



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION I  
475 ALLENDALE ROAD  
KING OF PRUSSIA, PA 19406-1415

June 14, 2010

Mr. Michael Pacilio  
Senior Vice President, Exelon Generating 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 05000352/2010006 AND 05000353/2010006

Dear Mr. Pacilio:

On May 28, 2010, the U.S. Nuclear Regulatory Commission (NRC) completed a triennial fire protection inspection at Limerick Generating Station. The inspectors also reviewed mitigation strategies for addressing large fires and explosions. The enclosed inspection report documents the inspection results, which were discussed on May 28, 2010, with Mr. William Maguire 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.

Based on the results of this inspection, no findings of significance were identified.

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).

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Sincerely,

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. 05000352/2010006 and 05000353/2010006  
w/Attachment: Supplemental Information

cc: Distribution via ListServ

June 10, 2010

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

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REPORT 05000352/2010006 AND 05000353/2010006

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/RA/

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DATE	6/10/10	6/14/10	6/10/10	6/14/10		

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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.: 05000352/2010006 and 05000353/2010006

Licensee: Exelon Generation Company, LLC

Facility: Limerick Generating Station, Units 1 & 2

Location: Sanatoga, PA 19464

Dates: May 10 through May 28, 2010

Inspectors: K. Young, Senior Reactor Inspector, Division of Reactor Safety (DRS  
(Team Leader)  
W. Cook, Senior Reactor Analyst, DRS  
R. Fuhrmeister, Senior Reactor Inspector, DRS  
J. Rady, Reactor Inspector, DRS  
N. Lafferty, Reactor Inspector (Observer), Division of Reactor Projects  
(DRP)  
S. Philpott, Project Manager, Licensing Process Branch (Observer),  
Office of Nuclear Reactor Regulation (NRR)

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

## SUMMARY OF FINDINGS

IR 05000352/2010006, 05000353/2010006; 05/10/2010 – 05/28/2010; Exelon Generation Company, LLC; Limerick Generating Station: Triennial Fire Protection Team Inspection.

The report covered a two-week triennial fire protection team inspection by Region I specialist inspectors. 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**

No findings of significance were identified.

### Other Findings

None

## 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 (LGS). The following fire areas (FAs) were selected for detailed review based on risk insights from the LGS Individual Plant Examination (IPE)/Individual Plant Examination of External Events (IPEEE):

- FA 2;
- FA 7;
- FA 22; and
- FA 67.

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

The inspection team evaluated the licensee's fire protection program (FPP) against applicable requirements which included plant Technical Specifications, Operating License Condition 2.C.(3), NRC Safety Evaluations Reports (SERs), 10 CFR 50.48, and Branch Technical Position (BTP) Chemical Engineering Branch (CMEB) 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 analysis.

The team also evaluated licensee mitigating strategies for addressing large fires and explosions as required by Operating License Conditions 2.C.(21) for Unit 1 and 2.C.(9) for Unit 2.

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 Post-Fire Safe Shutdown From Outside Main Control Room (Alternative Shutdown) and Normal Shutdown

a. Inspection Scope

Methodology

The team reviewed the safe shutdown analysis, operating procedures, piping and instrumentation drawings (P&IDs), electrical drawings, the UFSAR and other supporting documents to verify that hot and cold shutdown could be achieved and maintained for fires that rely on shutdown from outside the control room. This review included verification that shutdown from outside the control room 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. These inspection activities focused on ensuring the adequacy of systems selected for reactivity control, reactor coolant makeup, reactor decay heat removal, process monitoring instrumentation, and support systems functions. The team verified that the systems and components credited for use during this shutdown method would remain free from fire damage. 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).

Similarly, for fire areas that utilize shutdown from the control room, the team also verified that the shutdown methodology properly identified the components and systems necessary to achieve and maintain safe shutdown conditions.

Operational Implementation

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 safe 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. Time critical operator actions, which were verified, included restoration of alternating current (AC) electrical power, establishing the remote shutdown and local shutdown panels, establishing reactor coolant makeup, and establishing decay heat removal.

Specific procedures reviewed for alternative shutdown, including shutdown from outside the control room included the following:

- SE-1, Remote Shutdown, Revision 63;
- 1FSSG-3002, 13 kV Switchgear Area (U-1), Revision 6;
- 1FSSG-3002, 13 kV Switchgear Area (U-2), Revision 5;
- 2FSSG-2007, Corridor (4 kV), Revision 6;
- 2FSSG-3022, Fire Area 22 Fire Guide, Revision 7;

- 2FSSG-3067E, Safeguard System Access Area East, Revision 4; and
- 2FSSG-3067W, Safeguard System Access Area East, Revision 4.

