



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

May 7, 2012

EA 12-070

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

SUBJECT: LIMERICK GENERATING STATION – NRC INTEGRATED INSPECTION  
REPORT 05000352/2012002 AND 05000353/2012002 and NRC OFFICE OF  
INVESTIGATIONS REPORT 1-2011-033

Dear Mr. Pacilio:

On March 31, 2012, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Limerick Generating Station, Units 1 and 2. The enclosed inspection report documents the inspection results, which were discussed on April 16, 2012 with Mr. F. Kearney, Site Vice President, and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents one Severity Level IV violation of NRC requirements. Additionally, two licensee-identified violations, which were determined to be of very low safety significance, are listed in this report. However, because of the very low safety significance, and because they are entered into your corrective action program, the NRC is treating these findings as non-cited violations (NCVs), consistent with Section 2.3.2 of the NRC Enforcement Policy. If you contest any NCVs 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 Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at Limerick Generating Station.

This inspection also reviewed actions regarding your identification of an unattended locked high radiation area (LHRA) on April 14, 2011. In response, the Region I Field Office, NRC Office of Investigations, initiated an investigation on April 25, 2011, to determine whether a contract radiation protection technician serving as LHRA access guard intentionally left this boundary unattended, thereby causing Exelon to violate a Technical Specification requirement. Based on testimonial and documentary evidence gathered during the investigation, the NRC concluded

that while a violation of a Technical Specification requirement occurred, the NRC was unable to substantiate that the contract radiation protection technician deliberately left LHRA boundary unattended.

The safety significance of the violation was evaluated by the NRC and was found to be Green because the area was under constant camera surveillance coverage with a qualified health physics technician observing this area of the drywell from the remote monitoring system. Because the licensee promptly identified and evaluated this matter, the NRC categorized the issue as a licensee-identified NCV in accordance with The Enforcement Policy.

Please note that final NRC documents, such as the Office of Investigations report described above, may be made available to the public under the Freedom of Information Act (FOIA) subject to redaction of information appropriate under FOIA. Requests under FOIA should be made in accordance with 10 CFR 9.23, Request for Records.

In accordance with 10 CFR 2.390 of the NRCs "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 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/**

Paul G. Krohn, Chief  
Reactor Projects Branch 4  
Division of Reactor Projects

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

Enclosure: Inspection Report 05000352/2011002 and 05000353/2011002  
w/Attachment: Supplemental Information

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that while a violation of a Technical Specification requirement occurred, the NRC was unable to substantiate that the contract radiation protection technician deliberately left LHRA boundary unattended.

The safety significance of the violation was evaluated by the NRC and was found to be Green because the area was under constant camera surveillance coverage with a qualified health physics technician observing this area of the drywell from the remote monitoring system. Because the licensee promptly identified and evaluated this matter, the NRC categorized the issue as a licensee-identified NCV in accordance with The Enforcement Policy.

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 Paul G. Krohn, Chief  
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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.: 05000352/2012002 and 05000353/2012002

Licensee: Exelon Generation Company, LLC

Facility: Limerick Generating Station, Units 1 & 2

Location: Sanatoga, PA 19464

Dates: January 1, 2012 through March 31, 2012

Inspectors: E. DiPaolo, Senior Resident Inspector  
N. Sieller, Resident Inspector  
J. Hawkins, Resident Inspector  
J. Furia, Senior Health Physicist Inspector  
S. Barr, Senior Emergency Preparedness Inspector  
R. Nimitz, Senior Health Physicist Inspector  
E. Burket, Reactor Inspector

Approved By: Paul G. Krohn, Chief  
Reactor Projects Branch 4  
Division of Reactor Projects

Enclosure

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## SUMMARY OF FINDINGS

IR 05000352/2012002; 05000353/2012002; 01/01/2012-03/31/2012; Limerick Generating Station, Units 1 and 2; Follow-Up of Events and Notices of Enforcement Discretion.

This report covered a three-month period of inspection by resident inspectors and announced inspections performed by four regional inspectors. The inspectors identified one Severity Level IV 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." The cross-cutting aspects for the findings were determined using IMC 0310, "Components Within Cross-Cutting Areas." Findings for which the significance determination process does not apply may be Green, or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

### Cornerstone: Public Radiation Safety

**Severity Level IV.** The inspectors identified a Severity Level (SL) IV NCV of 10 Code of Federal Regulations (CFR) 50.72(b)(2)(xi) because the NRC Operations Center was not notified via the Emergency Notification System (ENS) within four hours of a reportable event related to the health and safety of the public and protection of the environment for which notification to other government agencies was made. Exelon did make a courtesy notification to the NRC resident inspection staff. However, Exelon did not formally report, to the NRC Operations Center, the notification of other government agencies regarding an abnormal radioactive liquid release, from the Limerick Generating Station common cooling tower blow down line on March 19, 2012. Inspectors performed system walkdowns and conducted an event follow-up inspection on March 20, 2012 to assess the impacts of the overflow event.

This deficiency was evaluated using the traditional enforcement process since the failure to make a required report could adversely impact the NRC's ability to carry out its regulatory mission. The deficiency was evaluated using the criteria contained in Section 6.9(d)(9) of the NRC's Enforcement Policy and determined to meet the criteria for disposition as a SL IV NCV. Exelon took immediate corrective actions pertaining to the abnormal release, including suspension of effluent releases via the cooling tower blow down line and initiation of actions to evaluate the cause and preclude recurrence, as well as the conduct of public dose calculations. Additionally, upon identification by the NRC that the issue was reportable, Exelon subsequently reported the event to the NRC Operations Center on April 11, 2012. Exelon also entered this issue into its corrective action program (IR 1347829).

This violation involved a failure to make a required report to the NRC and is considered to impact the regulatory process. Such violations are dispositioned using the traditional enforcement process instead of the Significance Determination Process. Using the Enforcement Policy Section 6.9, "Inaccurate and Incomplete Information or Failure to Make a Required Report," example (d)(9), which states, "A licensee fails to make a report required by 10 CFR 50.72 or 10 CFR 50.73," the NRC determined that this violation is more than minor and categorized as a SL IV violation. Because this violation involves the traditional enforcement process with no underlying technical violation that would be considered more than minor in accordance with IMC 0612, a cross-cutting aspect is not assigned to this violation. (Section 40A3)

Enclosure

**Other Findings**

Two violations of very low safety significance that were identified by Exelon were reviewed by the inspectors. Corrective actions taken or planned by Exelon have been entered into Exelon's CAP. These violations and corrective action tracking numbers are listed in Section 4OA7 of this report.

## REPORT DETAILS

### Summary of Plant Status

Unit 1 began the inspection period at 100 percent power. On January 4, operators reduced power to approximately 90 percent to perform control rod friction testing. Operators also removed the 6 'B' feedwater heater from service and entered end-of-cycle coastdown and feedwater temperature reduction operations in advance of the Unit 1 refueling outage. On February 19 operators commenced a reactor shutdown to commence refueling outage 1R14. Following the completion of refueling and maintenance activities, operators commenced a reactor startup on March 20. Operators synchronized the main generator to the electrical grid ending the refueling outage on March 24. Following power escalation activities and a series of control rod pattern adjustments, 100 percent power was achieved on March 31. Unit 1 remained at or near 100 percent power for the remainder of the inspection period.

Unit 2 began the inspection period at 100 percent power. On February 10, operators reduced power to approximately 60 percent to facilitate control rod scram time testing, a control rod sequence exchange, and performance of main turbine and main steam isolation valve testing. Unit 2 remained at or near 100 percent power for the remainder of the inspection period.

### 1. REACTOR SAFETY

#### **Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity**

#### 1R04 Equipment Alignment

#### .1 Partial System Walkdowns (71111.04Q – 3 samples)

##### a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

- Unit 1 reactor core isolation cooling (RCIC) system with the high pressure coolant injection (HPCI) system out-of-service due to turbine exhaust pressure instrument calibration and functional testing on January 23
- Unit 1 emergency diesel generators (EDGs) during EDG D13 loss of coolant/loss of offsite power logic testing on March 5
- Unit 1 HPCI system (a risk significant system) following return-to-service on March 27, 2012

The inspectors selected these systems based on their risk-significance relative to the reactor safety cornerstones at the time they were inspected. The inspectors reviewed applicable operating procedures, system diagrams, the updated final safety analysis report (UFSAR), Technical Specifications, work orders, condition reports, and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have impacted system performance of their intended safety functions. The inspectors also performed field walkdowns of accessible portions of the systems to verify system components and support equipment were aligned correctly and were operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no deficiencies. The inspectors also reviewed whether Exelon staff had properly identified equipment issues and entered them into the CAP for resolution with the appropriate significance

characterization. Documents reviewed for each section of this inspection report are listed in the Attachment.

b. Findings

No findings were identified.

.2 Full System Walkdown (71111.04S – 1 sample)

a. Inspection Scope

The inspectors performed a complete system walkdown of accessible portions of the Units 1 and 2 instrument air systems to verify the existing equipment lineup was correct. The inspectors reviewed operating procedures, surveillance tests, drawings, equipment line-up check-off lists, and the UFSAR to verify the system was aligned to perform its required safety functions. The inspectors also reviewed electrical power availability, component lubrication and equipment cooling, hangar and support functionality, and operability of support systems. The inspectors performed field walkdowns of accessible portions of the systems to verify system components and support equipment were aligned correctly and operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no deficiencies. Additionally, the inspectors reviewed a sample of related issue reports (IRs) and work orders to ensure Exelon appropriately evaluated and resolved any deficiencies.

b. Findings

No findings were identified.

1R05 Fire Protection

Resident Inspector Quarterly Walkdowns (71111.05Q – 6 samples)

a. Inspection Scope

The inspectors conducted tours of the areas listed below to assess the material condition and operational status of fire protection features. The inspectors verified that Exelon controlled combustible materials and ignition sources in accordance with administrative procedures. The inspectors verified that fire protection and suppression equipment was available for use as specified in the area pre-fire plan, and passive fire barriers were maintained in good material condition. The inspectors also verified that station personnel implemented compensatory measures for out of service, degraded, or inoperable fire protection equipment, as applicable, in accordance with procedures.

- Fire Area 25 (Elevation 289'), Unit Common Auxiliary Equipment Room
- Fire Area 29 (Elevation 181' and 217'), Unit 1 Suppression Pool and Drywell Sump Rooms 100 and 101
- Fire Area 33 (Elevation 177'), Unit 1 RCIC Pump Room 108
- Fire Area 34 (Elevation 177'), Unit 1 HPCI pump room 109
- Fire Area 43 (Elevation 217'), Unit 1 Safeguard Isolation Valve Area Room 309
- Fire Area 44 (Elevation 217'), Unit 1 Safeguard System Access Area Room 304

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06 – 1 sample)

Internal Flooding Review

a. Inspection Scope

The inspectors reviewed the UFSAR, the site flooding analysis, and plant procedures to assess susceptibilities involving internal flooding. The inspectors also reviewed the CAP to determine if Exelon identified and corrected flooding problems and whether operator actions for coping with flooding were adequate. The inspectors also focused on the Units 1 and 2 Core Spray Pump Rooms and adjacent passageways to verify the adequacy of equipment seals located below the flood line, floor and water penetration seals, watertight door seals, common drain lines and sumps, sump pumps, level alarms, control circuits, and temporary or removable flood barriers.

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07A – 1 sample)

a. Inspection Scope

The inspectors reviewed the Unit 1 'B' residual heat removal (RHR) heat exchanger heat exchanger to determine its readiness and availability to perform the intended safety functions. The inspectors reviewed the design basis for the component and verified Exelon's commitments to NRC Generic Letter 89-13. The inspectors observed portions of RT-2-012-391-1, "1B RHR Heat Exchanger Heat Transfer Test," performed on February 10, 2012. The inspectors reviewed the results of the test and verified that the heat exchanger could fulfill its design basis safety functions. The inspectors verified that Exelon initiated appropriate corrective actions for identified deficiencies. The inspectors also verified that the number of tubes plugged within the heat exchanger did not exceed the maximum amount allowed.

b. Findings

No findings were identified.

1R08 In-service Inspection (71111.08 – 1 sample)

a. Inspection Scope

Activities inspected during the Limerick Unit 1 refueling outage 1R14 included observations of ultrasonic testing (UT), magnetic particle testing, visual testing (VT), and calibration practices. The inspectors reviewed the applicable non-destructive examination (NDE) procedures, qualification certification for the personnel and procedures, and confirmed that relevant indications were properly documented and dispositioned.

The inspectors observed the in-process examination and post-test results of the dissimilar metal weld N2F, VRR-1RD-1A, which was examined with the phased array UT technique. Additionally, the inspectors observed a VT-3 and magnetic particle testing of an integral attachment, HBB-117-H018, on the 'A' RHR train.

The inspectors also examined portions of videos and pictures of in-vessel visual inspections of the jet pumps, the steam separator, and the core spray system to verify that Exelon is inspecting and monitoring in-vessel components in accordance with Boiling Water Reactor Vessel and Internals Project guidelines.

