January 23, 2004

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

SUBJECT: LIMERICK GENERATING STATION - NRC INTEGRATED INSPECTION REPORT 05000352/2003005, 05000353/2003005

Dear Mr. Crane:

On December 31, 2003, the United States Nuclear Regulatory Commission (NRC) completed an inspection at your Limerick Generating Station Units 1 and 2. The enclosed integrated report documents the inspection findings which were discussed on January 7, 2004, with Mr. R. DeGregorio and other members of your staff.

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

This report documents three NRC-identified findings of very low safety significance (Green). These findings were determined to involve violations of NRC requirements. However, because of their very low safety significance and because they are entered into your corrective action program, the NRC is treating these issues as non-cited violations (NCVs), in accordance with Section VI.A of the NRC's 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 the basis for your denial, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Region I; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the Limerick facility.

Since the terrorist attacks on September 11, 2001, the NRC has issued five Orders and several threat advisories to licensees of commercial power reactors to strengthen licensee capabilities, improve security force readiness, and enhance controls over access authorization. In addition to applicable baseline inspections, the NRC issued Temporary Instruction (TI) 2515/148, "Inspection of Nuclear Reactor Safeguards Interim Compensatory Measures," and its subsequent revision, to audit and inspect licensee implementation of the interim compensatory measures required by the Order. Phase 1 of TI 2515/148 was completed at all commercial nuclear power plants during calendar year (CY) 2002, and the remaining inspection activities for Limerick were completed in February 2003. The NRC will continue to monitor overall safeguards and security controls at Limerick.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (The Public Electronic Reading Room).

Sincerely,

/RA/

Mohamed Shanbaky, Chief
Projects Branch 4
Division of Reactor Projects

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

Enclosure: Inspection Report 05000352/2003005, 05000353/2003005
w/Attachment: Supplemental Information

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Plant Manager, Limerick Generating Station
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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: 05000352/2003005, 05000353/2003005

Licensee: Exelon Generation Company, LLC

Facility: Limerick Generating Station, Units 1 & 2

Location: Evergreen and Sanatoga Roads
Sanatoga, PA 19464

Dates: September 28, 2003 through December 31, 2003

Inspectors: A. Burritt, Senior Resident Inspector
B. Welling, Resident Inspector
A. Blamey, Senior Operations Engineer
A. Della Greca, Senior Reactor Inspector
D. Florek, Senior Project Engineer
J. Noggle, Senior Health Physicist
G. Smith, Senior Physical Security Inspector
S. Barr, Operations Engineer
J. Bobiak, Reactor Inspector
D. Caron, Physical Security Inspector
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G. Wilson, Reactor Inspector
B. Rini, NRC Intern

Approved by: Mohamed Shanbaky, Chief
Projects Branch 4
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CONTENTS

SUMMARY OF FINDINGS

IR 05000352/2003005, IR 05000353/2003005; 09/28/2003-12/31/2003; Limerick Generating Station, Units 1 and 2; Maintenance Risk Assessments and Emergent Work Evaluation, Operability Evaluations.

The report covered a 3-month period of inspection by resident inspectors and announced inspections by regional reactor inspectors, physical security inspectors, a project engineer, an operations engineer, an emergency preparedness inspector, and a health physicist. Three Green non-cited violations (NCVs) were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

Reactor Safety

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green. The inspector identified a finding of very low safety significance, that is also a non-cited violation of 10 CFR 50.65 (a)(4), because on August 5, 2003, Exelon performed testing on the Unit 1 D12 4 kV bus under-voltage relay without having properly assessed and managed the increase in risk associated with the test. Specifically, the risk was higher than Exelon originally determined since the test made the D12 4 kV bus and D12 EDG unavailable. As a result, based on the higher risk, the test should not have been performed with the plant at power.