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 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 of significance were identified.

.02 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 separation requirements of the UFSAR 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.

The team reviewed the licensee'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 protective features were being properly maintained and administrative controls were being implemented.

b. Findings

No findings of significance were identified.

.03 Passive Fire Protection

a. Inspection Scope

The team walked down accessible portions of the selected fire areas to observe material condition and the adequacy of design of fire area boundaries (including walls, fire doors, and fire dampers), and electrical raceway fire barriers to ensure they were appropriate for the fire hazards in the area.

The team reviewed installation/repair and qualification records for a sample of penetration seals to ensure the fill material was of the appropriate fire rating and that the installation met the engineering design. The team also reviewed similar records for the

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fire protection wraps to ensure the material was of an appropriate fire rating and that the installation met the engineering design.

b. Findings

No findings of significance were identified.

.04 Active Fire Protection

a. Inspection Scope

The team reviewed the design, maintenance, testing, and operation of the fire detection and suppression systems in the selected plant fire areas. This included verification that the manual and automatic detection and suppression systems were installed, tested, and maintained in accordance with the National Fire Protection Association (NFPA) code of record, or NRC approved deviations, and that each suppression system would control and/or extinguish fires associated with the hazards in the selected areas. A review of the design capability of the suppression agent delivery systems were verified to meet the code requirements for the hazards involved. The team also performed a walkdown of accessible portions of the detection and suppression systems in the selected areas as well as a walkdown of major system support equipment in other areas (e.g. fire pumps, Halon, and/or carbon dioxide (CO<sub>2</sub>) storage tanks and supply system) to assess the material condition of the systems and components.

The team reviewed electric and diesel fire pump flow and pressure tests to ensure that the pumps were meeting their design requirements. The team also reviewed the fire main loop flow tests to ensure that the flow distribution circuits were able to meet the design requirements.

The team assessed the fire brigade capabilities by reviewing training, qualification, and drill critique records. The team also reviewed 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. In addition, the team inspected the fire brigade equipment (including smoke removal equipment) to determine operational readiness for fire fighting.

b. Findings

No findings of significance were identified.

.05 Protection From Damage From Fire Suppression Activities

a. Inspection Scope

The team performed document reviews and plant walkdowns to verify that redundant trains of systems required for hot shutdown are not subject to damage from fire

suppression activities or from the rupture or inadvertent operation of fire suppression systems. Specifically, the team verified that:

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

b. Findings

No findings of significance were identified.

.06 Alternative Shutdown Capability

a. Inspection Scope

Alternative shutdown capability is discussed in section 1R05.01 of this report.

.07 Circuit Analysis

a. Inspection Scope

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

The team's review considered fire and cable attributes, 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 for a sample of components required for post-fire safe shutdown to verify that cables were routed as described in the cable routing matrices.

Cable failure modes were reviewed for the following components:

- HV-11-071, Loop 'A' Equipment Header Return Valve;
- HV-49-2F008, Steam Supply Line Outboard Containment Isolation Valve;
- HV-51-1F014A, RHR Heat Exchanger Tube Inlet Valve;
- HV-51-1F047A, Heat Exchanger Inlet Valve (from Pump Discharge);

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- HV-51-003A, Heat Exchanger Shell Side Discharge Valve;
- HV-51-2F021A, Drywell Spray Line Inboard Containment Isolation Valve;
- LI-42-2R010, Reactor Vessel Water Level Indicator; and,
- OAP506, Loop 'A' RHRSW Pump.

The team reviewed 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. The team confirmed that coordination studies had addressed multiple faults due to fire. Additionally, the team reviewed a sample of circuit breaker maintenance records to verify that circuit breakers for components required for post-fire safe shutdown were properly maintained in accordance with procedural requirements.

b. Findings

No findings of significance were identified.

.08 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 of significance were identified.

.09 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 and/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 in a manner that would ensure reliable operation.

## Findings

No findings of significance were identified.

### .10 Cold Shutdown Repairs

#### a. Inspection Scope

The team verified that the licensee 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 of significance were identified.

### .11 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 the licensee was effective in returning the equipment to service in a reasonable period of time.