Also, the inspectors performed a visual evaluation of the accessible areas of the drywell liner and the suppression pool vapor space to assess the condition of the protective coating.

The inspectors reviewed a repair/replacement activity associated with the cooling water supply to the 'B' control room chiller which involved the replacement of 6-inch gate and check valves, per work order CO 208398. The review was performed to evaluate specification and control of the welding process detailed in the work order, to determine that qualified weld procedures and welders were used for the welding, and that completed weld examinations were performed in accordance with the American Society of Mechanical Engineers (ASME) Code requirements.

The inspectors reviewed a sample of Limerick Unit 1 IRs to verify that in-service inspection (ISI) and NDE related issues were being properly identified and evaluated and that appropriate corrective actions were assigned.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification

.1 Resident Inspector Quarterly Review (71111.11Q – 1 sample)

a. Inspection Scope

The inspectors observed licensed operator training on the simulator on January 26 and February 2. The training involved operator interfaces, malfunctions, and transients involving recirculation pump adjustable speed drives. The solid-state adjustable speed drives were installed in Unit 1 during refueling outage 1R14 and replaced the recirculation pump motor-generator sets. The inspectors reviewed the classroom training lesson plan for the new equipment to verify that it contained appropriate design information and system operational information. Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance and procedure quality issues.

- Licensed operator simulator training on recirculation pump adjustable speed drives including malfunctions and transients on January 26 and February 2.

b. Findings

No findings were identified.

. 2 Licensed Operator Performance (71111.11Q – 1 sample)

a. Inspection Scope

The inspectors observed licensed operator performance in the main control room during the evolutions listed below. The inspectors verified operator compliance and use of plant procedures, performance of procedure steps in the proper sequence, and proper Technical Specification usage. Pre-job briefs, the use of human error prevent techniques, communications between crew members, and supervision of activities were observed to verify that they were performed consistent with establish plant practices.

- Unit 1 down power and shutdown for refueling outage 1R14 on February 19, 2012
- Unit 1 power escalation following startup for refueling outage 1R14 on March 22, 2012

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12Q – 2 samples)

a. Inspection Scope

The inspectors reviewed the samples listed below to assess the effectiveness of maintenance activities on structure, system, or component (SSC) performance and reliability. The inspectors reviewed system health reports, CAP documents, maintenance work orders, and maintenance rule basis documents to ensure that Exelon was identifying and properly evaluating performance problems within the scope of the maintenance rule. For each sample selected, the inspectors verified that the SSC was properly scoped into the maintenance rule in accordance with 10 CFR 50.65 and verified that the (a)(2) performance criteria established by Exelon staff was reasonable. As applicable, for SSCs classified as (a)(1), the inspectors assessed the adequacy of goals and corrective actions to return these SSCs to (a)(2). Additionally, the inspectors ensured that Exelon staff was identifying and addressing common cause failures that occurred within and across maintenance rule system boundaries.

- IRs 1311959, 1319633, and 1222301 documenting multiple failures of Rosemount trip units
- IR 1327817, EDG D13 voltage regulator rectifier forward voltage drop test failure and other rectifier issues

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 5 samples)

a. Inspection Scope

The inspectors reviewed station evaluation and management of plant risk for the maintenance and emergent work activities listed below to verify that Exelon performed

the appropriate risk assessments prior to removing equipment for work. The inspectors selected these activities based on potential risk significance relative to the reactor safety cornerstones. As applicable for each activity, the inspectors verified that Exelon personnel performed risk assessments as required by 10 CFR 60.65(a)(4) and that the assessments were accurate and complete. When Exelon performed emergent work, the inspectors verified that operations personnel promptly assessed and managed plant risk. The inspectors reviewed the scope of maintenance work and discussed the results of the assessment with the station's probabilistic risk analyst to verify plant conditions were consistent with the risk assessment. The inspectors also reviewed the Technical Specification requirements and inspected portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met.

- Control Enclosure and Unit 1 Reactor Building walk down of protected equipment during Yellow risk profile on February 22, 2012
- Unit 1 online risk during HPCI system maintenance and testing on January 6, 2012
- Units 1 and 2 online risk assessments during installation of an automated water drainage system for safety-related electrical manholes
- Units 1 and 2 online risk assessment following the emergent trip of the 'A' main control room chiller on January 30, 2012
- Units 1 and 2 risk management actions during planned replacement of portions of the 'A' loop RHRSW return piping from March 2 – 4, 2012

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 6 samples)

a. Inspection Scope

The inspectors reviewed operability determinations for the following degraded or non-conforming conditions:

- IR 1292258, Past operability/reportability of EDGs D12, D21, and D24 due to low emergency service water (ESW) flow during flow balance testing
- IR 1292570-12, ESW minimum flows at 60°F vice 95°F (Spray Pond Temperature) due to degraded system flow rates
- IR 1317228, Repeated 'A' main control room chiller trips on low freon temperature
- IR 1324565, Limerick response to Byron Station offsite source event on January 30, 2012
- IR1340288, Unit 1 adjustable speed drive equipment deficiencies
- IR 1346780-02, Technical evaluation for 'D' spray pond spray network operability for clogged nozzles

The inspectors selected these issues based on the risk significance of the associated components and systems. The inspectors evaluated the technical adequacy of the operability determinations to assess whether Technical Specification operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the Technical Specifications and UFSAR to

Exelon's evaluations to determine whether the components or systems were operable. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled by Exelon. The inspectors determined, where appropriate, compliance with bounding limitations associated with the evaluations.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 – 2 samples)

Permanent Modifications

a. Inspection Scope

The inspectors evaluated the modifications listed below to determine whether the modifications affected safety functions of systems that are important to safety. The inspectors verified that the design bases, licensing bases, and performance capability of the affected systems were not degraded by the modification. In addition, the inspectors reviewed modification documents associated with the upgrade and design changes.

- Engineering Change Request (ECR) 10-00208, Replace 'A' RHRSW Loop Return Piping – 1R14
- ECR 10-00461, Safety-Related Electrical Manhole Drainage System

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 6 samples)

a. Inspection Scope

The inspectors reviewed the post-maintenance tests for the maintenance activities listed below to verify that procedures and test activities ensured system operability and functional capability. The inspectors reviewed the test procedure to verify that the procedure adequately tested the safety functions that may have been affected by the maintenance activity, that the acceptance criteria in the procedure was consistent with the information in the applicable licensing basis and/or design basis documents, and that the procedure had been properly reviewed and approved. The inspectors also witnessed the test or reviewed test data to verify that the test results adequately demonstrated restoration of the affected safety functions.

- C0241240, Replace Unit 1 reactor protection system level indicating switch trip unit (LIS-042-1N680D)
- C0241307, Troubleshoot and replace D23 EDG voltage regulator motor-operated controller #2
- C0242031, Repair Unit 1 RCIC turbine exhaust line vacuum breaker outboard primary containment isolation valve leakage

- C0242288, RCIC turbine exhaust primary containment isolation valve rework after failing to fully close, (HV-049-1F060)
- R1031339, Replacement of the Unit 1 standby liquid control system squib valve (XV-048-1F004B)
- (AR 1344540) - HPCI overspeed test per RT-6-055-331-1 after spurious stop valve movement during turbine start

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20 – 1 sample)

a. Inspection Scope

The inspectors reviewed the station's work schedule and outage risk plan for the Unit 1 maintenance and refueling outage (1R14), which was conducted February 20 through March 21, 2012. The inspectors reviewed Exelon's development and implementation of outage plans and schedules to verify that risk, industry experience, previous site-specific problems, and defense-in-depth were considered. During the outage, the inspectors observed portions of the shutdown and cooldown processes and monitored controls associated with the following outage activities:

- Configuration management, including maintenance of defense-in-depth, commensurate with the outage plan for the key safety functions and compliance with the applicable Technical Specifications when taking equipment out of service
- Implementation of clearance activities and confirmation that tags were properly hung and that equipment was appropriately configured to safely support the associated work or testing
- Installation and configuration of reactor coolant pressure, level, and temperature instruments to provide accurate indication and instrument error accounting
- Status and configuration of electrical systems and switchyard activities to ensure that Technical Specifications were met
- Monitoring of decay heat removal operations
- Impact of outage work on the ability of the operators to operate the spent fuel pool cooling system
- Reactor water inventory controls, including flow paths, configurations, alternative means for inventory additions, and controls to prevent inventory loss
- Activities that could affect reactivity
- Maintenance of secondary containment as required by Technical Specifications
- Refueling activities, including fuel handling and fuel receipt inspections
- Fatigue management
- Identification and resolution of problems related to refueling outage activities

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 7 samples)

a. Inspection Scope

The inspectors observed performance of surveillance tests and/or reviewed test data of selected risk-significant SSCs to assess whether test results satisfied Technical Specifications, the UFSAR, and Exelon procedure requirements. The inspectors verified that test acceptance criteria were clear, tests demonstrated operational readiness and were consistent with design documentation, test instrumentation had current calibrations and the range and accuracy for the application, tests were performed as written, and applicable test prerequisites were satisfied. Upon test completion, the inspectors considered whether the test results supported that equipment was capable of performing the required safety functions. The inspectors reviewed the following surveillance tests:

- RT-2-011-262-0, Dual Loop Flow Verification: 'A' & 'B' ESW Loops through 'B' RHRSW Return Header
- ST-1-060-490-1, Unit 1 Integrated Leak Rate Test
- ST-4-015-490-1, Reactor Well Seals Leak Test
- ST-6-041-202-1, Main Steam Isolation Valve Cold Shutdown Valve Test (isolation valve test)
- ST-6-051-203-1, 'C' Loop Residual Heat Removal Cold Shutdown Valve Test (IST)
- ST-6-092-321-2, D21 EDG Loss of Coolant Accident (LOCA)/Load Reject Testing and Fast Start Operational Test Run
- ST-6-092-324-1, D14 DG LOCA/LOAD Reject Testing and Fast Start Operability Test Run, Revision 23 and ST-6-092-118-1 D14 EDG 4 kilo-volt Safeguard Loss of Power Logic System Functional and Outage Testing

b. Findings

No findings were identified.

## 2. **RADIATION SAFETY**

### **Cornerstones: Occupational Radiation Safety (OS)**

#### 2RS1 Access Control to Radiologically Significant Areas (71124.01)

a. Inspection Scope

The inspectors reviewed selected activities, and associated documentation, in the areas listed below. The evaluation of Exelon's performance was against criteria contained in 10 CFR Part 20, applicable Technical Specifications, and applicable station procedures.

#### Inspection Planning

The inspectors reviewed Performance Indicators (PI) for the Occupational Exposure Cornerstone. The inspectors also reviewed the results of recent radiation protection program audits and assessments, as available, and any reports of operational occurrences, related to occupational radiation safety since the last inspection.

#### Radiological Hazard Assessment

The inspectors reviewed plant operations to identify any significant new radiological hazards for onsite workers or members of the public. The inspectors assessed the

potential impact of the changes and monitoring, as appropriate, to detect and quantify the radiological hazards.

The inspectors toured and conducted walk-downs of radiological controlled areas (RCA) and reviewed radiological surveys from selected plant areas (e.g., Refueling floor, Unit 1 Reactor Cavity, Reactor Buildings, Turbine Buildings, Unit 1 Condenser areas, Unit 1 Drywell, and Unit 1 Suppression pool), to verify that the thoroughness and frequency of the surveys were appropriate for the given radiological hazard. The inspectors also evaluated material conditions and potential radiological conditions. The inspectors made independent radiation measurements to verify radiological conditions.

The inspectors selected various radiological risk-significant work activities (e.g., reactor cavity work, in-vessel work activities, drywell work activities, condenser work, reactor cavity platform decontamination, turbine work, and suppression pool diving activities) that involved exposure to radiation to verify that appropriate pre-work surveys were performed to identify and quantify the radiological hazards and to establish adequate protective measures. The evaluation included, as applicable: identification of discrete particles, the presence of alpha emitters, the potential for airborne radioactive materials, potential changes in radiological conditions, and non-uniform exposures of the body.

The inspectors selectively reviewed and discussed air sample survey records associated with various work activities to verify that samples were representative of the breathing zone and collected and counted in accordance with procedures.

The inspectors reviewed ongoing work activities in the radiological controlled area to evaluate methods used to update workers on changes in radiological conditions.

#### Instructions to Workers

The inspectors toured the radiologically controlled areas including Unit 1 outage work areas, and reviewed labeling of containers of radioactive materials to verify labeling was consistent with requirements and was informative to workers.

The inspectors reviewed various radiation work permits (RWP), As Low As is Reasonably Achievable (ALARA) reviews, and radiological surveys, used to access High Radiation Areas (HRA), to identify work control instructions or control barriers specified, use of stay times or permissible dose, and appropriate electronic personal dosimeter (EPD) alarm setpoints were in conformance with survey indications. The inspectors evaluated changes to EPD setpoints for specified conditions and updating of radiation work permits. The inspectors reviewed ongoing remote monitoring via teledosimetry.

