Structure Western Half (FA 122), Rev. 12
F-S-002, Pre-Fire Plan Strategy for Spray Pond Pump Structure Eastern Half (FA 123), Rev. 10

Fire Brigade Documents

Control Room Staffing Log for 5/1-10/13 (Fire Brigade Staffing and Post-Fire Safe Shutdown
Operator Staffing)
Fire Drill Spread Sheet (for Fire Brigade), Dated 5/21/13

Fire Protection Impairment Log, Dated 5/7/13

Learning Management System, Fire Brigade Qualifications, Dated 5/21/13

Fire Drills and Critiques

R1232817, "A" Crew, Backshift, Announced 3Q12, Bus Room, U1, Dated 9/28/12

R1240384, "B" Crew, Backshift, Unannounced, 4Q12, Cable Spreading Room, U2, Dated 10/11/12

R1248130, "B" Crew, Backshift, Unannounced, 1Q13, 480 VAC Load Center, U2, Dated 1/25/13

R1248675, "C" Crew, Dayshift, Announced 1Q13, 480 VAC Load Center, U2, Dated 3/3/13

R1248677, "E" Crew, Dayshift, Announced 1Q13, 480 VAC Load Center, U2, Dated 2/8/13

Fire Brigade Training

FBP01, Introduction Orientation

FBP02, Protective Clothing

FBP04, Fire Behavior & Essentials

FBP05, Ventilation

FBP07, Hose & Hose Streams

FBP09, Extinguishers & Agents

FBP11, Tactics & Strategy

FBP15, Pre-fire Plans

SCBA, Self Contained Breathing Apparatus (SCBA)(A Review for the Fire Brigade)

Operator Safe Shutdown Training

LEOJPM223, Start 0B SEW Pump from D12 Switchgear, Rev. 0

LEOJPM243, Alignment of Equipment for ADS Operation, Rev. 2

LEOJPM244, Open RCIC Inboard Isolation MOV (HV-049-1005) Using Emergency AC, Rev. 1

LEOJPM245, Start 0C ESW Pump from D23 Switchgear for SE-1, Rev. 2

LGSOPS0022, Fire Protection System, Rev. 0

LGSOPS2008, Fire Safe Shutdown Guides (FSSG), Rev. 1

LLOJPM0205, Place RCIC in Service at the RSP, Rev. 6

LLOJPM0206, Place the A RHR Loop in Suppression Pool Cooling from the Remote Shutdown Panel, Rev. 7

LLOJPM0207, Start 0B ESW Pump from D12 Switchgear for SE-6, Rev. 11

LLOJPM0221, Initiate Reactor Scram and MSIV Closure for Remote Shutdown, Rev. 5

LLOJPM0223, ESW Valve Closure for Remote Shutdown, (SE-1), Rev. 6

LLOJPM0225, SE-1-1, Connect Instrument Air to Instrument Gas For remote Shutdown, Rev. 7

LLOJPM0227, Open RCIC Inboard Isolation MOV Using Emergency AC Power, Rev. 4

LLOJPM0239, Protected Depressurization Control, Rev. 6

LLOJPM0243, Start RHRSW from the RSP, Rev. 4

LLOJPM0244, Open HV-59-29B ADS Nitrogen Gas Bottle Pressure to Operate A/C/N MSRVS (SE-1-1), Rev. 3

LLOJPM0250, Supply Emergency Power to RCIC Inboard Isolation Valve, Rev. 10

LLOJPM0258, Start 0C ESW Pump from D23 Switchboard for SE-1, Rev. 4

LLOJPM0261, Initiate Reactor Scram and MSIV Closure from AER Using SE-1, Rev. 11

A-10

LLOJPM0521, 1FSSG-3025 – Place the D12 Diesel Generator in Service Following A Fire in the Auxiliary Equipment Room (Time Critical), Rev. 1
LLOJPM0524, 1FSSG-3025 – Energize D12 Bus Following A Fire in the Auxiliary Equipment Room (Time Critical), Rev. 0
LLOJPM0711, Determination of Equipment Availability for Fire Safe Shutdown, Rev. 0
LLOJPM0721, Determination of Equipment Availability for Fire Safe Shutdown, Rev. 0
LLOJPM0758, Alignment of Equipment for Shutdown Cooling, Rev. 1
LLOJPM114P, Spray Pond Pump House HVAC, Rev. 3
LLOT0733, Fire Protection System, Rev. 0
LLOT0735, Remote Shutdown Panel, Rev. 13

