November 4, 2004

Mr. Christopher M. Crane
President and CNO
Exelon Nuclear
Exelon Generation Company, LLC
200 Exelon Way
Kennett Square, PA 19348

SUBJECT: LIMERICK GENERATING STATION - NRC INTEGRATED INSPECTION REPORT 05000352/2004004, 05000353/2004004

Dear Mr. Crane:

On September 30, 2004, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Limerick Generating Station Units 1 and 2. The enclosed integrated report documents the inspection findings which were discussed on October 8, 2004, with Mr. R. DeGregorio and other members of your staff.

This 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.

This report documents one self-revealing finding of very low safety significance (Green). This finding was determined to involve a violation of NRC requirements. However, because of its very low safety significance and because it is entered into your corrective action program, the NRC is treating this issue as a non-cited violation (NCV), in accordance with Section VI.A of the NRC's 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, 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 facility.

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 public inspection in the

NRC Public Document Room or from the Publicly Available Records (PARS) component of the NRC's document system (ADAMS). ADAMS is accessible from the NRC website at http://www.nrc.gov/reading-rm/adams.html (The Public Electronic Reading Room).

Sincerely,

/RA/

Mohamed Shanbaky, Chief
Projects Branch 4
Division of Reactor Projects

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

Enclosure: Inspection Report 05000352/2004004, 05000353/2004004
w/Attachment: Supplemental Information

cc w/encl:
Chief Operating Officer, Exelon Generation Company, LLC
Site Vice President - Limerick Generating Station
Plant Manager, Limerick Generating Station
Regulatory Assurance Manager - Limerick
Senior Vice President - Nuclear Services
Vice President - Mid-Atlantic Operations
Vice President - Operations Support
Vice President - Licensing and Regulatory Affairs
Director - Licensing and Regulatory Affairs, Exelon Generation Company, LLC
Manager, Licensing - Limerick Generating Station
Vice President, General Counsel and Secretary
Associate General Counsel, Exelon Generation Company
Correspondence Control Desk
J. Johnsrud, National Energy Committee
Chairman, Board of Supervisors of Limerick Township
R. Janati, Chief, Division of Nuclear Safety, Pennsylvania Bureau of Radiation Protection
J. Bradley Fewell, Assistant General Counsel, Exelon Nuclear
D. Allard, Director, Dep't of Environmental Protection, Bureau of Radiation Protection (SLO)

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G. Wunder, PM, NRR (Backup)
M. Shanbaky, DRP
A. Burritt, DRP
S. Hansell, DRP - Senior Resident Inspector
C. Colantoni, DRP - Resident Inspector
T. Haverkamp - Resident OA
T. Kim, Director, DOC
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U.S. NUCLEAR REGULATORY COMMISSION

REGION 1

Docket Nos.	50-352; 50-353
License Nos.	NPF-39, NPF-85
Report Nos.	05000352/2004004 and 05000353/2004004
Licensee:	Exelon Generation Company, LLC
Facility:	Limerick Generating Station, Units 1 & 2
Location:	Evergreen and Sanatoga Roads Sanatoga, PA 19464
Dates:	July 1, 2004 through September 30, 2004
Inspectors:	S. Hansell, Senior Resident Inspector J. Talieri, Resident Inspector C. Colantoni, Resident Inspector G. Bowman, Acting Resident Inspector B. Bickett, Reactor Inspector T. Moslak, Health Physicist N. McNamara, EP Inspector J. Noggle, Senior Health Physicist
Approved by:	Mohamed Shanbaky, Chief Projects Branch 4 Division of Reactor Projects

CONTENTS

SUMMARY OF FINDINGS

IR 05000352/2004004, IR 05000353/2004004; 07/01/2004 - 09/30/2004; Limerick Generating Station, Units 1 and 2; Personnel Performance During Non-Routine Plant Evolutions.

The report covered a 3-month period of inspection by resident inspectors and announced inspections by a reactor inspector, senior health physicists, an emergency preparedness inspector, and a Team review of Generic Letter No. 89-13/Temporary Instruction 2515/159. One Green non-cited violation (NCV) and one unresolved item were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter 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 3, dated July 2000.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Barrier Integrity

- Green. A self-revealing condition resulted in a non-cited violation of Operating License No. NPF-39, Section 2.C.(1), because Unit 1 exceeded the licensed thermal power limit of 3458 MWth by approximately 0.1 - 0.3% for a period of approximately four months. Limerick reduced power to 99% to account for the increase until the cause could be determined and corrected.

  The finding is more than minor because if left uncorrected, the finding would become a more significant safety concern, in that, reactor core thermal power could have exceeded the accident analysis initial power condition of 102%. In accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations," the inspectors determined that the finding was of very low safety significance (Green) using a Phase 1 Significance Determination Process evaluation, because there were no plant events that could have resulted in a breach of the fuel barrier during the overpower condition.

  A contributing cause of this finding is related to the problem identification and resolution cross-cutting area, in that Exelon performed multiple reviews that did not identify the overpower condition. These reviews included an apparent cause evaluation and an engineering technical evaluation. (Section 1R14)

B. Licensee-Identified Violations.

None.

REPORT DETAILS

Summary of Plant Status

Unit 1 operated at or near 100% power during the inspection period and remained at or near that power level except for brief periods of planned testing.

Unit 2 began this inspection period operating at 100% power. On September 24, 2004, power was reduced to 70% power to remove the 5A feedwater heater from service and plug damaged tubes. Reactor power was returned to 100% on October 1, 2004.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R01 Adverse Weather Protection (71111.01- 2 samples)

a. Inspection Scope

Adverse Weather Readiness. On September 23 and 29, 2004, the inspectors reviewed Exelon procedure SE-9, "Preparation for Severe Weather," related to local flooding in the vicinity of the pumping stations that supply water to the Limerick Generating Station. The inspectors reviewed Exelon's actions to ensure cooling tower make-up water would be available for both units due to loss of the Point Pleasant Pumping Station and impact on the Bradshaw Reservoir. This inspection activity represented two samples. The following procedures were reviewed:

S09.0.G, "Water Diversion Overview,"
SE-22, "Bradshaw Reservoir Failure,"
RT-6-111-640, "River Water Log."

b. Findings

No findings of significance were identified.

1R04 Equipment Alignment (71111.04Q - 4 samples, 71111.04S - 1 sample)

a. Inspection Scope

Partial System Walkdown. (71111.04Q - 4 samples)

The inspectors performed partial system walkdowns to verify system and component alignment and to note any discrepancies that would impact system operability. The inspectors verified selected portions of redundant or backup systems or trains were available while certain system components were out-of-service. The inspectors reviewed selected valve positions, general condition of major system components, and electrical power availability. This inspection activity represented four samples. The partial walkdowns included the following systems:

- Unit 1 “B” and “D” core spray systems with “A” and “C” core spray systems out of service for planned maintenance;
- Unit 1 reactor core isolation cooling with the condensate storage tank suction isolated and suppression pool pump suction valves open;
- “B” control room ventilation system when the “A” control room emergency fresh air supply (CREFAS) was inoperable due to a damper malfunction;
- Unit 1 reactor core isolation cooling and high pressure coolant injection pump suction lines in response to air found in the system piping.

