UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

December 11, 2009

Mr. Charles G. Pardee
Senior Vice President, Exelon Generation Company, LLC
President and Chief Nuclear Officer (CNO), Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

Dear Mr. Pardee:

SUBJECT: LIMERICK GENERATING STATION – NRC COMPONENT DESIGN BASES INSPECTION REPORT 05000352/2009006 & 05000353/2009006

On October 30, 2009, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the Limerick Generating Station, Units 1&2. The enclosed inspection report documents the inspection results, which were discussed on October 30, 2009, with Mr. E. Callan 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. In conducting the inspection, the team examined the adequacy of selected components and operator actions to mitigate postulated transients, initiating events, and design basis accidents. The inspection involved field walkdowns, examination of selected procedures, calculations and records, and interviews with station personnel.

This report documents one NRC-identified finding which was of very low safety significance (Green). The finding was determined to involve a violation of NRC requirements. However, because of the very low safety significance of the violation and because it was entered into your correction action program, the NRC is treating it as a non-cited violation (NCV) consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest the NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U. S. 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, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the Limerick Generating Station. In addition, if you disagree with the characterization of the finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region I, and the NRC Resident Inspector at the Limerick Generating Station. The information you provide will be considered in accordance with Inspection Manual Chapter 0305.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for the public inspection in the NRC Public Docket Room or from the Publicly Available Records component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

Lawrence T. Doerflein

Lawrence T. Doerflein, Chief
Engineering Branch 2
Division of Reactor Safety

Docket No. 50-352/353
License No. NPF-39/85

Enclosure: Inspection Report 05000352/2009006 & 05000353/2009006
w/Attachment: Supplemental Information

cc w/ encl: Distribution via ListServ

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Sincerely,

/RA/

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U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Docket Nos.:	50-352, 50-353
License Nos.:	NPF-39, NPF-85
Report No.:	05000352/2009006 & 05000353/2009006
Licensee:	Exelon Generation Company, LLC (Exelon)
Facility:	Limerick Generating Station, Units 1 & 2
Location:	Sanatoga, PA
Dates:	October 5 – October 30, 2009
Inspectors:	K. Mangan, Senior Reactor Inspector, Division of Reactor Safety (DRS), Team Leader J. Richmond, Senior Reactor Inspector, DRS M. Balazik, Reactor Inspector, DRS J. Hawkins, Reactor Inspector, Division of Reactor Projects E. Huang, Reactor Inspector, DRS S. Spiegelman, NRC Mechanical Contractor L. Hajos, NRC Electrical Contractor M. Orr, Reactor Inspector (Training), DRS J. Rady, Reactor Inspector (Training), DRS
Approved by:	Lawrence T. Doerflein, Chief Engineering Branch 2 Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000352/2009006, 05000353/2009006; 10/05/2009 – 10/30/2009; Exelon Generation Company, LLC; Limerick Generating Station, Units 1 & 2; Component Design Bases Inspection.

The report covers the Component Design Bases Inspection conducted by a team of five NRC inspectors and two NRC contractors. One finding of very low risk significance (Green) was identified; the finding was considered to be a non-cited violation (NCV). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the 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.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green. The team identified a finding of very low safety significance involving a non-cited violation of 10 CFR 50.63, "Loss of All Alternating Current (AC) Power," because Exelon's coping analysis did not determine whether the battery capability and capacity was sufficient to recover AC power at the end of the required coping period. Specifically, Exelon's battery sizing and station blackout (SBO) load profile calculation did not include those loads necessary to recover AC power, such as starting an emergency diesel generator (EDG) or closing 4 kV switchgear breakers. As a result, the calculation did not verify there was adequate direct current (DC) voltage available to critical equipment during the SBO coping period. Exelon entered the issue into their corrective action program and performed and operability assessment which determined the battery was operable.

  This issue was more than minor because it is associated with the design control 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. The team determined the finding was of very low safety significance because it was a design deficiency subsequently confirmed not to result in a loss of operability or functionality. The finding did not have a cross-cutting aspect because it was determined to be a legacy issue not considered to be indicative of current licensee performance. (Section 1R21.2.1.1)

B. Licensee-Identified Violations

None

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, Barrier Integrity

1R21 Component Design Bases Inspection (IP 71111.21)

.1 Inspection Sample Selection Process

The team selected risk significant components and operator actions for review using information contained in the Limerick Generating Station Probabilistic Risk Assessment (PRA) and the U. S. Nuclear Regulatory Commission's (NRC) Standardized Plant Analysis Risk (SPAR) model. Additionally, the Limerick Generating Station Significance Determination Process (SDP) Phase 2 Notebook was referenced in the selection of potential components and operator actions for review. In general, the selection process focused on components and operator actions that had a Risk Achievement Worth (RAW) factor greater than 1.3 or a Risk Reduction Worth (RRW) factor greater than 1.005. The components selected were located within both safety-related and non-safety related systems, and included a variety of components such as pumps, breakers, heat exchangers, electrical busses, transformers, and valves.

The team initially compiled a list of components and operator actions based on the risk factors previously mentioned. Additionally, the team reviewed the previous component design bases inspection report (05000352 & 353/2007007) and excluded those components previously inspected. The team then performed a margin assessment to narrow the focus of the inspection to 13 components, 5 operator actions and 4 operating experience samples. The team's evaluation of possible low design margin included consideration of original design issues, margin reductions due to modifications, or margin reductions identified as a result of material condition/equipment reliability issues. The assessment also included items such as failed performance test results, corrective action history, repeated maintenance, maintenance rule (a)1 status, operability reviews for degraded conditions, NRC resident inspector insights, system health reports, and industry operating experience. Finally, consideration was also given to the uniqueness and complexity of the design and the available defense-in-depth margins. The margin review of operator actions included complexity of the action, time to complete the action, and extent-of-training on the action.

The inspection performed by the team was conducted as outlined in NRC Inspection Procedure (IP) 71111.21. This inspection effort included walkdowns of selected components, interviews with operators, system engineers and design engineers, and reviews of associated design documents and calculations to assess the adequacy of the components to meet design basis, licensing basis, and risk-informed beyond design basis requirements. A summary of the reviews performed for each component, operator action, operating experience sample, and the specific inspection findings identified are discussed in the subsequent sections of this report. Documents reviewed for this inspection are listed in the Attachment.

:2 Results of Detailed Reviews

.2.1 Results of Detailed Component Reviews (13 samples)

.2.1.1 Unit 2 "A" 125/250 VDC Batteries (2A1D101/2A2D101)

a. Inspection Scope

The team inspected the "A" 125/250 VDC batteries to determine whether they could perform their design function to provide reliable DC power to connected loads during design and licensing bases events. The team found the configuration of the battery system used two 125 VDC batteries (2A1D101 and 2A2D101) in series to provide power to the "A" 250 VDC battery bus, while each individual 125 VDC battery also supplied a 125 VDC battery bus. The team reviewed design calculations, including battery sizing, load flow studies, and voltage drop calculations, to evaluate whether the battery capacity was adequate for the equipment load and duration required by design and licensing requirements, and to assess whether adequate voltage was available to meet minimum voltage specifications for the battery electrical loads during worst case loading conditions.