Hot Work and Ignition Source Permits

C0245199, Service Water Pipe Tunnel, Install 2" New Drain Assembly
C0245200, Service Water Pipe Tunnel, Install 3" New Drain Assembly
C0246128, Core Spray ESW Piping, Prep. 4" HBC-243-03 W-704
C0246131, RHR Pump & Heat Exchanger, System-011-Q, Prep 4" HBC-248-02 W-701
C0246378, U/2, HPCI Pump Room, 177' Elev.

Transient Combustible Evaluations

A1849066-64, Unit 1 and Unit 2 Reactor Building, Dated 1/14/13
A1849066-68, Spray Pond Pump House, Dated 1/17/13
A1849066-69, Unit 2 Reactor Enclosure, Dated 1/24/13
A1849066-72, Unit 2 Turbine Building, Dated 2/2/13
A1849066-78, Unit 1 Reactor Enclosure, Dated 3/3/13

Miscellaneous Documents

GL 86-10 Evaluation for IR 1511337, Assignment 3, Functionality Review for Halon Suppression System with Removable Floor Panels Installed but not fully Fastened
IN 2006-22, New Ultra-Low-Sulfur Diesel Fuel Oil Could Adversely Impact Diesel Engine Performance
IN 2009-02, Biodiesel in Fuel Oil Could Adversely Impact Diesel Performance
IN 2009-29, Potential Failure of Water Supply Pumps to Automatically Start Due to a Fire
LG-PRA-021.01, Fire PRA Summary and Quantification Notebook, Rev. 0
LG-PRA-021.02, LGS Fire PRA Plant Partitioning and Fire Ignition Frequency Notebook, Rev. 1
LG-PRA-021.04, LGS Fire PRA HRA Notebook, Rev. 0
LG-PRA-021.06, LGS Fire PRA Multi-Compartment Analysis Notebook, Rev. 0
LG-PRA-021.07, LGS Fire PRA Exposed Structural Steel Analysis Notebook, Rev. 0
Memo of Understanding, Emergency Response Support (Offsite Responders) for Limerick Generating Station, Dated 1/7/13
Memo of Understanding, Emergency Response Support (Offsite Responders) for Limerick Generating Station, Dated 1/24/13

Issue Reports

0567707	1073719	1483106	1516251*
1026375	1074128	1507917*	1516254*
1026647	1074131	1511087*	1516349*
1027384	1074132	1511333*	1516385*
1042127	1074139	1511337*	1516605*
1042162	1115989	1511763*	1517015*
1069300	1194683	1512528*	1517231*
1069527	1232817	1512580*	1517237*
1073033	1304334	1512881	1517247*
1073177	1316126	1513019	1517261*
1073485	1453268	1515025*	1517272*
1073587	1453697	1516231*	1517485*

* NRC identified during this inspection.

Work Orders

C0241006
R0502053
R1184277
R1218744
R1223593

LIST OF ACRONYMS

CFR	Code of Federal Regulations
DRS	Division of Reactor Safety
ADAMS	Agencywide Documents Access and Management System
BTP	Branch Technical Position
CAP	Corrective Action Program
CFR	Code of Federal Regulations
DC	Direct Current
ECR	Engineering Change Request
EDG	Emergency Diesel Generator
Elev.	Elevation
ESW	Emergency Service Water
FA	Fire Area
FHA	Fire Hazards Analysis
FIN	Finding
FPP	Fire Protection Program
FSSD	Fire Safe Shutdown
FZ	Fire Zone

GL	Generic Letter
IMC	[NRC] Inspection Manual Chapter
IN	[NRC] Information Notice
IP	[NRC] Inspection Procedure
IPE	Individual Plant Examination
IPEEE	Individual Plant Examination of External Events
IR	[NRC] Inspection Report
IR	Issue Report
KV	kilovolt
LER	Licensee Event Report
MSO	Multiple Spurious Operation
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
PARS	Publicly Available Records System
RHR	Residual Heat Removal
RSP	Remote Shutdown Panel
SDP	[NRC] Significance Determination Process
SER	[NRC] Safety Evaluation Report
UFSAR	Updated Final Safety Analysis Report