Complete System Walkdown. (71111.04S - 1 sample)

The inspectors performed a complete system walkdown on the Units 1 and 2 Emergency Core Cooling System (ECCS) room coolers to verify that the equipment was properly aligned. The walkdown included reviews of valve positions, major system components, electrical power availability, and equipment deficiencies. The inspectors reviewed system checkoff lists, system operating procedures, the system piping and instrumentation diagram, surveillance test data, and the updated final safety analysis report. The inspectors reviewed outstanding maintenance activities and condition reports associated with the ECCS system to determine if they would adversely affect system operability. The inspectors verified in the plant that the ECCS room cooler valves, including locked valves, were in the required position. This inspection activity represented one sample. The documents included in the review are listed in the report Attachment.

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05Q - 7 samples; 71111.05A - 1 sample)

a. Inspection Scope

Tour Plant Areas Important to Reactor Safety. (71111.05Q -7 samples)

The inspectors toured high risk areas at Limerick Units 1 and 2 to assess Exelon’s control of transient combustible material and ignition sources, fire detection and suppression capabilities, fire barriers, and any related compensatory measures. The inspectors reviewed the respective pre-fire action plan procedures and Section 9A of the Updated Final Safety Analysis Report. This inspection activity represented seven samples. The following fire areas were inspected:

- Unit 1 class 1E division 1 battery rooms
- Unit 1 class 1E division 2 battery rooms
- control structure ventilation fan room
- Unit 2 reactor core isolation cooling room
- Spray pond emergency service water and residual heat removal service water pump rooms

- Control room auxiliary equipment room
- Control room chiller rooms

Fire Drill. (71111.05A - 1 sample)

On July 29, 2004, the inspectors observed an unannounced fire drill in the Unit 2 turbine building and control structure elevation 239'. The inspectors evaluated various aspects of the fire brigade response, including use of protective gear and fire fighting equipment, communications with the main control room, and uses of the pre-fire plan procedure. The inspectors observed the fire drill critique and discussed the results with the fire protection specialist and station management. This inspection activity represented one sample.

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures (71111.06 - 1 sample)

a. Inspection Scope

The inspectors reviewed internal flood protection features for Units 1 and 2 associated with the emergency core cooling (ECCS) pump room floor drains and the removable equipment plug seals above the pump rooms. The inspectors reviewed the Updated Final Safety Analysis Report and piping and instrument diagram. The review included a plant walk down to verify the adequacy of floor drains in the ECCS pump rooms and adequate controls to ensure water could not enter the pump room from higher elevations. The inspectors also verified that procedures were in place to identify and respond to a flooding event in the pump rooms. The inspectors reviewed condition reports (CRs) related to ECCS pump room flood conditions. This inspection activity represented one sample.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification (71111.11Q - 1 sample)

1. Simulator Evaluation

a. Inspection Scope

On August 18, 2004, the inspectors observed a licensed operator requalification training program as-found simulator scenario to assess licensed operator performance and the evaluator’s critique. The inspectors discussed the results with operators, operations management, and instructors. This inspection activity represented one sample. The

inspectors also reviewed simulator scenario document, LSTS3222, “Inadvertent Opening of an SRV, ATWS.”

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness (71111.12 - 2 samples, 71111.12B - 5 samples)

1. Maintenance Rule Implementation (71111.12 - 2 samples)

a. Inspection Scope

The inspectors evaluated the follow-up actions for selected system, structure, or component (SSC) issues and reviewed the performance history of these SSCs to assess the effectiveness of Exelon's maintenance activities. The inspectors reviewed Exelon's problem identification and resolution actions, as applicable, for these issues to evaluate whether Exelon had appropriately monitored, evaluated, and dispositioned the issues in accordance with Exelon’s procedures and the requirements of 10 CFR 50.65(a)(1) and (a)(2), "Requirements for Monitoring the Effectiveness of Maintenance." In addition, the inspectors reviewed selected SSC classification, performance criteria and goals. The inspectors reviewed the associated maintenance action request and discussed the issue with engineering personnel. This inspection activity represented two samples. The following issues were reviewed:

- Unit 1 high pressure coolant injection/reactor core isolation coolant air bubble (A1464946)
- Unit 2 reactor core isolation coolant impact during Unit 2 high pressure coolant injection pump test (A252784)

b. Findings

No findings of significance were identified.

2. Maintenance Rule Program Implementation (71111.12B - 5 samples)

a. Inspection Scope

The inspectors conducted a review of Limerick’s periodic evaluation of implementation of the Maintenance Rule as required by 10 CFR 50.65 (a)(3). The evaluation covered a period from March 2002 to February 2004. The purpose of this review was to ensure that Limerick effectively assessed its (a)(1) goals, (a)(2) performance criteria, system monitoring, and preventive maintenance activities. The inspectors verified that the assessment was completed within the required time period and also that industry operating experience was utilized, where applicable. Additionally, the inspectors verified that Limerick appropriately balanced equipment reliability and availability when planning maintenance activities.

The inspectors selected a sample of five risk-significant systems to verify that: (1) the structures, systems, and components were properly characterized, (2) goals and performance criteria were appropriate, (3) corrective action plans were adequate, and (4) performance was being effectively monitored in accordance with Exelon procedure ER-AA-310, Rev. 3, “Implementation of the Maintenance Rule.” The following systems were selected for this detailed review:

- Reactor Core Isolation Cooling System (Unit 1)
- Emergency Service Water
- Toxic Gas Analyzers
- Ventilation System Air Controllers
- Emergency Diesel Generators

These systems were either in a(1) status or at some time during the assessment period had been in an a(1) status or experienced degraded performance. The inspectors reviewed corrective action documents for malfunctions and failures of these systems to determine if: (1) they had been correctly categorized as functional failures; (2) they were correctly categorized as preventable maintenance; and (3) their performance was adequately monitored to determine if classifying a system as (a)(1) was appropriate.

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments and Emergent Work Evaluation (71111.13 - 6 samples)

a. Inspection Scope

The inspectors reviewed the assessment and management of selected maintenance activities to evaluate the effectiveness of Exelon's risk management for planned and emergent work. The inspectors compared the risk assessments and risk management actions to the requirements of 10 CFR 50.65(a)(4) and the recommendations of NUMARC 93-01 Section 11, "Assessment of Risk Resulting from Performance of Maintenance Activities." The inspectors evaluated the selected activities to determine whether risk assessments were performed when required and appropriate risk management actions were identified.

The inspectors reviewed scheduled and emergent work activities with work control center planning personnel to verify whether risk management action threshold levels were correctly identified. The inspectors assessed those activities to evaluate whether appropriate implementation of risk management actions were performed in accordance with Exelon’s procedures.

The inspectors compared the assessed risk configuration to the actual plant conditions and any in-progress evolutions or external events to evaluate whether the assessment was accurate, complete, and appropriate for the issue. The inspectors performed control room and plant walkdowns to verify whether the compensatory measures

identified by the risk assessments were appropriately performed. This inspection activity represented six samples. The selected maintenance activities included:

- Replacement of Unit 2 reactor protection system turbine control valve and stop valve closure bypass Rosemount trip unit, WO #M1475881
- Unit 1 jet pump #14 indication failed downscale CR#238009
- Unit 2 residual heat removal room cooler pipe replacement WO#C0210332
- D13 emergency diesel generator inoperable due to DC fuel oil pump alarm problem AR #244599
- Unit 2 "B" reactor recirculation pump speed oscillations WO#C0211170
- Unit 2 feedwater heaters out-of-service to plug leaking tubes on the "5A" feedwater heater

b. Findings

No findings of significance were identified.

