August 4, 2011

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, UNITS 1 AND 2 - NRC INTEGRATED INSPECTION REPORT 05000352/2011003 AND 05000353/2011003

Dear Mr. Pacilio:

On June 30, 2011, the U. S. Nuclear Regulatory Commission (NRC) completed an inspection at your Limerick Generating Station Units 1 and 2. The enclosed integrated inspection report documents the inspection results which were discussed on July 13, 2011, with Mr. W. Maguire and other members of your staff.

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

This report documents two self-revealing findings of very low safety significance (Green). One of the findings was determined to involve a violation of NRC requirements. Additionally, a licensee-identified violation which was determined to be of very low safety significance is listed in this report. However, because of the very low safety significance and because they are entered into your corrective action program (CAP), the NRC is treating these violations as non-cited violations (NCVs), consistent with Section 2.3.2 of the NRC Enforcement Policy. If you contest any NCV in this report, you should provide a response within 30 days of the date of this inspection report, with basis for your denial, to the U. S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administration, Region I; the Director, Office of Enforcement, U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Limerick facility. If you disagree with the cross-cutting aspect assigned to any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region I and the NRC Senior Resident Inspector at the Limerick facility. The information you provide will be considered in accordance with Inspection Manual Chapter 0305.

In accordance with 10 Code of Federal Regulations (CFR) Part 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records 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
Projects Branch 4
Division of Reactor Projects

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

Enclosure: Inspection Report 05000352/2011003 and 05000353/2011003
w/Attachment: Supplemental Information

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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:	05000352/2011003 and 05000353/2011003
Licensee:	Exelon Generation Company, LLC
Facility:	Limerick Generating Station, Units 1 & 2
Location:	Sanatoga, PA 19464
Dates:	April 1, 2011 through June 30, 2011
Inspectors:	E. DiPaolo, Senior Resident Inspector N. Sieller, Resident Inspector E. Burket, Reactor Inspector S. Barr, Senior Emergency Preparedness Specialist (1EP4) T. Moslak, Health Physicist
Approved by:	Paul G. Krohn, Chief Projects Branch 4 Division of Reactor Projects

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SUMMARY OF FINDINGS

IR 05000352/2011003; 05000353/2011003; 04/01/2011-06/30/2011; Limerick Generating Station, Units 1 and 2; Refueling and Other Outages and Problem Identification and Resolution.

The report covered a three-month period of inspection by resident inspectors and announced inspections by regional reactor inspectors. Two Green findings were identified, one of which was a non-cited violation (NCV). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process." Findings for which the Significance Determination Process does not apply may be Green or be assigned a severity level after Nuclear Regulatory Commission (NRC) management review. Cross-cutting aspects associated with findings were determined using IMC 0310, "Components within the Cross-Cutting Areas," dated February 2010. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight," Revision 4, dated December 2006.

Cornerstone: Initiating Events

- Green. A Green, self-revealing NCV of Technical Specification (TS) 6.8.1, "Procedures and Programs," was identified for failure to position the Unit 2 recirculation loop isolation valves in accordance with the clearance instruction. As a result, the decay heat removal flow path, as provided by Unit 2 'A' residual heat removal (RHR), was in a degraded condition from April 6, 2011 until April 12, 2011, when the valve mispositioning was corrected. In addition, if the RHR system had been aligned to the Shutdown Cooling mode with the valves mispositioned in the open position, a large portion of the cooling flow would have bypassed the core, significantly impacting decay heat removal capability. Exelon entered the issue into the Corrective Action Program (CAP) for resolution.

  The inspectors determined that the failure to position the Unit 2 'A' loop recirculation pump suction and discharge valves to the closed positions in accordance with a clearance is a performance deficiency. This issue is more than minor because it was associated with the Configuration Control attribute of the Initiating Events cornerstone (i.e., shutdown equipment lineup), and it affected the cornerstone objective of limiting the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. This finding was determined to be of very low safety significance (Green) using IMC 0609, "Significance Determination Process," Appendix G, "Shutdown Operations Significance Determination Process," because the finding did not require quantitative assessment (i.e., the finding did not degrade the ability to recover decay heat removal once lost). Exelon entered this issue into the CAP for resolution. Corrective actions included remediating the reactor operator who applied the main control room tag and revising the cross check program to require a concurrent verification check on clearance applications for valves being de-energized with main control room indicators.

  The inspectors determined that this issue has a cross-cutting aspect in the area of Human Performance, Work Practices, because Exelon did not properly use human error prevention techniques (e.g., self and peer checking), commensurate with the risk of the assigned task. [H.4(a)] (Section 1R20)

- Green. A Green self-revealing finding was identified for Exelon's failure to identify and correct an adverse trend regarding out-of-calibration temperature switches in the Unit 1 and Unit 2 stator cooling water (SCW) systems. Specifically, between 1990 and 2011 the SCW outlet temperature switches were checked by Exelon on a two year frequency and found to be out-of-calibration approximately 50 percent of the time. Since 2005, the switches were found out-of-calibration nearly 70 percent of the time, often by a significant amount. Each time the switches were found out-of-calibration, they were recalibrated within acceptable limits, but the adverse trend was not recognized. The inspectors determined that Exelon's failure to identify and correct the adverse trend of out of calibration SCW outlet temperature switches was a performance deficiency which was reasonably within the licensee's ability to foresee and prevent. Specifically, Exelon's Performance Monitoring Program, described in ER-AA-2003, should have identified the trend during the system engineer's annual review of cause and repair codes for completed work orders. Exelon entered the issue into the CAP for resolution.

  The finding was more than minor because it was associated with the equipment performance attribute of the Initiating Events cornerstone and affected the cornerstone objective of limiting the likelihood of events that upset plant stability. Specifically, on February 25, 2011, the out of calibration SCW outlet temperature switches resulted in a SCW runback and manual scram of Limerick Unit 2 when the outlet temperature switches actuated 15 degrees lower than their intended set point. The finding was determined to be of very low safety significance (Green) in accordance with Phase 1 of IMC 0609, "Significance Determination Process," because the finding did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation equipment or functions would not be available.

  The inspectors determined that this finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Corrective Action Program, because Exelon did not identify the trend of out-of-calibration temperature switches in a timely manner. Exelon relied on the implementation of a thorough Performance Monitoring Program to supplement their CAP in the specific area of instrument performance monitoring and trending, and this program failed to detect the adverse trend in instrument performance. [P.1(b)] (Section 4OA2.7)

Licensee-Identified Violations

A violation of very low safety significance, which was identified by the licensee, has been reviewed by the inspectors. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program. This violation and corrective actions are listed in Section 4OA7 of this report.

REPORT DETAILS

Summary of Plant Status

Unit 1 began the inspection period operating at full rated thermal power (RTP) of 3458 megawatts thermal. On April 30, operators reduced power to approximately 95 percent to facilitate a measurement uncertainty power uprate. The unit achieved its post uprate RTP of 3515 megawatts thermal on May 1. A planned downpower to approximately 60 percent was performed on May 21 to facilitate main turbine valve testing, main condenser waterbox cleaning, and other secondary plant maintenance. The unit was returned to full RTP on May 23. On June 3, Unit 1 automatically scrammed following a main turbine trip. The main turbine trip was due to a false high reactor level signal caused by test instrumentation interaction with installed plant electrical circuitry during surveillance testing. A reactor startup was commenced on June 4. Operators synchronized the main generator to the grid on June 6 and achieved full RTP on June 8. A planned downpower to 77 percent was performed on June 10 to facilitate a followup control rod pattern adjustment. Unit 1 was returned to full RTP on June 11. Unit 1 remained at full RTP for the remainder of the inspection period.

Unit 2 began the inspection period in Operational Condition (OPCON) 5 (Refueling) for refueling outage 2R11. On April 22, Unit 2 entered OPCON 2 (Startup). Operators synchronized the main generator to the electrical grid ending the refueling outage on April 24. Full RTP of 3458 megawatts thermal was achieved on April 27. During the inspection period, power was periodically lowered during periods of high condensate temperature due to environmental conditions (i.e., high outside temperatures). On April 30, operators reduced power to approximately 92 percent to facilitate a measurement uncertainty power uprate. The unit achieved its post uprate RTP of 3515 megawatts May 9. On May 23, operators reduced power to approximately 94 percent to troubleshoot electrical generation lost efficiency and to perform additional measurement uncertainty power uprate testing. Power was returned to full RTP on May 25. On May 27, operators reduced power to approximately 85 percent to facilitate main turbine valve testing and a control rod sequence exchange. During the performance of main turbine valve testing on May 28 with the unit at 92 percent power, the number 3 main turbine control valve failed to reopen. As a result, operators reduced power to approximately 75 percent. On May 29, while restoring electro-hydraulic fluid to the control valve following troubleshooting, Unit 2 automatically scrammed due to a turbine control valve fast closure signal. The cause of the turbine control valve fast closure signal was due to low electro-hydraulic pressure caused by restoration activities on the number 3 control valve. On May 30, while in OPCON 2 (Startup) with all control rods still fully inserted, Unit 2 was manually scrammed per procedure following the loss of both reactor recirculation pumps due to an instrument failure. On May 31, a reactor startup was commenced on Unit 2. Operators synchronized the main generator to the electrical grid on June 2, and achieved full RTP on June 4. On June 9, while at 92 percent power due to high condensate temperatures, operators reduced power to 85 percent due to the failure of the primary power supply to the ‘B’ reactor feed pump controls. Following repairs, power was restored to full RTP on June 10. Unit 2 remained at full RTP for the remainder of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems and Barrier Integrity

