



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

July 24, 2007

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

**SUBJECT: LIMERICK GENERATING STATION - NRC INTEGRATED INSPECTION
REPORT 05000352/2007003 AND 05000353/2007003**

Dear Mr. Crane:

On June 30, 2007, the United States 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 18, 2007, with Mr. C. Mudrick and other members of your staff.

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

This report documents one self-revealing finding of very low safety significance (Green). This finding was determined to involve a violation of an NRC requirement. However, because of the very low safety significance and because it is entered into your corrective action program (CAP), the NRC is treating the finding as a non-cited violation (NCV), consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest the NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator Region I; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Limerick facility.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the

C. Crane

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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 05000352/2007003 and 05000353/2007003
w/Attachment: Supplemental Information

cc w/encl:

Chief Operating Officer, Exelon Generation Company, LLC
Site Vice President - Limerick Generating Station
Plant Manager, Limerick Generating Station
Regulatory Assurance Manager - Limerick
Senior Vice President - Nuclear Services
Vice President - Mid-Atlantic Operations
Vice President - Operations Support
Vice President - Licensing and Regulatory Affairs
Director - Licensing and Regulatory Affairs, Exelon Generation Company, LLC
Manager, Licensing - Limerick Generating Station
Vice President, General Counsel and Secretary
Associate General Counsel, Exelon Generation Company
Correspondence Control Desk
Director, Bureau of Radiation Protection, PA Department of Environmental Protection
J. Johnsrud, National Energy Committee, Sierra Club
Chairman, Board of Supervisors of Limerick Township
J. Bradley Fewell, Assistant General Counsel, Exelon Nuclear

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P. Krohn, DRP
R. Fuhrmeister, DRP
S. Hansell, DRP - Senior Resident Inspector
C. Bickett, DRP - Resident Inspector
L. Pinkham - Resident OA
ROPreports@nrc.gov
Region I Docket Room (with concurrences)

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U.S. NUCLEAR REGULATORY COMMISSION

REGION 1

Docket Nos: 50-352, 50-353

License Nos: NPF-39, NPF-85

Report No: 05000352/2007003 and 05000353/2007003

Licensee: Exelon Generation Company, LLC

Facility: Limerick Generating Station, Units 1 & 2

Location: Sanatoga, PA 19464

Dates: April 1, 2007 through June 30, 2007

Inspectors: S. Hansell, Senior Resident Inspector
C. Bickett, Resident Inspector
P. Finney, Reactor Inspector
L. Casey, Reactor Engineer
F. Arner, Senior Reactor Engineer
T. Moslak, Health Physicist
J. Richmond, Senior Reactor Inspector
R. Cureton, Emergency Preparedness Inspector

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

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SUMMARY OF FINDINGS

IR 05000352/2007-003, 05000353/2007-003; 04/01/2007 - 06/30/2007; Limerick Generating Station, Units 1 and 2; Post-Maintenance Testing.

The report covered a three-month period of inspection by resident inspectors and announced inspections by regional reactor inspectors. Inspectors identified one Green non-cited violation (NCV). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight," Revision 4, dated December 2006.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

Green. The inspectors identified a Green, self-revealing, non-cited violation of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," due to inadequate acceptance criteria in the maintenance procedure for adjusting the flow controllers of the High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) systems. This resulted in severe system flow oscillations during automatic injection following a reactor scram on April 24, 2007. Exelon has revised the maintenance procedure and has completed a root cause evaluation for this issue. Other corrective actions associated with the root cause evaluation are either completed or in progress and are documented in Exelon's corrective action process.

This issue is more than minor because it was associated with the Mitigating Systems cornerstone attribute of procedure quality and affected the objective of ensuring the capability of systems to prevent core damage following initiating events. The Region 1 Senior Reactor Analyst (SRA) determined that this issue was of very low safety significance based on an SDP Phase 1 evaluation because the safety function was not lost for either system given the training, procedures, and ability of the operators to take manual control of both systems and stop the flow oscillations. However, because this event impacted both the HPCI and RCIC systems, the SRA conducted a confirmatory risk assessment using the Limerick Standardized Plant Analysis Risk (SPAR) model. The dominant core damage sequence was a loss of the condenser heat sink with subsequent failure of HPCI and RCIC and failure of operators to depressurize the reactor to allow low pressure safety systems to inject. The assessment showed the increase in core damage frequency over a year was in the mid E-7 range, which confirmed the very low safety significance as determined in the Phase 1 SDP.

This finding has a human performance cross-cutting aspect in the area of resources (H.2.c) because Exelon did not ensure that the procedure for tuning of HPCI and RCIC flow controllers was adequate to verify proper automatic design basis operation of those systems. (H.2.c) (Section 1R19)

B. Licensee-Identified Violations

None.

REPORT DETAILS

Summary of Plant Status

Unit 1 began this inspection period operating at full rated thermal power and operated at full power the entire report period with the exception of routine control rod adjustments.

Unit 2 began this inspection period in a planned refueling and maintenance outage (2R09). The station commenced reactor startup on March 30, 2007. On April 1, operators shutdown Unit 2 from approximately 13 percent power for maintenance on the main generator hydrogen seals and an unexpected increase in drywell unidentified leakage rate due to failure to drain the reactor refueling bellows. Unit 2 returned to 100 percent power on April 5, 2007. On April 6, 2007, operators reduced reactor power to 80 percent due to unexpected changes in drywell parameters, including an increase in unidentified leakage rate. Operators shut down Unit 2 on April 9 to repair a degraded recirculation pump seal. Unit 2 returned to 100 percent power on April 12, 2007. On April 24, 2007, Limerick Unit 2 experienced an automatic reactor shutdown resulting from an unexpected reduction in feedwater flow to the reactor vessel. The unit returned to full power operation on April 30, 2007.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01 - 1 sample)

a. Inspection Scope

The inspectors evaluated Exelon's overall preparations and protection for summer weather. On June 19, 2007, the inspectors walked down portions of the service water system (including running service water pumps), circulating water pumps, station air compressors, main turbine and feedwater lubricating oil cooling systems, isophase bus cooling, alterex cooling, and the recirculation pump motor generator lubricating oil cooling systems. These systems were selected because they could be affected by warm weather and could affect plant operations as an event initiator. The inspectors reviewed the results of GP-7.1, "Summer Weather Preparation of Operation," which had been completed on May 31, 2007. All documents reviewed during this inspection period are listed in applicable sections of the Attachment.

b. Findings

No findings of significance were identified.

1R04 Equipment Alignment (71111.04)

.1 Partial Walkdown (71111.04Q - 3 samples)

a. Inspection Scope

The inspectors performed three partial walkdowns of plant systems to verify the operability of redundant or diverse trains and components when safety equipment in the opposite train was either inoperable, undergoing surveillance testing, or potentially degraded. The inspectors used plant Technical Specifications (TSs), Exelon operating procedures, plant piping and instrumentation drawings (P&IDs), and the Updated Final Safety Analysis Report (USFAR) 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 walkdown, the inspectors evaluated material condition and general housekeeping of the system and adjacent spaces. The inspectors performed the following samples:

- Unit 1 'B' Residual Heat Removal (RHR) System During 'A' RHR System Maintenance;
- D 24 Emergency Diesel Generator (EDG) After Load Reject Test; and
- 1A and C Core Spray System During 1B Core Spray System Maintenance.

b. Findings

No findings of significance were identified.

.2 Complete System Walkdown (71111.04S - 1 sample)

a. Inspection Scope

The inspectors conducted one complete walkdown of the Unit 2 Reactor Core Isolation Cooling (RCIC) system to verify the functional capability of the system. The inspectors used plant Technical Specifications, Exelon operating procedures, plant piping and instrumentation diagrams, the UFSAR, and past surveillance tests as guidance for conducting the complete system walkdown. The inspectors reviewed the alignment of system valves, position of electrical breakers, and settings of the system flow controller to ensure proper system configurations as described in plant procedures and drawings. During the walkdown, the inspectors evaluated material condition and general housekeeping of the system and adjacent spaces. The walkdown also included an evaluation of system piping, supports, and component foundations to ensure they were not degraded.

b. Findings

No findings of significance were identified.

1R05 Fire Protection

Fire Protection - Tours (71111.05Q - 9 samples)

a. Inspection Scope

The inspectors conducted a tour of the nine areas listed below to assess the material condition and operational status of fire protection features. The inspectors verified that combustibles and ignition sources were controlled in accordance with Exelon's administrative procedures, fire detection and suppression equipment was available for use, and that passive fire barriers were maintained in good material condition. The inspectors also verified that station personnel implemented compensatory measures for out-of-service, degraded, or inoperable fire protection equipment in accordance with Exelon's fire plan. The inspectors performed the following samples:

- Unit 1 Core Spray Rooms;
- D13 Diesel Generator Rooms and Fuel/Lube Oil Tank Room;
- D24 Diesel Generator Room during Monthly Surveillance Test;
- Unit 2 201' Elevation Room 279;
- Unit 1 and Unit 2 Cable Spreading Rooms;

- Auxiliary Equipment Room;
- Unit 1 217' Elevation Room;
- Unit 1 283' Elevation Room; and
- Unit 1 4kV Switchgear Rooms.