Battery maintenance and surveillance tests, including modified performance and service discharge tests and routine surveillance tests, were reviewed to assess whether the testing and maintenance was sufficient and whether those activities were performed in accordance with established procedures, vendor recommendations, industry standards, and design and licensing requirements. The team compared the service test and modified performance test load profiles to the load flow studies for the loss-of-coolant accident (LOCA) with a concurrent loss-of-offsite power (LOOP), and the station blackout (SBO) design assumptions to verify whether the load testing enveloped the predicted worst case loading conditions. In addition, the team compared as-found test and inspection results to established acceptance criteria in order to evaluate the as-found conditions and assess whether those conditions conformed to design basis assumptions and regulatory requirements.

Finally, the team performed field walkdowns of the "A" batteries, battery chargers, and associated distribution panels to independently assess the material condition of the battery cells and associated electrical equipment. Specifically, the team visually inspected the batteries for signs of degradation such as excessive terminal corrosion and electrolyte leaks. In addition, the team interviewed design and system engineers regarding the design, operation, testing, and maintenance of the battery.

b. Findings

Failure to Verify Battery Capacity to Recover from Station Blackout

Introduction: The team identified a finding of very low safety significance (Green) involving a non-cited violation of 10 CFR 50.63, "Loss of All Alternating Current Power," because Exelon's coping analysis did not determine whether the battery capability and capacity was sufficient to recover AC power at the end of the required 4 hour coping period. Specifically, Exelon's battery sizing and SBO load profile calculation did not include those loads necessary to recover AC power, such as starting an emergency diesel generator (EDG) or closing 4 kV switchgear breakers.

Description: The team reviewed calculation LE-0052, section 2.1, "Worst Case Battery Duty Cycle." The team noted that the calculation determined that the worst case duty cycle for each battery was determined to be loading from a LOCA-LOOP scenario. The conclusion was based on a comparison of critical battery parameters for each design basis event in which the battery was credited to provide mitigation. Exelon based their conclusion on critical battery parameters including final battery terminal voltage, peak discharge amperes, and total ampere-hours (AH) removed. Additionally, the team determined that section 7.4, "Battery Acceptance Criteria," of LE-0052 required the calculation to:

- Determine worst case scenario that provided the lowest battery terminal voltage.
- Determine the additional load that can be added to each battery.
- Use the worst case scenario to develop the battery duty cycles for the service and modified performance tests.

The team identified that LE-0052, "Class 1E Battery Load Duty Cycle Determination," evaluation of the SBO scenario did not include the necessary DC loads to recover AC power to the associated 4 kV bus at the end of an SBO 4-hour coping period. As a result the team concluded that the calculated SBO load profile was non-conservative. In response to the teams questions Exelon estimated that, during the last minute of the 4 hour coping period, the battery would have an additional 100 ampere load for a fraction of a minute, in order to start an emergency diesel generator (EDG), flash the generator field, and close a 4 kV breaker. The team concluded that with the estimated additional load, the worst case scenario for final terminal voltage and greatest AHs removed would most likely be an SBO scenario, not the LOCA-LOOP scenario. Therefore, the current battery analysis did not demonstrate that the battery had sufficient capacity and capability for the worst case loading profile. Additionally, the team determined that the service test and modified performance test battery duty cycle test loading did not envelope the additional estimated SBO battery load. As a result, those battery discharge tests did not demonstrated that the battery terminal voltage would be sufficient during the last minute of an SBO event.

Exelon entered this issue into their corrective action program as issue report (IR) 985061, to revise the calculation and performed a qualitative assessment to evaluate this issue, and concluded there was sufficient stored energy in each battery, at the end of the 4 hour SBO scenario, such that there was confidence that the batteries would meet their intended safety function in all operating modes. Exelon also intended to investigate if other calculations and tests needed to be revised. The team reviewed Exelon's evaluation and concluded it appeared reasonable.

Analysis: The team determined that the failure to verify adequate battery capacity and capability to recover from an SBO event was a performance deficiency. Specifically, Exelon's battery sizing and SBO load profile calculation did not include those loads necessary to recover AC power. The team concluded that this performance deficiency was reasonably within Exelon's ability to foresee and prevent. This issue was more than minor because it was similar to NRC Inspection Manual Chapter (IMC) 0612, Appendix E, "Examples of Minor Issues," Example 3.j, in that as a result of this deficiency, the team had a reasonable doubt of operability with respect to the battery capacity to recover from a station blackout. In addition, the finding was associated with the design control attribute of the Mitigating Systems cornerstone and affected the cornerstone objective of ensuring the availability, capability and reliability of systems that respond to initiating events to prevent undesirable consequences.

The team performed a Phase 1 SDP screening, in accordance with NRC IMC 0609, Attachment 4, "Phase 1 - Initial Screening and Characterization of Findings," and determined the finding was of very low safety significance (Green) because it was a design deficiency subsequently confirmed not to result in a loss of operability or functionality. The team did not identify a cross-cutting aspect associated with the finding because the performance deficiency occurred during the historical development of the SBO analysis and the analysis had not been reviewed during recent engineering activities. Therefore, the issue was determined not to be indicative of current licensee performance.

Enforcement 10 CFR 50.63, "Loss of All Alternating Current Power," requires that a plant be able to withstand for a specified duration and recover from a station blackout. In addition, control and protection systems, including station batteries, must provide sufficient capacity and capability to ensure that the core is cooled and appropriate containment integrity is maintained for the specified duration. Further, the capability for coping shall be determined by an appropriate coping analysis, which is expected to have the baseline assumptions, analyses, and related information used in the coping evaluations.

Contrary to the above, from initial plant startup to October 31, 2009, Exelon's analysis, for equipment credited in the SBO coping analysis, had not determined whether the battery capability and capacity was sufficient to recover AC power at the end of the required coping period. Specifically, Exelon's battery sizing and SBO load profile calculation did not include those loads necessary to recover AC power, such as starting an EDG (i.e., diesel generator field flashing) or closing 4 kV switchgear breakers (i.e., adequate DC control voltage). Because this finding was of very low safety significance and was entered into the corrective action program as issue report (IR) 985061, this violation was treated as a non-cited violation, consistent with Section VI.A of the NRC Enforcement Policy. **(NCV 05000352,353/2009006-01, Failure to Verify Battery Capacity to Recover from Station Blackout)**

.2.1.2 Residual Heat Removal (RHR) Heat Exchanger 'A' Service Water Inlet (HV-51-1F014A) and Heat Exchanger 'B' Service Water Outlet (HV-51-1F068B) & Water Return to Spray Pond (HV-12-32D) Motor Operated Valves(MOV) (3 samples)

a. Inspection Scope

The team inspected the motor operated valves (MOV) identified above to verify that they were capable of performing their design basis functions, which is to create a flow path for cooling water to enter and exit the RHR Heat Exchangers and return cooling water to the spray pond via the spray header during both normal and accident modes of operation. The team reviewed the Updated Final Safety Analysis Report (UFSAR), the Technical Specifications (TS), design basis documents, drawings, and procedures to identify the design basis requirements of each valve. The team reviewed periodic MOV diagnostic test results and stroke-timing test data to verify acceptance criteria were met and were in accordance with design requirements. The team verified the MOV safety functions and performance capability were adequately monitored and maintained for each MOV in accordance with Generic Letter (GL) 89-10 guidance. The team reviewed MOV weak link calculations to ensure the ability of the MOVs to remain functional while stroking under design basis conditions and verified the valve analysis used the maximum differential pressure expected across the valves when required to operate. Additionally, the team reviewed motor data, degraded voltage conditions, thermal overload sizing, and voltage drop calculation results to verify that the MOVs would have sufficient voltage and power available to perform their safety function at degraded voltage conditions.