#### b. Findings

No findings of significance were identified.

### .12 Large Fires and Explosions Mitigation Strategies

#### a. Inspection Scope

The team reviewed the licensee's preparedness to handle large fires or explosions by reviewing four mitigating strategies to verify they continue to meet operating license conditions 2.C.(21) for Unit 1 and 2.C.(9) for Unit 2 by determining that:

- Procedures are being maintained and adequate;
- Equipment is properly staged and is being maintained and tested; and,
- Station personnel are knowledgeable and can implement the procedures.

b. Findings

No findings of significance were identified.

4. **OTHER ACTIVITIES [OA]**

4OA2 Identification and Resolution of Problems

.01 Corrective Actions for Fire Protection Deficiencies

a. Inspection Scope

The team verified that the licensee was identifying fire protection and post-fire safe shutdown issues at an appropriate threshold and entering them into the corrective action program. The team also reviewed a sample of selected issues to verify that the licensee had taken or planned appropriate corrective actions.

Additionally, the team reviewed several Issue Reports (IRs) associated with the licensee's review of circuits for multiple spurious operations (MSO) scenarios that uses the guidance provided in NEI 00-01, Revision 2, "Guidance for Post-Fire Safe Shutdown Circuit Analysis" and Regulatory Guide 1.189, Revision 2, "Fire Protection for Nuclear Power Plants."

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

b. Findings

No findings of significance were identified.

The team determined that the licensee had identified several MSO scenarios for further review. The licensee placed the identified scenarios into their corrective action program and implemented alternate compensatory measures prior to the May 2, 2010.

4OA6 Meetings, Including Exit

Exit Meeting Summary

The team presented their preliminary inspection results to Mr. William Maguire, Site Vice President – Limerick Generating Station, and other members of the site staff at an exit meeting on May 28, 2010. No proprietary information was included in this inspection report.

ATTACHMENT: SUPPLEMENTAL INFORMATION

**ATTACHMENT**

**SUPPLEMENTAL INFORMATION**

**KEY POINTS OF CONTACT**

Licensee Personnel

M. Ajmara, Nuclear Oversight  
S. Bobyock, Engineering Programs Manager  
J. Brittain, Fire Protection Engineer  
F. Burzynski, Fire Marshal  
E. Callan, Plant Manager  
F. Coffey, Operations Support Manager  
G. Curtain, Fire Protection Engineer  
P. Gardner, Director Operations  
R. Harding, Regulatory Assurance  
J. Hunter, Manager Reg. Assurance  
S. Johnson, Assistant Plant Manager  
C. Markle, Assessment Specialist  
W. Maguire, Site Vice President - LGS  
T. Moore, Director of Engineering  
C. Pragman, Exelon Corporate Fire Protection  
R. Rhode, Operator Instructor  
C. Rich, Director Work Management  
S. Soerun, Safe Shutdown Engineer  
M. Taylor, Exelon Corporate Fire Protection

NRC

J. Rogge, Chief, Engineering Branch 3, Division of Reactor Safety  
W. Cook, Senior Reactor Analyst, Division of Reactor Safety  
E. DiPaolo, Senior Resident Inspector, Limerick Generating Station  
P. McKenna, Resident Inspector (Acting), Limerick Generating Station

**LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

Opened

NONE

Opened and Closed

NONE

Closed

NONE

Discussed

NONE

## LIST OF DOCUMENTS REVIEWED

### Fire Protection Licensing Documents

LGS, SER (NUREG 0991, 8/1983)  
LGS, SSER 2  
LGS, SSER 4  
LGS UFSAR, Section 9.5, Other Auxiliary Systems, Fire Protection  
LGS UFSAR, Section 9A, Fire Protection Evaluation Report

### Design Basis Documents

L-S-01B, Miscellaneous DC Systems, Rev. 2  
L-S-51, Fire Protection System, Rev. 6  
L-T-10, Fire Safe Shutdown, Rev. 11