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures (71111.06 - 1 sample)

External Flooding

a. Inspection Scope

The inspectors reviewed documents and inspected structures, systems, and components (SSCs) relative to the adequacy of external flood protection measures for the D22 EDG compartment during preparation for the D22 EDG planned maintenance period. The inspectors performed walkdowns of the relevant areas to verify the adequacy of flood mitigation doors and barriers, drainage systems, and other flood protection features. The inspectors also verified that adequate procedures were in place to identify and respond to an external flooding event.

b. Findings

No findings of significance were identified.

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

a. Inspection Scope

The inspectors reviewed the results of a Unit 2 'A' Loop Emergency Service Water (ESW) flow balance test. The station replaced ESW piping to the Unit 2 'A' and 'C' RHR room unit coolers and motor oil coolers during the 2R09 refueling outage. Exelon performed the ESW flow balance as part of system restoration from the piping work. The inspectors reviewed this test data to ensure that no deficiencies were masking degraded performance. Additionally, the inspectors reviewed historical performance of the RHR motor oil coolers on both Unit 1 and Unit 2 to ensure that minimum and maximum flow limits were maintained. The inspectors also conducted a walkdown of the '2A' and '2C' RHR pump motor oil coolers to assess their material condition.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Regualification Program (71111.11Q - 1 sample)

Resident Inspector Quarterly Review (1 sample)

a. Inspection Scope

On June 19, 2007, the inspectors observed a licensed operator requalification simulator scenario. The scenario included a simulated safety relief valve inadvertent opening that resulted in a manual reactor scram, a failure to scram, and main steam isolation valves failure to close. The inspectors assessed licensed operator performance and the training evaluators' critiques. In addition, the inspectors evaluated operator critical tasks that measure operator actions required to ensure the safe operation of the reactor and the protection of the nuclear fuel and primary containment barriers. The inspectors discussed the results with operators and training instructors.

b. Findings

No findings of significance 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 SSCs and identified issues to assess the effectiveness of Exelon's maintenance activities. The inspectors reviewed the performance history of risk significant SSCs and assessed Exelon's extent-of-condition determinations for those issues with potential common cause or generic implications to evaluate the adequacy of the station's corrective actions. 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 50.65, "Requirements for Monitoring the Effectiveness of Maintenance." In addition, the inspectors reviewed selected SSC classification, performance criteria and goals, and Exelon's corrective actions that were taken or planned, to evaluate whether the actions were reasonable and appropriate. The inspectors performed the following samples:

- Remote Shutdown Panel Incorrect Functional Failure Determination, IR 582306; and
- ESW Air-Operated Valve Failures.

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 - 7 samples)

a. Inspection Scope

The inspectors evaluated the effectiveness of Exelon's maintenance risk assessments required 10 CFR 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 reasonable assurance that the actual plant configuration matched the assessed configuration. Additionally, the inspectors verified that Exelon's risk management actions, for both planned and/or emergent work, were consistent with those described in ER-AA-600-1042, "On-Line Risk Management." Inspectors reviewed risk assessments for the following out-of-service or degraded structures, systems, and/or

components:

- TS3.0.4b - Risk Assessment for 2B Core Spray Loop Inoperable;
- Second Refuel Bellows Draining Not Performed, IR 611552;
- 2A Recirculation Pump Seal Replacement;
- Unit 2 'A' Main Transformer High Internal Gas, IR 622434;
- Inspection of High Pressure Coolant Injection (HPCI) Turbine Stop Check Valve, C0221334;
- Inspection of RCIC Pump Discharge Check Valve, A1616928; and
- HV-055-2F006 Failed to Stroke Open, IR 642617.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15 - 5 samples)

a. Inspection Scope

For the five operability evaluations described below, the inspectors assessed the technical adequacy of the 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 controlled adequately. The inspectors also reviewed a sample of issue reports to verify that Exelon identified and corrected deficiencies associated with operability evaluations. The inspectors performed the following samples:

- PSV-011-107C Leaking Approximately 5 gpm with 'C' ESW Operating for LOCA/LOOP testing;
- GP-18 Review HPCI/RCIC Oscillations, IR 620861;
- EDG Part 21 Issue Identified by Fairbanks-Morse on Cam Roller Bushing, IR 615703;
- D22 DC Fuel Oil Pump Running with D22 Fully Loaded, IR 635260; and
- Valve Stroke Time Outside of Acceptable Range, IR 642618.

b. Findings

No findings of significance were identified.

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

a. Inspection Scope

The inspectors reviewed the six post-maintenance tests (PMTs) listed below 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 applicable criteria in the procedures were consistent with information in the 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

inspectors performed the following samples:

- Testing Following Repairs to the 2B Traversing Incore Probe Machine, IR 618968;
- ST-2-042-643-2 Following Redundant Reactivity Control System Circuit Card Replacement;
- ST-6-049-230-2 RCIC Pump Valve and Flow Test Following Tuning;
- Testing Following Adjustments on Unit 2 HPCI;
- ST-6-052-232-2 'B' Loop Core Spray Pump, Valve and Flow Test; and
- ST-2-051-108-2, Division 4 RHR Logic System Functional Test.

b. Findings

Introduction. The inspectors identified a Green, self-revealing, non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," due to inadequate acceptance criteria in the maintenance procedure for adjusting the flow controllers of the Unit 2 HPCI and RCIC systems.

Description. On April 24, 2007, with Unit 2 at 100 percent power, the Redundant Reactivity Control System (RRCS) inadvertently initiated a reduction in total feedwater flow to the reactor vessel. This resulted in a rapid decline in reactor vessel water level from +35 inches to +12.5 inches, which resulted in an automatic scram, as designed. As water level continued to decrease during the event, the HPCI and RCIC systems automatically started at -38 inches, as designed. Following initiation, HPCI and RCIC experienced abnormal system flow oscillations from no-flow to full-flow (5600 gallons per minute for HPCI and 600 gallons per minute for RCIC) with a period of 3.4 seconds and 1.2 seconds respectively. Additionally, the common suction source for both systems unexpectedly swapped from the condensate storage tank (CST) to the suppression pool due to oscillations in indicated CST water level. Approximately two minutes following the scram, the operators placed both HPCI and RCIC flow controllers into manual control and restored reactor water level. Both systems responded as expected in manual control and flow oscillations ceased on both systems. Operators returned reactor water level back to the normal level of +35 inches.

Further investigation by the station revealed that the cause of the flow oscillations was improper tuning of the HPCI and RCIC systems. HPCI and RCIC both utilize Bailey Type 701 flow indicating controllers (FICs) located in the main control room. During normal power operation, station personnel determine FIC settings for each system while the system is drawing water from the CST and discharging through a full flow test return line back to the CST, also known as a CST-to-CST alignment. Industry operating experience has demonstrated that HPCI and RCIC system response is slower when operating in a CST-to-CST alignment compared to actual operation during vessel injection. Therefore, these systems need to be tuned appropriately to account for the difference in response during actual vessel injection. Exelon determined that the gain and reset settings for the FICs were outside of the expected range by a factor of 10. The as-found gain and reset settings for the Unit 2 RCIC FIC were 1.0 and 8.0 respectively, compared to the Unit 1 RCIC settings of 0.18 for the gain and 70 for the reset. Similarly, the as-found gain and reset settings for the Unit 2 HPCI FIC were 0.8 and 21 respectively, compared to the Unit 1 HPCI settings of 0.085 for the gain and 18 for the reset.

Aside from start-up testing in 1989, Unit 2 HPCI never performed an actual reactor vessel injection until this event. Unit 2 RCIC automatically initiated and successfully injected into the reactor vessel following reactor scrams in September 1990 and October 1994. In contrast,

both Unit 1 HPCI and RCIC had automatically initiated and successfully injected to the reactor vessel on two separate occasions over the last eight years. Based on this operating experience and because Unit 1 HPCI and RCIC flow controller settings are consistent with industry values, Limerick matched Unit 2 HPCI and RCIC flow controller settings to Unit 1 values. Additionally, post-maintenance testing and tuning runs with a revised procedure verified that Unit 2 HPCI and RCIC systems were operating correctly with the new flow controller settings.