The team discussed the design, operation, and maintenance of the MOVs with engineering staff to gain an understanding of performance history, maintenance, and overall component health of the MOVs. The team also conducted valve walkdowns to assess the material condition of the MOVs, and to verify the installed configurations were consistent with the plant drawings, and the design and licensing bases. Finally, issue reports and system health reports were reviewed to verify that deficiencies were appropriately identified and resolved.

b. Findings

Introduction: An unresolved item (URI) was identified because additional NRC review and evaluation is needed to determine if Exelon is meeting Technical Specification (TS) 3.8.4.2b. and/or TS Surveillance Requirement (SR) 4.8.4.2.2. The team questioned whether Exelon was meeting the licensing requirements for bypassing thermal overloads for all Class 1E MOV's with spring-to-normal control switches during an accident and/or whether testing used to satisfy the requirements for a Channel Function Test of the MOV circuit was adequate related to alarm testing.

Description: TS Section 3.8.4.2b states that the thermal overload protection of all Class 1E MOVs shall be bypassed under accident conditions for all valves with spring-to-normal control switches. The team referenced Regulatory Guide (RG) 1.106, "Thermal Overload Protection for Electric Motors on Motor-Operated Valves," which describes acceptable methods to ensure that thermal overload devices will not prevent MOVs from performing their safety related function. An acceptable method to ensure completion of a safety related function is to ensure that thermal overload protection devices that are normally in place during plant operation be bypassed under accident conditions and should be tested periodically. Section 8.1.6.1.19 of the UFSAR states that RG 1.106 is not applicable to Exelon per the implementation section, but concludes Exelon is in conformance with RG 1.106. In addition, Section 8.1.6.1.19a states that MOVs with spring-to-return control switches, during manual operation, the thermal overload is normally in the trip circuit; however, the thermal overload can be bypassed by holding the control switch in the appropriate open or close position. The team verified that operators were not expected to hold the switch in order to bypass the thermal overload during an accident condition. The team questioned if Exelon was meeting the intent of TS 3.8.4.2 because thermal overloads are not bypassed during an accident unless the overloads have been actuated and operators reposition the switch and hold it in the open or closed position. Exelon initiated issue report (IR) 985060 to review the issue and concluded in a position paper that they are in compliance with TS 3.8.4.2b.

Additionally, the team questioned the adequacy of testing of the thermal overload bypasses for spring-to-return control switches for manually operated Class 1E MOVs in accordance with SR 4.8.4.2.2. The surveillance requires a Channel Functional Test to be performed to verify that the thermal overload protection will be bypassed under accident conditions. Exelon's TS, Section 1.6a, defines Channel Functional Test for analog channels as the injection of a simulated signal into the channel as close to the sensor as practicable to verify operability including alarm and/or trip functions. The test performed to satisfy the SR cycles the valve remotely with the control switch to check the continuity of the bypass circuitry but does not verify operation of the alarm associated with a thermal overload condition. The team questioned whether Exelon was required to verify the alarm function associated with the thermal overloads. In response to the team's questions, Exelon supported a position that standard operating practice includes verification of valve position by the operators using valve indication lights and that the alarm function does not need to be tested.

This issue will be opened as a URI pending further NRC review in order to determine if LGS Units 1 & 2 are in compliance with their TS section 3.8.4.2 and SR 4.8.4.2.2 for thermal overload bypass operation in accident conditions and testing of the thermal overload alarm function. **(URI 05000352,353/2009006-02, TS Requirements for MOV Thermal Overload Bypass Feature)**

.2.1.3 '22' Emergency Diesel Generator Fuel Oil, Starting Air, and Lube Oil System

a. Inspection Scope

The team inspected the 22 EDG fuel oil, starting air, and lube oil systems to ensure they could respond to design basis events. The team reviewed the UFSAR, Technical Specifications, design basis calculations, vendor documents, and procedures to identify the design basis requirements for the systems. The team reviewed EDG surveillance test results and operating procedures to ensure the mechanical support systems were operating as designed, and verified appropriate maintenance was being performed on the fuel oil, starting air, and lube oil systems. The team reviewed fuel oil consumption calculations to verify Technical Specification requirements were adequate to meet design basis loading conditions. The team also reviewed the fuel oil low level setpoint to ensure a sufficient amount of fuel oil remained in the tank to meet the EDG design function. The team reviewed lube oil sample results, used by Exelon, to verify proper lubrication and evaluated fuel oil sample analysis results to ensure TS requirements were met. The team also reviewed the design specification for the starting air system, as well as EDG air start test results, normal operating pressure band, air compressor actuation setpoint, and TS limit for operability, to verify that the start air system was properly sized and could meet its design function for successive starts. In addition, the team interviewed the system engineer and performed a walkdown of the diesel generator, which included the above subsystems, during a surveillance run of the 22 EDG to assess material conditions and overall performance. Finally, the team reviewed the EDG maintenance history as well as selected issue reports to determine the overall health of the fuel oil, lube oil, and air starting systems and to ensure problems were properly identified and corrected.

b. Findings

No findings of significance were identified.

.2.1.4 Reactor Core Isolation Cooling Turbine, 10S212

a. Inspection Scope

The team inspected the Unit 2 reactor core isolation cooling (RCIC) system turbine, 10S212, to verify it was capable of meeting its design basis requirement to provide sufficient motive force to enable the RCIC pump to inject high pressure cooling water into the reactor vessel under transient and accident conditions. The team verified sufficient cooling was available to the RCIC turbine lube oil system during design basis events. The team reviewed the RCIC room heat-up analysis to determine the temperature response of the RCIC room to ensure proper environmental qualification of the RCIC system components. Also, the team reviewed the calibration process and setting of the RCIC flow controller to verify proper system response during design basis events. In addition, the team reviewed the design of the RCIC turbine exhaust line, vacuum breakers, and system response time to verify the exhaust line was not susceptible to water hammer during a loss-of-coolant accident. The team reviewed surveillance and in-service test results along with preventive maintenance procedures to verify acceptance criteria were met and acceptance limits were adequate to ensure that any potential degradation of the turbine would not result in the system becoming inoperable. The team performed a walkdown the turbine and associated support features, and interviewed system and design engineers to assess the material condition of the turbine. Finally, the team reviewed issue reports and system health reports to determine the overall health of the system, and to determine if issues entered into the corrective action program were appropriately addressed.

b. Findings

No findings of significance were identified.