#### Contamination and Radioactive Material Control

The inspectors observed locations where the licensee monitors potentially contaminated material leaving the RCA, and inspected the methods used for control, survey, and release from these areas. The inspectors observed the performance of personnel surveying and releasing material for unrestricted use to verify that it was performed in accordance with plant procedures and the procedures were sufficient to control the spread of contamination and prevent unintended release of radioactive materials from the site. The inspectors selectively evaluated the radiation monitoring instrumentation sensitivity for the type(s) of radiation present.

The inspectors reviewed the licensee's criteria for the survey and release of potentially contaminated material. The inspectors verified that there was guidance on how to respond to an alarm that indicates the presence of radioactive material.

The inspectors reviewed the licensee's procedures and records to verify that the radiation detection instrumentation was used at its typical sensitivity level based on appropriate counting parameters including application of alarm setpoints based on the instrument's typical sensitivity. The inspectors also discussed alarm setpoints and typical detection capabilities with cognizant licensee personnel.

#### Radiological Hazards Control and Work Coverage

The inspector toured the facility and reviewed ongoing work and evaluated ambient radiological conditions (e.g., radiation levels or potential radiation levels). The inspectors verified the existing conditions were consistent with posted surveys, RWPs, and worker briefings. Areas toured by the inspectors included the Unit 1 Drywell, Unit 1 Suppression Pool, Refueling Floors and Turbine Condenser areas.

The inspectors observed ongoing work activities and verified the adequacy of radiological controls, such as required surveys (including system breach radiation, contamination, and airborne surveys, and surveys of radiation dose rate gradients), radiation protection job coverage (including audio and visual surveillance for remote job coverage), and contamination controls. The inspectors selectively evaluated the licensee's means of using EPDs in high noise areas as HRA monitoring devices (e.g., use of teledosimetry).

The inspectors verified that radiation monitoring devices thermoluminescent dosimeters were placed on the individual's body consistent with the method that the licensee is employing to monitor dose from external radiation sources. The inspectors conducted direct observations of selected work to verify that the dosimeters were placed in the location of highest expected dose. As part of this review, the inspectors reviewed, for high radiation work areas with significant dose rate gradients, the use of dosimetry to effectively monitor exposure to personnel. The inspectors evaluated implementation of external effective dose equivalent measurement (EDEX).

The inspectors selectively reviewed RWPs for work within areas with the potential for individual worker internal exposures. The inspectors evaluated airborne radioactive controls and monitoring, including potentials for significant airborne levels (e.g., grinding, welding, system breaches, entry into tanks, cubicles, and reactor cavities). The inspectors directly observed welding and grinding activities, including use of local ventilation system and respiratory protection equipment, to minimize airborne radioactive exposure. The inspectors reviewed contamination system breach survey results. The inspectors reviewed control rod drive replacement activities.

The inspectors observed ongoing work activities within flooded pools (e.g., Unit 1 suppression pool, Unit 1 reactor cavity) and selectively reviewed physical and programmatic controls for highly activated or contaminated materials (nonfuel) stored within storage pools. The inspectors verified that appropriate controls (i.e., administrative and physical controls) were in place to preclude inadvertent removal of these materials from the pool.

The inspectors conducted selective inspection of posting and physical controls for HRAs and Very High Radiation Areas (VHRA), to verify conformance with the Occupational Pls. The inspectors evaluated down-posting of areas from HRAs.

#### Risk-Significant High Radiation Area and Very High Radiation Area Controls

The inspectors selectively discussed with the Radiation Protection Manager, supervisors, and technicians the controls and procedures for high-risk HRAs and VHRAs and any procedural changes since the last inspection. The inspectors discussed methods employed by the licensee to provide control of VHRA access including potential reduction in the effectiveness and level of worker protection (e.g., use of lock boxes). The inspectors discussed, with health physics supervisors, controls for special areas that had the potential to become VHRAs during certain plant operations including controls to ensure that an individual was not able to gain unauthorized access to the VHRA.

The inspectors conducted a locked HRA key inventory and discussed locked HRA key control and issuance with health physics staff.

#### Radiation Worker Performance

The inspectors toured radiological controlled areas and observed radiation worker performance with respect to stated radiation protection work requirements to determine if performance reflected the level of radiological hazards present. The inspectors interviewed numerous workers conducting work activities in the RCA to determine if workers were aware of the radiological conditions in their workplace and the RWP controls/limits in place.

The inspectors selectively reviewed radiological problem reports since the last inspection to identify human performance errors and determine if there were any observable patterns. The inspectors discussed corrective actions for identified concerns with licensee personnel.

#### Radiation Protection Technician Proficiency

The inspectors toured RCAs and observed the performance of radiation protection technicians with respect to radiation protection work requirements to determine if technicians were aware of the radiological conditions in their workplace and the RWP controls/limits and if their performance was consistent with their training and qualifications with respect to the radiological hazards and work activities.

The inspectors selectively reviewed outage radiological problem reports to identify those that indicate the cause of the events due to radiation protection technician error and to evaluate the corrective action approach taken by the licensee to resolve the reported problems.

#### Problem Identification and Resolution

The inspectors determined if problems associated with radiation monitoring and exposure control were being identified by the licensee at an appropriate threshold and were properly addressed for resolution in the licensee CAP. The inspectors discussed corrective actions for identified concerns.

b. Findings

No findings were identified.

2RS2 Occupational As Low As is Reasonably Achievable Planning and Controls (71124.02)

a. Inspection Scope

Inspection Planning

The inspectors reviewed pertinent information regarding plant collective exposure history, current exposure trends, and ongoing or planned activities in order to assess current performance and exposure challenges. The inspectors determined the plant's 3-year rolling average collective exposure.

The inspectors evaluated and determined the site-specific trends in collective exposures using various methods such as plant historical data, including outage work activity dose, evaluation of ALARA data, and source term data.

The inspectors reviewed site-specific procedures associated with maintaining occupational exposures ALARA including the processes used to estimate and track exposures from specific work activities.

Radiological Work Planning

The inspectors obtained from the licensee a list of work activities ranked by actual or estimated exposure that were planned for the Unit 1 outage and selected work activities of the highest exposure significance. These included reactor disassembly, reactor cavity decontamination, suppression pool work, scaffolding, in-service inspection, control rod drive work, and valve work.

The inspectors reviewed ALARA work activity plans and evaluations, exposure estimates, and exposure mitigation requirements. The inspectors determined if the licensee reasonably grouped the radiological work into work activities, based on historical precedence, industry norms, and/or special circumstances.

The inspectors determined if the licensee's planning identified appropriate dose mitigation features; considered, commensurate with the risk of the work activity, alternate mitigation features; and defined reasonable dose goals. As applicable, the inspectors verified that the ALARA assessments had taken into account decreased worker efficiency from use of respiratory protective devices.

The inspectors determined if work planning considered the use of remote technologies (such as teledosimetry, remote visual monitoring, and robotics) as a means to reduce dose and the use of dose reduction insights from industry operating experience and plant-specific lessons learned. The inspectors verified the integration of ALARA requirements into work procedure and RWP documents.

The inspectors selectively compared accrued results achieved (dose rate reductions, person-rem used), with the intended dose established in the licensee's ALARA planning for these work activities including person-hour estimates. The inspectors determined, the reasons for inconsistencies between intended and actual work activity doses, as

necessary. During the Unit 1 outage, the inspectors selectively evaluated reasons for increased doses for work as compared to original estimates. As part of this review, the inspectors reviewed on-going work-in-progress reviews (e.g., suppression pool work, scaffolding, and drywell in-service inspection).

#### Verification of Dose Estimates and Exposure Tracking Systems

The inspectors selected various ALARA work packages and reviewed the assumptions and bases for the collective exposure estimate for reasonable accuracy. The inspectors reviewed applicable procedures to determine the methodology for estimating exposures for specific work activities and the intended dose outcome. The inspectors also reviewed approvals by the station ALARA committee as applicable.

The inspectors verified, for the selected work activities, that the licensee established measures to track, trend, and if necessary to reduce, occupational doses for ongoing work activities including criteria to prompt additional reviews and/or controls. The inspectors evaluated the adequacy of the licensee's method for adjusting exposure estimates, re-planning work, when unexpected changes in scope or emergent work are encountered.

During the Unit 1 outage, the inspectors selectively evaluated the methods used to adjust exposure estimates, re-planning work due to emergent work, changes in work scope when identified, as well as variations in expected radiation dose rates.

#### Source Term Reduction and Control

The inspectors used licensee records to determine the historical trends and current status of significant tracked plant source term known to contribute to elevated facility aggregate exposure. The inspectors discussed the 1R14 Chemistry Plan and long term plans for source term reduction (e.g., cobalt reduction). The inspectors discussed contingency plans for potential changes in the source term as the result of changes in plant fuel performance issues or changes in plant primary chemistry. The inspectors discussed source term reduction efforts including system flushing and use of additional demineralization and filtration systems.

#### Radiation Worker and Radiation Protection Technician Performance

The inspectors observed both radiation workers' and radiation protection technicians' performance during work activities being performed in Radiation Areas, High Areas, and Airborne Radioactivity Areas. The inspectors determined if workers demonstrated the ALARA philosophy in practice and whether there were any procedure compliance issues. The inspectors observed performance to determine whether the training and skill level were sufficient with respect to the radiological hazards and the work involved.

#### Problem Identification and Resolution

The inspectors determined if problems associated with ALARA planning and controls were being identified by the licensee at an appropriate threshold and were properly addressed for resolution in the licensee CAP. The inspectors discussed corrective actions for identified ALARA concerns with the health physics staff.

b. Findings

No Findings were identified.

2RS3 In-Plant Airborne Radioactivity Control and Mitigation (71124.03)

a. Inspection Scope

Inspection Planning

The inspectors selectively reviewed the plant UFSAR, to identify areas of the plant designed as potential airborne radiation areas and any associated ventilation systems or airborne monitoring instrumentation. The inspectors also reviewed the UFSAR for overview of the respiratory protection program and a description of the types of devices used.

The inspectors reviewed procedures for maintenance, inspection, and use of respiratory protection equipment including procedures for air quality maintenance. The inspectors also reviewed, and directly observed, the use of respiratory protection equipment during ongoing work activities (e.g., submerged platform decontamination, control rod drive work).

The inspectors reviewed the reported PIs to identify any related to unintended dose resulting from personnel intakes of radioactive materials.

Engineering Controls

The inspectors evaluated the use of selected ventilation systems as to control airborne radioactivity. The inspectors discussed procedural guidance for use of installed plant systems to verify system use, to the extent practicable, during high-risk activities. The inspectors discussed verification of plant ventilation systems during reactor cavity work.

The inspectors reviewed selected installed ventilation systems (e.g., valve breeches, welding, and grinding activities) used to mitigate the potential for airborne radioactivity. The inspectors discussed use of installed systems during work activities with health physics staff.

The inspectors selected various temporary ventilation system setups (high efficiency particulate air filters) to support work in contaminated areas. The inspectors discussed the use of these systems as regards procedural guidance and ALARA (valve work, welding and grinding, and decontamination) with health physics staff.

The inspectors selected various installed systems to monitor and warn of changing airborne concentrations in the plant. The inspectors evaluated the alarms and setpoints to prompt licensee/worker action to ensure that doses are maintained within the limits of 10 CFR Part 20 and ALARA.

The inspectors evaluated that licensee's use of decision criteria for evaluating levels of hard-to-detect airborne radionuclides.

### Use of Respiratory Protection Devices

The inspectors evaluated the licensee's use of respiratory protective devices to maintain occupational doses ALARA. The inspectors selected one work activity (reactor cavity platform decontamination) where respiratory protection devices were used to limit the intake of radioactive materials, and evaluated the use of respirators. The inspectors evaluated the licensee's means to verify that the level of protection (protection factor) provided by the respiratory protection devices during use was at least as good as that assumed in the licensee's work controls and dose assessment.

The inspectors evaluated the use of certified respiratory protection devices to limit the intake of radioactive materials and evaluated that the devices were used consistent with their National Institute for Occupational Safety and Health/Mine Safety and Health Administration certification or conditions of NRC approval.

The inspectors reviewed records of air testing for supplied-air devices and self-contained breathing apparatus bottles to verify that air used in these devices met or exceeded appropriate quality criteria. The inspectors evaluated the plant breathing air supply systems met the minimum pressure and airflow requirements for the devices in use. The inspectors selectively reviewed use of supplied air systems.

The inspectors selected individuals qualified to use respiratory protection devices, and verified that they were qualified (by training and medical certification) to use the devices.

The inspectors observed individuals assigned to wear a respiratory protection device and observed them donning and functionally checking the device as appropriate. The inspectors discussed with them their use of the devices including how to properly respond to any device malfunction or unusual occurrence (e.g., escape on loss of air).

### Problem Identification and Resolution

The inspectors reviewed and discussed problems associated with the control and mitigation of in-plant airborne radioactivity to evaluate the licensee's identification and resolution in the CAP.

#### b. Findings

No findings were identified.

### 2RS4 Occupational Dose Assessment (71124.04)

#### a. Inspection Scope

##### Inspection Planning

The inspectors reviewed available radiation protection program audits related to internal and external dosimetry or corrective action documents to gain insights into overall licensee performance in the area of dose assessment.