1R01 Adverse Weather Protection

Summer Readiness of Offsite and Alternating Current (AC) Power Systems

Grid Stability (71111.01 - 1 sample)

a. Inspection Scope

The inspectors performed a review of plant features and procedures for the operationand continued availability of the offsite and alternate AC power system to evaluate the readiness of the systems prior to seasonal high grid loading. The inspectors reviewed Exelon's procedures affecting these areas and the communications protocols between the transmission system operator and Exelon. This review focused on changes to the established program and material condition of the offsite and alternate AC power equipment. The inspectors assessed whether appropriate procedures and protocols were established and implemented to monitor and maintain availability and reliability of both the offsite AC power system and the onsite alternate AC power system. The inspectors evaluated the material condition of the associated equipment by interviewing the responsible system manager, reviewing issue reports (IRs) and open work orders, and walking down portions of the offsite and AC power systems including the 500 kilo-volt (kV) switchyard. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R04 Equipment Alignment

.1 Partial Walkdown (71111.04Q – 3 samples)

a. Inspection Scope

The inspectors performed partial walkdowns of the plant systems listed below to verify operability following realignment after a system outage window or while safety-related equipment in the opposite train was inoperable, undergoing surveillance testing or was potentially degraded. The inspectors used TS's, Exelon operating procedures, plant piping and instrumentation diagrams, and the Updated Final Safety Analysis Report (UFSAR) as guidance for conducting partial system walkdowns. The inspectors reviewed the alignment of system valves and electrical breakers to ensure proper in-service or standby configurations as described in plant procedures and drawings. During the walkdowns, the inspectors evaluated the material condition and general housekeeping of the systems and adjacent spaces. The documents reviewed are listed in the Attachment. The inspectors performed walkdowns of the following areas:

- Offsite power sources and Unit 2 4kV safeguard buses prior to entering OPCON 2;
- Emergency diesel generator (EDG) D11 during the D13 EDG overhaul; and
- Unit 1 reactor core isolation cooling (RCIC) during high pressure coolant injection (HPCI) system outage window.

b. Findings

No findings were identified.

1R05 Fire Protection - Tours (71111.05Q – 6 samples)

a. Inspection Scope

The inspectors conducted a tour of the six areas listed below to assess the material condition and operational status of fire protection features. The inspectors verified that combustible materials and ignition sources were controlled in accordance with Exelon's procedures. Fire detection and suppression equipment was verified to be available for use, and passive fire barriers were verified to be 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 in accordance with the station's fire plan. The documents reviewed are listed in the Attachment. The inspectors toured the following areas:

- Unit 1 cable spreading room (Area 22);
- Unit 2 cable spreading room (Area 23);
- Auxiliary equipment room 542 (Area 25);
- Unit 2 'B' and 'D' RHR heat exchanger rooms (Area 55);
- Unit 2, reactor enclosure fan and filter area rooms 647, 648, 649, 650, 652 (Area 73); and
- Diesel-driven fire pump room (Zone F-P-001).

b. Findings

No findings were identified.

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

a. Inspection Scope

The inspectors selected the Unit 2 'B' RHR heat exchanger for review. The heat exchanger was replaced during refueling outage 2R11 because a larger number of tubes had been plugged on the original 'B' heat exchanger, causing a marginal heat transfer capability. The inspectors compared the design calculations for the new heat exchanger to the design basis requirements for the component to ensure the heat exchanger would be able to perform its safety functions. The inspectors observed portions of the heat exchanger installation to verify that appropriate work practices were employed, such that the heat exchanger would be expected to perform consistent with the design calculations. The inspectors reviewed Exelon's plans for full heat transfer testing of the heat exchanger to ensure it would be performed in a timely manner. The documents reviewed are listed in the Attachment.

b. Findings

No findings were identified

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

a. Inspection Scope

From April 4-8, the inspectors performed a review of Exelon's implementation of their risk-informed in-service inspection (ISI) program activities for monitoring degradation of

the reactor coolant system boundary and risk significant piping system boundaries for Limerick Unit 2 using the criteria specified in the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI. The sample selection was based on the inspection procedure objectives and risk priority of those components and systems where degradation would result in a significant increase in risk of core damage. The inspectors reviewed documentation, observed in-process non-destructive examinations (NDE) and interviewed inspection personnel to verify that the activities were performed in accordance with the ASME Boiler and Pressure Vessel Code Section XI requirements.

NDE Activities

The documents reviewed are listed in the Attachment. The inspectors' observation and documentation review of non-destructive testing included the following:

- Ultrasonic testing (UT) of reactor pressure vessel closure head weld DJ;
- Magnetic particle test of closure head to flange weld AG;
- Magnetic particle test of 8" pipe stanchion to 26" main steam system integral attachment weld;
- UT of reactor pressure vessel closure head dollar plate weld AH;
- Two UTs of 4" diameter RCIC system dissimilar metal welds;
- UT of 26" main steam pipe to elbow weld; and
- Radiographic testing of the Unit 2 'B' RHR heat exchanger N3 nozzle repair.

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

Additionally, the inspectors performed a visual evaluation of the primary containment and additional structural members attached to the liner to assess the condition of the protective coating. The evaluation included accessible locations on Elevations 213', 253', 286', 297' and 303'.

Repair/Replacement Consisting of Welding Activities

The inspectors selected two ASME Section XI repair/replacement plans for review where welding on a pressure boundary was performed. The review was performed to evaluate specification and control of the welding process detailed in the work order, determine that qualified weld procedures and welders were used for the welding, and that completed weld examinations were performed in accordance with the ASME code requirements. The two ASME Section XI repair/replacement work orders reviewed were:

- C0234098, Repair of pinhole leak in weld HBC-247-01 in the emergency service water system loop 'A' return piping; and
- R1162703, Remove and test 2" relief valve, PSV-052-2F032A, on the 'A' core spray pump inlet.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program Quarterly Review (71111.11Q - 1 sample)

a. Inspection Scope

On June 7, 2011, the inspectors observed a licensed operator requalification simulator training session. The simulator scenario, LSES-7020, tested the operators' ability to respond to an instrument failure, a reactor feed pump trip, and a failure of the reactor to scram. The inspectors observed licensed operator performance including the completion of operator critical tasks, which are required to ensure the safe operation of the reactor and protection of the nuclear fuel and primary containment barriers. The inspectors also assessed crew dynamics and supervisory oversight to verify the ability of operators to properly identify and implement appropriate TS actions, regulatory reports, emergency event declarations, and notifications. The inspectors observed training instructor critiques to verify that appropriate feedback was provided to the licensed operators, and ensure that appropriate actions were taken to remediate any missed operator critical tasks.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12Q – 2 samples)

a. Inspection Scope

The inspectors evaluated Exelon's work practices and follow-up corrective actions for two issues within the scope of the maintenance rule. The inspectors reviewed the performance history of these systems, structures, and components (SSCs) and assessed the effectiveness of Exelon's corrective actions, including any extent-of-condition determinations to address potential common cause or generic implications. The inspectors assessed Exelon's problem identification and resolution actions for these issues to evaluate whether Exelon had appropriately monitored, evaluated, and dispositioned the issues in accordance with Exelon procedures and the requirements of 10 CFR Part 50.65, "Requirements for Monitoring the Effectiveness of Maintenance." In addition, the inspectors reviewed the maintenance rule classifications, performance criteria, and goals for these SSCs and evaluated whether they appeared reasonable and appropriate. The documents reviewed are listed in the Attachment. The inspectors reviewed the following issues:

- System 35 – 66/220/500 kV substations & main transformers; and
- IR 1151354, Unit 1 HPCI turbine failed to reset following overspeed trip test.

b. Findings

No findings were identified.

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

a. Inspection Scope

The inspectors evaluated the effectiveness of Exelon's maintenance risk assessments required by 10 CFR Part 50.65(a)(4). This inspection included discussion with control room operators and risk analysis personnel regarding the use of Exelon's on-line risk monitoring software. The inspectors reviewed equipment tracking documentation, daily work schedules, and performed plant tours to gain assurance that the actual plant configuration matched the assessed configuration. Additionally, the inspectors verified that Exelon's risk management actions, for both planned and emergent work, were consistent with those described in Exelon procedure, ER-AA-600-1042, "On-Line Risk Management." The documents reviewed are listed in the Attachment. The inspectors reviewed the following samples:

- Yellow risk profile on May 3, 2011 for Unit 1, due to the planned unavailability of the 'A' control room emergency fresh air system, the Unit 1 'A' electro-hydraulic control (EHC) pump, and an offsite power source during EDG D11 testing;
- Yellow risk profile on May 17, 2011 for Unit 2, due to the planned unavailability of the Unit 2 'A' reactor enclosure recirculation system and the emergent unavailability of the 'A' standby gas treatment system;
- Yellow risk profile on May 23, 2011 for Unit 2, due to the emergent unavailability of the reactor core isolation system and the planned unavailability of the 'B' reactor enclosure cooling water heat exchanger;
- Unit 1 TS 3.0.4.b risk assessment for inoperable Unit 1 containment leak detector (10-5182) during startup from 1F46 forced outage; and
- Yellow risk profile on June 22, 2011 for Unit 1 due to HPCI emergent unavailability following planned maintenance.

b. Findings

No findings were identified.