.2.1.5 Unit 2 Reactor Core Isolation Cooling Pump

a. Inspection Scope

The team inspected the Unit 2 RCIC pump to verify it was capable of meeting its design basis requirement to provide high pressure cooling water to the reactor vessel under transient and accident conditions. The team evaluated if the pump could provide cooling water to the reactor vessel in order to maintain the vessel water level. The team's inspection focused on the ability of the RCIC pumps to deliver the design and licensing basis flowrate at a specified pressure. The net positive suction head (NPSH) calculation for the RCIC pump was reviewed for water delivery from both the condensate storage tank (CST) and suppression pool to verify that adequate NPSH was available at minimum water levels and pressures. The team reviewed vendor testing results, plant start-up testing reports, full flow testing and in-service test results to determine if the pump performance bounded the flow requirements in the safety analysis and to determine if Exelon had adequately addressed pump degradation. The team performed a walkdown of pump and associated support features, and interviewed system and design engineers to assess the material condition of the pump. Finally, the team reviewed issue reports and system health reports to determine the overall health of the system, and to determine if issues entered into the corrective action program were appropriately addressed.

b. Findings

No findings of significance were identified.

.2.1.6 Unit 2 RCIC Discharge Valve (HV-49-2F013)

a. Inspection Scope

The team inspected the Unit 2 motor operated valve (MOV) identified above to verify that it was capable of performing its design functions. The team assessed if the valve could meet its design functions which required valve repositioning to both the open and closed positions. The team reviewed the UFSAR, Technical Specifications, design basis documents, drawings, and procedures to identify the design basis requirements of the valve. The team reviewed periodic MOV diagnostic test results and stroke-timing test data to verify acceptance criteria were met and were in accordance with design requirements. The team also reviewed calculations to determine if the thrust and torque provided by the operator were consistent with valve operating requirements. The team reviewed design calculations, including load flow studies and voltage drop calculations to evaluate whether the battery capacity ensured adequate voltage was available to meet minimum voltage specifications of the motor during worst case conditions. The team also interviewed system and design engineers, and reviewed issue reports associated with the valve to determine the material condition of the valve. The issue reports were also reviewed to verify that corrective actions for the identified deficiencies were adequate.

b. Findings

No findings of significance were identified.

.2.1.7 Emergency Service Water Pump (0D-P548)

a. Inspection Scope

The team inspected the 'D' emergency service water (ESW) pump to verify it was capable of performing its design basis function. The team evaluated whether the pump capacity was sufficient to provide adequate flow to the safety-related components supplied by the ESW system during design basis events. Design calculations were reviewed to assess available pump NPSH and to evaluate the capability of the pump to provide flow to served components. Additionally, the team reviewed calculations which evaluated the supply of water to non-essential components that could be served by the ESW system as described in the emergency operating procedures. The team evaluated completed design modification documents to determine if the changes impacted the design and licensing basis requirements. The team also evaluated changes that impacted flow requirements to individual ESW system loads due to either a change in fouling factors or evaluations of new load requirements established by component vendors. The team reviewed ESW pump in-service testing (IST) results and ESW system flow verification tests to verify adequate system flow rate. Specifically, the team reviewed pump data trends for vibration, and pump differential pressure and flowrate test results to verify acceptance criteria were met and acceptance limits were adequate to ensure that any potential degradation of the pump would not result in the system becoming inoperable. The team performed a walkdown of the pump to evaluate its material condition and assess the pump's operating environment. Additionally, the team reviewed issue reports to verify the corrective actions adequately addressed the identified deficiencies. Finally, the pump motor specification, motor testing and electrical design basis calculations were reviewed to assure the adequacy of the motor and consistency with design basis under worst case voltage conditions.

b. Findings

No findings of significance were identified.

.2.1.8 480 VAC Motor Control Center, D224-R-C

a. Inspection Scope

The team inspected the D224-R-C motor control center (MCC) to verify it was capable of performing its design basis function. The team reviewed calculations and drawings to determine if the loading of the MCC was within the equipment ratings. The team reviewed the adequacy and appropriateness of design assumptions and calculations to determine if the minimum voltage allowed at the MCC would result in voltage at the motor terminals, under worst-case motor starting and loading conditions, above the minimum acceptable values for the equipment supplied by the bus. Additionally, the team reviewed maintenance and test procedures, and associated acceptance criteria, to ensure the equipment was being maintained in accordance with manufacturer recommendations and industry standards so that the equipment would be able to operate as designed during normal and accident conditions. The team also reviewed the adequacy of the short circuit ratings of the switchgear and circuit breakers, and the adequacy of protective device coordination provided for a selected sample of equipment supplied by the bus. Finally, the team conducted a walkdown of the MCC to assess the material condition and operating environment, and to verify that system alignments were consistent with the design documentation.

b. Findings

No findings of significance were identified.

.2.1.9 Emergency Diesel Generator Supply Breaker, 201-D22

a. Inspection Scope

The team inspected the EDG supply breaker to verify it was capable of performing its design basis function. The team reviewed calculations and drawings to determine whether the rating of the breaker was adequate to support the loads from the associated 4kV vital bus. The team reviewed the adequacy and appropriateness of design assumptions for calculations that evaluated the protection and relay coordination scheme between the EDG breaker and transformer supply breaker to the 4kV vital bus. The team reviewed the acceptance criteria of maintenance and test procedures to determine if the breaker testing ensured it was capable of supplying power necessary to ensure proper operation of connected equipment during normal and accident conditions. Finally, the team interviewed system and design engineers, and conducted a walkdown of the breaker and associated 4160V vital bus to assess the material condition, and determine whether the system alignment and operating environment were consistent with the design basis assumptions.

b. Findings

No findings of significance were identified.

.2.1.10 Emergency Diesel Generator (EDG) - Electrical, D22

a. Inspection Scope

The team inspected the electrical components associated with the D22 EDG in order to determine if the components were capable of supporting the EDG design basis function. The inspection of the EDG focused on its ability to power safety related loads during design basis events. The team reviewed load flow analysis and voltage drop calculations to verify that the EDG was capable of providing sufficient amperage and adequate voltage to the safety-related loads during worst-case loading conditions. The team also reviewed design calculations and surveillance test results to evaluate if the EDG had sufficient capability to accelerate the loads within the time periods specified in design basis documents during the sequential starting of loads in response to a design basis event. The tests were also reviewed to verify that the EDG test conditions enveloped the loading that would be present under a design basis event, that overlapping of loading steps did not occur, and that there was adequate basis for operability between test periods. The team reviewed protective relay settings to determine whether the settings were adequate to ensure the relays would only activate when EDG limits were exceeded and spurious activation of the relays would not cause an inadvertent trip of the EDG during an event. The team also reviewed the coordination analysis to ensure that the protective devices were adequately rated. Additionally, the team reviewed calculations and elementary drawings to determine if the diesel generator protective relaying was designed as described in the design basis documents and tested in accordance with the requirements of TS 3.8.1. Finally, the team performed a walkdown of EDG and associated support systems, and interviewed system and design engineers, to assess the material condition of the equipment.

b. Findings

No findings of significance were identified.

.2.1.11 4kV to 480 VAC Transformer, D224

a. Inspection Scope

The team inspected the 4kV to 480 volt transformer D224 to verify it was capable of performing its design basis function. The team reviewed calculations, drawings, maintenance procedures, and vendor manuals, and assessed the sizing, impedance, loading, protection features, and voltage taps setpoint for the transformer to ensure adequate voltage would be supplied to the vital 440Vac load center. The team reviewed the adequacy and appropriateness of design assumptions in calculations related to motor starting and loading voltages to determine if the voltage drop across the transformer was evaluated under worst-case motor starting and loading conditions, and to verify that voltage to connected loads would remain above the minimum acceptable values. The team also reviewed the ampacity for the source and load side feeder cables to ensure maximum cable ratings were not exceeded during operation based on lowest allowed voltage supplied from the 4kV vital bus. Additionally, the team reviewed the protective device settings to ensure that the feeder cables and transformer were protected in accordance with industry standards. Finally, the team performed a visual walkdown of the equipment, and interviewed system and design engineers to assess the installation configuration, material condition, and potential vulnerability to hazards.

b. Findings

No findings of significance were identified.