### Calculations/Engineering Evaluation Reports

Comparison of Performance for Marauder 95 gpm vs 125 gpm, 1-1/2" 100 Feet Rubber Lined Hose, July 2, 1997  
Comparison of Performance for Marauder 95 gpm vs 125 gpm, 1-3/4" 100 Feet Rubber Lined Hose, July 2, 1997  
EAS-26-0489, Limerick Generating Station Units 1 and 2 Safe Shutdown Analyses for Fire Events, 5/89  
ECR LG 97-00334, Hose Reels Missing Flow Orifices  
ECR LG-97-00855, Hose Reels Missing Flow Orifices  
ECR LG 98-00131, Modification P00736-2: Upgrade Thermolag / 1 Hr Rating, Rev. 2  
ECR LG 99-00484, Modification P00736S-1 & 2, New Sprinkler Systems (T-Lag Reduction)  
ECR LG 09-00317, Extent of Condition from IR 843591  
ECR LG 09-00369, CDBI FASA 15-Minute Ops Action in Flood PRA Not Achievable  
LEAF-0011, Fire Area 2, 13.2 kV Switchgear Room, Localized Suppression, Rev. 0  
LEAF-0021, Qualification of 3 Hour Darmatt KM-1 Fire Barrier System 02-01 in Accordance with NCR Generic Letter 86-10, Supplement 1, Rev. 0  
LF-0011, Hose Station Hydraulic Analysis  
LF-0016-002, Fire Area 002 Fire Safe Shutdown Analysis, Rev. 1  
LF-0016-007, Fire Area 007 Fire Safe Shutdown Analysis, Rev. 0  
LF-0016-022, Fire Area 022 Fire Safe Shutdown Analysis, Rev. 1  
LF-0016-067W, Fire Area 067W Fire Safe Shutdown Analysis, Rev. 0  
LF-0016-067E, Fire Area 067E Fire Safe Shutdown Analysis, Rev. 0  
LT-0021, Hydraulic Analysis of the Limerick WP-124 Suppression System, Rev. 0  
NE-C-420-1, Determination of 4kv Switchgear Motor Protection, Rev. 7

NE-294, Specification for Post-Fire Safe Shutdown Program Requirement for Limerick, Rev. 3  
6900E.02, Safeguard Auxiliary System – Phase Overcurrent Relay Selection and Coord., Rev. 8  
6900E.05B, LGS Units 1 & 2 Determination of 4kv Switchgear Motor Protection, Rev. 7  
6900E.11, LGS Units 1 & 2 Load Center Circuit Breakers – Overcurrent Trip Devices, Rev. 8

Procedures

CC-AA-209, Fire Protection Program Configuration Change Review, Rev. 1  
OP-AA-201-002, Fire Reports, Rev. 4  
OP-AA-201-003, Fire Drill Performance, Rev. 11  
OP-AA-201-004, Fire Prevention for Hot Work, Rev. 8  
OP-AA-201-005, Fire Brigade Qualification, Rev. 9  
OP-AA-201-007, Fire Protection Impairment Control, Rev. 6  
OP-AA-201-009, Control of Transient Combustible Material, Rev. 10  
ST-6-022-951-0, Fire Hose Station Visual Inspection, Rev. 2

Operations Procedures

ARC-MCR-006 E4U, REAC I EL 253 NEUT MONITOR, Rev. 2  
ARC-MCR-006 J2L, CONT EL 269 Control Room, Rev. 3  
ARC-MCR-006 J2U, CONT EL 217 SWGR I & II, Rev. 1  
GP-3, Normal Plant Shutdown, Rev. 130  
GP-3 Appendix 1, Establishing Cold Shutdown, Rev. 39  
SE-1, Remote Shutdown, Rev. 63  
SE-1-1, Protected Depressurization Control (Long Term Operation), Rev. 12  
SE-1-2, Protected Power Source, Rev. 11  
SE-1-3, Protected Ventilation Source, Rev. 15  
SE-8, Fire, Rev. 37  
T-100, LGS Trip Procedure, SCRAM/SCRAM Recovery, Rev. 17  
1FSSG-3002, 13 KV Switchgear Area, U-1, Rev. 6  
2FSSG-3002, 13 KV Switchgear Area, U-2, Rev. 5  
2FSSG-3007, Corridor (4 KV), Rev. 6  
1FSSG-3022, Fire Area 022 Fire Guide, Rev. 7  
2FSSG-3067E, Safeguard System Access Area East, Rev. 4  
2FSSG-3037W, Safeguard System Access Area West, Rev. 4

Large Fires and Explosions Mitigation Strategies Documents

LS-AA-126-1005, Dated May 9, 2010.  
RT-6-00-913-0, Rev. 5  
SE-8, Rev. 36  
SE-23, Rev. 20  
S100.1.A, Rev. 6  
T-216, Rev. 16  
TSG-4.1, Rev. 8  
TSG-4.2, Rev. 2