1R15 Operability Evaluations (71111.15 - 5 samples)

a. Inspection Scope

The inspectors assessed the technical adequacy of a sample of five operability evaluations to ensure that Exelon properly justified TS operability and verified that the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors reviewed the UFSAR to verify that the system or component remained available to perform its intended safety function. In addition, the inspectors reviewed compensatory measures implemented to ensure that the measures worked and were adequately controlled. The inspectors also reviewed a sample of IRs to verify that Exelon identified and corrected deficiencies associated with operability evaluations. The documents reviewed are listed in the Attachment. The inspectors reviewed the following evaluations:

- IR 1191498, Unit 1 main turbine control valve fast acting solenoid not functional due to EHC system power failure;
- IR 1192548, EDG D14 fuel oil transfer high differential pressure;

- IR 1193220, Unit 1 main generator power load unbalance protection feature out of service due to power supply failure;
- IR 1211765, Reactor vessel level instrument reference leg fill reading 0 gpm; and
- IR 1222690, Operational technical decision making evaluation for functionality of Unit 2 control valve number 1.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 – 2 samples)

a. Inspection Scope

The inspectors reviewed the two permanent plant modifications listed below to ensure that installation of the modifications did not adversely affect systems important to safety. The inspectors compared the modifications with the UFSAR and TS to verify that the modification did not affect system operability, availability, or adversely affect plant operations. The inspectors ensured that station personnel implemented the modification, in accordance with the configuration change process. The impact on existing procedures was reviewed to verify Exelon made appropriate revisions to reflect the changes. The inspectors verified that appropriate operator training was conducted, proper preventive maintenance was specified for new equipment, and license condition and regulatory commitments were incorporated into the modifications. The documents reviewed are listed in the Attachment. The inspectors reviewed the following samples:

- Engineering Change LG 10-00338, select motor operated valve circuit modifications to address spurious operation during fire scenarios; and
- Unit 1 & 2 measurement uncertainty recapture power uprate.

b. Findings

No findings were identified.

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

a. Inspection Scope

The inspectors reviewed six post-maintenance tests to verify that procedures and test activities ensured system operability and functional capability. The inspectors reviewed Exelon's test procedures to verify that the procedures adequately tested the safety functions that may have been affected by the maintenance activity, and that the acceptance criteria in the procedures were consistent with information in licensing and design basis documents. The inspectors also witnessed the test or reviewed test data to verify that the results adequately demonstrated restoration of the affected safety functions. The documents reviewed are listed in the Attachment. The inspectors reviewed the following samples:

- C0226340, Unit 2 'B' RHR heat exchanger piping weld post-maintenance testing;
- C0237799, Unit 2 'B' reactor enclosure recirculation fan failed to restart during EDG D22 LOCA/LOOP test;

- C0237805, Overhaul main steam isolation valve HV-041-2F028B actuator manifold;
- C0238393, Rebuild Unit 2 main turbine control valve number 3 (CV-001-3-OP) actuator;
- IR 1204464, Unit 2 'B' RHR pump suction valve interlock test failure; and
- IR193548, Number 3 main turbine bypass valve failed drop test (RT-6-031-760-2).

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities

Unit 2 Refueling Outage (71111.20 - 1 sample)

a. Inspection Scope

At the beginning of the inspection period, Unit 2 was in OPCON 5 (Refueling) with the reactor cavity flooded for refueling outage 2R11. On April 18, Unit 2 entered OPCON 2 (Startup). Operators synchronized the main generator to the electrical grid completing the refueling outage on April 24. Full RTP was achieved on April 27. During the inspection period, the inspectors conducted several containment walkdowns and monitored plant startup and heatup activities. The documents reviewed are listed in the Attachment. The inspectors reviewed Exelon's 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 TS 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 TS 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 TS;
- Refueling activities, including fuel handling and fuel receipt inspections;
- Fatigue management; and
- Identification and resolution of problems related to refueling outage activities.

b. Findings

Introduction: A Green, self-revealing NCV of Technical Specification (TS) 6.8.1, "Procedures and Programs," was identified for failure to position the Unit 2 recirculation loop isolation valves in accordance with the clearance instruction. As a result, the decay heat removal flow path, as provided by Unit 2 'A' residual heat removal (RHR), was in a

degraded condition from April 6, 2011 until April 12, 2011, when the valve mispositioning was corrected. In addition, if the RHR system had been aligned to the Shutdown Cooling mode with the valves mispositioned in the open position, a large portion of the cooling flow would have bypassed the core, significantly impacting decay heat removal capability.

Description: On April 13, 2011, while Unit 2 was in a refueling outage, Clearance 10001673 was being removed by Limerick operators. When power was restored to the 'A' recirculation pump (RCP) discharge isolation valve (HV-043-2F031A) in accordance with the clearance, the main control room indication showed that the valve was full open. The required position for the valve was closed per the clearance.

Exelon determined that, in addition to 'A' RCP discharge isolation valve being mispositioned, the loop's RCP suction isolation valve (HV-043-2F023A) was also inappropriately left in the open position contrary to Clearance 10001673. This condition had been discovered by maintenance personnel performing work on the motor-operator on April 12, 2011, one day before the discharge isolation valve was found out of position. The workers stopped work and informed their supervisor of the unexpected condition, and were instructed to continue with their work and ensure the valve was returned to the closed position at the end of their job. Per Exelon's apparent cause evaluation, "The information was passed along to maintenance supervision, but the condition was not communicated to the main control room at that time." Additionally, no IR was written to document the unexpected condition.

Exelon's review of the clearance determined that the main control hand switches were tagged on April 2, 2011. The reactor operator who applied the tags could not specifically remember applying the tags or closing the valves. Closing the valves from the control room hand switches would have required a peer check. Interviews with other reactor operators on the shift determined that a peer check to close the suction and discharge valves was not performed. Exelon concluded that the reactor operator who applied the tags used inadequate self-checking, and applied the tags without closing the valves. Because control power was removed from the valves shortly thereafter, the mispositioned valves were "hidden" from the operators until the clearance was removed on April 13.

During the time period from April 6 until April 12, both of the RCP isolation valves were open, and the 'A' loop of RHR was in the alternate decay heat removal (ADHR) mode. Prior to April 6, the 'B' loop of RHR was providing decay heat removal. During the ADHR mode of operation, the reactor cavity is flooded up and the fuel pool gates are removed. The normal flow path is from the fuel pool skimmer surge tank, through the RHR pump and RHR heat exchanger, and back to the reactor via the recirculation jet pumps. With RCP suction and discharge valves open, flow was returned to the reactor via recirculation jet pumps and also into the reactor annulus. The inspector concluded that the flow path misalignment had minimal to no effect on the ability to cool the reactor and spent fuel pool. However, during the time period of the misalignment, there were no restrictions on placing the 'A' RHR loop in the Shutdown Cooling mode. If this had occurred, the valve misalignments would have had a more significant impact on the ability to cool the core, because a significant portion of the cooling flow would have bypassed the core.

Analysis: The inspectors determined that the failure to position the Unit 2 'A' loop RCP suction and discharge valves (HV-043-2F023A and HV-043-2F031A, respectively) to the closed positions in accordance with Clearance 10001673 was a performance deficiency. This deficiency resulted in a degraded ADHR flow path. In addition, if the RHR system had been aligned to the shutdown cooling mode with these valves open, the flow path would have bypassed the core, significantly impacting decay heat removal capability. This issue is more than minor because it was associated with Configuration Control attribute of the Initiating Events cornerstone (i.e., shutdown equipment lineup), and it affected the cornerstone objective of limiting the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. This finding was determined to be of very low safety significance (Green) using IMC 0609, "Significance Determination Process," Appendix G, "Shutdown Operations Significance Determination Process," because the finding did not require quantitative assessment (i.e., the finding did not degrade the ability to recover decay heat removal once lost). Exelon entered this issue into the CAP as IR 1202252. Corrective actions included remediating the reactor operator who applied the main control room tag and revising the cross check program to require a concurrent verification check on clearance applications for valves being de-energized with main control room indicators.

The inspectors determined that this issue has a cross-cutting aspect in the area of Human Performance, Work Practices, because Exelon did not properly use human error prevention techniques (e.g., self and peer checking), commensurate with the risk of the assigned task [H.4(a)].

Enforcement: Limerick Unit 2 TS 6.8.1, "Procedures and Programs," requires, in part, that procedures be established and implemented covering the applicable activities in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978. Regulatory Guide 1.33, Appendix A, Section 1.c,. requires procedures for equipment control (e.g., locking and tagging). Clearance 1001673 required the main control room hand switches for valves HV-043-2F023A and HV-043-2F031A to be placed and tagged in a closed position. Contrary to the above, the main control hand switches for valves HV-043-2F023A and HV-043-2F031A were not placed in the closed position on April 2, 2011. As a result, the ADHR flow path was in a degraded condition when the Unit 2 'A' RHR loop was in operation from April 6, 2011 to April 12, 2011. Because this violation was determined to be of very low safety significance and has been entered in the CAP as IR 1202252, it is being treated as an NCV, consistent with Section 2.3.2 of the Enforcement Policy. **(NCV 05000353/2011003-01, Failure to Position Recirculation Isolation Valves in Accordance with Clearance.)**

1R22 Surveillance Testing (ST) (71111.22 – 5 samples; 3 routine surveillances, 1 in-service testing and 1 isolation valve)

a. Inspection Scope

The inspectors either witnessed the performance of, or reviewed test data, for five STs associated with risk-significant SSCs. The reviews verified that Exelon personnel followed TS requirements and that acceptance criteria were appropriate. The inspectors also verified that the station established proper test conditions, as specified in the procedures, that no equipment preconditioning activities occurred, and that acceptance

criteria were met. The documents reviewed are listed in the Attachment. The inspectors reviewed the following samples:

- ST-4-049-951-1, In-service Pressure Test of RCIC Pump and Turbine Supply (in-service testing);
- ST-4-076-807-1, 'B' Reactor Enclosure Recirculation System Charcoal Analysis;
- ST-4-EPP-800-0, Technical Support Center Ventilation Charcoal Analysis;
- ST-4-LLR-141-2, 'B' RHR Shutdown Cooling Return (isolation valve local leak rate test); and
- ST-6-092-321-1, D11 Diesel Generator LOCA/LOAD Reject Testing and Fast Start Operability Test Run.

b. Findings

No findings were identified.

2. RADIATION SAFETY

Cornerstone: Occupational Radiation Safety

2RS01 Radiological Hazard Assessment and Exposure Controls (71124.01 – 1 sample)

a. Inspection Scope

During the period April 4 - 8, 2011, the inspectors conducted the following activities to verify that the licensee was evaluating, monitoring, and controlling radiological hazards for work performed during the 2R11 refueling outage in locked high radiation areas (LHRA) and other radiological controlled areas (RCA). Implementation of these controls was reviewed against the criteria contained in 10 CFR Part 20, TS's, and the licensee's procedures.