.2.2 Detailed Operator Action Reviews (5 samples)

The team assessed manual operator actions and selected a sample of five operator actions for detailed review based upon risk significance, time urgency, and factors affecting the likelihood of human error. The operator actions were selected from a PRA ranking of operator action importance based on RAW and RRW values. The non-PRA considerations in the selection process included the following factors:

- Margin between the time needed to complete the actions and the time available prior to adverse reactor consequences;
- Complexity of the actions;
- Reliability and/or redundancy of components associated with the actions;
- Extent of actions to be performed outside of the control room;
- Procedural guidance to the operators; and
- Amount of relevant operator training conducted.

.2.2.1 Refill CST Using Alternate Means

a. Inspection Scope

The team evaluated the manual operator actions to align alternate means to refill the condensate storage tank (CST) using the fire water system to verify the operator actions were consistent with the design and licensing bases and assumptions in the risk assessment model. The team reviewed Exelon's PRA and human reliability analysis (HRA) calculations to determine when this action is credited and the time available for operators to perform this action. Additionally, the team conducted interviews, reviewed operator training documents, and walked down applicable areas of the plant to verify that the actions could be performed as required and to identify any unforeseen operator challenges. The team reviewed design drawings, calculations, vendor documentation, and operating procedures to determine if the actions would successfully refill the CST. The team independently inventoried pre-staged equipment and tools to verify equipment credited in the PRA evaluation was available, and to assess the material condition of the associated hoses, tools and support systems. The team walked down the operating procedures to evaluate if time critical tasks could be performed as assumed in the PRA and to assess the likelihood of cognitive or execution errors. The team evaluated the available time margins to perform the actions to verify the reasonableness of Exelon's risk assumptions. Finally, the team verified the accuracy of the CST vortex calculation to ensure proper operation of alarms and adherence to design limits.

b. Findings

No findings of significance were identified.

.2.2.2 Open Spray Pond Pump House Doors/Dampers for Manual Vent

a. Inspection Scope

The team evaluated the operators' ability to provide alternate ventilation to the equipment located in the spray pond pump house (SPPH). The team conducted interviews with the system engineer, system manager, and auxiliary operators concerning the applicable operator actions as described in the alternate ventilation procedure. The team also independently inventoried pre-staged equipment and tools, including the SPPH tool box, to evaluate if adequate equipment was available to allow the operators to perform the required actions. Exelon's PRA and HRA calculations were reviewed to determine when this action is credited, and to assess the adequacy of the assumptions made in the calculation and the time available for operators to perform this action. The team also validated indications in the control room and locally in the SPPH which were credited in the analysis or procedure. The team performed a walkthrough of the procedure with an operator to evaluate the available time margins and the reasonableness of Exelon's operating procedures as compared to the assumptions in the HRA calculation. Finally, the team observed the manual operation to open the SPPH roll-up door to verify the door would properly operate as described in the alternate ventilation line-up.

b. Findings

No findings of significance were identified.

.2.2.3 Cross Tie Emergency 4kV Buses

a. Inspection Scope

The team inspected the operator action to cross tie 4kV emergency buses following a loss-of-offsite power. The team reviewed Exelon's PRA and HRA calculations to determine when the action is credited and the amount of time available for the operators to complete the action in order to prevent core damage. The team conducted interviews, reviewed various training documents, and walked down plant areas to evaluate the ability of the operators to perform the necessary actions, and to identify unforeseen operator challenges. The team also reviewed applicable design drawings and procedures to ensure that actions described in the procedure would accomplish the intended function. Additionally, the team reviewed condition reports associated with the operator action to determine if deficiencies had been properly evaluated and corrected. Finally, the team observed a simulator scenario to confirm that operators could perform all of the required actions in the time assumed in the HRA calculation.

b. Findings

No findings of significance were identified.

.2.2.4 Maximize Control Rod Drive Flow for Reactor Pressure Vessel Injection

a. Inspection Scope

The team inspected the operator action to maximize control rod drive (CRD) flow for reactor pressure vessel injection credited in the PRA for certain beyond design basis events. The team reviewed Exelon's PRA and HRA calculations to determine when the action is credited and the amount of time available for the operators to complete the action. The procedure used to maximize CRD flow was reviewed to determine required operator actions and a walk down of the system was performed to validate the PRA assumptions. The team also conducted interviews with control room and auxiliary operators to assess if the knowledge level of the operators was adequate to complete the required actions. Additionally, the team reviewed condition reports associated with the operator action to determine if deficiencies had been properly evaluated and corrected. The team reviewed various training documents and walked down plant areas to evaluate the ability of the operators to perform the necessary actions and to identify unforeseen operator challenges. The team also reviewed applicable design drawings and procedures to ensure that actions described in the procedure would accomplish the intended function. Finally, the team observed a simulated walk down of this operator action to validate the assumptions in the PRA and verify the procedure could be implemented as written.

b. Findings

No findings of significance were identified.

.2.2.5 Motor Operated Valve Local Operation

a. Inspection Scope

The team reviewed the operator action to manually manipulate residual heat removal service water (RHRSW) valves following a failure of the power operator. The team reviewed Exelon's PRA and HRA studies to determine when and how quickly operators are credited with restoring decay heat removal by manually operating RHRSW valves. The team interviewed licensed operators, reviewed plant procedures, walked down applicable panels in the main control room and visually inspected the valves to assess the ability of the operators to perform the required actions. The team also reviewed various calculations, tests, and vendor documents to validate assumptions related to the ability to reposition the valves. Additionally, the team reviewed condition reports associated with the operator action to determine if deficiencies had been properly evaluated and corrected. Finally, the team observed a field walkthrough of the actions with an operator and the system engineer to verify that the operator could perform the appropriate action to operate the valve, and that the action could be completed in the required timeframe to prevent damage to equipment.

b. Findings

No findings of significance were identified.

.2.3 Review of Industry Operating Experience and Generic Issues (4 samples)

The team reviewed selected Operating Experience (OE) issues for applicability at Limerick Generating Station. The team performed a detailed review of the OE issues listed below to verify that Exelon had appropriately assessed potential applicability to site equipment and initiated corrective actions when necessary.

.2.3.1 NRC Information Notice 2008-05, Fires Involving Emergency Diesel Generator Exhaust Manifolds

a. Inspection Scope

The team evaluated Exelon's applicability review and disposition of NRC Information Notice (IN) 2008-05. The NRC issued the IN to alert licensees of several fires that were attributed to leaking exhaust manifold connections on Fairbanks-Morse opposed piston EDGs. The team reviewed Exelon's evaluation of the issues discussed in the Information Notice. Specifically, the team reviewed Exelon's analysis which addressed each concern and the actions in place to determine whether adequate measures were in place to limit the likelihood of EDG manifold exhaust fires.

b. Findings

No findings of significance were identified.