The inspectors reviewed the most recent National Voluntary Laboratory Accreditation Program (NVLAP) accreditation report for the licensee's dosimetry.

The inspectors reviewed licensee procedures associated with dosimetry operations, including issuance/use of external dosimetry (routine, multi-badging, extremity, neutron, etc.), assessment of internal dose (operation of whole body counter, assignment of dose based on derived air concentration-hours, urinalysis, etc.), and evaluation of and dose assessment for radiological incidents. The inspectors evaluated implementation of dose determination by use of EDEX. The inspectors evaluated procedure guidance for personnel monitoring.

#### External Dosimetry

The inspectors evaluated the use of personnel dosimeters that require processing, to verify NVLAP accreditation. The inspectors determined if the licensee uses a "correction factor" to address the response of the electronic dosimeter as compared to its NVLAP accredited dosimeter for situations when the electronic dosimeter must be used to assign dose.

#### Internal Dosimetry

The inspectors reviewed routine bioassay (in vivo) procedures used to assess dose from internally deposited nuclides using whole body counting equipment. The inspectors determined if the procedures address methods for determining if an individual is internally or externally contaminated, the release of contaminated individuals, the determination of entry route (ingestion, inhalation), and assignment of dose.

The inspectors selectively evaluated the routine whole body counting program, including use of passive monitoring provided, for detection and measurement of intakes of radioactive materials.

The inspectors evaluated the minimum detectable activity of the licensee's instrumentation used for passive whole body counting to determine if the minimum detectable activity was adequate to determine the potential for internally deposited radionuclides sufficient to prompt additional investigation.

#### Special Dosimetric Situations

The inspectors reviewed the licensee's program to inform workers, of the risks of radiation exposure to the embryo/fetus, the regulatory aspects of declaring a pregnancy, and the specific process to be used for declaring a pregnancy.

The inspectors reviewed the licensee's methodology for monitoring external dose in situations in which non-uniform fields are expected or large dose gradients could exist (e.g., diving activities and steam generator entries) to verify that the licensee established criteria for determining when alternate monitoring techniques (i.e., use of multi-badging or determination of effective dose EDEX using an approved method) were to be implemented. The inspectors selectively reviewed use of multi-badging (e.g., diving).

#### Problem Identification and Resolution

The inspectors selectively reviewed corrective action documents to verify that problems associated with occupational dose assessment were being identified by the licensee at an appropriate threshold and were properly addressed for resolution in the licensee CAP.

b. Findings

No findings were identified.

2RS5 Radiation Monitoring Instrumentation (71122.05)

a. Inspection Scope

Inspection Planning

The inspectors reviewed the plant UFSAR, to identify radiation instruments associated with monitoring area radiological conditions including airborne radioactivity, process streams, effluents, materials/articles, and workers.

The inspectors obtained a listing of in-service survey instrumentation including air samplers and small article monitors, along with instruments used for detecting and analyzing workers' external contamination (personnel contamination monitors) and workers' internal contamination (portal monitors (PM), whole body counters, etc.), including neutron monitoring instrumentation to determine whether an adequate number and type of instruments are available to support operations.

The inspectors selectively reviewed procedures that govern instrument source checks and calibrations. The inspectors review the calibration and source check procedures for adequacy.

Walkdowns and Observations

The inspectors selected various portable survey instruments in use for risk significant radiological work or available for issuance and checked calibration and source check stickers for currency, and to assess instrument material condition and operability.

The inspectors walked down portable area radiation monitors, and continuous air monitors to determine whether they were appropriately positioned relative to the radiation source(s) or area(s) they were intended to monitor. The inspectors selectively compared monitor response (via local or remote indication) with actual area conditions for consistency. The inspectors evaluated instrumentation in-place on the Unit 1 refueling bridge and work platforms.

The inspectors selected personnel contamination monitors, PMs, and small article monitors and verified that the periodic source checks were performed in accordance with licensee procedures.

Calibration and Testing Program

The inspectors selected laboratory analytical instruments used for radiological analyses (e.g., gross alpha, gross beta) to verify that daily performance checks and calibration data indicate that the frequency of the calibrations was adequate and there were no indications of degraded instrument performance. The inspectors reviewed applicable control charts.

The inspectors reviewed alarm setpoint data for various personnel and equipment monitors at three radiological controlled area exits to verify that the alarm setpoint values

were reasonable under the circumstances to ensure that licensed material was not released from the site.

#### Calibration and Check Sources

The inspectors selectively reviewed the licensee's latest 10 CFR Part 61 waste stream report to determine if the calibration sources used were representative of the types and energies of radiation encountered in the plant.

#### Problem Identification and Resolution

The inspectors selectively reviewed corrective action documents associated with radiation monitoring instrumentation to determine if the licensee identified issues at an appropriate threshold and placed the issues in the CAP for resolution. In addition, the inspectors evaluated the appropriateness of the corrective actions for a selected sample of problems documented by the licensee that involve radiation monitoring instrumentation.

#### b. Findings

No findings were identified.

### **Cornerstone: Occupational/Public Radiation Safety (PS)**

#### 2RS8 Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation (71124.08 – 1 sample)

#### a. Inspection Scope

The inspectors reviewed the solid radioactive waste system description in the Process Control Program (PCP), and the recent radiological effluent release report for information on the types, amounts, and processing of radioactive waste disposed.

The inspectors reviewed the scope of any quality assurance audits in this area since the last inspection.

The inspectors selected areas where containers of radioactive waste were stored, and verified that the containers were labeled in accordance with 10 CFR 20.1904, "Labeling Containers," or controlled in accordance with 10 CFR 20.1905, "Exemptions to Labeling Requirements," as appropriate.

The inspectors verified that the radioactive materials storage areas were controlled and posted in accordance with the requirements of 10 CFR Part 20, "Standards for Protection Against Radiation." For materials stored or used in the controlled or unrestricted areas, the inspectors verified that they were secured against unauthorized removal and controlled in accordance with 10 CFR 20.1801, "Security of Stored Material," and 10 CFR 20.1802, "Control of Material Not in Storage," as appropriate.

The inspectors verified that the licensee had established a process for monitoring the impact of long-term storage (e.g., buildup of any gases produced by waste decomposition, chemical reactions, container deformation, loss of container integrity, or re-release of free-flowing water) sufficient to identify potential unmonitored, unplanned

releases or nonconformance with waste disposal requirements. The inspectors selected containers of stored radioactive materials, and verified that there were no signs of swelling, leakage, and deformation.

The inspectors selected liquid and solid radioactive waste processing systems, and walked down accessible portions of systems to verify and assess that the current system configuration and operation agree with the descriptions in the UFSAR, offsite dose calculation manual, and PCP.

The inspectors selected radioactive waste processing equipment that was not operational and/or was abandoned in place, and verified that the licensee had established administrative and/or physical controls to ensure that the equipment would not contribute to an unmonitored release path and/or affect operating systems or be a source of unnecessary personnel exposure. The inspectors verified that the licensee had reviewed the safety significance of systems and equipment abandoned in place in accordance with 10 CFR 50.59, "Changes, Tests, and Experiments."

The inspectors reviewed the adequacy of any changes made to the radioactive waste processing systems since the last inspection. The inspectors verified that changes from what was described in the UFSAR were reviewed and documented in accordance with 10 CFR 50.59, as appropriate.

The inspectors selected processes for transferring radioactive waste resin and/or sludge discharges into shipping/disposal containers. The inspectors verified that the waste stream mixing, sampling procedures, and methodology for waste concentration averaging were consistent with the PCP, and provided representative samples of the waste product for the purposes of waste classification as described in 10 CFR 61.55, "Waste Classification."

For those systems that provide tank recirculation, the inspectors verified that the tank recirculation procedure provided sufficient mixing.

The inspectors verified that the licensee's PCP correctly described the current methods and procedures for dewatering waste.

The inspectors selected radioactive waste streams, and verified that the licensee's radiochemical sample analysis results were sufficient to support radioactive waste characterization as required by 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste." The inspectors verified that the licensee's use of scaling factors and calculations to account for difficult-to-measure radionuclides was technically sound and based on current 10 CFR Part 61 analysis.

For the waste streams selected above, the inspectors verified that changes to plant operational parameters were taken into account to (1) maintain the validity of the waste stream composition data between the annual or biennial sample analysis update, and (2) verified that waste shipments continued to meet the requirements of 10 CFR Part 61.

The inspectors verified that the licensee had established and maintained an adequate quality assurance program to ensure compliance with the waste classification and characterization requirements of 10 CFR 61.55, "Waste Classification" and 10 CFR 61.56, "Waste Characteristics."

The inspectors observed shipment packaging, surveying, labeling, marking, placarding, vehicle checks, emergency instructions, disposal manifest, shipping papers provided to the driver, and licensee verification of shipment readiness. The inspectors verified that the requirements of any applicable transport cask certificate of compliance had been met. The inspectors verified that the receiving licensee was authorized to receive the shipment packages.

The inspectors observed radiation workers during the conduct of radioactive waste processing and radioactive material shipment preparation and receipt activities. The inspectors verified that the shippers were knowledgeable of the shipping regulations and that shipping personnel demonstrated adequate skills to accomplish the package preparation requirements for public transport with respect to the licensee's response to NRC Bulletin 79-19, "Packaging of Low-Level Radioactive Waste for Transport and Burial," dated August 10, 1979, and 49 CFR Part 172, "Hazardous Materials Table, Special Provisions, Hazardous Materials Communication, Emergency Response Information, Training Requirements, and Security Plans," Subpart H, "Training." The inspectors verified that the licensee's training program provided training to personnel responsible for the conduct of radioactive waste processing and radioactive material shipment preparation activities. The inspectors observed a Type B shipment made on February 13-14, 2012 (shipment MM-12-05).

The inspectors selected non-excepted package shipment records and verified that the shipping documents indicate the proper shipper name; emergency response information and a 24-hour contact telephone number; accurate curie content and volume of material; and appropriate waste classification, transport index, and UN number. The inspectors verified that the shipment placarding was consistent with the information in the shipping documentation.

The inspectors verified that problems associated with radioactive waste processing, handling, storage, and transportation, were being identified by the licensee at an appropriate threshold, were properly characterized, and were properly addressed for resolution in the licensee CAP. The inspectors verified the appropriateness of the corrective actions for a selected sample of problems documented by the licensee that involve radioactive waste processing, handling, storage, and transportation. The inspector reviewed six issue reports that were initiated by the licensee during this inspection. to document minor items identified by the inspectors (IRs 1326774; 1326769; 1326778; 1327230; 1327238; 1328588).

The inspectors reviewed the results of selected audits performed since the last inspection of this program and evaluated the adequacy of the licensee's corrective actions for issues identified during those audits.

b. Findings

No findings were identified.

#### **4. OTHER ACTIVITIES**

##### **4OA1 Performance Indicator Verification (71151)**

##### **.1 Unplanned Power Changes (2 samples)**

##### **a. Inspection Scope**

The inspectors sampled Exelon's submittals for the Unplanned Power Changes (IE03) PI for both Unit 1 and Unit 2 for the period of January 1, 2011, through December 31, 2011. To determine the accuracy of the PI data reported during those periods, the inspectors used definitions and guidance contained in the Nuclear Energy Institute (NEI) Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6. The inspectors reviewed Exelon's operator narrative logs, maintenance planning schedules, and NRC integrated inspection reports to validate the accuracy of the submittals.

b. Findings

No findings were identified.

.2 Mitigating Systems Performance Index – Heat Removal System (4 samples)

a. Inspection Scope

The inspectors reviewed Exelon's submittal of the Mitigating Systems Performance Index for the following systems for the period of January 1, 2011 through December 31, 2011:

- Units 1 and 2 High Pressure Injection System (MS07)
- Units 1 and 2 Heat Removal System (MS08)

To determine the accuracy of the PI data reported during those periods, the inspectors used definitions and guidance contained in NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6. The inspectors also reviewed Exelon's operator narrative logs, IRs, mitigating systems performance index derivation reports, event reports, and NRC integrated inspection reports to validate the accuracy of the submittals.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152 – 1 annual sample)

.1 Routine Review of Problem Identification and Resolution Activities

a. Inspection Scope

As required by Inspection Procedure 71152, "Problem Identification and Resolution," the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that Exelon entered issues into the CAP at an appropriate threshold, gave adequate attention to timely corrective actions, and identified and addressed adverse trends. In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the CAP and periodically attended condition report screening meetings.

b. Findings

No findings were identified.

## .2 Annual Sample: South Stack Radiation Monitoring Technical Issue

### a. Inspection Scope

The inspectors performed an in-depth review of Exelon's evaluation and corrective actions associated with their discovery that the radiation monitoring instrumentation on the plant's South Stack potentially would not provide the indication required for the declaration of a General Emergency (GE) in accordance with the site emergency action levels (EALs).