  This issue is greater than minor because it is associated with the human performance attribute (incorrect assumption made in risk determination) and adversely affects the objective of the mitigating system cornerstone in that the EDG and associated bus were unavailable during the test and could not respond to certain initiating events. This finding is not suitable for analysis by a Significance Determination Process (SDP) because there is no current SDP to assess the significance of maintenance risk assessment findings. This finding was determined to be of very low safety significance (Green) and not greater than very low safety significance by management review because the performance deficiency did not result in a loss of the system safety function and the length of time that the D12 EDG and bus were unavailable was short (45 min). (Section 1R13)

Summary of Findings (cont'd)

- Green. The inspector identified a finding of very low safety significance (Green), that is also a non-cited violation of 10 CFR 50.65 (a)(4), because on October 20, 2003, Exelon performed testing on the Unit 2 D21 4 kV bus under-voltage relay without having properly assessed and managed the increase in risk associated with the test. Specifically, Exelon did not establish appropriate actions in the test procedure to ensure D21 bus and D21 EDG availability. The risk was higher than Exelon originally determined since the actions in the test procedure did not ensure that the D21 4 kV bus and D21 EDG would be available. As a result, based on the higher risk, the test should not have been performed with the plant at power.

  This issue is greater than minor because it is associated with the human performance attribute (incorrect assumption made in risk determination because operators and technicians actions added to the test procedure were not simple) and adversely affects the objective of the mitigating system cornerstone in that the EDG and associated bus were unavailable during the test and could not respond to certain initiating events. This finding is not suitable for analysis by a Significance Determination Process (SDP) because there is no current SDP to assess the significance of maintenance risk assessment findings. This finding was determined to be of very low safety significance (Green) and not greater than very low safety significance by management review because the performance deficiency did not result in a loss of the system safety function and the length of time that the D21 EDG and bus were unavailable was short (45 min). (Section 1R13)

  The inspector identified that a contributing cause of this finding was related to the cross-cutting area of Problem Identification and Resolution. Exelon's corrective action for the finding associated with the D12 bus under-voltage relay test performed on August 5, 2003, was not adequate to assure that the associated bus and EDG would be considered available when other bus under-voltage relays were tested. The corrective actions were inadequate because the technical review to support the procedure changes did not adequately evaluate the procedure change against the NUMARC 93-01 standard to ensure the procedure change maintained the EDG and associated bus available.

- Green. The inspectors identified a finding of very low safety significance that is also a non-cited violation of Technical Specification 6.8.1, "Procedures," because the chemistry staff did not follow procedures. Specifically, on several occasions since April 2003, Exelon staff did not perform the required daily sample and analysis of spray pond water and when pH in the spray pond water was outside of the specifications, did not take the actions described in the procedure within the specified time period.

  The finding is greater than minor because it is similar to example 4.a " Insignificant Procedural Errors" in Appendix E of NRC Inspection Manual Chapter 0612, "Power Reactor Inspection Reports." By not following the chemistry sampling and analysis procedure, Exelon adversely affected the

safety-related 2B RHR heat exchanger, in that, the reliability of the 2B RHR heat exchanger under post-accident conditions was reduced. The finding impacts the Mitigating System Integrity Cornerstone because it is associated with the reliability of the 2B RHR subsystem, a mitigating system.

The inspectors identified that a contributing cause of this finding involved a human performance error because neither a chemistry technician nor the technician's supervisor followed the steps prescribed by procedure CH-1010. (Section 1R15)

Report Details

Summary of Plant Status

Unit 1 began this inspection period operating at 100% power and remained at or near that power level except for brief periods of planned testing. On December 28, operators reduced power to about 93% due to a minor feedwater level control perturbation. Reactor power was restored to 100% on December 29, 2003.

Unit 2 began this inspection period operating at 100% power and remained at or near that power level except for brief periods of planned testing.

1. REACTOR SAFETY
Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R01 Adverse Weather Protection (71111.01 - 1 sample)

a. Inspection Scope

Seasonal Readiness. The inspector reviewed the station's 2003-2004 winter seasonal readiness preparation and toured the diesel rooms, the circulating water pump structure, and various areas of the reactor enclosure. The inspector verified the adequacy of the winter weather protection for key components within these structures. This inspection activity represented one sample. The systems included:

- Emergency Diesel Generators
- Circulating Water System
- Service Water System

The inspector also reviewed Exelon's lessons learned from events identified during the 2002-2003 winter season to determined if the lessons learned had been translated into 2003-2004 winter season readiness. This included emergency startup of the Perkiomen Makeup Water System.

The inspectors referred to the following documents.