1R14 Personnel Performance During Non-routine Plant Evolutions (71111.14 - 2 samples)

1. Unit 1 in Excess of Licensed Thermal Power Limit

a. Inspection Scope

On September 15, 2004, Exelon discovered that Unit 1 reactor was operating at 100.3% power, slightly above the 100% power limit. Operators reduced reactor power to 99% to account for the increase until the cause could be determined.

Following the 2004 spring refueling outage, Exelon noted higher than expected megawatt electric (MWe) output of Unit 1. In the course of investigating this issue, Exelon concluded that the cause of the increased output was inaccuracy of the Unit 1 generator output meter and that this increased electrical output did not constitute operation in excess of 100% power. In September 2004, after reviewing graphs of various balance of plant parameters, trended over a five-month period, Exelon detected increasing trends in condensate flow, main turbine control valve position, turbine steam flow, and turbine first stage pressure, all of which were indicative of increasing reactor power. Feedwater flow, however, remained constant for this period. After further review of this data, Exelon declared that Unit 1 was in a potential overpower condition.

The inspectors reviewed trends, operating experience, condition reports (CRs), troubleshooting plans, technical evaluations, and interviewed plant personnel in order to understand the circumstances that led to Unit 1 reactor operation in excess of the licensed thermal power limit. This inspection activity represented one sample. The documents included in the review are listed in the Attachment.

b. Findings

Introduction. The inspectors identified a Green self-revealing NCV of Section 2.C.(1), "Maximum Power Level" of Operating License No. NPF-39, because Exelon operated the Unit 1 reactor above the maximum core thermal power limit. A non-conservative feedwater flow signal resulted in the operation of Unit 1 reactor at 100.3% power, slightly above the 100% power limit of 3458 MWth from May 23, 2004 through September 15, 2004.

Description. Exelon performed a review of the main generator electrical output versus circulating water temperature using data from before and after the Unit 1 2004 spring refueling outage, and concluded that the reactor was not operating in excess of 100% power. They attributed the increase in generator output to improved condenser performance, circulating water flow, and cooling tower performance. Exelon documented this review in CR 214724 and classified it as a low level issue with no formal investigation required to determine causes or corrective actions.

Exelon's Nuclear Oversight group (NOS) recommended formal documentation of the basis supporting the conclusion that Unit 1 was not in an overpower condition and noted that even small changes in parameters such as feedwater flow and steam flow could result in operation in excess of 100% power. Exelon issued CR 222497 to address the problem and performed an apparent cause evaluation (ACE) to determine the cause and corrective actions. In addition to the ACE, Exelon also completed an engineering technical evaluation to document the conclusion that Unit 1 was not exceeding rated thermal power. The engineering technical evaluation, which incorporated plant data through June 2004, concluded that Unit 1 was operating within its licensed thermal limit. The ACE, which evaluated data through early August, concluded that increased Unit 1 electrical power output was a result of an inaccurate main generator output meter. The ACE was narrowly-focused on increased MW electric output because it referred to the conclusion from the technical evaluation that Unit 1 was not exceeding licensed thermal power instead of taking the opportunity to re-evaluate a potential overpower condition using the most recent plant data.

On September 15, 2004, Exelon identified Unit 1 to be in excess of the licensed thermal power limit for the period between May 23, 2004, and September 15, 2004. Operators reduced reactor power to 99% until the cause of the condition was corrected. Reactor operation in excess of the thermal power limit occurred due to a non-conservative feedwater flow input used for the core thermal power calculation. This resulted in the indicated feedwater flow signal reading less than the actual feedwater flow into the reactor vessel. The error led to actual reactor power exceeding the 100% power limit by 0.1 - 0.3% from May 23, 2004 to September 15, 2004.

Analysis. The finding is a performance deficiency because Exelon operated the Unit 1 reactor above the maximum core thermal power limit and missed opportunities to identify the limit was exceeded for several months. Traditional enforcement does not apply because the issue did not have any actual safety consequences or potential for impacting the NRC's regulatory function, and was not the result of any willful violation of

NRC requirements or Exelon procedures. This finding is greater than minor because if left uncorrected, it could become a more significant safety concern. The increasing rate of thermal power, if left uncorrected, could have resulted in reactor power exceeding the accident analysis initial power condition of 102%. The inspectors concluded that this issue is associated with the Configuration Control attribute of the Barrier Integrity cornerstone because the core thermal power is directly related to reactor manipulation and reactivity control. Reactor operation above the 100% core thermal power limit had the potential to impact the cornerstone objective because the margin to the fuel clad design limits was reduced for certain accidents or event.

This finding was assessed using Phase 1 of the Significance Determination Process (SDP) for Reactor Inspection Findings for At-Power Situations. The finding was determined to be of very low safety significance (Green), because while the reactor power exceeded the license condition limit of 3458 MWth, the plant accident analysis initial condition of 102% was not exceeded and the plant was not operated in an unanalyzed condition.

The inspectors identified that a contributing cause of the finding was related to the problem identification and resolution cross-cutting area, in that Exelon had multiple opportunities to identify and correct the overpower condition during the four-month period that reactor power exceeded the limit. The apparent root cause evaluation, which evaluated data through early August, concluded that increased Unit 1 electrical power output was a result of an inaccurate main generator output meter. The ACE was narrowly-focused on increased MW electric output because it referred to the conclusion from a prior technical evaluation that Unit 1 was not exceeding licensed thermal power instead of taking the opportunity to evaluate additional plant data for a potential overpower condition.

Enforcement. Limerick Generating Station Unit 1 facility Operating License, NPF-39, section 2.C.(1), limits the reactor core thermal power to 3458 MWth. Contrary to the above, thermal power on Limerick Unit 1 exceeded 3458 MWth from May 23, 2004 through September 15, 2004. During this period, the reactor core thermal power exceeded the limit by 0.1 - 0.3%. Because this issue is of very low safety significance and has been entered into Exelon's corrective action program (CRs 223187, 253342, and 222497), this violation is being treated as an NCV, consistent with Section VI.A of the NRC Enforcement Policy. **(NCV 05000352/2004004-01 Unit 1 in Excess of Licensed Thermal Power Limit)**

2. Unit 2 Reactor Recirculation Pump Speed Changes

a. Inspection Scope

The inspectors observed and reviewed licensed operator performance related to the Unit 2 "B" reactor recirculation pump speed reduction. The review included operators' control of the reactor recirculation system during scoop tube control troubleshooting

activities, installation and removal of a scoop tube mechanical locking device, and procedure changes for the recirculation pump normal and transient operations.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15 - 6 samples)

a. Inspection Scope

The inspectors reviewed operability determinations that were selected based on risk insights, to assess the adequacy of the evaluations, the use and control of compensatory measures, and compliance with the Technical Specifications. In addition, the inspectors reviewed the selected operability determinations to verify whether the determinations were performed in accordance with Exelon Procedure LS-AA-105, "Operability Determinations." The inspectors used the Technical Specifications, UFSAR, associated Design Basis Documents, and applicable issue request and condition report documents during these reviews. This inspection activity represented six samples. The issues reviewed included:

- Unit 2 reactor protection system turbine first stage pressure trip unit failed downscale (A1475881)
- Unit 1 jet pump #14 flow indication degraded (A238009)
- D14 jacket water heat exchanger is approaching minimum wall thickness (A1465308)
- Foreign material in bottom of Unit 2 standby liquid control tank (A238075)
- Lisega snubber qualification OPE-04-013 related to maximum radiation exposure for snubber operability (A241302)
- Potential water hammer related to Unit 1 and Unit 2 safeguard piping fill system (A249232)

b. Findings

No findings of significance were identified.