.2.3.2 NRC Information Notice (IN) 2009-10: Transformer Failures – Recent Operating Experience

a. Inspection Scope

The team reviewed Exelon's evaluation of NRC IN 2009-10, "Transformer Failures – Recent Operating Experience," and the associated corrective actions to address the operating experience. The team reviewed Exelon's main power transformer system health reports, IRs, maintenance templates for all preventive maintenance, work orders, and surveillance test results to verify that Exelon appropriately disposition concerns related to the IN, and the February 2008 low voltage bushing failure on the 2A main transformer that resulted in a turbine trip and reactor scram. Additionally, the team independently reviewed the large transformer long term asset management strategy to ensure aging management concerns were addressed for all main power transformers on site. The team also interviewed the system engineer to determine what actions were being taken to address the deficiencies identified in the Information Notice. The team determined Exelon had taken several actions in response to the IN including maintenance activities regarding bushing replacements, spare transformer availability, and automatic oil monitoring systems used on all main transformers.

b. Findings

No findings of significance were identified.

.2.3.3 NRC Information Notice 2002-15, Hydrogen Combustion Events in Foreign BWR Piping

a. Inspection Scope

The team evaluated Exelon's applicability review and disposition of IN 2002-15 and corresponding vendor notifications. The NRC issued this IN to inform licensees of explosions at two boiling water reactors (BWRs) due to the accumulation and subsequent combustion of hydrogen in system piping. The team reviewed Exelon's evaluation of the IN to assess the adequacy of their response to the issue. Specifically, the team interviewed a design engineer who participated in the review process to determine the process used by Exelon to evaluate potential hydrogen accumulation in plant systems. In addition, the team reviewed piping configurations to ensure that system configuration and operating procedures were adequate to prevent the accumulation of hydrogen in the piping.

b. Findings

No findings of significance were identified.

.2.3.4 NRC Information Notice 2006-31, Inadequate Fault Interrupting Rating of Breakers

a. Inspection Scope

The team reviewed IN 2006-31 which discussed problems related to the fault interrupting rating of breakers. The NRC issued the IN to inform licensees of deficiencies with short circuit current calculations related to breaker sizing. Specifically, following a review of the original breaker sizing calculations a licensee found that under specified plant conditions, at certain 480 V, 4.16kV, and 13.8 kV switchgear buses, the postulated bolted three-phase symmetrical fault currents may be higher than the capability of the equipment because the calculations had not take into account the contributions of the motor currents during the fault. The team reviewed Exelon's evaluation of the IN including engineering evaluations and calculations to determine if Exelon had appropriately reviewed the issue and addressed any deficiencies in order to verify that breakers throughout the plant were properly sized.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems (IP 71152)

a. Inspection Scope

The team reviewed a sample of problems that Exelon had identified and entered into their corrective action program. The team reviewed these issues to verify an appropriate threshold for identifying issues and to evaluate the effectiveness of corrective actions. In addition, corrective action documents written on issues identified during the inspection were reviewed to verify adequate problem identification and incorporation of the problem into the corrective action program. The specific corrective action documents that were sampled and reviewed by the team are listed in the attachment.

b. Findings

No findings of significance were identified.

4OA6 Meetings, including Exit

On October 30, 2009, the team presented the inspection results to Mr. E. Callan, Plant Manager, and other members of LGS staff. The team verified that none of the information in this report is proprietary.

ATTACHMENT

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

C. Mudrick	Vice President
E. Callan	Plant Manager
R. Dickinson	Engineering Director
J. Hunter	Regulatory Assurance Manager
R. Harding	Regulatory Assurance
R. George	Electrical Design Manager
K. Slough	Mechanical Design Manager
P. Turpinien	PRA Engineering
R Schwab	Design Engineering
T. Johnson	Design Engineering
H. Movafegh	Design Engineering
D. Williamson	Operations

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened and Closed

05000352/353/2009006-01	NCV	Failure to Verify Battery Capacity to Recover from Station Blackout (Section IR21.2.1.1)

Opened

05000352/353/2009006-02	URI	TS Requirements for MOV Thermal Overload Bypass Feature (Section IR21.2.1.2)

LIST OF DOCUMENTS REVIEWED

Calculations:

6300E.18, Electrical Loading Calculation, Rev. 9
6300E.19, LGS Short Circuit Calculation for AC Power System, Rev. 4
6300E.20, Voltage Regulation Study, Rev. 11
6300E.23, Millstone Undervoltage Study, Rev. 8
6380E.07, Diesel Generator Loading, Rev. 11
6900E.02, Safeguard Aux Sys - Phase Overcurrent Relay Selection and Coordination, Rev. 8
6900E.11, Load Center Circuit Breaker – Overcurrent Trip Devices, Rev. 8
6900E.15, 125/250 VDC System Fuse Selection and Coordination, Undervoltage Relay Setting and Safeguards Short Circuit Calculation, Rev. 9
ER-AA-302-1001, Rising Stem Motor Operator, Rev. 6
ER-AA-302-1006, MOV Maintenance and Testing, Rev. 6
ET-AA-302-1007, Actuator Capability, Rev. 5

HV-049-013, Midas Calculation Results, performed 10/5/2009
HV-049-2F013F, DC Motor Operated Motor Calculation, Rev. 3
HV-051-1F014A, MIDACALC Results, AC Motor Operated Globe Valve Calculation, Rev. 5
HV-051-1F068B, MIDACALC Results, AC Motor Operated Globe Valve Calculation, Rev. 2
IR 566862-38, Technical Evaluation for Emergency Diesel Generator (EDG) Over Frequency Review
LDCN FS-1657, Safety Evaluation of LDCN FS-1657 - Lowering ESW Flow Rate through RHR Motor Oil Coolers from 24 to 20.4 GPM, dated 8/23/1991
LDCN-1658, Safety Evaluation for LDCN1658 - Reduction of Control Room Chiller Condenser Water Flow During Two Unit WSW System Operation, dated 4/06/92
LE-0052, Class 1E Battery Load Duty Cycle Determination, Rev. 10&10A
LE-0069, Class 1E 125V DC System Voltage Analysis, Rev. 4
LF-0011, Hose Station Hydraulic Analysis, Rev. 0
LG 04-00433, Clarify UFSAR Regarding Suppression Pool Cooling, performed 12/18/2007
LM-0007, Diesel Generator Fuel Oil Consumption, Rev. 3
LM-0063, Diesel Generator Day Tank Minimum Level, Rev. 2
LM-0225, Design Analysis for Jacket Water for Diesel Generator, Rev. 3
LM-0296, Evaluate Required ESW Flow Rates to Core Spray, HPIC and RCIC Unit Coolers at Design Conditions, Rev. 2
LM-037, Evaluation of Heat Transfer Data to U1&2 RHR Motor Oil Coolers by GL 89-13, dated 4/14/91
LM-0379, Power Rerate Evaluation-SBO Analysis, Rev. 1
LM-060, LGS Blackout Analysis RCIC Room, Rev. 0
LM-0667, Diesel Generator Fuel Oil Storage Tank Volume, Rev. 0
LM-486, Determination of Thrust and Torque Capability of HV-49-2F013 and 2F012 Velan Design Report SR-65-89
LM-49, RCIC and RCIC Turbine System MOV DP Calculation, Rev. B
LM-510, Demonstrate Ability to Supply Minimum Flows to TECW/RECW from ESW, Rev. 0
M-11-22, NPSH for ESW Pumps, Rev. 4
M-49-04, RCIC Pump Pressure, NPSH, Allowable Degradation and Pipe Volume, Rev. 12
M-55-33, HPCI/RCIC Automatic Pump Suction Transfer Delay Timer, Rev. 8
M-55-37, Establish HPCI/RCIC CST Piping Dynamic Head Losses, Rev. 5
M-55-38, CST Vortex Limit for HPCI/RCIC Operation, Rev. 1
M81-10, Spray Pond Pump Facility Ventilation Requirements, Rev. 004
M81-28, Spray Pond Pump Structure Temperature-Time Curve after a LOCA/LOOP, Rev. 000
M81-44, Spray Pond Pump Structure Room Heat-up (App. R Review), Rev. 2
MIDACALC HV-049-1F013, DC Motor Operated Gate Valve, Rev. 3
MIDACALC HV-049-1F019, DC Motor Operated Globe Valve, Rev. 8
MIDACALC HV-049-1F029, DC Motor Operated Gate Valve, Rev. 1
MIDACALC HV-049-1F031, DC Motor Operated Gate Valve, Rev. 3
MIDACALC HV-049-1F045, DC Motor Operated Globe Valve, Rev. 3
MIDACALC HV-049-1F046, DC Motor Operated Globe Valve, Rev. 4
R89.088, Anchor Darling Maximum Thrust Report for HV-051-1F014A, Rev. 0
R89.103, Anchor Darling Maximum Thrust Report for HV-051-1F068B, Rev. B