Exelon had conducted an operating experience review for an NRC finding cited at another licensee's power plant, and the review determined that a similar historical issue existed at Limerick. Specifically, when Exelon implemented Revision 11 of EP-AA-1008, "Radiological Emergency Plan Annex for Limerick Generating Station," for the NEI 99-01, Revision 4, EALs, the GE threshold for the RG-1 EAL was changed from  $8.84\text{E-}2$  uCi/cc to  $2.71\text{E-}1$  uCi/cc. This change was implemented in May 2007. As part of the operating experience review, Limerick engineering review determined that the upper indicating limit of the South Stack radiation monitor was  $1\text{E-}1$  uCi/cc, and the monitor would not be capable of detecting the required GE threshold.

To determine whether Exelon was appropriately identifying, characterizing, and correcting problems associated with this issue, the inspectors assessed Exelon's: problem identification threshold; cause analyses; extent of condition reviews; compensatory actions; and the prioritization, timeliness, and adequacy of corrective actions. The inspectors reviewed Exelon's operating experience review documentation, interviewed operations and emergency preparedness personnel, observed in-plant testing of the South Stack radiation monitoring system, and reviewed Exelon's corrective action process close-out documentation.

### b. Findings and Observations

A licensee-identified, non-cited violation related to this issue is described in Section 4OA7 of this report.

Exelon initiated IR 1324991 to take corrective action for, and to investigate the cause of, the GE threshold discrepancy. Exelon took immediate corrective actions by lowering that threshold to  $9\text{E-}2$  uCi/cc, a value that the radiation monitor was known to be able to indicate. Exelon also contacted the instrument vendor to determine if the monitor was in fact able to accurately indicate any values above  $1\text{E-}1$  uCi/cc. The vendor provided information that the instrument was capable of indication beyond the original  $2.7\text{E-}1$  uCi/cc setpoint, and Exelon implemented a maintenance work order to test the indication range of the instrument and also to verify the accuracy of the indication by testing the monitor output with a calibrated source at the South Stack sensor. The licensee's investigation into the cause of the issue determined that the Limerick UFSAR did not have a clear range for the South Stack Radiation monitor range and that the range issue was not identified in the review for the EAL change implemented on May 17, 2007.

The inspectors identified that a performance deficiency had occurred relative to Exelon's review of plant instrumentation required for the implementation of the new EALs in May 2007 (see Section 4OA7 of this report). The inspectors determined that Exelon's operating experience review for the NRC finding cited at another plant was a good

initiative, and the subsequent investigation and corrective actions taken with regard to the South Stack radiation monitor were appropriate to address the identified condition.

4OA3 Event Follow-up (71153 – 1 sample, 71124.01, 71124.06, 71124.07)

Event Description and General Chronology

On March 19, 2012, operators conducted a scheduled radioactive release through the normal station line-up cooling tower blow down line as part of its radioactive effluent release program. Limerick Station utilizes the cooling tower blow down feature to help remove non-condensable materials such as solids during the evaporative cooling process. Blow down is a continuous process to maintain cooling tower chemistry using a flow rate of 3,000 - 4,000 gallons per minute (gpm). To support Exelon's offsite dose minimization program, the effluent from the liquid radioactive waste effluent discharge line is directed to this blow down line for dilution and release. During dilution and release, the cooling tower blow down flow rate is increased to increase dilution. The blow down flow rate had an administrative limit of 10,000 gpm to prevent unexpected releases from the Cooling Tower Blow-down Emergency Overflow Vent (Outfall 023). The blow down line extends into the Schuylkill River and has a 141 foot length of perforated pipe at the end to act as a diffuser. The process for releasing radioactive effluents via the blow down pathway is controlled by Exelon's Limerick Station Offsite Dose Calculation Manual including the minimum flow rate for dilution. The blow down flow for this release was approximately 6000 gpm.

During the March 19, 2012, release, security personnel notified control room operators that water was overflowing from Outfall 023 in the cooling tower blow down line near the station's Hold Pond at the south end of the site in the owner controlled area (OCA). Operators promptly secured the release and conducted walkdowns of the area and determined that the overflow of water traveled from Outfall 023 into the Possum Hollow Creek within the OCA. The creek flows into the Schuylkill River. Water samples were taken following the release from various onsite ground water monitoring wells and drainage points between Outfall 023 and the Schuylkill River. Water sample results from the days after the release showed the Possum Hollow Creek tritium levels at the lower limit of detection.

Exelon's investigation into the cause of the Outfall 023 overflow determined that the integrity of the blow down line piping was intact but that the diffuser piping was sufficiently blocked with river silt and debris which caused water pressure to build up and release through Outfall 023. Exelon had conducted laboratory tests of the tank water prior to the release that confirmed the water was within permitted state and federal effluent guidelines. Exelon conducted sampling of pooled water at the spill location and identified elevated levels of tritium in the area after the event. Exelon conducted a preliminary bounding dose assessment for a conservative release and blow down to the Possum Hollow Creek. Results indicated dose projections levels well below 10 CFR 50, Appendix I. Exelon does have a National Pollutant Discharge Elimination System (NPDES) permit to allow discharge of water from Outfall 023. Exelon determined that this event was reportable to the State and local offsite agencies per NEI 07-07, "Industry Ground Water Protection Initiative." Accordingly, Exelon communicated with the Governor's office and various congressional offices, as well as other state and local representatives regarding the inadvertent release and its potential environmental impacts. Exelon also made a courtesy notification to the NRC resident inspection staff.

## Areas of Inspection

### .1 Reportability

#### a. Inspection Scope

The inspectors reviewed Exelon's reporting of the March 19, 2012, abnormal liquid release. The review was against reporting criteria contained in 10 CFR 20, "Standards for Protection Against Radiation;" 10 CFR 50.72, "Immediate Notification Requirements for Operating Nuclear Power Reactors;" Technical Specifications; the Off-site Dose Calculation Manual (ODCM); NUREG-1022, "Event Reporting Guidelines: 10 CFR 50.72 and 10 CFR 50.73;" and with respect to Exelon procedures.

#### b. Findings and Observations

Exelon determined that this event was voluntarily reportable to the State and local offsite agencies in accordance with NEI 07-07, "Industry Ground Water Protection Initiative." Accordingly, Exelon communicated with the Governor's office and various congressional offices, as well as other state and local representatives regarding the inadvertent release and its potential environmental impacts. Exelon also verbally informed the NRC resident inspection staff. However, Exelon did not initially make a timely report to the NRC in accordance with the requirements of 10 CFR 50.72, but subsequently made the report at a later date.

Introduction. The inspectors identified a SL IV NCV of Title 10 of the Code of Federal Regulations (CFR) Part 50.72(b)(2)(xi) because the NRC Operations Center was not notified via the ENS within four hours of a reportable event related to the health and safety of the public and protection of the environment for which notification to other government agencies was made. Specifically, Exelon did not formally report, to the NRC Operations Center, the notification of other government agencies regarding an abnormal radioactive liquid release during a scheduled and planned effluent release from the Limerick Generating Station common cooling tower blow down line on March 19, 2012.

Description. On March 19, 2012, operators conducted a scheduled radioactive release through the normal station line-up cooling tower blow down line as part of its radioactive effluent release program. During the March 19, 2012, release, security personnel notified control room operators that water was overflowing from Outfall 023 (Blow-down Line Emergency vent) in the cooling tower blow-down line near the station's Hold Pond at the south end of the site in the licensee's owner controlled area (OCA). Operators secured the release and conducted walkdowns of the area and determined that the overflow of water traveled from Outfall 023 into the Possum Hollow Creek within the OCA. The creek flows into the Schuylkill River.

Exelon determined that this event was voluntarily reportable to the State and local offsite agencies, in accordance with NEI 07-07, "Industry Ground Water Protection Initiative." Accordingly, Exelon communicated with the Governor's office and various congressional offices, as well as other state and local representatives regarding the inadvertent release and its potential environmental impacts. Exelon also verbally notified the NRC resident inspection staff. Inspectors performed system walkdowns and conducted an event follow-up inspection the next day to assess the impacts of the overflow event. The informal notification allowed the NRC to engage and assure no adverse impacts to

public health and safety but the delay of filing a 50.72 report created a delay in timely notification of the public of an issue that would be of interest to them.

However, Exelon did not initially make a 10 CFR 50.72 notification to the NRC for this abnormal release. It was Exelon's position that because this was an event being reported under the voluntary NEI Groundwater Protection Initiative, the event was not reportable under 10 CFR 50.72.

The regional staff, in consultation with Office of General Counsel and Nuclear Reactor Regulation subject matter experts, did not concur with Exelon's position. NEI 07-07, Objective 2.2 states, in part, "voluntary communication to State and/or Local officials may also require NRC notification under 10 CFR 50.72(b)(2)(xi). Licensees should perform these notifications consistent with their existing program." Furthermore, Exelon procedure LS-AA-1110, "REPORTABLE EVENT SAF," Revision 17, SAF 1.9, "News Release or Notification of Other Government Agency," contains several examples which are similar in nature to this case and would require a 10 CFR 50.72 notification.

10 CFR 50.72(b)(2)(xi) states, in part, that a reportable event, "may include an inadvertent release of radioactively contaminated material." Additionally, notification of the resident inspector does not constitute compliance with 10 CFR 50.72(b)(2)(xi).

The inspectors determined that the failure to formally notify the NRC regarding the inadvertent radioactive release, as required by 10 CFR 50.72, was a performance deficiency. This event was related to the public's health and safety because it involved the potential to increase dose to the public through an un-modeled release pathway (Possum Hollow Creek to the Schuylkill River) that was accessible by the public (Schuylkill River).

Exelon's immediate corrective actions pertaining to the abnormal release included suspension of effluent releases via the cooling tower blow down line and initiation of actions to evaluate the cause and preclude recurrence, as well as conduct bounding dose calculations. Additionally, upon identification by the NRC that the issue was reportable, Exelon subsequently reported the event to the NRC Operations Center on April 11, 2012.

Analysis. This performance deficiency was evaluated using the traditional enforcement process since the failure to make a required report could adversely impact the NRC's ability to carry out its regulatory mission. The NRC has an obligation to inform the public about issues within the NRC's purview that potentially affect or raise a concern about public health and safety or protection of the environment. This is done via the Event Notification process as established by 10 CFR 50.72. NRC fulfills its obligation by posting events reported under this system on its public web page the day that they're reported. Thus, the NRC needs accurate and timely information regarding such situations. It is important to note that the licensee in this case did inform the NRC resident inspectors of the release within a day of the event (after having reported it to state government officials). However, this informal communication to inspectors onsite does not constitute a formal notification and does not satisfy the objective of the NRC's event reporting system described above. Although the circumstances of this issue were mitigated by the fact that the radiological consequences of the inadvertent release were minor and the fact that the licensee satisfied the objective of the voluntary NEI initiative by reporting it to State officials, the inspectors determined that this finding met the

criteria for disposition as a SL IV NCV, per Section 6.9(d)(9) of the NRC's Enforcement Policy.

Because this violation involves the traditional enforcement process with no underlying technical violation that would be considered more than minor in accordance with IMC 0612, a cross-cutting aspect is not assigned to this violation.

Enforcement. 10 CFR Part 50.72(b)(2)(xi) requires, in part, that the licensee shall notify the NRC as soon as practical and in all cases, within four hours of the occurrence of any event or situation, related to the health and safety of the public or onsite personnel, or protection of the environment, for which a news release is planned or notification to other government agencies has been or will be made. Such an event may include an inadvertent release of radioactively contaminated materials. Contrary to these requirements, on March 19, 2012, Exelon failed to make the appropriate four-hour report when an event related to the health and safety of the public and protection of the environment occurred, and notification of other government agencies was made. Specifically, offsite organizations, including the Governor's office and various congressional offices, as well as other state and local representatives received communications from Exelon regarding a Limerick Generating Station inadvertent release and its potential environmental impacts. Because the licensee has entered this issue into its CAP (IRs 1347829, 1342540, 1342884), the issue is being treated as a SL IV NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy.  
**(NCV 05000352, 05000353/2012002-01, Failure to Make a 10 CFR 50.72(b)(2)(xi) Notification)**

## .2 Emergency Declaration Aspects

### a. Inspection Scope

The inspectors reviewed the emergency declaration aspects of the abnormal liquid release. The review was with respect to criteria contained in Exelon Emergency Action Level (EAL) procedures.

### b. Findings and Observations

No findings were identified. Exelon conducted a prompt evaluation of the need to enter an EAL. The event did not result in need for declaration of an emergency condition as described in the station's Hot or Cold Matrix EALs.

## .3 Operational Aspects

### a. Inspection Scope

The inspectors reviewed the operational aspects of the activities to locate, isolate, and control radioactivity and any impact on plant operations. The inspectors reviewed process plant computer data, control room logs, and interviewed Exelon personnel to understand if the plant experienced any operational effects. In addition, the inspectors performed plant walkdowns, and examined and reviewed licensee investigation and ongoing work activities.

### b. Findings and Observations

No findings were identified. The inspectors determined there were no issues identified associated with operational reactor safety.

#### .4 Occupational Exposure Control

##### a. Inspection Scope

The inspectors reviewed the occupational radiological safety aspects associated with the liquid radioactivity release on March 19, 2012. The inspectors also reviewed and evaluated Exelon's prompt investigation conducted to evaluate the event and establish corrective actions.