1R19 Post Maintenance Testing (71111.19 - 6 samples)

a. Inspection Scope

The inspectors observed portions of post-maintenance testing activities in the field to determine whether the tests were performed in accordance with the approved procedures. The inspectors assessed the test's adequacy by comparing the test methodology to the scope of maintenance work performed. In addition, the inspectors evaluated the test acceptance criteria to verify whether the test demonstrated that the tested components satisfied the applicable design and licensing bases and the Technical Specification requirements. The inspectors reviewed the recorded test data

to determine whether the acceptance criteria were satisfied. This inspection activity represented six samples. The maintenance activities reviewed included:

- Unit 2 “A” residual heat removal pump flow surveillance test after motor preventive maintenance, ST-6-051-231-2
- Unit 1 jet pump #14 transmitter calibration after transmitter replacement, IC-C-11-00305
- Spray pond recirculation system post maintenance testing following installation (conducted under ECR LG 04-328)
- Unit 1 reactor core isolation cooling (RCIC) pump, valve, and flow test following maintenance on the pump condensate storage tank suction valve, ST-6-049-230-1
- Unit 2 2B motor generator post maintenance testing following replacement of amplifier card and removal of gag
- ST-6-107-590-1&2, “Control Room Daily Surveillance Log,” reviewed effectiveness of Limerick’s response to an Oyster Creek reactor overpower event.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing (71111.22 - 5 samples)

a. Inspection Scope

The inspectors reviewed and observed portions of the following surveillance tests, and compared test data with established acceptance criteria to verify the systems demonstrated the capability of performing the intended safety functions. The inspectors also verified that the systems and components maintained operational readiness, met applicable Technical Specification requirements, and were capable of performing the design basis functions. This inspection activity represented five samples. The observed or reviewed surveillance tests included:

- ST-6-092-314-2, “D24 diesel generator slow start operability test run”
- ST-6-092-312-1, “D12 emergency diesel generator slow start surveillance”
- ST-6-022-251-0, “Motor driven fire pump flow test”
- ST-6-092-312-2, “D22 diesel generator slow start operability test run”
- D14 jacket water heat exchanger performance test

b. Findings

No findings of significance were identified.

1R23 Temporary Plant Modifications (71111.23 - 1 sample)

a. Inspection Scope

The inspectors reviewed Exelon's analysis related to installation of a recirculation system in the spray pond. This modification installed aspirators and aerators to prevent stratification of spray pond water and to provide for better control of spray pond water chemistry. The spray pond water chemistry controls would help to minimize corrosion of safety-related heat exchangers. The spray pond water chemistry control issues and their impact on safety-related equipment were previously discussed in NRC Inspection Report 05000352/2003004, 05000353/2003004. The inspectors reviewed the following documents to verify that the design basis, licensing basis, and performance capability of the spray pond would not be degraded by this modification:

- ECR LG 04-00328, Spray Pond Recirculation Project
- LGS 50.59 Screening LG2004S053
- Water Works With Otterbine Triton$_2$ Owner's Manual (Subsurface Aspirating Aeration Systems)
- Water Works With Otterbine High Volume Industrial Aerator Owner's Manual (Surface Spray Industrial Aerator)
- AR 1471004

This inspection activity represented one sample.

b. Findings

No findings of significance were identified.

Cornerstone: Emergency Preparedness

1EP4 Emergency Action Level and Emergency Plan Changes (71114.04 - 2 samples)

1. Protective Action Recommendation Review

a. Inspection Scope

On August 2, 2004, the NRC issued Regulatory Issue Summary (RIS) No. 2004-13 entitled, "Consideration of Sheltering in Licensee's Range of Protective Action Recommendations" (NRC Accession No. ML041210046). The RIS was issued to clarify the regulatory requirement (10 CFR 50.47(b)(10)) that licensees develop a range of protective actions that includes sheltering when making a Protective Action Recommendation (PAR). It was determined during a regional review, that the Exelon Standard Emergency Plan (Peach Bottom, Limerick and Three Mile Island) did not contain a sheltering option in their PAR scheme. This review was specific to the Limerick Annex Emergency Plan.

b. Findings

NRC requirements state that a range of protective actions be developed which should consider evacuation and sheltering. In addition, EPA 400-R-92-001, Section 5.5.3, "Manual of Protective Action Guides and Protective actions for Nuclear Accidents (EPA 400)," dated May 1992, provides further guidance on evacuation and sheltering. After a review of several licensee's emergency plans, the NRC staff identified a "generic misinterpretation of the regulatory requirement to include sheltering in a licensee's PARs consistent with Federal guidance." Exelon stated that sheltering was eliminated from the Limerick Emergency Plan as a PAR option prior to Exelon's ownership. However, Exelon was not able to generate the 10 CFR 50.54(q) plan change review during the inspection to determine the basis for that change and the timeframe the revision was made. Exelon is continuing to search for the document and will forward it to the NRC for review when located.

However, based on the NRC's clarification of the regulatory requirement, Exelon has taken steps to place sheltering back into their emergency plan as a PAR option.

This issue affects the EP cornerstone and could be more than minor because it impacts the attribute of procedure quality which in turn impacts the cornerstone objective of ensuring that the licensee is capable of implementing adequate measures to protect the health and safety of the public in the event of a radiological emergency. However, due to the generic misinterpretation of the regulatory requirement, the NRC is reviewing the enforcement aspects of this misinterpretation for final disposition of this issue. Therefore, this issue is unresolved pending the results of NRC headquarters' review. **(URI 05000352/2004004-02; 05000353/2004004-02, Removal of sheltering from PAR options**.)

2. Emergency Action Level and Emergency Plan Changes

a. Inspection Scope (IP 7111404)

A regional in-office review was conducted of licensee-submitted revisions to the emergency plan, implementing procedures and EALs which were received by the NRC during the period of April - September 2004. A thorough review was conducted of plan aspects related to the risk significant planning standards (RSPS), such as classifications, notifications and protective action recommendations. A cursory review was conducted for non-RSPS portions. These changes were reviewed against 10 CFR 50.47(b) and the requirements of Appendix E and they are subject to future inspections to ensure that the combination of these changes continue to meet NRC regulations. The inspection was conducted in accordance with NRC Inspection Procedure 71114, Attachment 4, and the applicable requirements in 10 CFR 50.54(q) were used as reference criteria.

b. Findings

No findings of significance were identified.