Completed Tests/Surveillances

- RT-6-000-900-0, Inspection of Safe Shutdown Equipment, Rev. 23, Completed 1/24/10
- RT-6-108-300-0, Fire Safe Shutdown Emergency Lighting Unit (ELU) Operability Verification, Rev. 16, Completed 3/20/10
- RT-6-108-300-1, Fire Safe Shutdown Emergency Lighting Unit (ELU) Operability Verification, Rev. 17, Completed 4/1/10
- RT-6-108-300-2, Fire Safe Shutdown Emergency Lighting Unit (ELU) Operability Verification, Rev. 17, Completed 1/23/10
- ST-2-088-320-0, Remote Shutdown System ESW and RHRSW Operability Test, Rev. 15, Completed 08/05/09
- ST-2-088-320-1, Remote Shutdown System RCIC Operability Test, Rev. 11, Completed 12/04/08
- ST-2-088-321-1, Remote Shutdown System DIV 1 RHR Operability Test, Rev. 18, Completed 12/29/08
- ST-2-088-321-2, Remote Shutdown System Div. 1 RHR Operability Test, Rev. 14, Completed 07/14/09
- ST-2-088-324-1, Remote Shutdown System Div 2 RHR Operability Test, Rev. 7, Completed 11/14/08
- ST-2-088-401-1, Remote Shutdown/Accident Monitoring Drywell Temperature and Suppression Chamber Temperature Calibration (TE-057-122, TE-057-125, TT-057-122, TI-057-122, TR-057-122), Rev. 12, Completed 08/03/09
- ST-2-088-402-1, Remote Shutdown Monitoring – RHR System Flow Calibration (FT-051-1N001, FY-051-1K011, FI-051-1R005), Rev. 12, Completed 08/12/09
- ST-2-088-403-1, Remote Shutdown Monitoring, RCIC System Flow Calibration (FT-049-1N003, FY-049-1K001, FI-049-1R001-1), Rev. 9, Completed 06/02/08
- ST-2-088-405-0, Remote Shutdown Monitoring – RHR Service Water Pumps Loop 'A' Calibration (PT-012-001A, PI-012-001A-1, PI-012-001A-2, PI-012-001A-3), Rev. 15, Completed 10/14/09
- ST-2-088-410-1, Remote Shutdown System – Reactor Vessel Water Level Calibration (LT-042-1N010, LI-042-1R010), Rev. 10, Completed 03/14/08, 03/22/10
- ST-2-088-410-2, Remote Shutdown System – Reactor Vessel Water Level Calibration (LT-042-2N010, LI-042-2R010), Rev. 4, Completed 03/23/09
- ST-4-022-920-2, Fire Rated Assembly Inspection, Completed April 5, 2009
- ST-4-022-921-1, Fire Damper Inspection/Functional Test, Completed April 3, 2009
- ST-4-022-922-2, Fire Penetration Test Sample Visual Inspection, Completed April 1, 2009
- ST-4-022-924-2, Encapsulated Raceway Inspection, Completed November 21, 2008
- ST-4-041-470-1, Cyclic Test Of Main Steam Safety Relief Valve Solenoid and Air Operator Assemblies, Rev. 3, Completed 04/06/10
- ST-6-088-301-1, Suppression Pool Spray Remote Shutdown System Valve Test, Rev. 0, Completed 12/30/08
- ST-6-088-321-1, Remote Shutdown System D11 Safeguard Breaker Operability Test, Rev. 3, Completed 03/31/10
- 1P-13.2, Preoperational Test Procedure, Fire Protection CO2 System, Startup Subsystem 13C, Rev. 0

Quality Assurance (QA) Audits and Self Assessments

FASA Self-Assessment Report, Limerick Triennial Fire Protection Inspection, 2010  
 NOSA-LIM-08-09, Limerick Fire Protection Program Audit Report, 6/9-20/08

System Health Reports

4<sup>th</sup> Quarter 2009, LGS Fire Protection Fire Safe Shutdown Program  
 1<sup>st</sup> Quarter 2010, LGS Fire Protection Fire Safe Shutdown Program