##### b. Findings and Observations

No findings were identified.

Exelon conducted loose surface contamination evaluations from the emergency release point and did not detect any radioactivity at the location with the exception of tritium in water samples at levels expected from the planned effluent discharge. Exelon's review of the occupational dose consequences did not identify any significant occupational dose potential.

#### .5 Public Exposure Control

##### a. Inspection Scope

The inspectors reviewed the public radiological controls aspects of the March 19, 2012, abnormal liquid release. In particular, the potential dose consequences to members of the public were evaluated. The inspectors reviewed radiological measurements, including analytical methodology; sampling and evaluation of potential hard-to-detect radionuclides; evaluation of residual radioactivity; control of total radioactivity released; assessment of the projected radiation doses to members of the public based on possible exposure pathways; maintenance of records in accordance with 10 CFR 50.75; and development and implementation of enhanced periodic sampling. The inspectors also reviewed down-stream composite water sample data.

The review in this area was against criteria contained in Technical Specifications, 10 CFR 20, "Standards for protection against radiation," and the station's ODCM.

##### b. Findings and Observations

No findings were identified.

The inspectors evaluated Exelon's radiological assessment relative to public health and safety. From the data available, the inspectors confirmed that the radiological conditions associated with this occurrence did not, nor were expected to, result in any significant projected public dose in excess of NRC regulatory limits and requirements. The inspectors did not identify any significant off-site dose consequences to members of the public associated with the radioactivity release. Exelon was continuing to evaluate soil contamination levels for purposes of documentation to support decommissioning planning activities in accordance with 10 CFR 50.75(g). Exelon documented the evaluation of releases in its corrective action program (IR 1342540).

## .6 Event Causes and Evaluations

### a. Inspection Scope

The inspectors reviewed and evaluated Exelon's ongoing investigations associated with the abnormal liquid release on March 19, 2012. The inspectors reviewed available documentation, including records such as prompt investigations.

### b. Findings and Observations

The inspectors reviewed the recent history of cooling tower blow down emergency overflow vent (Outfall 023) discharge events. The inspectors found that, in addition to the overflow event of March 19, 2012, there were three additional known events that were documented in the CAP since 2008. The inspectors noted that the emergency overflow vent line is located outside the protected area near the station's holding pond, not monitored during radioactive waste discharges, and does not contain any alarm function to inform operators that an overflow is occurring. Therefore, overflow of the vent is not readily detectable by plant personnel. The known overflow discharges were caused by either exceeding the 10,000 gpm flow limit of the blow down line or the plugging of the Schuylkill River diffuser with silt and debris and river bed material. An overflow event on March 20, 2008, was caused by blow down flow exceeding the 10,000 gpm limit. All other documented overflow events, on August 9, 2008, April 25, 2009, and March 19, 2012, were caused by reduced discharge capability due to diffuser blockage.

The inspectors found that the potential to discharge through Outfall 023 and release radioactive effluents during radioactive waste discharges was recognized by Exelon in two documented CAP products. First, IR 752414 documented the March 20, 2008 event and , contained an action to revise RT-5-009-802-0, "National Discharge Eliminations System (NPDES) Sampling-Outfall 023 Excessive Cooling Tower Blow Down," to drive sampling for gamma isotopic and tritium sampling when an overflow event occurs due to excessive blow down during a radioactive waste discharge. Second, IR 798054 was written on July 18, 2008, when a semi-annual sample from a well in the vicinity of Outfall 023 identified low levels of tritium. Exelon determined that the second event was not reportable under the NEI-07-07 guidelines but Exelon did include a discussion in its 2008 Annual Radiological Environmental Operating Report (IR 798054). The in-progress notes of an action item to evaluate the tritium data included a statement that the likely source of the tritium was from a radioactive spill that occurred during the overflow event occurring on March 20, 2008. None of the ARs documenting overflow events or tritium detection in ground water wells contained actions to prevent and/or detect the occurrence of discharges through Outfall 023 during radioactive waste plant discharges.

Preventive maintenance (PM 256513) task is an annual work item to clean and inspect the Schuylkill River discharge diffuser. The PM was scheduled to be performed in September 2011. However, the PM could not be performed at that time due to high river level and flow conditions. Exelon completed a PM deferral evaluation and concluded that the PM could be delayed until the Summer 2012. No contingency repair plan or increased monitoring of Outfall 023 was put in place during the deferral period. The inspectors noted that the PM deferral evaluation recognized the potential for diffuser clogging and the potential to overflow the vent. The deferral noted that the consequence would only result in additional sampling of the Outfall 023 area due to NPDES permit

requirements. The inspectors noted that evaluation did not address the potential for abnormal radioactivity effluent releases through Outfall 023. The inspectors determined that the failure to correct recurring cooling tower blow down emergency overflow vent discharges through Outfall 023 during radioactive waste plant discharges was a performance deficiency. This resulted in the abnormal release of radioactive effluents through a non-ODCM controlled and analyzed release point on March 19, 2012.

Notwithstanding the above, the inspectors concluded that the licensee had established primary controls over the tank releases that would limit doses to a member of the public. The controls over tank discharges included: 1) use of station radioactive waste processing equipment to limit radioactivity concentrations within the tank; 2) conduct of dose projections to ensure doses were well below 10 CFR 50, Appendix I, ALARA requirements; 4) placement of administrative limits on tank activity; and 5) use of in-line radioactivity monitoring instrumentation for the liquid radwaste discharge line to stop potential unplanned releases above evaluated levels. The inspectors concluded that there was reasonable assurance that releases did not, nor were likely to, have resulted in a dose to a member of the public exceeding a small fraction of 10 CFR 50, Appendix I, ALARA limits. Since the dose consequence did not, nor were likely to, have exceeded a small fraction of regulatory limits, the performance deficiency was determined to be of minor significance.

Exelon entered this issue into the CAP as IR 1342540. Immediate corrective actions included: 1) delay of additional releases until interim actions were implemented; 2) further administrative limitation of cooling tower blow down rate to prevent discharges through Outfall 023; and 3) cleaning of the Schuylkill River diffuser.

#### 4OA6 Meetings, Including Exit

On April 16, 2012, the inspectors presented the inspection results to Mr. F. Kearney, Site Vice President, and other members of the Limerick staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

#### 4OA7 Licensee-Identified Violations

The following violations of very low safety significance (Green) were identified by Exelon and are violations of NRC requirements which meet the criteria of the NRC Enforcement Policy for being dispositioned as NCVs.

- 10 CFR 50.54(q) requires, in part, that a power reactor licensee follow an Emergency Plan that meets the requirements of 10 CFR 50.47(b). 10 CFR 50.47(b) requires, in part, that a standard emergency classification and action level scheme, the bases of which includes facility system and effluent parameters, is in use by the licensee. Contrary to the above, between May 2011 and February 2012, Exelon did not have a documented basis for a useable parameter for the declaration of a General Emergency (GE) using the LGS South Stack effluent radiation monitor. In May 2007, Exelon implemented Revision 11 of EP-AA-1008, "Radiological Emergency Plan Annex for Limerick Generating Station," which updated the station emergency action levels (EALs) to the NEI 99-01, Revision 4, standard. The new LGS EAL scheme changed the South Stack GE declaration threshold from  $8.84\text{E-}2$  uCi/cc to  $2.71\text{E-}1$  uCi/cc, yet the Updated Final Safety Analysis Report listed the upper limit of that monitor as  $1\text{E-}1$  uCi/cc. Exelon discovered the discrepancy on February 9, 2012, and entered it into their CAP as IR 1324991. Exelon implemented immediate

corrective actions by lowering the GE declaration threshold to  $9\text{E-}2$  uCi/cc, and by contacting the monitor vendor to determine the actual indicating capability of the monitor. The vendor informed Exelon that it believed the monitor was capable of displaying an accurate indication through the entire decade of  $1\text{E-}1$  uCi/cc, that  $1\text{E-}1$  was not the upper limit of indication. Exelon developed a work order and conducted an electronic test of the monitor itself on February 14, 2012, and a system test of the sensor and monitor using a calibrated radioactive source on February 16, 2012. The results of those tests indicated that the monitor was capable of accurately indicating  $2.71\text{E-}1$  uCi/cc. The inspectors determined that the finding was of very low safety significance (Green) in accordance with NRC IMC 0609, Appendix B, "Emergency Preparedness Significance Determination Process," Sheet 1, because, although the licensee had not maintained their EALs as required by 10 CFR 50.47(b), the resultant failure would not have precluded the declaration of any GE event.

- A violation of Limerick Unit 2 Technical Specification 6.12.2, which states, in part: For High Radiation Areas with dose rates greater than 1.0 rem/hr (at 30 cm), but less than 500 rad/hr (at 1 meter) shall be controlled as follows: a. Each accessible entryway to such an area shall be conspicuously posted as a High Radiation Area and shall be provided with a locked door, gate, or guard that prevents unauthorized entry. RP-AA-460, "Controls for High and Locked High Radiation Areas," implements this requirement. Attachment 6 of RP-AA-460, states, in part:
  - Item 1: "REMAIN outside the assigned area and MAINTAIN direct "line-of-sight" surveillance of the access to the LHRA..."
  - Item 7: "Prior to transferring Access Control Guard responsibilities, verify that the individual has a signed copy of this form (for a non-RP relief individual) and that the new Access Control Guard is aware of the conditions of the work area."

Contrary to the above, on April 14, 2011, a technician filling the role of a LHRA access control guard for the LHRA associated with the Unit 2 drywell equipment hatch, left the post unguarded for several minutes. An OI investigation determined that the technician's actions did not constitute deliberate misconduct; however, the NRC confirmed that the TS had been violated. The violation is similar to IMC 0612, Appendix E, example 6g which states an HRA access not controlled in accordance with procedures is more than minor if a radiation area of greater than 100mrem/hr at 30 cm actually existed in the area. This violation is of very low safety significance since, there is no evidence anyone attempt to gain access while the access point was unguarded was short, the duration of time the access was unguarded, and the presence of cameras which allowed for remote monitoring. Exelon enter the issue into their CR process as IR 1202506.

#### **ATTACHMENT: SUPPLEMENTARY INFORMATION**

## **SUPPLEMENTARY INFORMATION**

### **KEY POINTS OF CONTACT**

#### Licensee Personnel

F. Kearney, Site Vice President  
P. Gardner, Plant Manager  
C. Rich, Director of Operations  
D. Doran, Director of Engineering  
R. Kreider, Director of Maintenance  
P. Colgan, Director of Work Management  
C. Gerdes, Security Manager  
R. Dickinson, Director of Training  
K. Kemper, Manager Nuclear Oversight  
D. Merchant, Radiation Protection Manager  
J. Hunter, Manager, Regulatory Assurance  
M. Gillin, Sr. Manager Engineering Systems  
L. Harding, Regulatory Assurance Engineer  
R. Rhode, Licensed Operator Requalification Training Supervisor  
D. Wahl, Effluent REMP Engineer  
R. Higgins, Environmental Engineer  
L. Konen, Chemistry Technician  
B. Lance, Chemistry Manager  
A. Varghese, Site Engineer, Radiation Monitoring  
A. Lambert, Design Engineer  
L. Parlato, Radiation Protection Technician  
A. Rocco, System Engineer  
D. Ryan, Senior Chemist  
J. Duskin, Supervisor, Radiation Protection Instrumentation  
R. Goskins, Instrument Technician  
P. Imm, Radiological Engineering Supervisor  
J. Ristetler, Supervisor – Radiation Protection  
S. Sweisford, Instrument Technician  
H. Miller, HP Shipping  
C. Smith, Chemistry  
G. Budock, ISI Program Owner  
T. Kirkpatrick, Radiation Protection Supervisor  
J. Bruno, Radiological Engineer  
J. Commisky, ALARA Specialist  
N. Harmon, Senior technical Specialist  
R. Nealis, Senior Chemist  
C. Conroy, Environmental Chemist

#### Other:

M. Murphy, Inspector, Commonwealth of Pennsylvania

**LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED**Opened/Closed

|                         |     |                                                                       |
|-------------------------|-----|-----------------------------------------------------------------------|
| 05000352,353/2012002-01 | NCV | Failure to Make a 10 CFR 50.72 (b)(2)(xi) Notification (Section 40A3) |
|-------------------------|-----|-----------------------------------------------------------------------|

Opened

None

Closed

None

**LIST OF DOCUMENTS REVIEWED****Section 1R04: Equipment Alignment**Issue Reports

A1225516    1323926

Procedures

1S55.1.A (COL), Equipment Alignment for Automatic Operation of HPCI System, Revision 28  
 1S49.1.A (COL), Valve Alignment to Assure Availability of the RCIC System, Revision 16

Miscellaneous

PEP I0009296

PM 379315

HBC-192-1, Isometric –Reactor Building ESW Unit 1, Revision 14

AD-330, Garflex Nitrile/Neoprene molded bellows with two ASA 150 FF Loose Flanges, 3/10/78  
 R1220381-01