1EP6 Drill Evaluation (71114.06 - 1 sample)

a. Inspection Scope

The inspectors evaluated a Licensed Operator Simulator evaluation for a Site Area Emergency and General Emergency Classification on August 18, 2004. The inspectors reviewed the scenarios to identify the timing and location of classification, notification and PAR development activities. During the drill and exercise, the inspectors reviewed checklists and forms used for classification and notification activities, and compared them to the criteria in Exelon's Emergency Plan, EP-AA-1000, and supporting procedures. This inspection activity represented one sample.

b. Findings

No findings of significance were identified.

2. RADIATION SAFETY

Cornerstone: Occupational Radiation Safety

2OS3 Radiation Monitoring Instrumentation and Protective Equipment (71121.03 - 9 samples)

a. Inspection Scope

During the period July 19 - 22, 2004, the inspectors conducted the following activities to evaluate the operability and accuracy of radiation monitoring instrumentation, and the adequacy of the respiratory protection program for issuing self-contained breathing apparatus (SCBA) to emergency response personnel. Implementation of these programs was reviewed against the criteria contained in 10 CFR 20, applicable industry standards, and the licensee's procedures.

- The inspectors reviewed the relevant procedures and observed technicians performing calibrations on portable survey instruments (E-520 and RO-2A) and an air sampler (Radeco H-809).

- The inspectors reviewed the calibration records for selected survey instruments and contamination monitors including small article contamination monitors (SAM-9), personnel contamination monitors (PCM-1C), and portable survey instruments (RO-2, RO-20, and E-520).

- The calibration records and pre-operational quality control data were reviewed for the Fast-Scan and Accu-Scan whole body counting systems.

- The inspectors reviewed the operating procedure and current source activities/dose rate characterizations for the Shepherd Model 89 calibrator and the Shepherd Model 142 Panoramic Irradiator.

- The inspectors reviewed the current 10 CFR 61 sampling results for Units 1 and 2 to determine if the calibration sources used are representative of the plant source term.

- The inspectors reviewed calibration data and maintenance histories for area radiation monitors, not covered by the Maintenance Rule, including those located in the Units 1 and 2 drywells and transversing incore probe (TIP) rooms. The operational status of these instruments was discussed with the System Manager and an Instrumentation & Control Foreman.

- The inspectors evaluated the adequacy of the respiratory protection program regarding the maintenance and issuance of self-contained breathing apparatus (SCBA) to emergency response personnel. Training and qualification records were reviewed for three licensed operators from each of the five operating shifts, and for selected radiation protection personnel and maintenance technicians, who would wear SCBAs in the event of an emergency. Three of the SCBAs staged for use in the control room and three SCBAs that were staged in the Operations Support Center (OSC) were physically inspected and the maintenance/test records for other selected SCBAs, staged in other plant areas, were reviewed. The method for refilling SCBA cylinders was evaluated and the quarterly compressor air sample results were reviewed to confirm that the air quality met CGA G-7.1 Grade E (1997) standards.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator (PI) Verification

a. Inspection Scope (71151 - 3 samples)

The inspector reviewed the licensee's procedure for developing the data for the EP PIs which are: (1) Drill and Exercise Performance (DEP); (2) ERO Drill Participation; and (3) ANS Reliability. The inspector reviewed documentation from drills in 2003 and 2004, ERO drill participation rosters and ANS testing results to verify the accuracy of the reported data. Data generated since the July 2003 EP PI verification was reviewed during this inspection. The review of these performance indicators was conducted in accordance with NRC Inspection Procedure 71151. The acceptance criteria used for the review were 10 CFR 50.9 and NEI 99-02, Revision 2, Regulatory Assessment Performance Indicator Guidelines.

b. Findings

No findings of significance were identified.

4OA2 Problem Identification and Resolution

a. Inspection Scope

1. Routine PI&R Review

The inspectors reviewed selected issue reports (IRs) as part of the routine baseline inspection documented in this report. The IRs were assessed to verify whether the full extent of the various problems were adequately identified, appropriate evaluations were performed, and reasonable corrective actions were identified. The inspectors evaluated the IRs against the requirements of LS-AA-125, "Corrective Action Program (CAP) Procedure," and 10 CFR 50, Appendix B, Criterion XVI, “Corrective Action.” During this inspection period, the inspectors performed a screening review of each item that Exelon entered into their corrective action program, to assess whether there were any unidentified repetitive equipment failures or human performance issues that might warrant additional follow up.

2. Radiation Monitoring Instrumentation and Protective Equipment (71121.03)

The inspectors reviewed selected CRs and Radiation Protection Department self-assessments to evaluate the licensee’s threshold for identifying, evaluating and resolving problems in implementing the radiation monitoring and respiratory protection programs. Included in this review were thirteen (13) CRs and two (2) focused area self-assessments. This review was conducted against the criteria contained in 10 CFR 20,Technical Specifications, and the licensee’s procedures.

3. Cross-References to PI&R Findings Documented Elsewhere

Section 1R14 describes a finding where Exelon had multiple opportunities to identify and correct a Unit 1 reactor overpower condition during a four-month period when reactor power exceeded the allowable limit.

b. Findings

No findings of significance were identified.

4OA3 Event Followup (71153 - 2 samples)

1. Dropped spent fuel pin

a. Inspection Scope

The inspectors observed Exelon's response to a dropped spent fuel pin incident that occurred during underwater testing. The pin's contact with the spent fuel pool floor resulted in the separation of both end caps. During initial recovery efforts, eight fuel pellets were released into a preplanned containment area. The fuel pellets were confined under water in the containment area on the spent fuel pool floor until they were moved back into the original fuel bundle. There was no release of radiation on the refuel floor or to the environment. Exelon's recovery actions and the radiological consequence of the incident were reviewed from July 1- 9, 2004.

The following documents were reviewed with respect to the requirements in 10 CFR 20 and Exelon's procedures:

- Condition Report (CR) 233343
- Unit 1 North Stack wide range and normal range noble gas monitor readings June 29-July 6, 2004
- particulate and iodine air sample analysis results taken during the initial event on July 1, 2004
- spent fuel pool water sample analysis results from June 29- July 8, 2004
- radiation and contamination surveys of the refueling floor prior to, and after the July 1, 2004 rod drop incident
- spent fuel rod noble gas source calculation and bounding calculation of noble gas exposure to refuel floor personnel during the July 1, 2004 incident

b. Findings

No findings of significance were identified.

2. (Closed) LER 50-353/2004-001-00 Unplanned RPS Actuation - Unit 2 Scram due to 500kV Switchyard Faults

On June 22, 2004, an internal fault occurred on a 500kV circuit breaker during opening for planned maintenance resulting in a loss of the 500kV #1 bus. A concurrent failure associated with a second 500kV circuit breaker resulted in the loss of the 500kV #3 bus. These two failures caused a trip of both Unit 2 main generator output circuit breakers which resulted in an automatic reactor scram. The inspectors did not identify any findings as a result of this LER review. The licensee documented this event in their corrective action program (CR 230585). This LER is closed.

4OA5 Other Activities

1. Review of Generic Letter 89-13: Service Water System Problems Affecting Safety-Related Equipment (TI 2515/159)

Heat Sink Performance (71111.07B - 2 samples)

a. Inspection Scope

The inspectors reviewed Limerick Generating Station's Emergency Service Water (ESW) and Residual Heat Removal Service Water (RHRSW) system and component performance which included a review of ESW and RHRSW system design requirements, operating, maintenance, and testing procedures. The inspectors reviewed Exelon's inspection, cleaning, chemical control, and performance monitoring methods, frequencies, and test results of the ESW and RHRSW systems and related components. This review was to ensure compliance with commitments made in their response to the five recommended actions of Generic Letter (GL) 89-13, "Service Water System Problems Affecting Safety-Related Equipment." The inspectors reviewed design bases summary information including flow calculations and related modifications to ensure that Exelon was maintaining the design bases of the ESW and RHRSW systems.