Drawings and Wiring Diagrams

E-15, Single Line Meter and Relay Diagram 4kv Safeguard Power System 1 Unit, Rev. 29  
 E-27, Single Line Meter and Relay Diag. MCC Load Tab. D214-R-G1 and D224-R-G1  
 Reactor Area, Rev. 31  
 E-30, Sht. 3, Single Line Diagram Instrumentation AC System 1 Unit, Rev. 26  
 E-31, Sht. 3, Single Line Diagram Instrumentation AC System 2 Unit, Rev. 19  
 E-33, Sht. 1, Single Line Meter and Relay Diagram 125/250VDC System Unit 1, Rev. 44  
 E-34, Sht. 1, Single Line Meter and Relay Diagram 125/250VDC System 2 Unit, Rev. 37  
  
 E-55, Sht. 1, Single Line Meter and Relay Diagram MCC Load Tabulation D114-R-G, D124-R-G  
 Reactor Area Safeguard MCC, Rev. 51  
 E-67, Sht. 1, Single Line Meter and Relay Diagram MCC Load Tabulation D214-R-G and  
 D224-R-G Reactor Area, Rev. 44  
 E-68, Sht. 1, Single Line Meter and Relay Diagram MCC Load Tabulation D214-R-C, D224-R-C,  
 D234-E & D244-R-E Reactor Area, Rev. 38  
 E-102, Sht. 1, Schematic Block Diagram RHR System 1 & 2 Units, Rev. 22  
 E-102, Sht. 2, Schematic Block Diagram RHR System 1 & 2 Units, Rev. 33  
 E-105, Sht. 2, Schematic Block Diagram RCIC System 1 & 2 Units, Rev. 28  
 E-115, Sht. 1, Schematic Block Diagram PGCC SITS Cables 1 & 2 Units and Common, Rev. 34  
 E-115, Sht. 2, Schematic Block Diagram PGCC SITS Cables 1 & 2 Units and Common, Rev. 14  
 E-115, Sht. 3, Schematic Block Diagram PGCC SITS Cables 1 & 2 Units and Common, Rev. 27  
 E-115, Sht. 4, Schematic Block Diagram PGCC SITS Cables 1 & 2 Units and Common, Rev. 21  
 E-115, Sht. 5, Schematic Block Diagram PGCC SITS Cables 1 & 2 Units and Common, Rev. 32  
 E-115, Sht. 6, Schematic Block Diagram PGCC SITS Cables 1 & 2 Units and Common, Rev. 20  
 E-325, Sht. 1, Schematic Diagram Cooling Water Shutoff Valves to Service Water and ESW – 1  
 & 2 Units, Rev. 10  
 E-361, Sht. 1, Schematic Diagram RHR Service Water Pumps Common, Rev. 28  
 E-371, Sht. 1, Schematic Diag. RHR Heat Exch. Tube Side Inlet MOV's – 1 & 2 Units, Rev. 13  
 E-10024, Block Diagram Radio and Distributed Antenna System, Rev. 1  
 M-1-E11-1040-E-048, Sht. 2, Elementary Diagram Residual Heat Removal System, Rev. 0  
 M-1-E51-1040-E-032, Sht. 1, Elementary Diagram Reactor Core Isolation, Rev. 13  
 M-1-E51-1040-E-032, Sht. 2, Elementary Diagram Reactor Core Isolation, Rev. 0  
 737-D-VC-00039, Sheets 1-16, 3 Hour Darmatt KM-1 Barrier 02-01 Arrangement, Rev. 0  
 8031-C-756, Control Area, Key Plans – Interior Walls EI 180'-0" to EI 332'-0" area 8, Rev. 21  
 8031-E-28, Spec. for 600 Volt Power, Control and Inst. Cable for The LGS Units 1 & 2, Rev. 18  
 8031-FSC-198-22-8, Cable tray Thru Fire Barrier  
 8031-FSC-198-1652-4, Penetration Seal Design  
 8031-M-1-C61-1050-E-012.25, Sht. 2, Elementary Diag. Remote Shutdown System, Rev. 17

8031-M-1-C61-1050-E-014.13, Sht. 4, Elementary Diag. Remote Shutdown System, Rev. 13  
8031-M-1-E11-1040-E-016, Sht. 1, Elementary Diagram Residual Heat Removal System, Rev. 33  
8031-PSA-763, Control Room Area 8 Interior Wall Elevations, Wall No. 68 Thru 75 & 102 Thru  
04, Rev. 16