Limerick Generating Station procedure IC-11-00712, "Tuning of Inner Loop and Outer Loop HPCI/RCIC Controls," establishes guidelines for tuning of the HPCI and RCIC systems. Though station personnel had utilized this procedure during prior system tuning runs, the procedure was insufficient to ensure proper design basis automatic operation of HPCI and RCIC during vessel injection. Specifically, the acceptance criteria for control system dampening was inadequate. Exelon revised this procedure to maintain Unit 2 HPCI and RCIC flow controller settings at acceptable values to ensure proper operation of these systems during vessel injection. The station has also completed a root cause evaluation of this event and is currently implementing additional corrective actions.

The performance deficiency associated with this event was use of inadequate acceptance criteria in the maintenance procedure for tuning of HPCI and RCIC in a CST-to-CST alignment. Use of this maintenance procedure did not ensure proper automatic design basis operation of these systems and resulted in flow oscillations during automatic injection of HPCI and RCIC following the automatic reactor scram on April 24. Operators quickly took manual control of both systems in response to the oscillations, as directed by station procedures, and both systems operated properly in the manual mode.

Analysis. Traditional enforcement does not apply because the issue did not have any actual safety consequence or potential for impacting the NRCs regulatory function, and was not the result of any willful violation of NRC requirements or Exelon procedures. This issue was more than minor because it affected the Mitigating System cornerstone attribute of procedure quality and affected the objective of ensuring the capability of systems to prevent core damage following initiating events. This issue was of very low safety significance (Green) based on a SDP Phase 1 evaluation because the safety function was not lost for either system given the training, procedures, and ability of the operators to take manual control of both systems and stop the flow oscillations. Additionally, the finding did not screen as potentially risk-significant due to a seismic, flooding, or severe weather initiating event. However, because this issue impacted both HPCI and RCIC, the Region 1 Senior Reactor Analyst (SRA) conducted a confirmatory risk assessment using the Limerick Standardized Plant Analysis Risk (SPAR) model, version EE-3.22. This model assumed the following:

- Operators need to take manual control of HPCI and RCIC for the systems to be successful. This was conservatively assumed as necessary to prevent a high reactor vessel water level trip and subsequent restart at low reactor vessel water level.
- The operator actions for taking manual control of HPCI and RCIC were dependent on each other, i.e., if the operator did not take control of RCIC, there was an increased chance that the operator would also not take manual control of HPCI and vice versa.
- The SRA increased the chance that operators would not take manual control of both HPCI and RCIC by an order of magnitude to address the need to take manual action sooner than expected due to flow oscillations.

The dominant core damage sequence was loss of condenser heat sink with subsequent failure

of HPCI and RCIC and failure of operators to depressurize the reactor to allow low pressure safety systems to inject. The assessment showed the increase in core damage frequency over a year was in the mid E-7 range which confirmed the very low safety significance (Green) as determined in SDP Phase 1.

This finding has a human performance cross-cutting aspect in the area of resources because Exelon did not ensure that the procedure for tuning of HPCI and RCIC FICs was adequate to verify proper automatic design basis operation of those systems. (H.2.c)

Enforcement. 10 CFR 50 Appendix B, Criterion V, "Instructions, Procedures, and Drawings," states, in part, that instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished. Contrary to this, Limerick procedure IC-11-00712, "Tuning of Inner Loop and Outer Loop HPCI/RCIC Controls," was insufficient to ensure proper automatic design basis operation of HPCI and RCIC in that it did not include appropriate quantitative or qualitative acceptance criteria for control system dampening in the CST-to-CST alignment. The improper Unit 2 HPCI and RCIC flow controller settings had existed since May 1999 and, as a result, both systems experienced severe flow oscillations during automatic vessel injection following the reactor scram on April 24, 2007. Because this finding is of very low safety significance and Exelon has added this issue into their corrective action program (IR 620861), the NRC is treating this violation as a non-cited violation in accordance with Section VI.A of the NRC Enforcement Policy. **(NCV 05000353/2007003-01, Inadequate HPCI/RCIC Flow Controller Tuning Procedure Acceptance Criteria)**

1R20 Refueling and Other Outage Activities (71111.20 - 2 samples)

.1 2A Recirculation Pump Seal Replacement Maintenance Outage

a. Inspection Scope

The inspectors reviewed the station's work schedule for the Limerick Unit 2 'A' recirculation pump seal replacement maintenance outage (2M37) which was conducted April 9 through April 12, 2007. The inspectors confirmed that Exelon had appropriately considered risk, industry experience, previous site-specific problems, and defense-in-depth in developing and implementing their schedule and outage plan. During the maintenance outage, the inspectors observed portions of the shutdown and cooldown processes and monitored Exelon controls associated with the outage activities listed below:

- Configuration management, including maintenance of defense-in-depth commensurate with the outage plan for key safety functions and compliance with the applicable Technical Specifications when taking equipment out of service;
- Implementation of clearance activities and confirmation that tags were properly hung and equipment appropriately configured to safely support the associated work or testing;
- Installation and configuration of reactor coolant pressure, level, and temperature instruments to provide accurate indication and instrument error accounting;
- Status and configuration of electrical systems and switchyard activities to ensure that Technical Specifications were met;
- Monitoring of decay heat removal operations;
- Impact of outage work on the ability of the operators to operate the spent fuel pool cooling system;

- Reactor water inventory controls, including flow paths, configurations, alternative means for inventory addition, and controls to prevent inventory loss;
- Activities that could affect reactivity;
- Maintenance of secondary containment as required by TS;
- Startup and ascension to full power operation and tracking of startup prerequisites; and
- Identification and resolution of problems related to refueling outage activities.

b. Findings

No findings of significance were identified.

.2 Unit 2 Automatic Reactor Scram

a. Inspection Scope

The inspectors evaluated the activities associated with the forced outage that occurred as a result of the Unit 2 scram due to a reduction in feedwater flow inadvertently initiated by the RRCS. From April 24 through April 30, 2007, the inspectors monitored the activities listed below:

- Limerick's forced outage plan, including appropriate consideration of risk, industry experience, and previous site-specific problems;
- Plant Operations Review Committee and Outage Control Center meetings;
- RRCS, HPCI, and RCIC troubleshooting and repair activities; and
- Portions of the reactor startup and ascension to full power operation.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing (71111.22 - 5 samples)

a. Inspection Scope

The inspectors witnessed the performance and/or reviewed test data for the following five surveillance tests that are associated with selected risk-significant SSCs. The review 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 had been met. The inspectors performed the following samples:

- ST-6-055-200-1, HPCI Valve Test (Unit 1);
- ST-6-048-230-2, Standby Liquid Control (SLC) Pump Valve and Flow Test;
- ST-6-092-315-2, D21 Diesel Generator Fast Start Operability Test Run;
- ST-6-092-324-2, D24 Loss of Coolant Accident Load Reject Test; and
- ST-6-055-200-2, HPCI Valve Test (Unit 2).

b. Findings

No findings of significance were identified.

1R23 Temporary Plant Modifications (71111.23 - 1 sample)a. Inspection Scope

The inspectors reviewed and compared the temporary modification listed below with the UFSAR and TS's to verify that the modification did not affect operability or availability of the affected system. The inspectors ensured that station personnel implemented the modification in accordance with the applicable temporary configuration change process. The inspectors also reviewed the impact on existing procedures to verify appropriate revisions were made to reflect the temporary configuration change. Additionally, the inspectors evaluated the adequacy of proposed testing upon removal of the change. The inspectors performed the following samples:

- ECR 07-00096, Revision 0, 2B Drywell Chiller Temporary Configuration Change.

b. Findings

No findings of significance were identified.

Cornerstone: Emergency Preparedness1EP2 Alert and Notification System (ANS) Evaluationa. Inspection Scope (71114.02 - 1 sample)

Inspectors conducted an onsite review to assess the maintenance and testing of Exelon's ANS. During this inspection, the inspectors interviewed site emergency preparedness (EP) staff responsible for implementation of the ANS testing and maintenance. Inspectors also reviewed issue reports (IRs) pertaining to the ANS for causes, trends, and corrective actions. The inspectors reviewed Exelon's original ANS design report to ensure compliance with those commitments for system maintenance and testing. The inspectors conducted this inspection in accordance with NRC Inspection Procedure 71114, Attachment 2, and used planning standard 10 CFR 50.47(b)(5) and the related requirements of 10 CFR 50, Appendix E as reference criteria.

b. Findings

No findings of significance were identified.

1EP3 Emergency Response Organization (ERO) Staffing and Augmentation Systema. Inspection Scope (71114.03 - 1 sample)

The inspectors conducted a review of Limerick's ERO augmentation staffing requirements and the process for notifying the ERO. Inspectors performed this to ensure the readiness of key staff for responding to an event and to ensure timely facility activation. The inspectors reviewed procedures, IRs, and call-in drills associated with the ERO notification system and drills. The inspectors interviewed personnel responsible for testing the ERO augmentation process. The inspectors compared qualification requirements to the training records for a sample of ERO members. The inspectors also verified that the EP department staff were receiving required training as specified in the emergency plan. Inspectors conducted the

inspection in accordance with NRC Inspection Procedure 71114, Attachment 3, and used planning standard 10 CFR 50.47(b)(2) and related requirements of 10 CFR 50, Appendix E as reference criteria.

b. Findings

No findings of significance were identified.