- OP-AA-108-109, "Seasonal Readiness"
- GP-7, "Cold Weather Preparation and Operation"
- S10.7.C, "Service Water Flow Adjustments"
- S96.1.A, "Startup and Shutdown of Reactor Enclosure Heat System"
- 1S96.1.A, "Equipment Alignment to Place Unit 1 Reactor Building and Diesel Generator Enclosure Heat System In Service"
- S99.1.A, "Startup and Shutdown of Perkiomen Makeup Water System"

b. Findings

No findings of significance were identified.

1R04 Equipment Alignment (71111.04 - 3 samples)

a. Inspection Scope

Partial System Walkdown. (71111.04Q) The inspectors performed partial system walkdowns to verify system and component alignment and to note any discrepancies that would impact system operability. The inspectors verified selected portions of redundant or backup systems or trains were available while certain system components were out-of-service. The inspectors reviewed selected valve positions, general condition of major system components, and electrical power availability. This inspection activity represented three samples. The partial walk-downs included the following systems:

- 2B residual heat removal with 2A residual heat removal out-of-service
- 1A residual heat removal with 1B residual heat removal out-of-service
- Unit 2 high pressure coolant injection and reactor core isolation cooling with Division 1 Automatic Depressurization System out-of-service

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05 - 5 samples)

a. Inspection Scope

Tour Plant Areas Important to Reactor Safety. (71111.05Q) The inspectors toured high risk areas at Limerick Units 1 and 2 to assess Exelon's control of transient combustible material and ignition sources, fire detection and suppression capabilities, fire barriers, and any related compensatory measures. The inspectors reviewed the respective pre-fire action plan procedures and Section 9A of the Updated Final Safety Analysis Report. This inspection activity represented five samples. The following fire areas were inspected:

- D11 diesel generator room and fuel oil/lube oil room (fire area 79)
- D12 diesel generator room and fuel oil/lube oil room (fire area 81)
- D13 diesel generator room and fuel oil/lube oil room (fire area 80)
- D14 diesel generator room and fuel oil/lube oil room (fire area 82)
- Unit 1 diesel generator access corridor and condensate pump area rooms (fire area 124)

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures (71111.06 - 2 samples)

a. Inspection Scope

The inspector reviewed documents and inspected structures, systems, and components relative to the adequacy of external and internal flood protection measures for safety related and risk significant systems and components. The inspector performed a walkdown of the relevant areas to verify the adequacy of sealing of equipment below the projected flood water level, water tight doors, flooding instrumentation, and other flood protection features. The inspector verified that adequate procedures were in place to identify and respond to floods. The inspector also reviewed condition reports and action requests (ARs) related to flood protection. This inspection activity represented two samples. The inspector verified the adequacy of flood protection measures for:

- External flooding
- Internal flooding (Unit 2 core spray system rooms)

The following documents were included in the review:

- UFSAR Section 3.4.1
- Emergency Operating Procedure T-103
- Procedure SE-4-1, Reactor Enclosure Flooding
- Procedure SE-4-3, Flooding External to Power Block
- ARs: 00187690, A0774932, A0777958, A1435818, A1435823, A1435824, A1440806

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification (71111.11)

1. Simulator Evaluation (71111.11Q - 1 sample)

a. Inspection Scope

On November 19, 2003, the inspector observed a licensed operator requalification training program as-found simulator scenario to assess licensed operator performance and the evaluator's critique. The inspector discussed the results with operators, operations management, and instructors. This inspection activity represented one sample. The inspector also referred to the simulator scenario document, LSTS-2002 and the following off-normal plant procedures and emergency operating procedures:

- OT-104, "Unexpected/Unexplained Positive or Negative Reactivity Insertion"

- OT-101, “High Drywell Pressure Inadvertent Opening of a Relief Valve”
- T-101, “RPV Control”
- T-102, “Primary Containment Control”
- T-112, “Emergency Blowdown”

b. Findings

No findings of significance were identified.

2. Licensed Operator Requalification Program (71111.11B - 1 sample)

a. Inspection Scope

The following inspection activities were performed using NUREG-1021, Rev. 8, “Operator Licensing Examination Standards for Power Reactors,” Inspection Procedure Attachment 71111.11, “Licensed Operator Requalification Program,” and NRC Manual Chapter 0609, Appendix I, “Operator Requalification Human Performance Significance Determination Process (SDP),” as acceptance criteria, 10 CFR 55.46 Simulator Rule (sampling basis). These inspection activities were performed for both units.