The inspectors reviewed system operating, abnormal and emergency procedures and operator training material associated with open-cycle service water systems. This review was to determine whether the procedures were adequate to ensure that safety-related equipment cooled by the ESW and RHRSW systems would function as intended, and that the trained operators would perform effectively. The inspectors also reviewed operator logs to determine the adequacy of temperature and flow monitoring, and to evaluate operator effectiveness in varying the ESW and RHRSW system heat exchanger flow rates due to changing climate (temperature) conditions. During plant tours and procedure and training reviews, the inspectors verified the ability of operators to locally operate the ESW and RHRSW components. The inspectors reviewed selected the ESW and RHRSW system maintenance procedures and/or work orders for technical adequacy and proper implementation. The maintenance history and preventive maintenance requirements for the selected ESW and RHRSW system components were reviewed to determine the effectiveness of corrective and preventive maintenance.

The inspectors reviewed Exelon's program for operating experience and its implementation with respect to all open-cycle service water systems in order to assess the effectiveness of operating experience in maintaining service water system functionality. The inspectors reviewed the operating experience administrative procedure, selected several operating experience items for detailed review, and interviewed responsible station personnel.

The inspectors sampled applicable condition reports, LERs, system health reports and related past self-revealing and NRC-identified inspection findings. The inspector

reviewed these documents to better understand the ESW and RHRSW system maintenance and operational history, and Exelon's response to those identified adverse conditions.

This inspection also fulfilled inspection attributes and requirements for Limerick's Biennial Heat Sink Inspection (71111.07B - 2 samples). The following heat exchangers were selected for review:

a. Unit 2C residual heat removal pump motor oil cooler (2C-E220)
b. Unit 1C residual heat removal unit cooler (1C-V210)

b. Observations and Findings

No findings of significance were identified.

Overall, the inspectors concluded that Exelon's response to GL 89-13 was appropriate and the recommended actions from GL 89-13, in general, have been effectively implemented and maintained. In addition, Exelon's operating experience program and procedure has appropriately addressed and incorporated service water items when applicable.

The specific responses to the questions directed by TI 2515/159 are contained in the Attachment of this report.

4OA6 Meetings, Including Exit

Exit Meetings

On October 8, 2004, the resident inspectors presented the inspection results to Mr. DeGregorio and other members of his staff, who acknowledged the findings. The inspectors confirmed that proprietary information was not included in the inspection report.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Exelon Generation Company

E. Callan, Director - Engineering
B. Hanson, Plant Manager
R. Harding, Regulatory Assurance
C. Mudrick, Director - Operations
P. Orphanos, Shift Operations Superintendent

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000352/2004004-01	NCV	Unit 1 in Excess of Licensed Thermal Power Limit

Opened

05000352/2004004-02 and 05000353/2004004-02	URI	Removal of sheltering from PAR options

Closed

05000353/2004-001-01	LER	Unplanned RPS Actuation - Unit 2 Scram due to 500kV Switchyard Faults

LIST OF DOCUMENTS REVIEWED

Section1R04: Equipment Alignment

Partial System Walkdown. (71111.04Q)

S52.1.A, “Core Spray Setup for Service Operation”
S52.9.A, “Routine Inspection of the Core Spray System”

Complete System Walkdown. (71111.04S)

L-S-02, “Emergency Service Water Design Bases Document”
2S11.1.A(COL-2), “Equipment Alignment of Emergency Service Water Loop “B” System”
UFSAR Section 9.2.2, “Emergency Service Water system”
RT-2-011-253-0, “ESW Loop “A” Flow Verification”
RT-2-011-254-0, “ESW Loop “B” Flow Verification”

Section 1R12: Maintenance Effectiveness

ER-AA-310, Rev. 3, "Implementation of the Maintenance Rule."
ER-LG-310-1010, Rev. 3, "Maintenance Rule Implementation - LGS."
ER-AA-310-1004, Rev. 1, "Maintenance Rule - Performance Monitoring."
ER-AA-310-1002, Rev. 1, "Maintenance Rule - SSC Risk Significance Determination."
ER-AA-310-1007, Rev. 2, "Maintenance Rule - Periodic (a)(3) assessment."
ER-AA-310-1005, Rev. 1, "Maintenance Rule - Dispositioning between (a)(1) & (a)(2)."
MA-AA-716-017, Rev. 0, "Equipment Readiness and Reliability Program."
MA-AA-716-210, Rev. 3, "Performance Centered Maintenance Process."
ER-AA-600-1044, Rev. 3, "Maintenance Rule Support."
Limerick Maintenance Rule (a)(3) Periodic Assessment March 2002 - February 2004.
Maintenance Rule Expert Panel Meeting Minutes/Notes - Various Dates (2002 - 2004)

(a)(1) Action Plans
Love Controllers
Emergency Service Water
Toxic Gas Analyzers
Wide Range Accident Monitors
Fuel Assemblies

System Health Reports/MR Basis Documents

Love Controllers
Emergency Service Water
RCIC Toxic Gas Analyzers
EDGs Plant Process Rad Monitoring
HVAC Fuel

Corrective Action Plans Reviewed

AR128563, AR192497, AR60306, AR201890, AR215819, AR60417, AR161841, AR190738, AR153689, AR154775, AR159310, AR173683, AR168117, AR128557, AR160041, AR114368, AR100575, AR128549, AR157452, AR141115

Section 1R14: Personnel Performance Related to Nonroutine Plant Evolutions and Events

CRs 214724, 222497, 223187, 250909, 253342, and 253354
Engineering Technical Evaluation as documented in AR A1475771
Limerick Unit 1 Thermal Power Discrepancy Troubleshooting Plan
Thermal Performance Balance Sheets for 5/11/2004, 6/9/2004, 7/7/2004, and 8/5/2004
ER-AA-510-1005, Thermal Performance - Design and Expected Output Determination
Balance of plant trend graphs - condensate flow, feedwater flow, main turbine control valve position, turbine steam flow, turbine first stage pressure