1EP4 Emergency Action Level (EAL) and Emergency Plan Changes

a. Inspection Scope (71114.04 - 1 sample)

Since the last NRC inspection of this program area, Emergency Plan, Revision 26, was implemented based on Exelon's determination, in accordance with 10 CFR 50.54(q), that the changes resulted in no decrease in effectiveness of the Plan, and that the revised Plan continued to meet the requirements of 10 CFR 50.47(b) and Appendix E to 10 CFR 50. The inspectors conducted a sampling review of the Emergency Plan changes, and changes to the lower-tier emergency plan implementing procedures, to evaluate the changes for potential decreases in effectiveness of the Emergency Plan. However, this review was not documented in a Safety Evaluation Report and does not constitute formal NRC approval of the changes. Therefore, these changes remain subject to future NRC inspection in their entirety.

b. Findings

No findings of significance were identified.

1EP5 Correction of Emergency Preparedness Weaknesses

a. Inspection Scope (71114.05 - 1 sample)

The inspectors reviewed self-assessments and audit reports to assess Exelon's ability to evaluate their performance and programs. The inspectors reviewed IRs initiated from June 2006 to May 2007 at Limerick from drills, self-assessments, and audits for 2006 and 2007 required by 50.54(t). Inspectors conducted this inspection according to NRC Inspection Procedure 71114, Attachment 5 and used planning standard 10 CFR 50.47(b)(14) and the related requirements of 10 CFR 50, Appendix E as reference criteria.

b. Findings

No findings of significance were identified.

1EP6 Drill Evaluation (71114.06 - 1 sample)

a. Inspection Scope

The inspectors observed a licensed operator requalification simulator exercise evaluation to identify the timing and adequacy of classification, notification, and protective action recommendation (PAR) development activities. During the simulator evaluation, the inspectors reviewed checklists and forms used for classification and notification activities, and compared them to the criteria in Exelon's Emergency Plan, EP-MA-114-100-F-01, "State/Local Event Notification Form," and supporting procedures.

- Simulator Exercise Evaluation: General Emergency classification due to a simulated steam leak in the outboard main steam isolation valve room and corresponding drywell high radiation monitor indication. The event also included an Alert declaration due to a simulated helicopter crash into the spray pond "A" spray network on May 22, 2007.

b. Findings

No findings of significance were identified.

2. **RADIATION SAFETY**

Cornerstone: Occupational Radiation Safety

2OS3 Radiation Monitoring Instrumentation and Protective Equipment (71121.03)

a. Inspection Scope (9 samples)

During the period of May 7 - 11, 2007, the inspector conducted the following activities to evaluate the operability and accuracy of radiation monitoring instrumentation, and the adequacy of the respiratory protection program for issuing self-contained breathing apparatus (SCBA) to emergency response personnel. The inspector reviewed implementation of these programs against the criteria contained in 10 CFR 20, applicable industry standards, and Exelon procedures.

- The inspector reviewed the relevant procedures and observed a technician performing calibrations on the following portable survey instruments: RO-2A (No. 330263), E-140N (No. 332395), and E-520 (No. 331905). The inspector also observed daily source checks performed on the three SAM-9 monitors, five PCM-1C monitors, and the PM-7 monitor, located at the main control point.
- The inspector reviewed the calibration records for selected survey instruments and contamination monitors, currently in use, including small article contamination monitors (SAM-9), personnel contamination monitors (PM-7 and PCM-1C), hand-held survey instruments (Delta-5, E-140N, RO-2, RO-2A, Telepole, E-520), and label air samplers (Gillian HFS 513A).
- The inspector reviewed Exelon's actions when portable survey instruments were found to be outside the "as-found" calibration acceptance criteria during re-calibration checks. As part of this evaluation, the inspector reviewed ten Out-Of-Tolerance reports for selected instrumentation.
- The inspector reviewed the operating procedure and current source activities/dose rate characterizations for the Shepherd Model 89 calibrator.
- The inspector reviewed the current 10 CFR 61 sampling results for Units 1 and 2 and the resulting determination of the plant's average beta and average gamma energies to determine if the calibration sources used are representative of the plant source term.
- The inspector reviewed the current calibration records for the Fast-Scan and Accu-Scan whole body counting systems.

- The inspector reviewed the calibration data and maintenance histories for area radiation monitors (ARM), not covered by the Maintenance Rule, including ARMs located in the Units 1 and 2 drywells and the traversing incore probe (TIP) areas. The inspector discussed the operational status of these instruments with the System Manager and the Instrumentation and Control Supervisor.
- The inspector evaluated the adequacy of the respiratory protection program regarding the maintenance and issuance of SCBAs to emergency response personnel. The inspector reviewed training and qualification records for at least three licensed operators from each of the operating shifts, and for selected radiation protection personnel who would wear SCBAs in the event of an emergency. The inspector observed a technician perform functional inspections on three SCBAs staged in the Main Control Room and two SCBAs staged on the Unit 2 turbine deck. The inspector also reviewed maintenance, hydrostatic test records, and flow test records for other selected SCBAs staged in other plant areas. The inspector evaluated the method of refilling SCBA cylinders and reviewed the compressor air sample results to confirm that the air quality met CGA G-7.1, Grade E (2004) standards.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator (PI) Verification (71151- 3 samples)

a. Inspection Scope

Cornerstone: Emergency Preparedness

The inspectors reviewed data for the EP PIs which are: (1) Drill and Exercise Performance (DEP); (2) ERO Drill Participation; and (3) Alert and Notification System (ANS) Reliability. The inspectors reviewed supporting documentation from drills and tests from April 2006 to March 2007 to verify the accuracy of the reported data. Inspectors conducted the review of these PIs in accordance with NRC Inspection Procedure 71151. Inspector used 10 CFR 50.9 and NEI 99-02, Revision 4, "Regulatory Assessment Performance Indicator Guidelines" as the acceptance criteria for this review.

b. Findings

No findings of significance were identified.

4OA2 Identification and Resolution of Problems (71152 - 1 semi-annual trend sample and 1 annual sample)

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

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 performed a screening of all items entered into Limerick's CAP. The

inspectors accomplished this by reviewing the description of each new issue report and accessing Exelon's computerized database.

.2 Semi-Annual Review to Identify Trends

a. Inspection Scope

As required by inspection procedure 71152, "Identification and Resolution of Problems," the inspectors performed a review of Exelon's CAP and associated documents to identify trends that could indicate the existence of a more significant safety issue. The inspectors' review was focused on corrective maintenance issues identified within the CAP. The review also included a sample of March 2007 system health overview reports along with issues identified in the Limerick station focus area report. Additionally, the inspectors reviewed a sample of troubleshooting, rework, and testing control forms to ensure an adverse trend of equipment performance did not exist outside of the CAP.

b. Assessment and Observations

No findings of significance were identified. The inspectors observed that issues selected for review were appropriately categorized and prioritized in accordance with Exelon's corrective action process.

.3 Radiation Monitoring Instrumentation and Protective Equipment (71121.03)

a. Inspection Scope

The inspector reviewed issue reports, Radiation Protection Department self-assessments, Nuclear Oversight Department (NOS) Audits, and NOS Objective Evidence reports to evaluate Exelon's threshold for identifying, evaluating, and resolving problems in implementing the radiation monitoring and respiratory protection programs. This review was conducted against the criteria contained in 10 CFR 20, Technical Specifications, and the Licensee's procedures.

b. Findings

No findings of significance were identified.

.4 Annual Sample: Operator Workaround Review

a. Inspection Scope

The inspectors reviewed Exelon's operator workaround program to verify that station personnel are identifying operator workaround problems at an appropriate threshold, have entered them into the CAP, and have proposed or implemented appropriate corrective actions. The inspectors reviewed archived operator logs, control room boards, main control room deficiencies, unplanned lit annunciators, and a sample of issue reports to determine the impact on the operators' ability to implement abnormal and emergency operating procedures.

b. Findings and Observations

No findings of significance were identified. The inspectors determined that the issues reviewed did not adversely affect the capability of the operators to implement abnormal or emergency operating procedures and had been appropriately classified and prioritized.

4OA3 Event Followup (71153)

.1 Unit 2 Automatic Scram due to an Inadvertent Reduction in Feedwater Flow

a. Inspection Scope

The inspectors responded to an automatic reactor scram that occurred on April 24, 2007. The inspectors discussed the scram with operations personnel, engineering, and Limerick management to gain an understanding of the event and assess follow-up actions. The inspectors reviewed operator actions taken in accordance with Exelon procedures and reviewed unit and system indications to verify that actions and system responses were as expected. The inspectors also reviewed troubleshooting documentation, the associated prompt investigation, and the root cause determination to assess the detail of review and adequacy of root cause and proposed corrective actions prior to unit restart.