Completed Surveillance and Modification Acceptance Testing:
1P-55.1, Preoperational Test Procedure, Control Rod Drive Hydraulic System (CRDHS), and Test Report, dated 7/25/84
2113535L-01, RCIC Pump and Valve Test, performed 9/4/09
8031-M-71-427(2)-1, EDG Air Receiver Test Data, dated 01/19/80

8031-M-71-427(3)-1, EDG Air Receiver Test Data, dated 01/19/80
C0230813-02, Ultrasonic Thickness Examination of HBC-507-3, performed 10/19/09
C0230871-02, Magnetic Particle Examination of HBC 507-3, performed 10/14/09
MA-AA-716-210-1001, PCM Template for Power Transformers (Oil Filled), performed 7/16/09
R0950593, ESW Loop B Flow Balance, performed 8/15/06
R0995355, ESW Loop A Flow Balance, performed 1/8/06
R1020270, ESW Loop A Flow Balance, performed 2/22/07
R1027439, ESW Loop A D/P and Flow Data Collection, performed 1/9/07
R1034073, ESW Loop B D/P and Flow Data Collection, performed 6/16/06
R1045115, ESW Loop B Flow Balance, performed 8/18/07
R1060185, ESW Loop A Flow Balance, performed 4/26/08
R1062926, ESW Loop B D/P and Flow Data Collection, performed 7/9/07
R1069838, ESW Loop A D/P and Flow Data Collection, performed 2/25/08
R1078085, ESW Loop B Flow Balance, performed 8/14/08
R1101205-01, ESW Loop B D/P and Flow Data Collection, performed 7/4/08
R1102947-01, RCIC Pump and Valve Test, performed 9/4/08
R1110187-01, RCIC Pump and Valve Test, performed 12/5/08
R1112132, ESW Loop A D/P and Flow Data Collection, performed 10/8/08
R1127282-01, B Loop ESW Flow Test, performed 6/4/09
R1132011-01, A Loop ESW Pump, Valve and Flow Test, performed 7/25/09
R1134196, ESW Loop B D/P and Flow Data Collection, performed 10/6/09
RT-4-049-331-1, RCIC Overspeed Trip Test, performed 03/13/08
RT-6-100-905-1, Routine Inspection of T-200 Hose Storage Locker, performed 9/23/09
RT-6-100-906-1, T-200 Procedure TAG and Banana-jack Accountability, performed 4/21/09
ST-2-020-401-2, Electrical Power Systems 2BG501 Diesel Generator Critical and Non-Critical Instruments Calibration/Functional Tests, performed 08/28/09
ST-2-049-100-1, RCIC Logic System Functional Simulated Automatic Actuation Test, performed 12/01/08
ST-2-049-101-1, RCIC Logic System Functional Isolation Logic Test, performed12/01/08
ST-2-088-403-1, Remote Shutdown Monitoring RCIC System Flow Cal., performed 06/02/08
ST-4-049-951-2, ISI Pressure Test of RCIC Pump and Turbine Supply, performed 09/14/06
ST-4-049-952-1, RCIC Vacuum Breaker Test, performed 09/01/09 and 06/05/09
ST-4-092-2, ISI Pressure Test of the D22 Diesel Fuel and Diesel Oil storage and Transfer Systems, performed 05/28/09
ST-4-095-901-2, Div. I 2A1D101 Visual Inspection Cell to Cell and Terminal Tightness and Resistance checks, performed 5/29/08
ST-4-095-902-2, Div. I 2A2D101 Visual Inspection Cell to Cell and Terminal Tightness and Resistance Check, performed 2/4/09, 5/29/08 & 2/4/09
ST-4-095-951-2, Div. I 2A1D101 Safeguard Battery Mod Performance Test, performed 3/25/09 & 3/10/05,
ST-4-095-952-2, Div. I 2A2D101 Safeguard Battery Mod Performance Test, performed 3/26/09 & 3/10/05
ST-4-095-971-2, Div. I 2A1D101 Safeguard Battery Service Test, performed 3/14/07
ST-4-095-972-2, Div. I 2A2D101 Safeguard Battery Service Test, performed 3/14/07
ST-4-LLR-991-1, RCIC Vacuum Relief Local Leak Rate Test, performed 03/16/08
ST-6-020-232-2, D22 Diesel Generator Fuel Oil Transfer Pump, Valve and Flow Test, performed 08/29/09
ST-6-020-812-2, D22 Diesel Generator Fuel Oil Analysis, performed 08/29/09
ST-6-049-200-1, RCIC Valve Test, performed 08/31/09
ST-6-049-230-1, RCIC Pump, Valve, Flow Test, performed 09/02/09

ST-6-095-905-2, Unit 2 Safeguard Battery Weekly Inspection, performed 8/19/09, 8/26/09, 9/2/09, & 9/09/09
ST-6-095-911-2, Div I 125/250 VDC 2A1D101/2A2D101 Safeguard Battery Quarterly Inspection, performed 8/3/05, 11/2/05, 12/7/05, 2/1/06, 5/2/06, 8/2/06, 11/1/06, 1/31/07, 5/2/07 & 8/1/07, 1/30/08, 4/30/08, 7/30/08, 10/29/08, 1/28/09, 4/29/09, & 7/29/09
ST-6-095-915-2, Div I 125/250 VDC 2A1D101/2A2D101 Safeguard Battery Monthly Inspection, performed 5/28/09, 7/1/09, 7/24/09, & 8/27/09
TT1.12, Technical Test Procedure, Control Rod Drive Hydraulic System, performed 1/16/84