Radiological Hazards Control and Work Coverage

The inspectors identified work performed in radiological controlled areas in Unit 2 and evaluated the licensee's assessment of the radiological hazards. The inspectors evaluated the survey maps, exposure control evaluations, electronic dosimeter dose/dose rate alarm set points, and radiation work permits (RWP), associated with these areas, to determine if the exposure controls were acceptable. Specific outage work activities evaluated included replacement of the 2B-RHR heat exchanger and maintenance on the RHR heat exchanger bypass valve (HV-C-051-2F048B). For these tasks, the inspectors attended the pre-job briefings and discussed the job assignments with the workers. The inspectors also observed (from the remote monitoring system) local power range monitor (LPRM) flushes and reviewed the implementation of exposure controls for control rod drive change-outs.

The inspectors reviewed the air sample records for samples taken in the drywell to determine if the samples collected were representative of the breathing air zone and analyzed/recorded in accordance with established procedures. During tours of Unit 2, the inspectors verified that continuous air monitors/samplers were strategically located to assure that potential airborne contamination could be timely identified and that the monitors were located in low background areas.

The inspectors toured accessible radiological controlled areas in Unit 2, including the drywell, fuel floor, reactor building, turbine building, and waste processing building and with the assistance of a radiation protection technician, performed independent radiation surveys of selected areas to confirm the accuracy of survey data, and the adequacy of postings. During tours, the inspectors verified that selected locked high radiation areas were secured and properly posted. Also, radiation protection technicians were questioned regarding their knowledge of plant radiological conditions for selected jobs, and the associated controls.

Additionally the inspectors reviewed the RWPs developed for other work performed during 2R11 including scaffolding installation/removal and snubber inspections. In particular, the inspectors reviewed the electronic dosimeter dose/dose rate alarm setpoints, stated on the RWP, to determine if the setpoints were consistent with the survey indications and plant policy.

Instructions to Workers

By attending pre-job briefings, the inspectors determined that workers performing radiological significant tasks were properly informed of electronic dosimeter alarm setpoints, low dose waiting areas, stay times, and work site radiological conditions. By observing work-in-progress, the inspectors determined that stay times were appropriately monitored by supervision to assure no procedural limit was exceeded. Jobs observed included LPRM flushes, valve removal from the drywell, and preparations for replacing the 2 'B' RHR heat exchanger.

During tours of the drywell, the inspectors determined that LHRA, hot spots, and high dose rate components had the appropriate warning signs. Additionally, the inspectors identified that low dose waiting areas were appropriately surveyed, identified, and used by personnel.

The inspectors discussed with radiation protection supervision the procedural controls for accessing LHRAs and very high radiation areas and determined that no changes have been made to reduce the effectiveness and level of worker protection.

Contamination and Radioactive Material Control

During tours of the drywell, waste processing building, and turbine building, the inspectors confirmed that contaminated materials were properly bagged, surveyed/ labeled, and segregated from work areas. The inspectors observed workers using contamination monitors to determine if various tools/equipment were potentially contaminated and met criteria for releasing the materials from the RCA.

Radiological Hazards Control and Work Coverage

By observing preparations for performing LPRM flushes, the inspectors determined that workers wore the appropriate protective equipment, had dosimetry properly located on their bodies, and were under the positive control of radiation protection personnel. Clear radio communication was established between the workers and the remote monitoring system. Supervisory personnel controlled the movements of the workers to assure that exposure was minimized.

Radiation Worker Performance

During job performance observations, the inspectors determined that workers complied with RWP requirements and were aware of radiological conditions at the work site. Additionally, the inspectors determined that radiation protection technicians were aware of RWP controls/limits applied to various tasks and provided positive control of workers to reduce the potential of unplanned exposure and personnel contaminations.

b. Findings

No findings were identified.

2RS02 Occupational ALARA Planning and Controls (71124.02 – 1 sample)

a. Inspection Scope

During the period April 4 – 8, 2011, the inspectors conducted the following activities to verify that the licensee was properly implementing operational, engineering, and administrative controls to maintain personnel exposure as low as is reasonably achievable (ALARA) for tasks performed during the Unit 2 refueling outage (2R11) and for a Unit 1 forced outage that occurred in March 2011.

Implementation of this program was reviewed against the criteria contained in the 10 CFR Part 20, applicable industry standards, and the licensee's procedures.

Radiological Work Planning

The inspectors reviewed pertinent information regarding site cumulative exposure history, current exposure trends, and the ongoing exposure challenges for the Unit 2 refueling outage. The inspectors reviewed the 2R11 Outage ALARA Plan.

The inspectors reviewed the exposure status for tasks performed during the Unit 2 outage and compared actual exposure with forecasted estimates contained in various project ALARA Plans (AP). In particular, the inspectors evaluated the effectiveness of ALARA controls for all jobs that were estimated to exceed 5 person-rem. These jobs included the Unit 2 'B' RHR heat exchanger replacement (AP 2011-027), reactor vessel disassembly (AP 2011-039), control rod drive exchange (2011-034), drywell scaffolding installation/removal (AP 2011-010), reactor cavity decontamination (AP 2011-042), reactor reassembly (AP 2011-040), and reactor cavity work platform activities (AP 2011-041).

The inspectors reviewed the Work-In-Progress ALARA reviews for selected jobs whose actual dose was tracking above the forecasted exposure, including scaffolding installation and snubber inspections.

The inspectors evaluated the departmental interfaces between radiation protection, operations, maintenance crafts, and engineering to identify missing ALARA program elements and interface problems. The evaluation was accomplished by interviewing site staff, reviewing outage Work-in-Progress reviews, attending Station ALARA Committee (SAC) meetings, and reviewing recent SAC meeting minutes. The agenda for SAC

meetings, which the inspectors attended, included review of actual exposure for scaffolding installation, snubber inspections, and outage dose trends.

Verification of Dose Estimates

The inspectors reviewed the assumptions and basis for the 2R11 outage ALARA forecasted exposure. The inspectors reviewed the revisions made to various outage project dose estimates due to emergent work; such as the snubber inspections and scaffolding installation, and radiation protection support activities, authorized by the SAC. The inspectors also reviewed the departmental outage dose summary to assess how actual exposure was trending with respect to forecasted exposure for various departments.

The inspectors evaluated the implementation of the licensee's procedures associated with monitoring and re-evaluating dose estimates and allocations when the forecasted cumulative exposure for tasks was approached. Included in the review were Work-In-Progress reports that evaluated the effectiveness of ALARA measures and addressed shortcomings in original dose estimates.

Additionally, the inspectors reviewed the exposures for the ten (10) workers receiving the highest doses for 2011 to confirm that no individual exceeded the regulatory limits or PI thresholds. As part of this review, the inspectors reviewed the dose level extension records for three (3) workers whose administrative dose limit was raised to permit them to perform control rod drive replacements.

Source Term Reduction and Control

The inspectors reviewed the status and historical trends for the Unit 2 source term. Through review of survey maps, and interviews with the Radiation Protection Manager, the inspectors evaluated recent source term measurements and control strategies. Specific strategies employed include jet pump wedge replacements, control of moisture carryover, pre-filling the main steam lines, use of macro-porous resin in the fuel pool demineralizer, flushes of the low pressure coolant injection system, remote monitoring of outage activities, and installing shielding on the reactor head stand.

The inspectors reviewed the effectiveness of temporary shielding by reviewing pre/post-installation radiation surveys for selected components having elevated dose rates. Shielding packages reviewed included those placed on the reactor head stand and radwaste lines.

Job Site Inspections

The inspectors reviewed the ALARA controls specified in APs and RWPs, and toured the work areas for projects performed during 2R11. Job sites toured included the replacement of the Unit 2 'B' RHR heat exchanger, valve removal in the dry well, and various jobs performed in the turbine building. The inspectors also observed LPRM flushes using the remote monitoring system. During tours, workers were questioned regarding their knowledge of job site radiological conditions and ALARA measures applied to their tasks.

b. Findings

No findings were identified.

2RS03 In-Plant Airborne Radioactivity Control and Mitigation (71124.03 – 1 sample)

a. Inspection Scope

During the period April 4 - 8, 2011, the inspectors conducted the following activities to verify that in-plant airborne concentrations of radioactive materials are being controlled and monitored, and to verify that respiratory protection devices are properly selected and used by qualified personnel.

Implementation of these programs was evaluated against the criteria contained in 10 CFR Part 20, applicable industry standards, and the licensee's procedures.

Engineering Controls

The inspectors evaluated the use of air samplers, continuous air monitors (airborne monitoring system-4) and portable HEPA ventilation systems, used during the 2R11 outage. The inspectors determined that the monitors and ventilation systems were appropriately located at work locations in the RCA where airborne contamination could potentially occur. The inspectors reviewed testing records and operating parameters for selected portable HEPA ventilation systems to determine that procedural performance criteria were met.

Respiratory Protection

The inspectors reviewed the use of respiratory protection devices worn by workers. The inspectors reviewed air sampling records, RWPs, and total effective dose equivalent ALARA DAC; i.e., derived air concentrations, evaluations to determine if the use of respiratory protection devices was commensurate with the potential external dose that may be received when wearing these devices.

b. Findings

No findings were identified.

2RS04 Occupational Dose Assessment (71124.04 – 1 sample)

a. Inspection Scope

During the period April 4 - 8, 2011, the inspectors conducted the following activities to verify the accuracy and operability of personal monitoring equipment and the methods for determining a worker's total effective dose equivalent.

Implementation of these programs was evaluated against the criteria contained in 10 CFR Part 20, applicable industry standards, and the licensee's procedures.