All equipment operated as expected in response to the transient with the exception of the HPCI and RCIC systems. Operators observed full range flow oscillations on both the HPCI and RCIC systems during vessel injection. Additionally, the injection source for these systems unexpectedly swapped from the condensate storage tank to the suppression pool. The operators immediately placed both systems in manual control and the oscillations ceased. Operators then restored reactor water level to normal.

Exelon's investigation of the event revealed that the most likely cause of the scram was an intermittent failure of a circuit card in the 1B channel of the RRCS circuitry. The combination of this failure and the simultaneous performance of a routine surveillance test on the 1A channel resulted in a feedwater flow runback and subsequent reactor scram on low water level. Exelon has replaced the suspect circuit card and revised the associated surveillance test procedure to prevent further inadvertent actuations of the RRCS.

b. Findings

The finding associated with this event was dispositioned in Section 1R19.

.2 (Closed) LER 05000353/2-06-001, HPCI Speed Control Failure

On October 15, 2006, the Unit 2 HPCI System turbine control valve failed to open during the weekly HPCI turbine hydraulic operability check performed under routine test, RT-6-055-340-2. The test directed the operator to start the HPCI auxiliary oil pump and verify that the HPCI turbine control valve opens. Exelon's investigation determined that the ramp generator signal converter (RGSC), which is part of the HPCI turbine control system, had failed resulting in the failure of the control valve to open. Station personnel installed a replacement RGSC, calibrated the control system, and ran the HPCI system satisfactorily on October 17, 2006.

Exelon's apparent cause investigation reviewed the prior maintenance history with the component and also performed an extent of condition review since the RGSC is also utilized in the Reactor Core Cooling System controls. Exelon also reviewed the impact the failure had on

the maintenance rule and system health indicator programs. The inspectors identified no findings in their review of the issue. Exelon documented this issue and its corrective actions in IR 544200. This LER is closed.

4OA5 Other

World Association of Nuclear Operations (WANO) Peer Assessment Report Review

a. Inspection Scope

The inspectors reviewed the final report for the WANO plant assessment of Limerick Generating Station conducted in January 2007. The inspectors reviewed the report to ensure that issues identified were consistent with the NRC perspectives of Limerick performance and to verify that the WANO team did not identify any significant safety issues requiring further NRC follow-up.

b. Findings

No findings of significance were identified.

4OA6 Meetings, Including Exit

Exit Meeting Summary

On July 18, 2007, the resident inspectors presented the inspection results to Mr. C. Mudrick and other members of his staff. The inspectors confirmed that proprietary information was not included in the inspection report.

2006 Annual Assessment Meeting

On April 18, 2007, Mr. P. Krohn, the resident inspectors, and other members of the NRC staff conducted a meeting with Mr. C. Mudrick and other members of Limerick Generating Station management to discuss the results of the NRC assessment of Exelon's performance at Limerick Generating Station from January 1 to December 31, 2006. The handouts from the meeting are available electronically from the NRCs document system (ADAMS) under accession number ML071090388. Following the meeting, the NRC staff held a session to accept public comment and respond to public questions.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION**KEY POINTS OF CONTACT**Exelon Generation Company

C. Mudrick, Site Vice President
 E. Callan, Plant Manager
 D. DiCello, Radiation Protection Manager
 R. Dickinson, Director Engineering
 N. Bartle, System Manager, Safeguard Motor Control Centers
 J. Berg, System Manager, HPCI and RCIC
 J. Duskin, Instrumentation Physicist
 M. Evans, System Manager, Reactor Recirculation
 J. George, System Manager, Remote Shutdown Panel
 M. Gift, System Manager, Radiation Monitoring Systems
 R. Gosby, Radiation Protection Technician, Instrumentation
 R. Harding, Engineer, Regulatory Assurance
 R. Kreider, Manager, Regulatory Assurance
 T. Leddy, Radiation Protection Technician, Respiratory Protection
 M. Lyate, Manager, Support Health Physics
 L. Parlato, Respiratory Protection Physicist
 S. Sweisford, Radiation Protection Technician, Instrumentation
 D. Malinowski, Simulator Instructor
 B. Tracy, System Manager
 P. Tarpinian, PRA Engineer
 D. Boylan, Summer Readiness Coordinator
 R. Newmaster, Manager - Emergency Preparedness, Limerick

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSEDOpened

05000353/2007-001-0	LER	Scram Discharge Volume Vent and Drain Valves Opened due to Fuse Removal
05000353/2007-002-0	LER	Automatic Actuation of Main Condenser Low Vacuum Isolation Logic During Refueling Outage

Opened and Closed

05000353/2007003-01	NCV	Inadequate HPCI/RCIC Flow Controller Tuning Procedure Acceptance Criteria (Section 1R19)
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Closed

05000353/2006-001-0	LER	HPCI Ramp Generator Signal Converter Failure (Section 4OA3.2)
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Discussed

None

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

Procedures

WC-AA-107, "Seasonal Readiness," Revision 4
GP-7.1, "Summer Weather Preparation and Operation," Revision 17
S10.7.C, "Service Water Flow Adjustments," Revision 20

Work Orders

R0667302 (GP-7.1, completed 05-31-07)

Miscellaneous

Letter from C. Mudrick to R. DeGregorio, "2007 Site Summer Readiness," dated May 12, 2007
AR A1465043 Evaluation-01
AR A1404559 Evaluation-01
IR 644718*
IR 644644*

Section 1R04: Equipment Alignment

Procedures

S92.9.N, "Routine Inspection of the Diesel Generators," Revision 52
1S11.1A (COL-2), "Equipment Alignment of Emergency Service Water Loop 'B' System",
Revision 43
S51.1A, "Set Up of RHR System for Automatic Operation in LPCI Mode", Revision 37
0S12.1.A (COL-2), "Alignment for Normal Operation of the Residual Heat Removal Service
Water System for - Loop B", Revision 17

Drawings

Dwg M-12, Sh.1, "Residual Heat Removal Service Water", Revision 63
Dwg M-51, Sh.3, "Residual Heat Removal", Revision 64
Dwg M-51, Sh.4, "Residual Heat Removal", Revision 65

Miscellaneous

Work schedules for 06/04/2007 - 06/09/2007
Operator Logs dated 06/04/2007 - 06/05/2007

Section 1R05: Fire Protection

Procedures

F-A-432, "Unit 1 D14 Emerg 4KV Switchgear Room 432 (EL. 239) Fire Area 14," Revision 7
F-A-449, "Unit 1 Cable Spreading Room (EL. 254) Fire Area 22," Revision 10
F-A-450, "Unit 2 Cable Spreading Room (EL. 254) Fire Area 23," Revision 6
F-R-279, "Unit 2 Safeguard System Access Area Rooms 279 and 287 (EL. 201) Fire Area 65,"
Revision 4
F-R-304, "Unit 1 Safeguard System Access Area Room 304 (EL. 217) Fire Area 44," Revision 8
F-R-500, "Unit 1 Standby Liquid Control and General Equipment Areas, RWCU Compartments,
FPCW Area, and Main Steam Tunnel, Rooms 500 Through 511, 519, and 523 (EL. 283, 295)

Fire Area 47," Revision 11
RT-6-022-900-1, "Unit 1 Reactor Enclosure Portable Fire Extinguishers Monthly Inspection,"
Revision 4, completed 06/09/2007

Issue Reports and Action Requests
IR 308003, "10-C979 Panel in Alarm"

Section 1R06: Flood Protection Measures

Procedures
SE-4, "Flood," Revision 5

Issue Reports and Action Requests
IR 061223, "Water in D11/D12 Diesel Oil Storage Tank"

Miscellaneous
LM-0615, "Assessment of Safety Related Equipment for Potential Flooding due to the Revised PMP
in Response to NRC RAI on LGS IPEEE," Revision 0
UFSAR, Section 3.4, "Water Level (Flood) Design"

Section 1R07: Heat Sink Performance

Procedures
RT-2-011-251-0, "ESW Loop 'A' Flow Balance", Revision 14, 02/22/07
RT-2-011-251-0, "ESW Loop 'A' Flow Balance", Revision 11, 01/07/06
RT-2-011-253-0, "ESW Loop 'A' D/P and Flow Data Collection", Revision 16

Issue Reports and Action Requests
IR 605536
AR A1446410-E67
AR A1467419

Drawings
Dwg —11, Sh.1, "Emergency Service Water", Revision 68
Dwg —11, Sh.4, "Emergency Service Water", Revision 50