Piping and Instrumentation Diagrams

8031-M-11, Sht. 2, P&ID, Emergency Service Water (Unit 1 and Common), Rev. 84  
8031-M-12, Sht. 1, P&ID, Residual Heat Removal Service Water (Common), Rev. 69  
8031-M-42, Sht. 3, P&ID, Nuclear Boiler Vessel Instrumentation (Unit 2), Rev. 21  
8031-M-49, Sht. 2, P&ID, Reactor Core Isolation Cooling (Unit 2), Rev. 48  
8031-M-50, Sht. 1, PI&D, RCIC Pump Turbine, Rev. 35  
8031-M-51, Sht. 1, P&ID, Residual Heat Removal (Unit 1), Rev. 65  
8031-M-51, Sht. 2, P&ID, Residual Heat Removal (Unit 1), Rev. 66  
8031-M-51, Sht. 5, P&ID, Residual Heat Removal (Unit 2), Rev. 30  
8031-M-51, Sht. 6, P&ID, Residual Heat Removal (Unit 2), Rev. 23  
8031-M-55, Sht. 1, PI&D, High Pressure Coolant Injection, Rev. 53  
8031-M-56, Sht. 1, PI&D, HPCI Pump Turbine, Rev. 4

Vendor Manuals

Akron Firefighting Equipment Electrical Assault Nozzle, Style 4815 Technical Service Parts List  
Akron Firefighting Equipment Operating Instructions, Electrical Assault Nozzle  
Assault Specification and Technical Data  
Exide Lightguard F100/F100RT, ELU Vendor Manual  
Marauder Nozzles Specification Sheet

Pre-Fire Plans

F-A-336, 13.2 KV Switchgear Room 336 (El. 217'), Rev. 12  
F-A-437, Common, Corridor 437 (El. 239'), Rev. 9  
F-A-449, Common, Unit 1 Cable Spreading Room (El. 254'), Rev. 12  
F-R-370, Unit 2 Safeguards System Access Area Room 370 (El. 217'), Rev. 10

Fire Drills and Critiques

F-R-181, 2B Core Spray Pump Room, Completed 5/21/09  
F-R-402, U1 Reactor Enclosure, Room 402, Completed 2/4/09 and 5/16/09  
F-R-475, U2 Reactor Enclosure, Room 475, Completed 2/12/09  
F-R-500, U1 Reactor Enclosure, Fire Area 47, Completed 5/12/09

Fire Brigade Training

FBP01, Introduction/Orientation, Rev. 6  
FBP02, Protective Clothing, Rev. 5  
FBP04, Fire Behavior & Essentials, Rev. 9  
FBP05, Ventilation, Rev. 6  
FBP07, Hose Streams, Appliances, Tools, Rev. 6  
FBP08, Rescue, Rev. 7

FBP09, Extinguishers and Agents, Rev. 8  
 FBP11, Tactics and Strategy, Rev. 7  
 FBP13, Communications, Rev. 3  
 FBP14, Building Construction/Awareness, Rev. 6  
 FBP15, Pre-Fire Plans, Rev. 6  
 FBP17, Foam/Multi-Agent Operations, Rev. 1  
 IMS-01, Incident Management System, Rev. 2

#### Operator Safe Shutdown Training

JPM Number LLOJPM0207, Start 0B ESW Pump from D12 Switchgear for SE-06, Rev. 9  
 JPM Number LLOJPM0224, Supply Alternate DC Control Power for ADS, Rev. 10  
 JPM Number LLOJPM0261, Initiate Reactor SCRAM and MSIV Closure from AER Using SE-1  
 (Alternate Path), Rev. 7  
 JPM Number LLOJPM0267, Alignment of Equipment for Manual Operation of LPCI, Rev. 4  
 JPM Number 0250, Supply Emergency Power to RCIC Inboard Isolation Valve, Rev. 8  
 LSTS-4001, Fire with Unusual Event Declaration/Grid Emergency, Rev. 0