External Dosimetry

The inspectors verified that the licensee's dosimetry processer was accredited by the National Voluntary Laboratory Accreditation Program. The inspectors verified that the approved dosimeter irradiation categories were consistent with the types and energies of the site's source term. The inspectors reviewed the results of a vender audit, that the licensee performed of the dosimetry processer, to assess the quality of the provided services.

The inspectors confirmed that the licensee has developed "correction factors" to address the response of electronic dosimeters as compared to thermo-luminescent dosimeters.

Internal Dosimetry

The inspectors evaluated the equipment and methods used to assess worker dose resulting from the uptake of radioactive materials. Included in this review were bioassay procedures, whole body counting equipment (FastScan, AccuScan, portal contamination monitors) calibration and operating procedures, and the analytical results for 10 CFR Part 61 samples.

The inspectors determined that the procedural methods include techniques to distinguish internally deposited radioisotopes from external contamination, methods to assess dose from hard-to-measure radioisotopes, and methods to distinguish ingestion pathways from inhalation pathways.

The inspectors reviewed the results from a whole body count for a contaminated worker to assess the adequacy of the bioassay method including counting time, background radiation contribution, and the nuclide library used for assessing deposition. No individual exposure exceeded a committed effective dose equivalent of 10 mrem.

Special Dosimetric Situations

Declared Pregnant Workers (DPW)

The inspectors reviewed the procedural controls, and associated records, for managing DPW and determined that three (3) DPWs were employed during the Unit 2 outage. The inspectors reviewed the individual exposure results and monitoring controls to assure compliance with 10 CFR Part 20.

Effective Dose Equivalent Methods

The inspectors reviewed the licensee's procedures for monitoring external dose where significant dose gradients exist at the work site. For 2R11, external effective dose equivalent methods were used in assessing personnel exposure for control rod drive replacements. The inspectors confirmed that procedural controls were met including appropriate placement of thermo-luminescent dosimeters and electronic dosimeters on the workers and remotely monitoring worker dose using telemetry. The inspectors reviewed the preliminary dose assessment based on electronic dosimeter readings.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator (PI) Verification

Initiating Events and Mitigating Systems Cornerstone PIs (71151 – 4 samples)

a. Inspection Scope

The inspectors sampled Exelon's submittal of the Initiating Events cornerstone and Mitigating Systems cornerstone PIs listed below to verify the accuracy of the data recorded from April 2010 – March 2011. The inspectors utilized PI definitions and guidance contained in Nuclear Energy Institute 99-02, "Regulatory Assessment Performance Indicator Guidelines," Revision 6, to verify the basis in reporting for each data element. The inspectors reviewed various documents, including portions of the main control room logs, issue reports, power history curves, work orders, and system derivation reports. The inspectors also discussed the method for compiling and reporting PIs with cognizant engineering personnel and compared graphical representations from the most recent PI report to the raw data to verify that the report correctly reflected the data. Documents reviewed included operator logs and licensee event reports.

Cornerstone: Mitigating Systems

- Unit 1 and Unit 2 Safety System Functional Failures (MS05); and
- Unit 1 and Unit 2 Emergency AC Power System (MS06).

b. Findings

No findings were identified.

4OA2 Identification and Resolution of Problems

.1 Review of Items Entered into the Corrective Action Program (CAP)

a. Inspection Scope

As required by Inspection Procedure 71152, "Identification and Resolution of Problems," and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors screened all items entered into Limerick's CAP. The inspectors accomplished this by reviewing each new condition report, attending management review committee meetings, and accessing Exelon's computerized database.

b. Findings

No findings were identified.

.2 Problem Identification and Resolution (In-Service Inspection)

The extent of oversight of ISI/NDE activities including the topics of current ISI oversight and surveillance were reviewed. The inspector reviewed a sample of condition reports

shown in Attachment 1 to confirm that identified problems were being documented for evaluation and proper resolution.

b. Findings

No findings were identified.

.3 Problem Identification and Resolution (Radiological Hazard Assessment and Exposure Controls)

A review of Nuclear Oversight field observation reports, dose/dose rate alarm reports, personnel contamination event reports and associated issue reports, was conducted to determine if identified problems and negative performance trends were entered into the corrective action program and evaluated for resolution and to determine if an observable pattern traceable to a similar cause was evident. Relevant IRs, associated with radiological hazard assessment, initiated between January – March 2011, were reviewed and discussed with the licensee staff to determine if the follow up activities were being conducted in an effective and timely manner, commensurate with their safety significance.

b. Findings

No findings were identified.

.4 Problem Identification and Resolution (ALARA Planning and Controls)

The inspectors reviewed elements of the licensee's corrective action program related to implementing the ALARA program to determine if problems were being entered into the program for timely resolution, the comprehensiveness of the cause evaluation, and the effectiveness of the corrective actions. Specifically, issue reports related to programmatic dose challenges, personnel contaminations, dose/dose rate alarms, and the effectiveness in predicting and controlling worker exposure were reviewed.

.5 Problem Identification and Resolution (In-Plant Airborne Radioactivity Control and Mitigation)

The inspectors reviewed elements of the licensee's corrective action program related to implementing the airborne monitoring program to determine if problems were being entered into the program for timely resolution, the comprehensiveness of the cause evaluation, and the effectiveness of the corrective actions. Specifically, issue reports related to monitoring challenges, personnel contaminations, dose assessments, and the reliability of monitoring equipment were reviewed.

b. Findings

No findings were identified.

.5 Problem Identification and Resolution (Occupational Dose Assessment)

The inspectors reviewed elements of the licensee's corrective action program related to implementing the dosimetry program to determine if problems were being entered into the program for timely resolution, the comprehensiveness of the cause evaluation, and the effectiveness of the corrective actions. Specifically, the results of a vender audit,

and issue reports related to dose assessments, personnel contaminations, and dose/dose rate alarms were reviewed.

b. Findings

No findings were identified.

.6 Semi-Annual Review to Identify Trends (71152 - 1 Semi-Annual trend sample)

Inspection Scope

The inspectors performed a semi-annual review of site issues to identify trends that might indicate the existence of more safety significant safety issues, as required by Inspection Procedure 71152, "Identification and Resolution of Problems." The inspectors' review included repetitive or closely-related issues that may have been documented by Exelon outside of the CAP, such as Plant Health Committee reports including the Top Ten Equipment Issues List, the Plant Health Committee Issues List, the Open Action Items List, and the Performance Improvement Integration Matrix. The inspectors also reviewed Exelon's corrective action database for the first and second quarters of 2011, to assess IRs written in various subject areas (e.g., equipment problems, human performance issues, etc.), as well as individual issues identified during the NRC's daily IR review (Section 4OA2.1).

Findings and Observations

No findings were identified. The inspectors assessed that Exelon was generally identifying issues at a low threshold and entering the issues into the CAP for resolution. The inspectors noted a negative trend in that several plant issues/events were not entered into CAP in a timely manner. The issues involved were isolated to the Operations and Maintenance departments.

a. As discussed in NCV 05000353/2011003-01 (Section 1R20), maintenance workers found the Unit 2 'A' RCP suction valve in the open position on April 12, 2011, which was unexpected based on Clearance 10001673. Although the workers stopped work and informed their supervisor, an IR was not written to document and investigate the unexpected condition. This was a missed opportunity to identify the degraded ADHR flow path a day earlier than it was identified. See Section 1R20 for additional details of the issue. This observation was attributed to the Maintenance department.

b. On December 12, 2010, the Unit 1 HPCI system was rendered inoperable due to a failure of the overspeed trip mechanism to reset during periodic testing. The cause of the failure was determined to be most likely due to foreign material blocking a drain port in the overspeed trip device. Review of the device's maintenance history found that two of the last three inspections on Unit 1, and the last two inspections on Unit 2, had identified foreign material (dirt, paint chips, etc.) in the oil line ports. However, no IRs were written to document the unexpected condition. Had IRs been written, the CAP process might have led the station to do further disassembly and cleaning, which may have prevented the December 12 failure. This observation was attributed to the Maintenance department. Exelon submitted LER 05000352/2010002-00: "High Pressure Injection System Overspeed Trip Mechanism Failed to Reset." The NRC determined the issue was a Green Licensee-Identified NCV and it is documented in section 4OA7 of this report.

c. During the Spring 2010 Unit 1 refueling outage (1R13), an unexpected drain down of the Unit 2 condensate storage tank occurred while operators were conducting a planned draining of the Unit 1 reactor cavity. The prerequisites for the planned draining of the reactor cavity did not ensure that the condensate transfer pump suction was lined up to the Unit 1 condensate storage tank. Instead, the pump was lined up to the Unit 2 condensate storage tank, which enabled the drain down to occur. Had the drain down not been identified and halted by operators, the Unit 2 control rod drive pumps would have tripped on low suction pressure. Despite the significance of this event, no IR was written at the time of occurrence. A year later, Exelon entered the event into the CAP as IR 1200209. A separate IR was also written (IR 1200211) to document that an IR was not generated at the time of the event, which was contrary to CAP procedural guidance. This observation was attributed to the Operations department.

d. On February 26, 2011, in preparation for startup from a forced outage (2F43), shutdown cooling was being placed in service. Because of an inadequate turnover of partially completed procedures, an unexpected alarm was received when completing the valve alignment. The alarm was caused by the depressurization of the RHR suction piping when two valves were open at the same time, contrary to procedures. No IR was written to document the unexpected condition at the time of occurrence. Instead, this condition was identified as an extent of condition review for IR 1200211 (see example 'c' above). Exelon documented the event in IR 1200633 on May 10, 2011. This observation was attributed to the Operations department.

The inspectors determined that except as noted, the events described above were minor in nature. However, collectively they constituted a negative trend of not entering issues/events into the CAP in a timely manner. Exelon wrote IR 1237270 to perform a common cause analysis of the NRC-identified examples as well as other examples identified by Exelon.