Section 1EP4: Emergency Action Level and Emergency Plan Changes

EP-AA-1000, Standard Emergency Plan, Revision 14

Section 2OS3: Radiation Monitoring Instrumentation and Protective Equipment

Procedures

RP-AA-210, Rev 5, "Dosimetry Issue, Usage, and Control"
RP-AA-220, Rev 2, "Bioassay Program"
RP-AA-350, Rev 1, "Personnel Contamination Monitoring, Decontamination, and Reporting"
RP-AA-700, Rev 0, "Controls for Radiation Protection Instrumentation"
RP-LG-700-1001, Rev 1, "Radiation Protection Instrumentation Operations Guidelines"
RP-LG-220-1002, Rev 1, "Perform Calibration Checks and a Whole Body Count on the FastScan"
RP-LG-740, Rev 0, "Operation of MDH/RADCAL 2025 series X-ray Monitor"
RP-LG-8250, Rev 4, "Operation of the BARON III Compressor Refill System and Recharging Scott 4500 PSIG cylinders"
HP-C-308, Rev 0, "Calibration of NE Technology Model SAM-9, Small Articles Monitor"
HP-C-409, Rev 0, "Calibration and Preventive Maintenance of Eberline Model PCM-1C, Personnel Contamination Monitor"
HP-C-413, Rev 0, "Calibration of Eberline RO-2 and RO-2A"
IC-C-12-00110, Rev 1, "Calibration of Eberline Model RO-20 Ion Chambers"
IC-C-12-0112, Rev 0, "Calibration of Eberline Model E-520 Geiger Counter"
IC-12-00439, Rev 1, "Calibration of the RADECO Model H-809C Portable Air Sampler"
IC-11-0376, Rev 5, "Calibration of General Electric Area Radiation Monitors"
RT-0-111-900-0, Rev 25, "One Hour SCBA Cylinder Inspection and Functional Test"

Technical Reports

RP-03-002, Justification for annual calibration of Siemens Mk-II Electronics Dosimeters Models EPD and EPDN

Section 40A2 .1: Radiation Monitoring Instrumentation and Protective Equipment

Condition Reports

00206937, 00231308, 00229854, 00213897, 00211566, 00211354, 00205649, 00203871, 00187741, 00186565, 00175250, 00170787, 00169372,

Focused Area Self-Assessments:

Radiation Monitoring and Protective Equipment, April 26 - June 2, 2004
Radiation Protection Instrumentation Program, November 5-6, 2002

Section 40A5: Review of Generic Letter 89-13: Service Water System Problems Affecting Safety-Related Equipment (TI 2515/159)

Procedures

RT-6-011-604-0,'B' Loop ESW Unit Cooler Throttle Valve Flush
RT-2-011-254-0, Rev 14, ESW Loop 'B' Glow Verification
RT-2-011-252-0, Rev 13, ESW Loop 'B' Flow Balance
RT-2-011-251-0, ESW Loop 'A' Flow Balance
Control Room ESW/RHRSW Overhead Alarm Response Procedures
LS-AA-115, Rev 3, Operating Experience Procedure
C4-LG-130-828, Rev 0, Clam Control Activities

Other Documents

Generic Letter (GL) 89-13, Service Water System Problems Affecting Safety-Related Equipment dated July 18, 1989
GL 89-13, Frequently Asked Questions dated April 4, 1990
PECO Response to GL 89-13 for PB Units 2 & 3, LGS Units 1 & 2 dated January 29, 1990
LGS GL 89-13 Implementation of Actions dated August 5, 1991
SWOPSI, Service Water Operational Performance System Inspection
LGS GL 89-13 Program Implementation Document, Rev. 4
Focused Area Self Assessment, LGS 89-13 Program and Balance-of-Plant Heat Exchangers conducted August 11-12, 2003
LS-17, Rev 11, GL 89-13 Heat Exchanger Data Table Service Water System Design Basis
Spray Pond Plan, original dated Jan 17, 2003 with updates to date of inspection
T04409, Plant Commitment for ESW Pump Wetwell Screen Periodic Inspections
PEP I0012388, Missed Testing of Unit 2 RHR Heat Exchangers dated March 19, 2001
Unit 1 ESW 'A' and 'B' Loop Valve Position Check-off List
Replacement of ESW Valves HV-011, -042, -072, -043, -073
Limerick GL 89-13 Quarterly System Health Reports, 4th Qtr 2000 through 2nd Qtr 2004
ER-AA-340, Rev 2, GL 89-13 Program Implementing Procedure,
ER-AA-340-1001, Rev 2, GL 89-13 Program Implementation Instructional Guide
ER-AA-340-1002, Rev 2, Service Water Heat Exchanger and Component Inspection Guide
Service Water and Residual Heat Removal Service Water Technical Specifications
USFAR Section 9.2, Water Systems
ENANPG-13, Engineering Training Certification Guide For GL 89-13 Program Manager
ENANPG-18, Engineering Training Certification Guide for Service Water Heat Exchanger/Component Inspector
Simulator Training Scenarios:
a. LSTS1014, ESW Pump Trip, Inadvertent SLC Pump Start, ATWS
b. LSTS2027, Abnormal ESW Operation, Station Black Out
c. LSTS3120, Jet Pump Failure, Loss of Service Water, Abnormal ESW Operation
Training Lesson Plans: NLSRO 400, NLSRO 680, LLOT400, LLOT 680, LLEOT11
ML-008, Rev. 7, App. E, ESW and RHRSW IST Bases
GL 89-13 Heat Exchanger Performance Test Trending Documents

Work Orders and Engineering Change Requests (ECR)

ECR 04-00328, Spray Pond Recirculation Project
ECR 02-00249, Increase Allowable Sediment Level in Spray Pond
Work Order C0209468, 1D-E507 NDE (UT) Monitor JW HX Head Eroded Area
Various work control documents related to heat transfer tests

Heat Transfer Test Documents

RT-2-011-398-2, Unit 2C RHR Motor Oil Cooler Heat Transfer Test
RT-2-011-398-1, Unit 1C RHR Motor Oil Cooler Heat Transfer Test
RT-2-011-392-0, 'B' MCR Chiller Heat Transfer Test
RT-2-012-391-1, 1B-E205 RHR Heat Exchanger Heat Transfer Test
RT-2-012-390-1, 1A-E205 RHR Heat Exchanger Heat Transfer Test
RT-2-011-392-0, 'B' MCR Chiller Heat Transfer Test
RT-2-011-391-0, 'A' MCR Chiller Heat Transfer Test
ST-2-011-390-0, ESW/Diesel Generator Heat Transfer Test
RT-2-011-395-2, 2BV211 Core Spray Room Cooler Air to Water Heat Transfer Test
RT-2-011-394-1, 1EV211 Core Spray Room Cooler Air to Water Heat Transfer Test
RT-2-011-393-1, 1HV210 RHR Room Cooler Air to Water Heat Transfer Test
RT-2-011-392-1, 1CV210 RHR Room Cooler Air to Water Heat Transfer Test
RT-2-011-391-1, 1BV210 RHR Room Cooler Air to Water Heat Transfer Test
RT-2-011-390-1, 1AV210 RHR Room Cooler Air to Water Heat Transfer Test

Action Requests and Condition Reports

Action Request (AR) 76196, Diesel Generator HX Cleaning, 89-13 Recommendation
AR A1465308, D14 Emergency Diesel Generator (EDG) Wall Thinning
Condition Report (CR) 98546, ESW Pinhole Leaks
CR 115030, Failure of Unit 2C Motor Oil Cooler Heat Transfer Test
CR 117920, ESW Piping Leaks
CR 141513, EDG (D22) HX Partition Plate Erosion
CR 142874 Quality Review Team, RHR Pump Room Unit Coolers
CR 149191, Unsat Eddy Current Testing on 2B RHR Heat Exchanger
CR 164202, Transition Plan for HX Inspection Program
CR 245232, 4" ESW Pipe Clogged 50%
CR 253302, Unsat GL 89-13 Heat Transfer Test with No Retest After Cleaning
Various Condition Reports related to emergency service water system