Section 1R11: Licensed Operator Requalification Program

Procedures
EOP T-117, "Level/Power Control," Revision 15
EOP T-104, "Radioactivity Release Control," Revision 12
EOP T-103, "Secondary Containment Control," Revision 17
EOP T-270, "Terminate and Prevent injection into RPV," Revision 12

Miscellaneous
LSES-8020, "Licensed Operator Training Simulator Evaluation Scenario," Revision 0

Section 1R12: Maintenance Effectiveness

Procedures

ST-2-088-413-1, "Remote Shutdown System - RHR Heat Exchanger Bypass Valve (HV-C-051-1F048A) Position Indication Calibration," Revision 7, completed 10/07/2005
ST-2-088-413-1, "Remote Shutdown System - RHR Heat Exchanger Bypass Valve (HV-C-051-1F048A) Position Indication Calibration," Revision 7, completed 10/15/2005

Issue Reports and Action Requests

IR 359693, "Apparent Cause Evaluation for Increased Frequency of ESW Valve Silting"
IR 468189, "Closure of C, A, N SRVs at RSP Results in Blown Red Bulb"
IR 502769, "'1A' RHR HTX Bypass Valve Indication ZI-051-148A-1 Failed"
IR 521326, "201 SFGD Control Switch at Remote S/D Panel Has High Resistance"
IR 564927, "PI-42-170-2 Erratic Indication During ST-2-088-400-1"
IR 582306, "Remote Shutdown Panel Incorrect FF Determination"
IR 589154, "Unsat Condition (152-11605 Contact 3-4) Per ST-2-088-326-1"
IR 624429, "HV-011-011A Did Not Stroke Fully Closed"
IR 626191, "(a)(1) Determination of AOV Failures"

Miscellaneous

8031-M-11 Sh. 1, "Emergency Service Water P&ID," Revision 68
8031-M-11 Sh. 2, "Emergency Service Water P&ID," Revision 77
System Health Report for Air Operated Valves, 1st Quarter 2007
Maintenance Rule Performance Criteria Report for ESW System-011, dated 06/21/2007
Maintenance Rule Scope and Performance Monitoring Criteria for ESW System-011, dated June 25, 2007
Maintenance Rule Scope and Performance Monitoring Report for the Remote Shutdown Panel, System 88.
Maintenance Rule Database Failure Report for the Remote Shutdown Panel, System 88
Maintenance Rule Expert Panel Meeting Minutes, Meeting 0702, dated 02/27/2007

Section 1R13: Maintenance Risk Assessments and Emergent Work Control

Procedures

M-043-002, "Reactor Recirculation Pump Mechanical Seal Replacement Without Motor Removal," Revision 14
M-055-001, "Preventative Maintenance Procedure for HPCI Turbine Exhaust Stop-Check Valve, 55-F021, Internal Examination," Revision 3
M-095-002, "Limerick Generating Station 250 VDC Westinghouse MCU Maintenance," Revision 3
M-095-003, "Limerick Generating Station 250 VDC Motor Control Center Cleaning and Examination," Revision 1
M-400-019, "Anchor/Darling Bolted Bonnet Swing Check Valve with Hinge Pin Supported by Valve Body Maintenance," Revisions 4 and 5
RT-2-043-001-2, "Recirculation Pump Seal Cavity Pressure Sensing Line Venting," Revision 3
S43.3.A, "Filling and Venting Recirculation Pump Loop and Seal," Revision 30
S55.1.A, "Normal HPCI Line-Up for Automatic Operation," Revision 30
S55.1.D, "HPCI System Full Flow Functional Test," Revision 33

Issue Reports and Action Requests

IR 479779, "1A Recirc Pump Seal Unexpected Pressure Response"
IR 489517, "1A Recirc Pump Seal Investigation"
IR 613865, "Unidentified Drywell Leakage Post 2R09"

IR 614600, "Unit Cooler Drain Flow Increased More Than Leakage Value"
IR 614663, "During D/W Inspection Water Was Found on Subpile Room Floor"
IR 614675, "Water Found in Subpile Room"
IR 614891, "Recirc Pump Mechanical Seals Replaced Without ASME R+R Plans"
IR 636406, "FME, Piece of Cotter Pin Missing"
IR 642617, "HV-055-2F006 Failed to Stroke Open"
AR A0383745, "Perform M-095-003 Clean and Examine Bus and Starters"
AR A1229089, "Received Div 2 Batt Ground When Stroking HV-055-2F006"
AR A1423488, "(2A-P201) Seal Chamber Replacement"
AR A1616713, "Inspect HPCI Turbine Exhaust Stop/Check Valve"
AR A1616928, "Inspect RCIC Pump Discharge Check Valve"
AR A1620585, "HV-055-2F006 Failed to Stroke Open"

Miscellaneous

8031-M-43, Sh. 3, "Reactor Recirculation Pump (Unit 2)," Revision 15
8031-M-43, Sh. 4, "Reactor Recirculation Pump (Unit 2)," Revision 9
8031-M-49, Sh. 2, "Reactor Core Isolation Cooling (Unit 2)," Revision 47
8031-M-50, Sh. 2, "RCIC Pump/Turbine (Unit 2)," Revision 10
8031-M-55, Sh. 2, "High Pressure Coolant Injection (Unit 2)," Revision 49
8031-M-56, Sh. 2, "HPCI Pump/Turbine (Unit 2)," Revision 11
C0221609, "Replace Open Contactor for 2DB-2-01"
M-1-E41-1040-E-017, Sh. 1, "Elementary Diagram HPCI System," Revision 21
M-1-E41-1040-E-017, Sh. 1A, "Elementary Diagram HPCI System," Revision 0
Operator Logs dated 06/01/2007 - 06/04/2007
Paragon Risk Assessment Schedule View Report for June 2-3 and June 9-10, 2007
R0700337, "Clean/Exam Bus and Starters, Test/Cal Breakers"
R0720425, "M-095-003, Clean, Examine Bus and Cal"
R0935695, "Mechanical Seal Chamber Replacement"
R1062716, "Recirc PP Seal Cavity Pressure Sensing Line Vent"

Section 1R15: Operability

Issue Reports and Action Requests

IR 597518, "HV-055-2F042 DC MOV Motor Nameplate Discrepancy"
IR 615703, "10 CFR 21 Identified by Fairbanks-Morse on CAM Roller Bushing"
IR 635260, "D22 DC Fuel Oil Pump Running with D22 Fully Loaded"
AR A1511305, "Adjust D22 PSV-020-225B-2 to Increase Pressure"
AR A1620792, "Trip/Reset Knob for HPCI Turbine Stop Sticks When Released"

Procedures

OP-AA-108-115, "Operability Determinations," Revision 1
ST-6-092-112-2, "D22 Diesel Generator 24 Hour Endurance Test," Revision 23, completed
05/31/2007

Work Orders

C0213521, "Replace Regulating Valve PSV-020-225B-2"

Miscellaneous

NRC Part 9900 Technical Guidance, "Operability Determinations and Functionality Assessments for
Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety," dated
09/26/2005
Operator Logs dated 06/21/2007

Section 1R19: Post Maintenance Testing

Procedures

GP-18, "Scram/ATWS Event Review," Revision 11, 10/19/1994
IC-11-00361, "Calibration of RCIC Turbine Governor Control System for the Limerick Generating Station," Revision 6
IC-11-00712, "Tuning of Inner and Outer Loop HPCI/RCIC Controls," Revision 1
IC-11-00712, "Tuning of Inner and Outer Loop HPCI/RCIC Controls," Revision 5
IC-11-00712, "Tuning of Inner and Outer Loop HPCI/RCIC Controls," Revision 6
IC-11-00743, "Operation of the Traversing In-core Probe (TIP) System," Revision 2
IC-11-00744, "Manual Withdrawal of the Traversing In-core Probe (TIP) Detector," Revision 0
OP-AA-108-115, "Operability Determinations," Revision 1
RT-2-074-300-2, "TIP Machine Functional," Revision 2
S55.1.D, "HPCI System Full Flow Functional Test," Revision 33
S74.0.A, "Operation of the Traversing In-Core Probe System," Revision 52
ST-2-042-643-2, "ATWS-Reactor Vessel Pressure - High; Division 1B, Functional Test", Revision 13, completed 04/26/07
ST-2-042-641-2, "ATWS-Reactor Vessel Pressure - High; Division 1A, Functional Test", Revision 12, completed 04/26/07
ST-2-051-108-2, "Div IV RHR (LPCI) LSF/SAA-Non-Outage," Revision 6
ST-6-049-230-2, "RCIC Pump, Valve, and Flow Test," Revision 57, completed 04/28/2007
ST-6-049-320-2, "RCIC Operability Verification," Revision 19, completed 04/26/2007
ST-6-052-232-2, "B Loop Core Spray Pump, Valve and Flow Test," Revision 43
ST-6-055-230-2, "HPCI Pump, Valve, Valve, and Flow Test," Revision 55, completed 04/27/2007
ST-6-055-321-2, "HPCI Operability Verification," Revision 16, completed 04/26/2007