.7 Annual Sample: Unit 2 Manual Reactor Scram due to Stator Cooling Water (SCW) Runback (71152 – 1 In-depth review sample)

a. Inspection Scope

The inspectors reviewed Exelon's actions in response to the February 25, 2011 manual reactor scram of Unit 2. The inspectors reviewed the root cause report (IR 1180231) and met with engineers and maintenance personnel in order to assess the adequacy of Exelon's evaluation and corrective actions. Specific documents reviewed are listed in the Attachment.

b. Findings

Introduction: A Green self-revealing finding was identified for Exelon's failure to identify and correct an adverse trend regarding out-of-calibration temperature switches in the Unit 1 and Unit 2 SCW systems. Specifically, between 1990 and 2011 the SCW outlet temperature switches were checked by Exelon on a two-year frequency and found to be out-of- calibration approximately 50 percent of the time. Since 2005, the switches were found out-of-calibration nearly 70 percent of the time, often by a significant amount. Each time the switches were found out-of-calibration, they were recalibrated within

acceptable limits, but the adverse trend was not recognized. On February 25, 2011, two Unit 2 SCW outlet temperature switches actuated 15 degrees Fahrenheit earlier than their expected setpoint. This resulted in a turbine generator runback, dual recirculation pump trip, and a manual reactor scram.

Description: On February 25, Unit 2 was operating at 100 percent power when an automatic SCW runback occurred. This consisted of a turbine generator runback followed by a trip of the 'A' and 'B' RCPs. Upon seeing both RCPs trip, operators inserted a manual reactor scram in accordance with their procedures. The plant responded as designed, and there were no complications to the scram. In response to the event, Exelon performed a root cause investigation (under IR 1180231) and determined that the SCW runback was caused by a sensed high temperature condition in the SCW system. Specifically, two out of three SCW outlet temperature switches had actuated and completed the logic for a SCW runback. Exelon determined that an actual high temperature condition had not occurred. Instead, the temperature switches were out-of-calibration and had actuated 15 degrees lower than their expected set point.

During the root cause investigation, Exelon discovered that the Unit 1 and Unit 2 SCW outlet temperature switches had frequently been found out-of-calibration throughout the life of the plant. Each switch was checked on a two-year frequency as part of Exelon's preventive maintenance program, and over 59 checks had been performed since 1990. Approximately 50 percent of the time the temperature switches had been found out-of-calibration. Since 2005, the switches had been found out-of-calibration nearly 70 percent of the time, and they were off by as much as 10 degrees. In each instance, the technicians recalibrated the switches back within their allowable limits and assigned a "condition and repair code" to the work order to indicate that the switches had been found out-of-calibration.

Exelon's root cause report noted that the technicians did not write IRs to capture the instrument deficiencies in the CAP, which rendered the CAP trending process ineffective in identifying the SCW switch trend. However, in accordance with Exelon procedures, the Performance Monitoring Program should have identified adverse trends in instrument performance by reviewing the cause and repair codes assigned to the completed work orders. The inspectors learned that Exelon procedures require engineers to create performance monitoring plans for their assigned systems. The plans specify which components are important to monitor and what aspects of component performance should be monitored. The plans should include an annual review of work order cause and repair codes to assess the effectiveness of preventive maintenance on included components. Exelon discovered that the SCW temperature switch calibration history was not included in any of the performance monitoring plans, and was therefore not being trended or reviewed each year. Therefore, neither the Performance Monitoring Plans nor the CAP were able to identify this negative trend. Exelon considered this a latent organizational weakness and a missed opportunity to identify the switch calibration issues prior to the February 25 event.

To address the programmatic weakness identified regarding the performance monitoring program, Exelon conducted training for all engineers in the fleet. Exelon also created an action in CAP for engineers to review their performance monitoring plans with their supervisors and identify whether additional components should be added for performance trending. A final action entered into CAP was to determine whether, going forward, IRs should be written for instruments found out of calibration. Although the

performance monitoring procedures direct engineers to trend instrument performance using work order cause and repair codes, Exelon recognized that entering instrument performance issues into CAP could serve as a second method of identifying trends. In addition, since IRs are reviewed by many members of the organization on a daily basis, instrument performance issues might be recognized more readily and effectively if entered into CAP.

Analysis: The inspectors determined that Exelon's failure to identify and correct the adverse trend of out-of-calibration SCW outlet temperature switches was a performance deficiency which was reasonably within the licensee's ability to foresee and prevent. Specifically, Exelon's Performance Monitoring Program, described in ER-AA-2003, should have identified the trend during engineer's annual review of cause and repair codes for completed work orders. The finding was more than minor because it was associated with the equipment performance attribute of the Initiating Events cornerstone and affected the cornerstone objective of limiting the likelihood of events that upset plant stability. Specifically, on February 25, 2011, the out-of-calibration SCW outlet temperature switches resulted in a SCW runback and manual scram of Limerick Unit 2 when they actuated 15 degrees lower than their intended set point. The finding was determined to be of very low safety significance (Green) in accordance with a Phase 1 of IMC 0609, "Significance Determination Process," because the finding did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation equipment or functions would not be available.

The inspectors determined that this finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Corrective Action Program, because Exelon did not identify the trend of out-of-calibration temperature switches in a timely manner. Exelon relied on the implementation of a thorough Performance Monitoring Program to supplement their CAP in the specific area of instrument performance monitoring and trending, and this program failed to detect the adverse trend in instrument performance. [P.1(b)]

Enforcement: Enforcement action does not apply because the performance deficiency did not involve a violation of regulatory requirements. Specifically, the SCW outlet temperature switches are not safety-related components. Because the finding does not involve a violation of regulatory requirements, was determined to be of very low safety significance, and was entered into the licensee's CAP as IR 1180231, it is characterized as a finding. **FIN 05000353/2011003-03, Failure to Identify Adverse Trend regarding Out of Calibration Instrumentation**.

4OA3 Event Follow-up (71153 – 7 samples)

.1 Plant Events

a. Inspection Scope

For the five plant events listed below, the inspectors reviewed and/or observed plant parameters, reviewed personnel performance, and evaluated performance of mitigating systems. The inspectors communicated the plant events to appropriate regional personnel and compared the event details with criteria contained in IMC 0309, "Reactive Inspection Decision Basis for Reactors," for consideration of potential reactive inspection activities. As applicable, the inspectors verified that Exelon made appropriate

emergency action classification assessments and properly reported the event in accordance with 10 CFR Parts 50.72 and 50.73. The inspectors reviewed Exelon's follow-up actions related to the events to assure that appropriate corrective actions were implemented commensurate with their safety significance.

- Unit 2 feedwater primary containment isolation valve discovered not be fully closed affecting RCIC system operability;
- Unit 2 automatic scram due to low EHC system pressure on May 29, 2011;
- Unit 2 manual scram in OPCON 2 (Startup) with all control rods fully inserted following the loss of both reactor recirculation pumps on May 30, 2011 due to instrumentation failure;
- Unit 1 automatic scram due to main turbine trip during surveillance testing on June 3, 2011; and
- Unit 1 HPCI system unable to perform its safety function due to turbine control valve failure.

b. Findings

No findings were identified.

.2 (Closed) Licensee Event Report (LER) 05000353/2011002-00: Manual Actuation of the Reactor Protection System Due to Stator Cooling Water High Temperature Actuation.

On February 25, 2011, Limerick operators inserted a manual scram for Limerick Unit 2 following an automatic trip of both reactor recirculation pumps. The pumps tripped due to a main generator SCW high temperature actuation which also resulted in an automatic main turbine runback. Exelon's investigation determined that SCW high temperature actuation was due to not properly controlling a degraded SCW temperature control valve that required manual operator action in lieu of an automatic control function, as well as three SCW high temperature switches that were improperly calibrated during the previous refueling outage. The enforcement aspects of this issue are discussed in Section 4OA2.7. The inspectors did not identify any new issues during the review of the LER. This LER is closed.

.3 (Closed) LER 05000352/2010002-00: High Pressure Injection System Overspeed Trip Mechanism Failure to Reset.

On December 12, 2010, the Unit 1 HPCI system was rendered inoperable due to a failure of the turbine overspeed trip mechanism to reset during periodic testing. The cause of the failure to reset was caused by a temporary blockage of the overspeed trip mechanism piston drain port by foreign material. A maintenance procedure for the HPCI system overhaul were determined to be inadequate because it did not direct disassembly of the overspeed trip device for further inspection and cleaning in the event that foreign material is identified at pipe connection points. The enforcement aspects of this issue are discussed in Section 4OA7. The inspectors did not identify any new issues during the review of the LER. This LER is closed.

4OA5 Other Activities

.1 (Closed) NRC Temporary Instruction 2515/183, "Follow-up to the Fukushima Daiichi Nuclear Station Fuel Damage Event"

The inspectors assessed the activities and actions taken by the licensee to assess its readiness to respond to an event similar to the Fukushima Daiichi nuclear plant fuel damage event. This included (1) an assessment of the licensee's capability to mitigate conditions that may result from beyond design basis events, with a particular emphasis on strategies related to the spent fuel pool, as required by NRC Security Order Section B.5.b issued February 25, 2002, as committed to in severe accident management guidelines, and as required by 10 CFR 50.54(hh); (2) an assessment of the licensee's capability to mitigate station blackout conditions, as required by 10 CFR 50.63 and station design bases; (3) an assessment of the licensee's capability to mitigate internal and external flooding events, as required by station design bases; and (4) an assessment of the thoroughness of the walkdowns and inspections of important equipment needed to mitigate fire and flood events, which were performed by the licensee to identify any potential loss of function of this equipment during seismic events possible for the site. Following issuance of the report, the inspectors conducted detailed follow-up on selected issues.

Inspection Report 05000352, 05000353/2011008 (ML111300367) documented detailed results of this inspection activity.