LIST OF ACRONYMS

CAP	Corrective Actions Program
CFR	Code of Federal Regulations
CR	Condition Report
ECCS	Emergency Core Cooling System
ECR	Engineering Change Request
EDG	Emergency Diesel Generator
EP	Emergency Preparedness

ESW	Emergency Service Water
GL	Generic Letter
IST	In-Service Testing
LER	Licensee Event Report
LGS	Limerick Generating Station
MC	Manual Chapter
MIC	Microbiologically Influenced Corrosion
Mn	Manganese
MR	Maintenance Rule
NCV	Non-cited Violation
NRC	Nuclear Regulatory Commission
OSC	Operations Support Center
PAR	Protective Action Recommendation
PCM	Personnel contamination Monitors
PI	Performance Indicator
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RIS	Regulatory Issue Summary
SAM	Small Article Monitor
SCBA	Self Contained Breathing Apparatus
SDP	Significance Determination Process
SSC	System, Structure, or Component
SW	Service Water
SWOPSI	Service Water Operational Performance System Inspection
TI	Temporary Inspection
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item

TI 2515/159 - REVIEW OF GENERIC LETTER 89-13: SERVICE WATER SYSTEM PROBLEMS AFFECTING SAFETY-RELATED EQUIPMENT

Reporting Requirements:

a.1. The effectiveness of Generic Letter (GL) 89-13 in communicating information

Generic Letter 89-13 was effective in communicating the importance of understanding service water system health and increased Exelon's awareness with respect to implementing maintenance and testing programs to ensure the design basis and operability of effected systems were maintained. It provided a foundation of recommended practices that contributed to improved overall performance of risk significant service water systems. It has increased station awareness of service water (SW) issues to ensure support for system improvements and has ensured that appropriate design bases were developed from which to assess and maintain operability of the systems.

a.2. Licensee actions that are being implemented for the five recommended actions of GL 89-13

Exelon has taken actions which are generally reasonable and appropriate to ensure that the commitments made to GL 89-13 and its recommended actions are met. Specifically:

- GL 89-13 Recommendation #1 - Develop a Biofouling Program. Efforts at Limerick continue to evolve specifically in the area of chemistry challenges in the spray pond environment. The recent addition of an aeration system in the spray pond has improved the ability of the plant to control spray pond chemistry. This is an area that will need continued monitoring as the plant takes on the task of removing excess sludge from the spray pond.

- GL 89-13 Recommendation #2 - Conduct a Test Program to Verify Heat Transfer Capabilities for Safety-Related Heat Exchangers (HX) Cooled by Service Water Systems. A program is clearly in place to test HX capabilities at Limerick. The program continues to evolve. Some related issues are covered in the answer to "a.4" in this attachment.

- GL 89-13 Recommendation #3 - Establish an Open Cycle SW System Routine Inspection and Maintenance Program to Ensure Erosion/Corrosion, Protective Coatings, Silting and Biofouling cannot Degrade Safety-Related System Performance. Limerick's program was reviewed and has been in place in accordance with the recommendations of GL 89-13. This program also continues to evolve. The site has been challenged by Microbiologically Influenced Corrosion (MIC), pinhole leaks, and silting in room coolers which has led in some cases to reliability questions (which the plant is actively working to address) and unplanned technical specification entries.

- GL 89-13 Recommendation #4 - Confirm that SW Systems will Meet Design Basis. Limerick's efforts in this area have produced improvements in documentation which supports the actual design bases for safety-related service water systems. The inspection did raise a question regarding Limerick's tendency to utilize available cooler capacity margins and spray pond volume margin to determine whether developing conditions are operational concerns or still within bounds of the design bases for the safety-related systems. The direct result of continuing to use the available margin is that at some point action will be required to correct the deficient condition and by then the situation will likely be worse. For example, continuing to allow the depth of the sludge in the spray pond to increase may have been a significant contributor to the increased number on manganese (Mn) chemistry excursions the spray pond has experienced. The inspection team did note improvements in increased cooler flushing and throttle valve flushing programs but also noted that the improvements tended to be reactionary.

- GL 89-13 Recommendation #5 - Confirm that Maintenance Practices, Operation and Emergency Procedures, and Training are Adequate to Ensure Safety-Related Equipment Operates as Intended. This part of the program was effectively implemented.

a.3. Effective programmatic maintenance of the actions in response to GL 89-13

Overall, Exelon has maintained effective GL 89-13 programs and procedures to meet their commitments. The appointment of an individual to be solely responsible for GL 89-13 issues in September of 2000 is noted as a significant improvement to the program. The ongoing efforts to improve chemistry in the spray pond and to replace piping in the mid-bore category which provides cooling flow to safety-related coolers are also noted as significant improvements to system reliability.

However, there were examples that indicate areas where actions in response to GL 89-13 commitments have not been as effective as desired. Specifically,

- The inspectors noted untimely or limited responses to Mn excursions in the spray pond and the potential impact on safety related equipment specifically RHRSW.

- Engineering analysis to select representative coolers for monitoring is not well documented nor seemingly rigorous enough in nature to determine the most susceptible cooler to monitor in each portion of the program. This process may have contributed to the extensive tube plugging required in the 2B RHRSW because 2A was chosen to be monitored.

- Exelon procedure (ER-AA-340-1001) states that disposition for a test failure under the GL 89-13 program requires that the "group of heat exchangers" represented by the failed cooler will all be examined to assess extent of condition. This is not currently done at Limerick or at least could not be demonstrated as having been done for previous failed tests.

a.4. As applicable, identify noteworthy SWS operational history that supports inspection results

The following items were noted as particularly indicative of problems in the safety-related service water systems during this inspection:

- In 2001, the NRC inspectors identified a finding that the GL 89-13 commitment to test the RHRSW HX's at five year intervals had been missed. (Green Finding).

- Implementation of the GL 89-13 recommendation to test after "corrective actions" have been conducted was missed when repairs were made to the 2C RHR Motor Oil Cooler after it failed a test. CR#253302 (July 2002)

- Some initial cooler tests conducted in the GL 89-13 program produced data which was later determined to be unusable or of such poor quality because of the data collection process or clearance (tag out) problems that the program could not use the data. This was indicated on tracking documents for the program. Retests were not conducted when the bad results were identified or in some cases reviewed too late to redo the data during the scheduled cycle.

- Limerick GL 89-13 Program Implementation document (Rev 4) indicates that all room coolers will be tested, cleaned and tested. This has not been common practice. (A CR was generated during the inspection to add post cleaning tests to RHR room coolers.)

- A review of Condition Reports and discussions with system engineers showed that Limerick has experienced and responded to significant numbers of pinhole leaks in small bore service water piping which present challenges to system operations. One instance of a pinhole leak on a 20-inch pipe was noted on a Condition Report and the actions taken were seen as appropriate including the development of a program to investigate other susceptible large bore piping locations and testing to ensure early detection. The proactive nature of this response represented a good response to the concerns for corrosion to service water piping systems.

a.5. Effectiveness assessment of licensee's program procedure(s) on related SWS operating experience

The inspectors determined that Exelon's operating experience program and its implementation were adequate to maintain service water system functionality. Several operating experience items were reviewed and found to have been evaluated appropriately. Efforts to assign new operating experience for evaluation to the right person and subsequent communications of concerns generated was noted throughout the program. The inspectors observed that relevant industry operating experience has been incorporated into appropriate training programs.