#### Transient Combustible Evaluations

A1744917-38  
 A1744917-39  
 A1744917-40  
 A1744917-41  
 A1744917-42

#### Miscellaneous Documents

BISCO Test Report No. 748-41, Fire Test Configuration for a Three Hour Rated Fire Seal  
 Control Room Shift Complement for Fire Brigade & Safe Shutdown Operators 4/26-29/2010  
 Fire System Impairment Log, 4/23/10  
 INDMS – Cable Location Report  
 INDMS – Safe and Alternate Shutdown Logics  
 LGS Maintenance Rule Scope & Performance Monitoring, Emergency Lighting (8 Hour Packs)  
 Limerick Fire Induced MSO 6 Month Project Strategy  
 NE-294, Specification for Post-Fire Safe Shutdown Program Requirements at LGS, Rev. 3  
 SDOC 831-D-VC-0006, Test Report on Three-Hour Fire Test and Five Minute Hose Stream Test  
 on PECO Energy Test Slab 4, Rev. 0  
 SDOC 737-D-VC-00050, Fire Endurance Test of Thermo-Lag 330-1 Fire Protection Envelopes on  
 12' and 14" Cable Trays and 1", 2" and 5" Conduits (Using Various Upgrades of Thermo-  
 Lag 770-1, Rev. 0  
 SDOC 831-D-VC-00013, Test Report for a 1 Hour Fire Test on Darmatt KM1 Fire Protection  
 System for a Representative Site Configuration of a 24"X24"X18" Junction Box, Rev. 0  
 SDOC 831-D-VC-0015, Test Report for a 3 Hour Fire Test on Darmatt KM1 Fire Protection  
 System for Electrical Circuit Systems to ASTM E119 NRC GL 86-10 Supplement 1, Rev. 0  
 SDOC 831-D-VC-0032, Report On A Three Hour Fire and 5 Minute Water Hose stream Test on  
 3/4" and 5" Diameter Generic Conduit Insulated with Darmatt KM1, Rev. 0

SDOC 831-D-VC-0044, Report on the Three Hour Fire Test / 5 Minute Water Hose Test on Darmatt KM1 Fire Protection System for Protecting ¾" and 4" Diameter Rigid Steel Conduits at Braidwood and Byron NPS, Rev. 0

VU1200-TD-003, PECO Energy LGS Thermo-Lag Fire Endurance Qualification Report, Rev. 3 Utilizing BISCO SF-20 Silicone Foam (Dow Corning 3-6548)

White Paper, Description of Fire Safe Shutdown Radio System

8031-E-28, Specification for 600 Volt Power, Control and Instrumentation Cable for the LGS Units 1 & 2 for the Philadelphia Electric Company, Rev. 18

Issue Reports

0617637	0793229	0843591	0884947	0656185	0993022
1041652#	1061665	1061908#	1061914#	1061920#	1061926#
1061929#	1061935#	1061942#	1061950#	1061965#	1061996#
1061999#	1062012#	1062016#	1062022#	1062025#	1062030#
1062036#	1062040#	1062048#	1062092#	1062102#	1062110#
1062116#	1062121#	1062140#	1062145#	1062150#	1062155#
1062163#	1062172#	1062181#	1062187#	1062190#	1062195#
1062197#	1062200#	1062503#	1062507#	1062511#	1063220*
1063227*	1063255*	1063262*	1063778*	1068483*	1068511*
1069300*	1069527*	1069560*	1073033*	1073177*	1073304
1073485*	1073587*	1073719*	1074128*	1074131*	1074132*
1074139*					

# Licensee identified during multiple spurious operations review of RG 1.189, Rev. 2 & NEI 00 01, Rev. 2. Alternate compensatory actions were implemented accordingly.

\* NRC identified during this inspection.

Action Requests

A1031688	A1354849	A1361986	A1397453	A1483451	A1698208
A1702750	00617637	00771615	00921985		

Work Orders

R0564411	R0812059	R0827448	R0856144	R0918809	R1123936
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**LIST OF ACRONYMS**

ADAMS	Agencywide Documents Access and Management System
AC	Alternating Current
BTP	Branch Technical Position
CFR	Code of Federal Regulations
CMEB	Chemical Engineering Branch
CO <sub>2</sub>	Carbon Dioxide
DRS	Division of Reactor Safety
EGM	Enforcement Guidance Memorandum
FA	Fire Area
FHA	Fire Hazards Analysis
FPP	Fire Protection Program
FSSG	Fire Safe Shutdown Guide
HPCI	High Pressure Coolant Injection
INDMS	Integrated Nuclear Data Management System
IP	Inspection Procedure
IPE	Individual Plant Examination
IPEEE	Individual Plant Examination of External Events
IR	Issue Report
JPM	Job Performance Measures
LGS	Limerick Generating Station
MSO	Multiple Spurious Operation
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
PAR	Publicly Available Records
P&ID	Piping and Instrumentation Drawing
QA	Quality Assurance
RCIC	Reactor Core Isolation Cooling
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
SER	Safety Evaluation Report
UFSAR	Updated Final Safety Analysis Report