.2 (Closed) NRC Temporary Instruction 2515/184, "Availability and Readiness Inspection of Severe Accident Management Guidelines (SAMGs)"

On May 18, 2011, the inspectors completed a review of the licensee's severe accident management guidelines, implemented as a voluntary industry initiative in the 1990's, to determine (1) whether the SAMGs were available and updated, (2) whether the licensee had procedures and processes in place to control and update its SAMGs, (3) the nature and extent of the licensee's training of personnel on the use of SAMGs, and (4) licensee personnel's familiarity with SAMG implementation.

The results of this review were provided to the NRC task force chartered by the Executive Director for Operations to conduct a near-term evaluation of the need for agency actions following the Fukushima Daiichi fuel damage event in Japan. Plant-specific results for Limerick Generating Station were provided in an Attachment to a memorandum to the Chief, Reactor Inspection Branch, Division of Inspection and Regional Support, dated May 27, 2011 (ML111470361).

4OA6 Meetings, Including Exit

On July 13, the inspectors presented the inspection results to Mr. W. Maguire and other members his staff. The inspectors confirmed that proprietary information was not included in the inspection report.

4OA7 Licensee-Identified Violations

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

Limerick Unit 2 TS 6.8.1, "Procedures and Programs," requires, in part, that procedure be established and implemented covering the applicable activities in Appendix A of

Regulatory Guide 1.33, Revision 2, February 1978. Regulatory Guide 1.33, Appendix A, Section 9.a, requires procedures for performing maintenance. Procedure M-C-756-001, "HPCI Turbine Inspection," Revision 26, contained instructions for the HPCI turbine oil system cleaning and inspection. Contrary to TS 6.8.1, Procedure M-C-756-001 was inadequate because it did not direct disassembly of the overspeed trip device for further inspection and cleaning in the event that foreign material was identified at pipe connection points. As a result, the Unit 2 HPCI system was rendered inoperable and nonfunctional on December 12, 2010, because the overspeed trip mechanism failed to reset during periodic testing due to foreign material in the oil turbine oil system. Because this issue was determined to be of very low risk significance (Green), and Exelon has entered this issue into the CAP as IR 1151354, this issue is being characterized as a Licensee Identified NCV.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel:
W. Maguire, Site Vice President
P. Gardner, Plant Manager
N. Dennin, Director of Operations
R. Kreider, Director of Maintenance
P. Colgan, Director of Work Management
C. Gerdes, Security Manager
R. Dickinson, Director of Training
D. Merchant, Radiation Protection Manager
D. Palena, Manager Nuclear Oversight
J. Hunter, Manager, Regulatory Assurance
R. Harding, Regulatory Assurance Engineer
R. Rhode, Licensed Operator Requalification Training Supervisor
D. Doran, Director of Engineering
J. Duskin, Instrumentation Physicist
C. Gray, Field Operations Manager, Radiation Protection
P. Imm, Manager, Radiological Engineering
M. McGill, Engineer, Limerick Engineering Response Team
L. Parlatore, Respiratory Protection Physicist
S. Bobyock, Manager, Engineering Programs
G. Budock, ISI Program Owner
C. Hawkins, NDE Level III
M. Karasek, IVVI Program Engineer
J. Commiskey, Radiological Engineer
N. Harmon, Radiation Protection Dosimetry Specialist
T. Micsz, Radiological Engineer
R. Shorts, Radiation Protection Technician

NRC Personnel:
E. DiPaolo, Senior Resident Inspector
N. Sieller, Resident Inspector
T. Hedigan, Operations Engineer
T. Moslak, Health Physicist
S. Barr, Senior Emergency Preparedness Specialist

Other Personnel:
M. Murphy, Inspector, Commonwealth of Pennsylvania

LIST OF ITEMS OPENED OR CLOSED

Opened

None

Closed

2515/183	TI	Follow-up to the Fukushima Daiichi Nuclear Station Fuel Damage Event (Section 4OA5.1)
2515/184	TI	Availability and Readiness Inspection of Severe Accident Management Guidelines (Section 4OA5.2)
05000353/2011-002-00	LER	Manual Actuation of the Reactor Protection System due to Stator Cooling Water High Temperature Actuation (Section 4OA3.6.2)
05000352/2010-002-00	LER	High Pressure Coolant Injection System Overspeed Trip Mechanism Failure to Reset (Section 4OA3.3)

Opened and Closed

05000353/2011003-01	NCV	Failure to Position Recirculation Isolation Valves in Accordance with Clearance (Section 1R20.1)
05000353/2011003-03	FIN	Failure to Identify Adverse Trend regarding Out-of-Calibration Instrumentation (Section 4OA2.7)

Discussed

None

LIST OF DOCUMENTS REVIEWED

Common References

Limerick Unit 1 and Unit 2 UFSAR
Limerick Unit 1 and Unit 2 TSs
Limerick Unit 1 and Unit 2 Technical Requirements Manual
Limerick Unit 1 and Unit 2 Operator Logs

Section 1R01: Adverse Weather Protection

Procedures

E-5, Grid Emergency, Revision 19
OP-AA-108-107, Switchyard Control, Revision 2
OP-AA-108-107-1001, Station Response to Grid Capacity Conditions, Revision 3
OP-AA-108-107-1002, Interface Procedure between Exelon Energy Delivery (COMED/PECO) and Exelon Generation (Nuclear Power) for Transmission Operations, Revision 5
WC-AA-8000, Interface Procedure between Exelon Energy Delivery (COMED/PECO) and Exelon Generation (Nuclear Power) for Construction and Maintenance Activities, Revision 4

Other

Exelon 60-Day Response to Generic Letter 2006-002, dated April 3, 2006

Section 1R04: Equipment Alignment

Procedures

2S91.9.A (COL), Normal Alignment of 13KV System Breakers with Main Generator Off Line, Revision 1
2S92.9.A (COL), Normal Alignment of 4KV Safeguard Breakers, Revision 3
1S92.1.N (COL-1), Equipment Alignment for 1 'A' Diesel Generator Operation, Revision 29

Section 1R05: Fire Protection

Procedures

F-R-174, Unit 'B' and 'D' RHR Heat Exchanger and Pump Rooms 174 and 281, Area 55
CC-LG-201, Hazard Barrier Control Program, Revision 0

Section 1R07: Heat Sink Performance

Other

ECR 09-00333, 2B-E205 Replacement of 2 'B' RHR Heat Exchanger, Revision 8

Section 1R08: In-service Inspection

Issue Reports

978123	1057723	1108430	1111117	1120034	1166932
1168722	1181172	1184405	1196338	1196500	1197581
1197608	1197636	1197966	1198223	1198255	1198801
1198944	1199686				

Work Orders

C0234098, HBC-247-01 Weld Repair Pin Hole in Reducer
R1162703, PSV-052-2F032A Remove and Test 2" Relief Valve
C0234380, N3 Radiograph SW-1 Repair
C0233574, ECR 09-00333 Preout work for 2B RHR Heat Exchanger Replacement

Audits/Self Assessments
Limerick Welding FASA Self-Assessment Report, dated 09/21/2010
Unit 2 Pre-NRC Inspection for Inservice Inspection Activities, dated 02/01/2011
Inservice Inspection, Inservice Test, and Appendix J Audit Report, dated 08/25/2010

Miscellaneous
ASME Section XI
ASME Code Case N-513-2
ASME Code Case N-578-1
NDE Procedures
GEH-PDI-UT-1, PDI Generic Procedure for the Ultrasonic Examination of Ferritic Pipe Welds, Revision 7
GEH-PDI-UT-2, PDI Generic Procedure for the Ultrasonic Examination of Austentic Pipe Welds, Revision 6
GEH-PDI-UT-10, PDI Generic Procedure for the Ultrasonic Examination of Dissimilar Metal Welds, Revision 4
GEH-UT-300, Procedure for Manual Examination of Reactor Vessel Assembly Welds in Accordance with PDI, Revision 10
GEH-VT-204, Procedure for IVVI of BWR 4 Reactor Pressure Vessel Internals, Revision 13
ER-AA-335-003, Magnetic Particle Examination, Revision 4
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 5
MA-LG-793-001, Visual Examination of Containment Vessels and Internals, Revision 3

NDE Examination Reports
176400 199801 287800 288500 714500 714600
714900

Program Procedures
ER-AA-330-009, ASME Section XI Repair/Replacement Program, Revision 6
ER-LG-330-1001, Limerick Generating Station Units 1 & 2 ISI Program Plan, Revision 3
ER-AA-335-025, Oversight of Vendor NDE Activities, Revision 5

Operability Evaluations
OPE-10-005, HBC-247-01 ESW Piping Flaw (Pinhole Leak), Revision 0
OPE-10-004, HBC-283-01 Leak, Revision 0
OPE-09-005, HBC-239-06 FW W1001 ESW Piping Flaw, Revision 1

Section 1R12: Maintenance Effectiveness
Issue Reports
1193744

Procedures
ER-AA-310-1002, Maintenance Rule Function Safety Significance Determination, Revision 3

Section 1R13: Maintenance Risk Assessments and Emergent Work Control
Procedures
OU-AP-103, Shutdown Safety Management Program, Revision 11

Section 1R15: Operability Evaluations
Issue Reports
1192548

Miscellaneous
A0832979
NRC Generic Letter 92-04, Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Purguant to 10CFR 50.54(F), dated August 19, 1992

Section 1R18: Plant Modifications

Issue Reports
1209214

Procedures
SP-MUR-LGS-02, Unit 2 Measurement Uncertainty Recapture Power
SP-MUR-LGS-01, Unit 1 Measurement Uncertainty Recapture Power Update Power Ascension Testing, Revision 0
GP-5, Steady State Operations, Revision 151
S06.7.B, Operation of the LEFM System, Revision 2
T-220 Defeat of Inboard Main Steam Line Drain Valve Isolation Logic, Revision 7
GP-8.3 Isolation Resets, Revision 10
S41.7.A Use of Main Steam Line Drains and Condensate System as an Alternative Decay Heat Removal Method, Revision 10