Corrective Action Documents

001365365	00620861	00792295	00924068	00979904
001365396	00620929	00793332	00924302	00981375*
001594481	00635879	00801752	00924540	00981439*
00159449	00645797	00801939*	00937780	00981715*
001659786	00646126	00802580	00943451	00982392*
00207810	00648278	00806853	00943454	00982715*
00322849	00655131	00827284	00958578	00982970*
00359693	00660875	00834202	00964002	00983443*
00365911	00662003	00837377	00966343	00983459*
00387682	00671542	00844788	00966347	00984420*
00394130	00676985	00847711	00968600	00984431*
00396949	00683817	00848811	00973009	00984841*
00397197	00685729	00854644	00974712	00984885*
00425148	00691841	00854648	00975536*	00985060*
00468013	00699223	00876264	00975559	00985061*
00489232	00732221	00882619	00975564	00985217*
00520361	00740106	00896992	00975665*	00985888*
00521373	00744646	00897033	00976111 *	00985997 *
00531025	00750205	00897601	00976128*	00986476*
00550999	00759288	00899308	00976217 *	00986477*
00560081	00759789	00900265	00976657*	A1334500-01
00566862	00763097	00906483	00977119*	A1417010-01
00566929	00767674	00916451	00977188*	A1536878-01
00567707	00780164	00920567	00977190*	A1692921
00588473	00784049	00922518	00977229*	
00608851	00787125	00922524	00977266	
00619755	00792286	00923825	00978208*	

* Issue report written as a result of this inspection effort.

Licensing and Design Basis Documents:

FS-1657, Safety Evaluation for FS1657, dated 8/23/91
LDCN-1658, Safety Evaluation for LDCN-1658, dated 3/12/92
Letter, PECO to NRC, 10CFR50.63 SBO Response to NRC Concerns, dated 02/14/92
Letter, PECO to NRC, 10CFR50.63 SBO Supplemental Information, dated 04/09/90
Letter, PECO to NRC, Response to 10CFR50.63 SBO, dated 04/17/89
Limerick Generation Station Unit 1&2 Technical Specification, Rev. 197
L-S-04, Design Basis Document for RHRSW System, Rev. 11
L-S-07, Design Basis Document for EDG and Auxiliary Systems, Rev. 14
L-S-39, Design Basis Document for RCIC System, Rev. 12

Philadelphia Electric Charles Kowalski to NRC Charles Rossi, NRC Bulletin 88-04, Potential Safety Related Pump Loss, June 30, 1988
NO-AA-10, Quality Assurance Topical Report, Rev. 84
SAIC-91/6651, Technical Evaluation Report LGS Unit 1 and 2 Station Blackout Evaluation – dated 03/08/91
Technical Specification Amendment, DC Electrical Power Sources (ML030290755), 01/29/03
UFSAR Change per ECR 09-00151, EDG Electrical Loads, Rev. 0
UFSAR, LGS Safety Analysis Report, Rev. 13

Drawings:
013-01, Reactor Enclosure Cooling Water System (Training Document), Rev. 01
014-01, Turbine Enclosure Cooling Water (Training Document), Rev. 01
092-01, Sht. 2-1, Electrical Distribution, Rev. 1
8031-E-1, Sht. 1, Single Line Diagram Station, Rev. 26
8031-E-371, Sht. 1 and 2, Schematic Diagram RHR Ht Ex Tube Side Inlet MOV's, Rev. 13
8031-E-55, Sht. 1, Single Line Meter and Relay Diagram MCC Load Tabulation, Rev. 50
8031-E-57, Sht. 1, Single Line Meter and Relay Diagram MCC Load Tabulation, Rev. 41
8031-M-11, Sht. 1, 2, 3 ,4 & 5, ESW System Unit 1, Unit 2 and Common, Rev. 9, 81, 52, 50, & 48
8031-M-12, Sht. 1, 2 & 3, Residual Heat Removal System, Rev. 63, 6 & 6
8031-M-13, Sht. 1 & 2, Reactor Enclosure Cooling Water, Rev. 41 & 15
8031-M-14, Sht. 1 & 2, Turbine Enclosure Cooling Water Unit 1, Rev. 30 & 11
8031-M1-C00-C-15-2, RHR Induction Motor, Rev. 0
8031-M1-G-002, Process Diagram, RCIC System, Rev. 10
8031-M-20, Sht. 12, Fuel & Diesel Oil Storage and Transfer Starting Air System, Rev. 11
8031-M-20, Sht. 9, Fuel & Diesel Oil Storage and Transfer System, Rev. 16
8031-M-49, Sht. 1, Reactor Core Isolation Cooling, Rev. 53
8031-M-50, Sht. 1, 2, 3 & 4, RCIC Pump/Turbine Unit 2, Rev. 37, 11, 1 & 2
8031-M-51, Sht. 1, 2, 3 & 4, Residual Heat Removal (Unit 1), Rev. 66, 66, 65 & 66
8031-M-71-240, Sht. 1, EDG Air Receiver, Rev. 6
8031-M-71-502, Sht. 1, EDG Air Receiver Stainless Steel, Rev. 9
8031-M-74-3, Diesel Oil Basket Strainers Data Sheet, Rev. 6
8031-M-E51-1040-E-006, Sht. 1, Elementary Drawing Reactor Core Isolation Cooling, Rev. 25
E-0001, Sht. 1, Station Single Line Diagram, Rev. 26
E-0092, Sht. 1, 125/250 Meter & Relay Schematic Diagram, Rev. 31
E-0105, Sht. 2, RCIC Schematic Block Diagram, Rev. 28
E-0603, Sht. 1 & 2, Schematic Diagram of Main Control Room Annunciator Panels, Rev. 22 & 20
E-1420, Sht. 1 & 2, Max. Allowable Cable Lengths - Power & Control Circuits, Rev. 1 & 0
E-34, Sht. 1, Single Line Meter & Relay 125/250 VDC System, Rev. 37
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LIST OF ACRONYMS

AC	Alternating Current
AH	Ampere-hours
BWR	Boiling Water Reactor
CFR	Code of Federal Regulations
CRD	Control Rod Drive
CST	Condensate Storage Tank
DC	Direct Current
DRS	Division of Reactor Safety
EDG	Emergency Diesel Generator
EOP	Emergency Operating Procedure
ESAS	Engineered Safeguards Actuation System
ESW	Emergency Service Water
GL	Generic Letter
HRA	Human Reliability Analysis
IEEE	Institute of Electrical and Electronics Engineers
IMC	Inspection Manual Chapter
IN	Information Notice
IP	Inspection Procedure
IR	Issue Report
IST	In-service Testing
kV	Kilovolts
LGS	Limerick Generating Station
LOCA	Loss-of-Coolant Accident
LOOP	Loss-of-Off-site Power
MCC	Motor Control Center
MOV	Motor Operated Valve
NCV	Non-cited Violation
NPSH	Net Positive Suction Head
NRC	U. S. Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation

PRA	Probabilistic Risk Assessment
RAW	Risk Achievement Worth
RCIC	Reactor Core Isolation Cooling
RG	Regulatory Guide
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RRW	Risk Reduction Worth
SBO	Station Blackout
SDP	Significance Determination Process
SPAR	Standardized Plant Analysis Risk
SR	Surveillance Requirement
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
VAC or Vac	Volts, Alternating Current
VDC or Vdc	Volts, Direct Current
SPPH	Spray Pond Pump House