Issue Reports and Action Requests

AR A1435204, "Unit 1 RCIC Flow Controller Settings Verification"
AR A1435206, "Unit 2 RCIC Flow Controller Setting Verification"
AR A1612924, "2B TIP Stuck in Containment Past Indexer Machine"
AR A1613385
IRs 621278, 621280, 621307, 621321
IR 167771, "U2 Scram: RCIC Pump Flow Oscillations in Auto Control (Peach Bottom)"
IR 176803, "As Left Controller Settings Can Not be Obtained"
IR 618968, "2B Tip Stuck in Containment Past Indexer Machine"
IR 620428, "Need Part Approved for Use"
IR 620861, "GP-18 Review HPCI/RCIC Oscillations"
IR 620928, "2B TIP Machine Did Not Record Data"
IR 621171, "GP-18 Review HPCI/RCIC Oscillations - RCIC AR"
IR 621249, "Verify U2 HPCI/RCIC Flow Controller and EGR Needle Valve Set"
IR 622371, "HPCI EGM Overspeed Test Switch Should Be Replaced"
IR 630267, "Inspect HPCI Turbine Exhaust Stop/Check Valve"
IR 640817, "Unit 2 RCIC Flow Controller Gain Setting"

Miscellaneous

C0221014, "2B-S215 Replace Motor"
C0221041, "Replace Circuit Cards"
C0221047, "Perform Tuning During HPCI Run"
GE SIL 336, "Surveillance Testing Recommendations for HPCI and RCIC," Revision 1
GE SIL 351, "HPCI and RCIC Turbine Control System Calibration," Revision 2
Operator Logs dated 04/18/2007 - 04/19/2007

Operator Logs dated 04/24/2007 - 04/27/2007
2B TIP Machine Update, dated 04/18/2007
PORC Meeting Minutes 07-012, 04/25/2007
R0775872, "(20-S212) RCIC Turbine Controls"
R0825743, "(FIC-049-1R600) Perform Routine Calibration"
R0834994, "(FIC-049-1R600) Perform Routine Calibration"
R0874237, "Calibrate EGM/EGR and Speed Indication"
R1009850, "SC X-M1-10150 Perform Calibration"
Unit 2 RCIC Tuning Data, dated 09/07/2006 and 04/26/2007
Unit 2 HPCI Tuning Data, dated 03/31/2007 and 04/26/2007

Section 1R20: Refueling Outage Activities

Procedures

ARC-MCR-211 A2, "2A Recirc Pump Seal Leakage Hi Flow, "Revision 0
ARC-MCR-212 C5, "Drywell Equipment Drain Tank / Floor Drain Sump Leakage Hi Flow," Revision 1
ARC-MCR-215 B5, "Drywell Cooler Drain Flow High," Revision 1
GP-2, Appendix 1, "Reactor Start-up and Heat-up," Revision 36
GP-3, "Normal Plant Shutdown," Revision 119
GP-3, Appendix 1, "Establishing Cold Shutdown," Revision 29
GP-18, "Scram/ATWS Event Review," Revision 51, completed for 2F38
OT-101, "High Drywell Pressure - Bases," Revision 29
ST-2-042-641-2, "ATWS - Reactor Vessel Pressure - High; Division 1A Functional Test," Revision 12
ST-2-049-401-2, "RCIC - Condensate Storage Tank Level - Low; Calibration/Functional Test,"
Revision 4, completed 10/11/2005
ST-2-049-402-2, "RCIC - Condensate Storage Tank Level - Low, Calibration/Functional Test,"
Revision 6, completed 07/15/2005
ST-2-055-401-2, "ECCS - Condensate Storage Tank Level - Low, Div 2 (HPCI) Calibration/Functional
Test," Revision 5, completed 12/15/2006
ST-2-055-402-2, "ECCS - Condensate Storage Tank Level-Low, Div 2 (HPCI) Calibration/Functional
Test," Revision 5, completed 12/15/2006
ST-2-055-403-2, "ECCS - Suppression Pool Water Level-High: Division 2 (HPCI)
Calibration/Functional Test," Revision 12, completed 04/20/2006
ST-2-055-402-2, "ECCS - Suppression Pool Water Level - High: Division 2 (HPCI)
Calibration/Functional Test," Revision 17, completed 03/21/2007
ST-2-055-404-2, "ECCS - Suppression Pool Water Level - High: Division 2 (HPCI)
Calibration/Functional Test," Revision 15, completed 04/21/2006
ST-4-049-952-2, "RCIC Vacuum Breaker Test," Revision 7

Issue Reports and Action Requests

AR A1608964, "U2 Exh Line Vacuum Bkr High Temp"
IR 608010, "U2 RCIC Exh Line Vacuum Bkr High Temp"
IR 621304, "PI-049-2R001 Needle is Off-Scale High"
IR 621307, "Work Order C0221041 Planned Wrong Card Replacement"
IR 621572, "RCIC Suction High Pressure When Swapping from the Suppression Pool to CST"
IR 621638, "Independent Review of LGS U2 Scram on Rx Low Water Level"
IR 622127, "RCIC Vacuum Breaker Line Hi Temp Alarm While Performing S49"

Miscellaneous

Operator Logs, dated 04/05/2007 - 04/11/2007
RRCS Complex Troubleshooting Data Sheets
R0805351, "PM RCIC EGM/RGSC Replacement"

R1032968, "SC X-M1-20150 Perform Routine Calibration"

Section 1R22: Surveillance Testing

Procedures

ST-6-055-200-2, "HPCI Valve Test," Revision 47, completed 06/21/2007
ST-6-055-200-2, "HPCI Valve Test," Revision 47, completed 03/29/2007
ST-6-092-366-0, "Inoperable Unit 2 Safeguard Power Supply Actions for Both Units,"
Revision 28

Issue Reports and Action Requests

IRs 590216, 590218
IR 642618, "Valve Stroke Time Outside of Acceptable Range"

Miscellaneous

UFSAR Sections 7.4.1.2, 9.3.5

Section 1R23: Temporary Plant Modifications

Procedures

S87.7.A, "Abnormal Drywell Chilled Water System Operation," Revision 31
S87.9.A, "Routine Inspection of The Drywell Chilled Water System," Revision 31
CC-AA-102, "Design Input and Configuration Change Impact Screening," Revision 13
CC-AA-112, "Temporary Configuration Changes," Revision 11

Section 1EP2: Alert and Notification System (ANS) Evaluation

Limerick Generating Station Upgraded Public Alert and Notification System (ANS) Report,
April 2005
EP-MA-121-1002, "Exelon East Alert and Notification System (ANS) Program," Revision 4
EP-MA-121-1004, "Exelon East ANS Corrective Maintenance," Revision 4
EP-MA-121-1005, "Exelon East ANS Preventive Maintenance Program," Revision 3
EP-MA-121-1006, "Exelon East NAS Siren Monitoring, Troubleshooting, and Testing,"
Revision 5
Corrective Maintenance Field Work Instructions for ANS Control Points, Repeaters and Sirens,
Approved December 2004
Preventative Maintenance Field Work Instructions for ANS Control Points, Repeaters and Sirens

Issue Reports

578599	398722	581739
505191	512657	511072
533816	509535	533816
472844	457624	

Section 1EP3: Emergency Response Organization (ERO) Staffing and Augmentation System

EP-AA-1008, "Radiological Emergency Plan Annex for Limerick Generating Station,"
Revision 11
TQ-AA-113, "ERO Training and Qualification," Revision 8
PIMS Individual Qualification Report, 06/25/2007
PIMS Personnel Job Status Report, 06/25/2007
Offsite Training Attendance Rosters for 2005, 2006, 2007 (January - May)

Limerick Emergency Response Organization Weekly On-Call Schedule, 06/25/2007

Section 1EP4: Emergency Action Level (EAL) and Emergency Plan Changes

- EP-AA-120-1001, "10 CFR 50.54(q) Change Evaluation," Revision 4
 06-12 "ERO Training and Qualification," TQ-AA-113, Revision 7
 06-16 "Radiological Emergency Plan," EP-AA-1000, Revision 17
 06-33 "EP Plan Administration," EP-AA-120, Revision 7
 06-96 "Emergency Preparedness Advisory Committee," EP-AA-120-1004, Revision 0
 06-97 "Quarterly Satellite Phone Test," EP-MA-124-1004, Revision 0
 06-99 "EP Fundamentals," EP-AA-1101, Revision 3
 06-101 "Exelon East ANS Program," EP-MA-121-1002, Revision 4
 06-102 "Exelon East ANS Corrective Maintenance Program," EP-MA-121-1004, Revision 4
 06-103 "Exelon East ANS Preventative Maintenance Program," EP-MA-121-1005, Revision 3
 06-107 "LGS Annex," EP-AA-1008, Revision 10
 06-108 "ERO Fundamentals," EP-AA-1102, Revision 2
 06-110 "Mid-Atlantic ERO Notification or Augmentation," EP-AA-112-100-F-07
 07-09 Various LGS Procedures
 07-11 "Exelon East ANS Siren Monitoring, Troubleshooting, and Testing," EP-MA-121-1006, Revision 4
 07-13 "Emergency Plan Annex for LGS," EP-AA-1008, Revision 11
 07-39 "Exelon East ANS Siren Monitoring, Troubleshooting, and Testing," EP-MA-121-1006, Revision 5