Engineering Documents
ECR 10-00338 Modify Select Motor Operated Valve Circuits to Prevent Spurious Operations During Postulated Hot Short Fire Scenario, Revision 2
50.59 Evaluation ECR 10-00338 Modify Select Motor Operated Valve Circuits to Prevent Spurious Operations During Postulated Hot Short Fire Scenario, Revision 1
Design Attribute Review for ECR 10-00338 Modify Select Motor Operated Valve Circuits to Prevent Spurious Operations During Postulated Hot Short Fire Scenario, Revision 1

Miscellaneous
Limerick Generating Station, Units 1 and 2 – Issuance of Amendments
Re: Measurement Uncertainty Recapture Power Update, dated April 18, 2011

Section 1R19: Post-Maintenance Testing

Issue Reports
1199008 1200016 1193548 0602923

Procedures
ST-6-041-202-2, MSIV Cold Shutdown Valve Test, Revision 18
ST-2-041-471-2, RPS-Main Steam Isolation Valve-Closure, Revision 8
ST-6-092-116-2, D22 Diesel Generator 4KV Safeguard Loss of Power Logic System Functional Outage Testing, Revision 18
ST-6-051-232-2, Unit 2 'B' RHR Pump, Valve, and Flow Test, Revision 65
ST-2-051-106-2, Unit 2 Division II RHR Low Pressure Coolant Injection Logic System Functional Test – Non – Outage, Revision 9
ST-6-001-765-2, Main Turbine Control Valve Exercise and RPS Channel Functional Test, Revision 44
M-C-701-023, Main Turbine Valve Actuator/Spring Can Removal, Inspection, and Installation, Revision 14
IC-11-00497, Alignment of the Electro-Hydraulic Control System of the General Electric Turbine Generator, Revision 17
RT-6-031-760-2, Bypass Valve Closure on Loss of EHC, Revision 0

Work Order
R1034803 dated 4/5/2007
R1127885 dated 3/23/2009

Section 1R20: Refueling and Other Outage Activities

Procedures
GP-2, Appendix 2, Drywell – Suppression Pool Closeout and Inspections, Revision 38
GP-6.1, Unit 2 Shutdown Operations – Refueling, Core Alterations and Core Off – Loading, Revision 26
NF-AA-330-1001, Core Verification Guide, Revision 6
GP-2, Appendix 1, Reactor Startup and Heat-up, Revision 38

Section 1R22: Surveillance Testing

Issue Reports
119908 1200572 1214119 1219466

Procedures
ST-4-049-951-1, ISI Inservice Pressure Test of RCIC Pump and Turbine Supply, Revision 2
ST-4-049-951-2, ISI Inservice Pressure Test of RCIC Pump and Turbine Supply, Revision 3

Work Orders
R1076828
R1045268

Section 2RS01: Radiological Hazard Assessment and Exposure Controls/ ALARA Planning & Controls

Procedures
RP-MA-403-1001, Radiation Work Permit Processing, Revision 3
RP-AA-203, Exposure Control and Authorization, Revision 3
RP-LG-300-102, Removing Items from the Spent Fuel Pool, Reactor Cavity, Equipment Pit, or Cask Pit, Revision 2
RP-LG-301-1001, Radiation Protection Survey Documentation, Revision 4
RP-AA-350, Personnel Contamination Monitoring, Decontamination, and Reporting, Revision 7
RP-AA-376-1001, Radiological Postings, Labeling, and Marking Standard, Revision 4
RP-AA-400, ALARA Program, Revision 5
RP-LG-400-1004, Emergent Dose Control and Authorization, Revision 3
RP-AA-401, Operational ALARA Planning and Controls, Revision 9
RP-AA-403, Administration of the Radiation Work Permit Program, Revision 1
RP-AA-460, Controls for High and Locked High Radiation Areas, Revision 19
RP-AA-460-001, Controls for Very High Radiation Areas, Revision 1
RP-AA-460-002, Additional High Radiation Exposure Control, Revision 0
RP-LG-460-102, Initial Entry into the Drywell, Revision 4
RP-LG-460-1016, Radiation Protection Controlled Keys, Revision 9
RT-0-100-460-0, High Radiation and Locked High Radiation Door Preventative Maintenance Inspection, Revision 3
RP-AA-302, Determination of Alpha Levels and Monitoring, Revision 3

Section 2RS02: Occupational ALARA Planning and Controls

Issue Reports:
01193497 01176262 01136395 01153014 01166182 01198823
01197872 01198198 01198331 01198235 01198311 01091028
01116828 01123983 01123986 01176262 01180807 01197307
01197251

Station ALARA Committee Meeting Minutes:
Meeting Nos. 2011-15/13/12/11/09/06

Miscellaneous Documents:
National Voluntary Laboratory Accreditation Program Certification Records, Personnel Dosimetry Performance Testing
Annual Review Report of the 2010 10 CFR Part 61 Radionuclide Analysis
Electronic Dosimeter Dose/Dose Rate Alarm Reports, January – March 2011
Top Ten Individual Exposure Records for 2011
Portable HEPA Inventory & Test Records
EPRI Standard Radiation Monitoring Program Data Summary for Unit 2 piping
Unit 2 Reactor Coolant System 2R11 Clean Up Data
2010 AccuScan Calibration
2010 FastScan Calibration
Exelon Corporation Audit SR 2008-001 of Dosimetry Provider

Section 2RS03: In-Plant Airborne Radioactivity Control and Mitigation

Procedures
RP-AA-301, Radiological Air Sampling Program, Revision 2
RP-AA-441, Evaluation and Selection Process for Radiological Respirator Use, Revision 4
RP-AA-870-1002, Use of Vacuum Cleaners in Radiologically Controlled Areas, Revision 1
RP-AA-870-1001, Set-Up and Operation of Portable Air Filtration Equipment, Revision 2
RP-LG-500-1012, Breach and Control of Radioactive Systems, Revision 1

2RS04Occupational Dose Assessment

Procedures
RP-AA-210, Dosimetry Issue, Usage, and Control, Revision 20
RP-AA-220, Bioassay Program, Revision 5
RP-AA-222, Methods for Estimating Internal Exposure from In Vivo and In Vitro Bioassay Data, Revision 3
RP-AA-250, External Dose Assessments from Contamination, Revision 4
RP-LG-220-1002, Perform Calibration Checks and Whole Body Count on the FastScan, Revision 4
RP-AA-280, Occupational Exposure Reporting, Revision 7
RP-AA-12, Internal Dose Control Program Description, Revision 0
RP-AA-270, Prenatal Radiation Exposure, Revision 4
RP-AA-225, Quality Control Operations for the Canberra FastScan Whole Body Counter, Revision 0
RP-11-03, Committed Effective Dose Equivalent Dose Assessment for HTM Isotopes for 2011

Section 2R11: ALARA Plans (AP)/ Work-In-Progress Reviews

AP 2011-010, Installation/Removal of Scaffolding, Unit 2 Drywell
AP 2011-017, DW Snubber Work
AP 2011-027, Replace 2B RHR Heat Exchanger
AP 2011-033, HV-C-051-2F048B Maintenance
AP 2011-034, 2R11 Control Rod Drive Exchange and Support Work
AP 2011-039, 2R11 Refuel Outage Middle Activities
AP 2011-040, 2R11 Reactor Reassembly
AP 2011-041, 2R11 Refuel Floor-Reactor Cavity Work Platform Activities
AP 2011-042, 2R11 Reactor Cavity Decontamination

Micro ALARA Plans:
11-090, Unit 1 EHC Oil Cleanup in Condenser Area
11-091, Unit 1 SWATS
11-093, Unit 1 Moisture Separator Manway Weld Repairs

Section 4OA2: Problem Identification and Resolution

Issue Reports
1180231 1193146 1219469 1219862

Section 4OA3: Event Followup

Issue Reports
1231487 1230677 1219476 1207704 1206083

Procedures
GP-2, Preparation for Startup, Revision 139

Other
TI 2515/184, Availability and Readiness of SAMGs
LER 2011-002-00, Manual Actuation of the Reactor Protection System Due to Stator Cooling Water High Temperature Actuation
NUREG 0696, Functional Criteria for Emergency Response Facilities, February 1981
NUREG 0737, Clarifications of TMI Action Plan Requirements, November 1980
Regulatory Guide 1.52, Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants, Revision 3
Regulatory Guide 1.140, Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants, Revision 2

LIST OF ACRONYMS

AC	Alternating Current
ADAMS	Agency wide Documents Access Management System
ADHR	Alternate Decay Heat Removal
ALARA	As Low As is Reasonably Achievable
AP	ALARA Plans
ASME	American Society of Mechanical Engineers
CAP	Corrective Action Program
CFR	Code of Federal Regulations
DPW	Declared Pregnant Workers
EAL	Emergency Action Level
EDG	Emergency Diesel Generator
EHC	Electro-Hydraulic Control
HPCI	High Pressure Coolant Injection
IMC	Inspection Manual Chapter
IR	Issue Report
ISI	In-service Inspection
IVVI	In-Vessel Visual Inspection
LER	Licensee Event Report
LHRA	Locked High Radiation Areas
LPRM	Local Power Range Monitor
NCV	Non-Cited Violations
NDE	Non-Destructive Examination
NRC	Nuclear Regulatory Commission
OPCON	Operational Condition
PI	Performance Indicator
RCA	Radiological Controlled Area
RCIC	Reactor Core Isolation Cooling
RCP	Recirculation Pump
RHR	Residual Heat Removal
RTP	Rated Thermal Power
RWP	Radiation Work Permits
SAC	Station ALARA Committee
SAMG	Severe Accident Management Guidelines
SCW	Stator Cooling Water
SSC	Systems, Structures and Components
ST	Surveillance Test
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
UT	Ultrasonic Testing