**Section 1R04S: Full System Walkdown**Issue Reports

|         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|
| 1232232 | 1318738 | 1323089 | 1322808 | 1317779 | 1321516 |
| 1291212 | 1284611 |         |         |         |         |

Procedures

ON-119, Loss of Instrumental Air, Revision 26 (Bases)

S15.6.A, Removing a Instrument Air Compressor from Service, Revision 12

S15.1.B, Normal Starting of Instrument Air, Service Air, or Backup Service Air Compressors,  
 Revision 25

ARC-MCR-218-B-1, 2A Instrument Air Compressor Trouble

Miscellaneous

LGS Maintenance Rule (a)(1) monitoring plan – Instrument Air  
 R1164880

**Section 1R05: Fire Protection****Procedures**

F-R-108, Unit 1 RCIC Pump Room 108 (EL 177) Fire Area 33, Revision 10  
 F-R-304, Unit 1 Safeguard System Access Area Room 304 (EL 217) Fire Area 44, Revision 11  
 F-R-309, Unit 1 Safeguard Isolation Valve Area Room 309 (EL 217) Fire Area 43, Revision 10  
 F-R-100, Unit 1 Suppression Pool and Drywell Sump Rooms 100 and 101 (Elevation 181' and 217') Fire Area 29, Revision 7  
 F-R-109 Unit 1 HPCI pump room 109 (EL 177) Fire Area 34, Revision 10  
 F-R-542, Common, Auxiliary Equipment Room 542 (EL 289) Fire Area 25, Revision 011  
 F-R-109, Unit 1 HPCI Pump Room 109 (EL 177) Fire Area 34, Revision 10  
 F-R-100, Unit 1 Suppression Pool and Drywell Sump Rooms 100 and 101 (EL 181 and 217) Fire Area 29, Revision 007  
 SE-8, Fire, Revision 044  
 S22.8.H, Inoperable Fire Protection Equipment Actions, Revision 027  
 OP-MA-201-007, Fire Protection System Impairment Control, Revision 6

**Miscellaneous**

E-1408, Fire Alarm System Notes, Symbols and Details  
 UFSAR (LGS) Appendix 9A, Fire Protection Evaluation Report, Revision 13  
 M-22-14 Fire Hazard Analysis Combustible Loading, Revision 0011

**Section 1R06: Flood Protection Measures****Issue Reports**

1322871      1325550      1324965

**Procedures**

SE-4-1, Reactor Enclosure Flooding, Revision 8

**Miscellaneous**

C-0018, Sub-Drainage System Station Building Area, Sheet. 1, Revision 7  
 C-0019, Sections and Detail Sub-Drainage System, Sheet 1, Revision 6  
 C-0016, Yard Piping-Sections and Details, Sheet 1, Revision 11  
 CC-LG-201, Hazard Barrier Control Program, Revision 3  
 NPB-014, Moderate Energy Line Break Analysis for RX Enclosures, Revision 6  
 FSK-M-83, Sheet 5, Reactor Building Unit 1 Plan at EL 177' 0"

**Section 1R07: Heat Sink Performance****Procedures**

RT-2-012-391-1, 1B-E205 RHR Heat Exchanger Heat Transfer Test, Revision 7  
 RT-1-012-390-0, RHR Heat Exchanger Heat Transfer Performance Computation Test, Revision 8

**Section 1R08: In-service Inspection****Issue Reports**

|         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|
| 1048718 | 1163647 | 1166932 | 1178370 | 1179452 | 1233803 |
| 1244448 | 1257835 | 1273651 | 1293854 | 1322479 | 1322488 |
| 1329929 | 1330875 | 1331128 | 1331737 | 1331952 | 1331969 |

|          |          |         |          |         |         |
|----------|----------|---------|----------|---------|---------|
| 1331975  | 1332153  | 1332291 | 1332450  | 1297234 | 1654729 |
| 1332969* | 1332983* | 1332997 | 1333471* |         |         |

(\*NRC Identified during inspection)

Work Orders

|          |          |          |          |
|----------|----------|----------|----------|
| C0208398 | C0233495 | R1095727 | R1095729 |
|----------|----------|----------|----------|

Audits/Self Assessments

Limerick Welding FASA Self-Assessment Report, dated 09/21/10

Unit 1 Pre-NRC Inspection for In-service Inspection Activities, dated 12/27/11

NDE Procedures

EPRI-DMV-PA-1, Procedure for Manual Phased Array Ultrasonic Examination of Dissimilar Metal Welds, Revision 3

ER-AA-330-005, Visual Examination of Section XI Class CC Concrete Containment Structures, Revision 9

ER-AA-335-001, Qualification and Certification of NDE Personnel, Revision 5

ER-AA-335-002, Liquid Penetrant Examination, Revision 5

ER-AA-335-003, Magnetic Particle Examination, Revision 4

ER-AA-335-005, Radiographic Examination, Revision 4

ER-AA-335-014, VT-1 Visual Examination, Revision 6

ER-AA-335-015, VT-2 Visual Examination, Revision 11

ER-AA-335-016, VT-3 Visual Examination of Component Supports, Attachments and Interiors of Reactor Vessels, Revision

ER-AA-335-018, Detailed, General, VT-1, VT-1C, VT-3 and VT-3C Visual

Examination of ASME Class MC and CC Containment Surfaces and Components, Revision 6

ER-AA-335-F-02, PDI Generic Procedure for the Ultrasonic Examination of Ferritic Pipe Welds, Revision 0

GEH-PDI-UT-1, PDI Generic Procedure for the Ultrasonic Examination of Ferritic Pipe Welds, Revision 8

GEH-PDI-UT-10, PDI Generic Procedure for the Ultrasonic Examination of Dissimilar Metal Welds, Revision 8

GEH-VT-204, Procedure for In-vessel Visual Inspection of BWR 4 Reactor Pressure Vessel Internals, Revision 13

MA-LG-793-001, Visual Examination of Containment Vessels and Internals, Revision 4

NDE Examination Reports

601280, dated 2/26/12

601291, dated 2/29/12

600650, dated 2/28/12

600290, dated 2/23/12

602520, dated 2/23/12

601890, dated 2/27/12

Program Procedures

ER-AA-330-009, ASME Section XI Repair/Replacement Program, Revision 6

ER-LG-330-1001, ISI Program Plan, Limerick Generating Station Units 1 & 2, Revision 4

ER-LG-330-1002, ISI Augmented Inspection Program Limerick Generating Station, Units 1 & 2, Revision 2

Miscellaneous

Limerick ISI Program Health Report, 4<sup>th</sup> Quarter, 2011

LGS Unit 1 Summary Report for In-service Inspection (1R13), dated 7/9/10

**Section 1R11: Licensed Operator Regualification Program**

Miscellaneous

LGS Licensed Operator Regualification Training Lesson Plan LLOR1201F, Adjustable Speed Drives, Revision 0

**Section 1R12: Maintenance Effectiveness**

Issue Reports

1319633      1222351      1284678      1311959

Procedures

ST-2-052-607-1, ECCS-Core Spray Pump Discharge Pressure – High; Division Functional Test, Revision 3

IC-C-11-00405, Rack Calibration of Rosemont Trip Units, Revision 6

Miscellaneous

SIL 468R1, Rosemont 510DU and 710DU Trip Units, 10/17/88

IE 80-16, Operational Deficiencies in Rosemount Model 510DU Trip Units and Model 1152 Pressure Transmitters, 6/27/80

**Section 1R13: Maintenance Risk Assessments and Emergent Work Control**

Procedures

SP-214, Replacement of 'A' Loop RHRSW Return Piping During 1R14, Revision 0

Maintenance Orders/Work Orders

WO C0240441

Miscellaneous

Barrier Breach Permit MH-101

ECR 10-00461, Electrical Manhole Drainage System

Paragon Unit 1 Outage Shutdown Risk Profile

Protected Equipment and Barrier Report for February 22, 2012

**Section 1R15: Operability Evaluations**

Issue Reports

1342560      1292570

Work Orders

C0242348

Procedures

RT-6-012-900-0, Spray Pond Spray Nozzle Test, Revision 7

RT-6-012-600-0, Spray Pond Spray Network Flush, Revision 16

S11.2.A ESW shutdown, Revision 26

S12.1.A RHRSW startup, Revision 50

Miscellaneous

NUREG – 0800, Standard Review Plan, Branch Technical Position 8-6, Adequacy of Station  
 Electric Distribution System Voltages, Revision 3  
 UFSAR, Chapter 8  
 E-1412, Category 1 Conduit Support, Revision 56  
 E-1406, Conduits Notes and Details, Revision 75  
 MAT 10-00247

**Section 1R18: Plant Modifications**Issue Reports

1336716      1335813      A1746287

Maintenance Orders/Work Orders

C0240441      C0239018

Miscellaneous

UFSAR Chapter 3, Design of Structures, Components, Equipment, and Systems  
 ECR-10-00208, Attachment 18, Pipe Staging Temporary Pipe Support Condition Computation,  
 Revision 4

**Section 1R19: Post-Maintenance Testing**Issue Reports

|         |         |         |          |         |         |
|---------|---------|---------|----------|---------|---------|
| 1339267 | 1335606 | 1339269 | A1851635 | 1266542 | 1328690 |
| 516425  | 802382  | 781939  | 1339791  | 1339979 |         |
| 1339168 | 1337884 |         |          |         |         |

Work Orders

C0239752      C0239830      C0242288

Procedures

ST-6-055-231-1, HPCI Pump Comprehensive Test, Revision 1  
 ST-2-055-810-1, HPCI System Response Time Testing, Revision 12  
 ST-6-049-200-1, RCIC Valve Test, Revision 49  
 ST-6-107-200-0, IST Valve Stroke Surveillance Log, Revision 26  
 ST-6-048-230-1, SLC Pump, Valve and Flow Test, Revision 38  
 RT-6-055-340-1, HPCI Turbine Hydraulic Control System Operability Check, Revision 13  
 GP-10, Reactor Pressure Vessel Leakage Test, Revision 64

Miscellaneous

TRT 12-066  
 8031-M-1-E41-C002-G-1.3, HPCI Section Hydraulic Trip, Revision 3  
 Dresser-Rand HPCI Hydraulic Overspeed Trip (Mechanical) – 11/2/88  
 ECR-11-00104  
 ER-AA-1200, Critical Component Failure Clock, Revision 8  
 R1031339  
 R1144977

**Section 1R20: Refueling and Other Outage Activities**Issue Reports

1347829      1330463      1331844

Procedures

FH-105, Core Component movement, Revision 45

GP-6.1, Core Shuffle, Revision 25

GP-6.2, Shutdown Operations – Shutdown Condition Technical Specification Actions,  
Revision 49

MA-AA-716-008-1008, Reactor Services Refuel Floor FME Plan, Revision 7

OU-AA-103, Shutdown Safety Management Program, Revision 11

OU-AB-4001, BWR Fuel and Core Component Handling Practices, Revision 6

OU-LG-104, Limerick Generating Station Shutdown Safety Management Program, Revision 13

S51.8.B, Shutdown Cooling/Reactor Coolant Circulation Operation, Startup and Shutdown,  
Revision 71

S51.7.A, Draining Reactor Well and Dryer/Seperator Storage Pool with RHR, Revision 19

LS-AA-1110, News Release or Notification of other Government Agency

**Section 1R22: Surveillance Testing**Issue Reports

|         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|
| 1329296 | 1341696 | 1341608 | 1341609 | 1337982 | 1338026 |
| 1336086 | 1338611 | 1338489 | 1058940 | 1058904 | 1327817 |
| 1338527 | 1328531 | 1328562 | 900755  | 721408  |         |

Work Orders

C0240940

Procedures

ER-AA-321-1005, Condition Monitoring for In-service Testing of Check Valves, Revision 5

ER-AA-1200, Critical Component Failure Clock, Revision 8

ST-2-036-528-1, Excess Flow Check Valve Functional Test, Revision 4

ST-6-041-202-1, MSIV Cold Shutdown Valve Test, Revision 23

ST-4-LLR-051-1, Main Steam Line 'C', Revision 12

ST-6-092-933-1, D13 Diesel Generator Governor and Voltage Regulator Post Maintenance  
Test, Revision 9

ST-6-092-118-2, D24 Diesel Generator 4 KV SFGD Loss of Power LSF/SAA and Outage  
Testing, Revision 16

ST-6-092-324-1, D14 Diesel Generator LOCA/LOAD Reject Testing and Fast Start Operability  
Test Run, Revision 23

S41.1.B, MSIV Closure Time Set Up Procedure, Revision 5

IC-11002002, Emergency Diesel Generator Voltage Regulator, Revision 12

Miscellaneous

NUREG 1482, Guidelines for In-service Testing at Nuclear Plants, Revision 2

TRM 3.6.3, Primary Containment Isolation Valves

White Paper: "Testing LPCI Testable Check Valves"

FSAR Sections 6.2.4.3.1.2.1.3, Table 6.2-17

2004 ASME OM Code – ISTC-5221

Unit 1 System 060 'A'(1) Determination

1046167-02, 1R13 MSIV Stroke Time Results and Analysis  
 743781, 1R12 MSIV Stroke Time Results and Analysis