Section 1EP5: Correction of Emergency Preparedness Weaknesses

- EP-AA-125, "Emergency Preparedness Self Evaluation Process," Revision 4
 LS-AA-126, "Self-Assessment Program," Revision 5
 LS-AA-126-1001, "Focused Area Self-Assessments," Revision 4
 Drill Critique Reports – 2006 & 2007
 50.54(t) Audits done by the Nuclear Oversight Committee (2006 & 2007)

Issue Reports:

371345	627167	425042
500550	375785	433046
508559	382672	464627
562701	499616	
562703	390389	

Section 1EP6: Drill Evaluation**Procedures**

- Limerick Generating Station Annex - Table 3-1 Emergency Action Level (EAL) Matrix
 Limerick Generating Station Annex - Table 3-2 Emergency Action Level (EAL) Technical Basis;
 Recognition Category Hazards and Other Conditions
 EP-AA-112-100-F-01, "Shift Emergency Director Checklist," Revision F
 IR 632496 "Missed DEP Opportunity"

Section 2OS3 Radiation Monitoring Instrumentation and Protective Equipment**Procedures**

- RP-AA-203-1002, "Response to Electronic Dosimeter Reset Alarms," Revision 0
 RP-AA-210, "Dosimetry Issue, Usage, and Control," Revision 9

RP-AA-700, "Controls for Radiation Protection Instrumentation," Revision 2
 RP-LG-700-1001, "Radiation Protection Instrumentation Operations Guidelines," Revision 2
 RP-LG-220-1002, "Perform Calibration Checks and a Whole Body Count on the FastScan," Revision 1
 RP-LG-710, "Calibration of Eberline Model E-520 Geiger Counter," Revision 0
 RP-LG-715, "Calibration of Eberline Model E-140N Count Rate Meter," Revision 0
 RP-LG-720, "Calibration of NE Technology Model SAM-9 Small Articles Monitor," Revision 1
 RP-LG-721, "Calibration and Preventive Maintenance of Eberline Model PCM-1C, Personnel Contamination Monitor," Revision 2
 RP-LG-724, "Calibration of Eberline RO-2 and RO-2A Ion Chamber," Revision 0
 RP-LG-740, "Operation of MDH/RADCAL 2025 series X-ray Monitor," Revision 0
 RP-LG-8250, "Operation of the BARON III Compressor Refill System and Recharging Scott 4500 PSIG cylinders," Revision 5
 IC-C-12-00110, "Calibration of Eberline Model RO-20 Ion Chambers," Revision 1
 IC-C-12-0112, "Calibration of Eberline Model E-520 Geiger Counter," Revision 0
 IC-12-00439, "Calibration of the RADECO Model H-809C Portable Air Sampler," Revision 1
 IC-11-0376, "Calibration of General Electric Area Radiation Monitors," Revision 5
 RT-0-111-900-0, "One Hour SCBA Cylinder Inspection and Functional Test," Revision 28
 ZRP-5220-03, "Calibration Check of the Thermo Electron MK2 Electronic Dosimeter," Revision 1

Technical Reports

RP-03-002, "Justification for annual calibration of Siemens Mk-II Electronics Dosimeters Models EPD and EPDN"
 RP-07-006, "Thermo Scientific Personnel Contamination Monitor (PCM) Alarm Setting"
 RP-07-007, "10 CFR 61 Report for 2007"

Issue Reports:

432065	521217	605748
494067	563468	612788
570677	567701	330197
507233	585315	

Focused Area Self-Assessments /Audits:

Radiation Monitoring Instrumentation and Protective Equipment, October 27, 2006
 Radiation Monitoring and Protective Equipment, July 19-21, 2006
 Audit of Hagemeyer SCBA Services, March 09, 2006
 Nuclear Oversight Objective Evidence Report (IR 338414)

Calibration Records Reviewed:

Area Radiation Monitors: RIS01-M1-1K600, RIS13-M1-1&2K600, RIS14-M1-1&2K600, RIS06-M1-1K600, RIS11-M1-1K600, RIS15-M1-1&2K600, RIS16-M1-1K600, RIS17-M1-1&2K600, RIS18-M1-1&2K600, RIS19-M1-1&2K600, RIS20-M1-1&2K600, RIS23-M1-1K600

PCM-1C Nos.: 332370, 332369, 332165, 332333, 332321

PM-7 Nos.: 333914, 333910

SAM-9 Nos.: 334212, 334219, 334829

RM-20 Nos.: 330486, 332698, 330487

RO-2 Nos.: 074185, 332276,

E-140N No. 330391

Delta 5 No.: 334879

Telepole No. 078147

E-520 No. : 330336
Gillian Lapel Air Sampler No.: 333946

Out-Of-Tolerance Reports (OOTR) for Instruments

Nos. : 332265, 333898, 078788, 331983, 079190, 331977, 077038, 076735, 334721, 334960

SCBA Packs Inspected

Nos: 67, 405, 16, 51, 75, 82, 400

Section 4OA1: Performance Indicator (PI) Verification

ERO Drill Participation PI data, April 2006 - March 2007
Public Notification System PI data, April 2006 - March 2007
DEP PI data, April 2006 - March 2007

Section 4OA2: Other

Issue Reports and Action Requests

A1612183, "HS-006-211A Not Functioning Properly"
A1572787, "D22 Fuel Oil Storage Tank Hi/Lo Level Alarm Alarming"
A1547699, "LIC-069-234A Output Drifting Open"
A1559259, "TISH-019-113C Is Alarming Early"
A1532978, "D11 D/G Cell Temp Indicating High"
A1568626, "FV-C-046-1F002B CRD Flow Controller Hunting"
A1602738, "Unit 1 CST Low Temperature Alarm 4 deg. Above Setpoint"
A1618657, "BPV Full Closed Green Light Not Lit"
A1506625, "Vibration Monitoring On HV-51-2F050A and B"
A1612675, "HV-055-1F100 Change In Packing Leak Characteristics"
IR 628579, "Inadvertent RCIC Out Of Service Annunciator"
IR 608781, "2A DW Chiller Tripped"
IR 319338, "U/2 RCIC Suction/Discharge Pressure Issues"
IR 624429, "HV-011-011A Not Stroke Fully Closed"

Miscellaneous

TRT-07-149, "Void In RCIC Discharge Piping"
TRT-07-148, "U/2 RCIC Out Of Service Alarm"

Section 4OA3: Event Followup

Procedures

RT-6-055-340-2, "HPCI Turbine Hydraulic Control System Operability Check"

Issue Reports and Action Requests

IR 544200, "Apparent Cause Report for Failed U2 HPCI RGSC"
IR 620856, "Unit 2 Automatic Scram"

Miscellaneous

LIM-26223, "Failure Analysis of a Woodward, RGSC associated with Limerick Unit 2"

LIST OF ACRONYMS

ADAMS	Agencywide Documents Access Management System
ANS	Alert and Notification System
AR	action request
ARM	area radiation monitor
ATWS	anticipated transient without a scram
CAP	Corrective Action Program
CFR	Code of Federal Regulations
CST	condensate storage tank
DEP	drill and exercise performance
EAL	emergency action level
EDG	emergency diesel generator
EP	emergency preparedness
ERO	Emergency Response Organization
ESW	emergency service water
FIC	flow indicating controller
HPCI	high pressure coolant injection
IMC	inspection manual chapter
IR	issue report
LGS	Limerick Generating Station
NCV	non-cited violation
NOS	Nuclear Oversight Department
NRC	Nuclear Regulatory Commission
OA	other activities
PAR	protective action recommendation
PARS	Publicly Available Records
PI	performance indicator
P&ID	pipng and instrumentation drawing
PMT	post-maintenance test
RCIC	reactor core isolation cooling
RGSC	ramp generator signal converter
RHR	residual heat removal
RRCS	redundant reactivity control system
SAM	small article monitor
SCBA	self contained breathing apparatus
SDP	significance determination process
SPAR	Standardized Plant Analysis Risk
SRA	Senior Risk Analyst
SSC	structure, system, component
TIP	traversing incore probe
TS	technical specification
UFSAR	updated final safety analysis report
WANO	World Association of Nuclear Operations