### **Section RS01: Access Control to Radiologically Significant Areas**

#### **Issue Reports**

|         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|
| 1332720 | 1332499 | 1332507 | 1332725 | 1333552 | 1334110 |
| 1334442 | 1329324 | 1329358 |         |         |         |

#### **Procedures**

RP-AA-460, Control for High and Locked High Radiation Areas, Revision 21  
 RP-AA-460-001, Control for Very High Radiation Areas, Revision 2  
 RP-AA-460-002, Additional High Radiation Area Exposure Control, Revision 0  
 RP-AA-460-003, Access to HRAs/Locked High Radiation Areas/VHRAs in Response to Potential or Actual Emergency, Revision 1  
 RP-AA-460-1006, Controls for Replacement of In-core Detectors and Associated Components, Revision 0  
 RP-AB-460, TIP Area Access Controls, Revision 1  
 RP-LG-460-102, Initial Entry into the Drywell, Revision 7  
 RP-LG-460-105, Drywell Entries at Power, Revision 6  
 RP-LG-460-103, Upper Level Drywell Access Control during Irradiated Core Component Moves, Revision 4  
 RP-AA-503, Unconditional Release Surveys, Revision 5  
 RP-AA-503-F-01, Unconditional Release Instruction for Using Small Article Monitor for Personnel Items used in the Radiological Controlled Area but Not in Contaminated Area, Revision 1  
 RP-AA-350-1001, Response to Guardhouse Portal Monitor Alarm, Revision 0  
 RP-AA-350-1002, Managing Large Scale Contamination Events, Revision 0  
 RP-AA-302, Determination of Alpha Levels and Monitoring, Revision 4  
 RP-AA-250, External Dose Assessment from Contamination, Revision 5  
 RP-AA-301, Radiological Air Sampling Program, Revision 4  
 RP-AA-461, Radiological Controls for Contaminated Water Diving, Revision 2  
 RP-AA-401-1002, Radiological Risk Management  
 RP-AA-376, Radiological Posting, Labeling and Marking, Revision 6  
 RP-AA-376, Radiological Posting, Labeling, and Monitoring Standard, Revision 6

#### **Documents**

LGS-11-006, Rev.0, Canberra ARGOS-5, Plant-mix gamma Sensitivity  
 10 CFR 61 Waste Stream Report - 2012  
 Dose Records  
 Contamination Control – Personnel Contamination Data  
 Dosimetry Performance Testing Data  
 PI Summary Data

### **Section RS02: Occupational ALARA Planning and Controls**

#### **Issue Reports**

|         |         |         |         |         |
|---------|---------|---------|---------|---------|
| 1332862 | 1334532 | 1334508 | 1332749 | 1332834 |
|---------|---------|---------|---------|---------|

#### **Procedures**

RP-AA-400-1007, Elevated Dose Rate Planning, Revision 0  
 CY-AB-120-130, BWR Shutdown Chemistry, Revision 9

CY-AB-120-120, BWR Start-up Chemistry, Revision 8  
 CY-AB-120-1300, Elemental Cobalt Transport Study, Revision 0  
 CY-LG-120-1301, Outage Cobalt Limits, Revision 6  
 RP-AA-463-1001, Failed Fuel Surveillance Guidance, Revision 0

#### Documents

Cumulative C0-60 Carry-Over Analysis  
 1R14 Chemistry Plan  
 1R14 Elemental Cobalt Sampling List  
 1R14 Dose Reduction HIT team Action List  
 1R14 Dose Reduction HIT Team - Dose Gap Closure Initiative  
 Source term Reduction Flushes  
 Limerick Dose 2012-2016, Dose Reduction Excellence Plan, Revision 0  
 LGS- Dose Excellence Plan  
 CRUD Burst Response Plan  
 Work-In-Progress Job Reviews and ALARA Reviews  
 Outage Report Data

### **Section RS03: In-plant Airborne Radioactivity Control and Mitigation**

#### Procedures

RP-AA-301, Radiological Air Sampling Program, Revision 4  
 RP-LG-300-101, Routine Survey Program and Documentation  
 RP-AA-440, Respiratory Protection Program, Revision 10  
 RP-LG-460-101, Drywell and Suppression Pool Air Sampling  
 FH-105, Core Component Movement- Fuel Transfer, Revision 45  
 FH-106, Core Component and Irradiated Item Movement- No Core Transfer, Revision 35  
 RP-AA-870-1001, Set-up and Operation of Portable Air Filtration Equipment, Revision 1  
 RP-AA-870-1002, Use of Vacuum Cleaners in Radiological Controlled Areas, Revision 3  
 RP-AA-870-1003, Testing Portable High Efficiency Particulate Air Filter Units, Revision 0  
 RP-LG-441-1001, Respiratory Field Use and Air testing, Revision 7  
 RP-LG-825-101, Breathing Air Analysis, Revision 4  
 RP-LG-825-1011, Inspection and Use of the Mururoa V4F1R Supplied Suit, Revision 1

#### Documents

LGS-12-001, Rev. 0, Testing of the Mururoa Type V4F1R Airline Suit  
 Breathing Air Laboratory Sampling Results (Service Air – 163987, 163988, 163986)  
 Breathing Air Quality Data Log (records)  
 EC Type Examination Certificate (No. 0073/197/162/02/01/005)  
 Respirator Qualification Records (training, medical certification)  
 Corrective Action Documents (various)  
 Airborne Radioactivity Intake Assessments

### **Section RS04: Occupational Dose Assessment**

#### Inspection Reports

|         |         |         |         |         |
|---------|---------|---------|---------|---------|
| 1324052 | 1332720 | 1329324 | 1332281 | 133054  |
| 1331298 | 1331306 | 1332050 | 1332050 | 1329823 |

Procedures

RP-AA-210, Dosimetry Issue, Usage, and Control, Revision 22  
 RP-AA-222, Methods for Estimating Internal Exposure from In Vivo and  
 In Vitro Bioassay Data, Revision 3  
 RP-AA-220, Bioassay Program, Revision 8  
 RP-AA-250, External Dose Assessment form Contamination, Revision 5  
 RP-AA-210-1001, Dosimetry Logs and Forms, Revision 7  
 RP-LG-300-101, Routine Survey Program and Documentation, Revision 11  
 RP-AA-210, Dosimetry Issue, Usage, and Control, Revision 22  
 RP-AA-350, Personnel Contamination Monitoring, Decontamination, and Reporting, Revision 10

Documents

NVLAP testing Certification In-light  
 RP-AA-220, Annual Bioassay Program Review for 2011  
 Exposure Control and Dose Records  
 General Source Term Data  
 Personnel Contamination Event Logs  
 Personnel Intake Investigations  
 Data for Conduct of EDEX Assessment

**Section RS05: Radiation Monitoring Instrumentation**

Procedures

RP-AA-503, Unconditional Release Surveys, Revision 5  
 RP-AA-503-F-01, Unconditional Release Instruction for Using Small Article Monitor for  
 Personnel Items Used in the Radiological Controlled Area But Not in Contaminated  
 Area, Revision 1  
 RP-AA-350-1001, Response to Guardhouse Portal Monitor Alarm, Revision 0  
 RP-AA-350-1002, Managing Large Scale Contamination Events  
 RP-AA-302, Determination of Alpha Levels and Monitoring, Revision 4

Documents

General Source Term Data  
 General Instrumentation Calibration and Source Check Data: (Lapel- 12-00961, 12-00962;  
 RO-2 – 332263, 79928; RO2A- 332415, 76546; RSO-50- 78167;Telepole – 79463,  
 77619; Rm-14 - 75460; AMP -100- 77472, 75270, 76558, 76116; SAC 4- 333901,  
 333895; Bicron- 79463; GAST-21-1190, 21-1613, 21-1626, AMS-4-334833, 76442;  
 EC-4-332481  
 Dosimetry (telemetry check data) – 7828495 - 99

**Section 2RS8: Radioactive Solid Waste Processing and Radioactive Material Handling,  
 Storage, and Transportation**

Issue Reports

|         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|
| 1086877 | 1088414 | 1108144 | 1122713 | 1142256 | 1241388 |
| 1092212 | 1092568 | 1236185 | 1240056 |         |         |

Procedures

TQ-AA-166, Radioactive Material Shipping Training, Revision 0  
 RW-AA-100, Process Control Program for Radioactive Wastes, Revision 7  
 RP-AA-605, 10 CFR 61 Program, Revision 4

RP-LG-600-1005, Waste Shipments from Limerick to Peach Bottom, Revision 0  
 Audit NIOSHA-LG-11-3T, RAM Shipping, 12/14/11  
 Teledyne Brown Engineering Report of Analysis for Waste Streams (2011 & 2010): Deep Bed;  
 Waste Sludge; Dry Active Waste; and, Fuel Floor

Shipment Records

MM-10-048; MM-11-059; MM-11-107; MM-12-005; MM-12-017

RPTI 8.05, Radioactive Material Shipments, Revision 19

**Section 40A3: Followup of Events and Notices of Enforcement Discretion**

Issue Reports

|         |         |        |        |         |
|---------|---------|--------|--------|---------|
| 1342540 | 8055533 | 911591 | 798054 | 1299575 |
|---------|---------|--------|--------|---------|

Procedures

LS-AA-1120, Reportable Event RAD 1.34, Industry Ground Water Protection Initiative  
 (GPI) Voluntary Communication, Revision 13  
 CY-LG-170-301, Limerick Offsite Dose calculation Manual, Revision 25  
 CY-LG-170-2020, Non-routine Radiological Discharge, Revision 1  
 ST-061-570-0, Radwaste Discharge Permit, Revision 46  
 LS-AA-1120, Reportable Event RAD 1.34, Industry Ground Water Protection Initiative Voluntary  
 Communication, Revision 13  
 SG3.C, Inventory Release from 00T308 Floor Drain Sample tank Number 2 to Cooling Tower  
 Blow- down Line, Revision 35  
 SG2.1.E, Inventory Release from OA(B) T303 Equipment Drain tank to Cooling Tower Blow-  
 down Line, Revision 25

Miscellaneous

NEI 07-07, Industry Groundwater Protection Initiative, August 2007  
 Drawing C-401, Schuylkill River facility, Revision 2  
 Drawing C-4109, Diffuser, Revision 2  
 Tank Release 12-0015  
 NPDES No. PA 0051926  
 Limerick Generating Station Hot and Cold Matrix Table LGS-3-1, Emergency Action Matrix  
 R15H -063-OK04, Liquid Radiation Monitor  
 Dose Projections  
 Liquid Radiation Discharge Monitor Alarm Set-point Calculations  
 Downstream Compositor Sampling Results

**LIST OF ACRONYMS**

|       |                                                    |
|-------|----------------------------------------------------|
| ADAMS | Agency wide Documents Access and Management System |
| ALARA | As Low As is Reasonably Achievable                 |
| ASME  | American Society of Mechanical Engineers           |
| CAP   | Corrective Action Program                          |
| CFR   | Code of Federal Regulations                        |
| DAC   | Derived Air Concentration                          |
| EAL   | Emergency Action Level                             |
| ECR   | Engineering Change Request                         |
| EDEX  | Effective Dose Equivalent for External Exposure    |
| EDG   | Emergency Diesel Generator                         |
| ENS   | Emergency Notification System                      |
| EPD   | Electronic Personal Dosimeter                      |
| ESW   | Emergency Service Water                            |
| FOIA  | Freedom of Information Act                         |
| FSAR  | Final Safety Analysis Report                       |
| HEPA  | High Efficiency Particulate Air                    |
| HPCI  | High Pressure Coolant Injection                    |
| HRA   | High Radiation Area                                |
| IMC   | Inspection Manual Chapter                          |
| IR    | Issue Report                                       |
| ISI   | In-service Inspection                              |
| IST   | In-Service Test                                    |
| IVVI  | In-Vessel Visual Inspection                        |
| LER   | Licensee Event Report                              |
| LHRA  | Locked High Radiation Area                         |
| LOCA  | Loss of Coolant Accident                           |
| NCV   | Non-Cited Violation                                |
| NDE   | Non-Destructive Examination                        |
| NEI   | Nuclear Energy Institute                           |
| NPDES | National Pollutant Discharge Elimination System    |
| NRC   | Nuclear Regulatory Commission                      |
| NVLAP | National Laboratory Accreditation Program          |
| ODCM  | Offsite Dose Calculation Manual                    |
| PCP   | Process Control Program                            |
| PI    | Performance Indicators                             |
| PM    | Portal Monitor                                     |
| RCIC  | Reactor Core Isolation                             |
| RHR   | Residual Heat Removal                              |
| RCA   | Radiological Controlled Area                       |
| RPM   | Radiation Protection Manager                       |
| RWP   | Radiation Work Permit                              |
| SL    | Security Level                                     |
| SSC   | Structure, System, or Component                    |
| UFSAR | Updated Final Safety Analysis Report               |
| UT    | Ultrasonic Testing                                 |
| VHRA  | Very High Radiation Area                           |
| VT    | Visual Testing                                     |