The inspectors reviewed documentation of operating history since the last requalification program inspection. The inspectors also discussed facility operating events with the resident staff. Documents reviewed included NRC inspection reports and licensee Condition Reports that involved human performance and Technical Specification compliance issues.

The Inspectors reviewed two RO and two SRO comprehensive biennial written exams administered in 2003 (i.e., administered exam weeks 3 and 4). The inspectors reviewed two sets of Scenarios and JPMs also administered during this current exam cycle (i.e., weeks 3 and 4) to ensure the quality of these exams met or exceeded the criteria established in the Examination Standards and 10 CFR 55.59.

The inspectors observed the administration of operating examinations to two crews (i.e., E Shift operating crew and staff crew). The operating examination consisted of four simulator scenarios for the operating crew, three for the staff crew, and one set of five job performance measures administered to each individual. As part of the examination observation, the inspectors assessed the adequacy of licensee examination security measures.

The inspectors interviewed 2 evaluators, 2 training supervisors, 3 ROs, and 4 SROs for feedback regarding the implementation of the licensed operator requalification program, and to ensure training staff modified the program, when appropriate, to recommended changes. In addition, recent plant and industry events or changes were reviewed to ensure that these items were adequately addressed in the Requalification Training Program.

Remediation training records for the prior two years were reviewed by assessing five instances of evaluation failures, which included one operating exam crew failure.

Conformance with operator license conditions was verified by reviewing the following records:

- Attendance records for the most recent year training cycle
- 10 medical records (5 SRO; 5 RO) to confirm that all records were complete, that restrictions noted by the doctor were reflected on the individual's license, and that the exams were given within 24 months.
- Proficiency watch-standing and reactivation records. A sample of six licensed operator watch-standing documentation was reviewed for the current and prior quarter to verify currency and conformance with the requirements of 10CFR55.

The inspectors observed simulator performance during the conduct of the examinations, and reviewed simulator performance tests and discrepancy reports to verify compliance with the requirements of 10CFR55.46. Limerick is committed to the ANSI 3.5-1985 standard. The inspectors reviewed simulator configuration control and performance testing through interviews and the review of: facility simulator procedures; open and closed simulator work requests and discrepancy reports; and the review of test results. Specifically, the following tests were reviewed:

Normal operations tests:
- 6.01 NORMOPS: Plant Startup To Hot Standby
- 6.04 NORMOPS: Load Changes

Transient tests:
- 7.01 Reactor (Manual) Scram
- 7.02 Simultaneous Trip of All Reactor Feedwater Pumps
- Event Review 2003-02: 2R07 Start of Outage Reactor Scram

Malfunction tests:
- 3-MAD141B SRV1F013E Sticks Open
- 3-MEH104A Turbine Control System Fails High
- 3-MFW041 Feedwater Master Controller Fails (0-100%)
- 3-MRR433A Recirc Pump 1A Seal No. 1 Fails

Core Performance tests:
- 6.10 NORMOPS: Manual Heat Balance

On October 31, 2003, the inspectors conducted an in-office review of licensee requalification exam results. These results included the annual operating test only (i.e., the comprehensive written exam was administered last year). The inspection assessed whether pass rates were consistent with the guidance of NRC Manual Chapter 0609, Appendix I, "Operator Requalification Human Performance Significance Determination Process (SDP)." The inspectors verified that:

- Crew failure rate on the dynamic simulator was less than 20%.
- Individual failure rate on the dynamic simulator test was less than or equal to 20%.
- Individual failure rate on the walk-through test (JPMs) was less than or equal to 20%.
- Individual failure rate on the comprehensive biennial written exam was less than or equal to 20%.
- More than 75% of the individuals passed all portions of the exam

On December 15, 2003, the inspector conducted an in-office review of senior reactor operator limited to fuel handling (LSRO) annual operating test results for 2003. The inspection assessed whether pass rates were consistent with the guidance of NRC Manual Chapter 0609, Appendix I, “Operator Requalification Human Performance Significance Determination Process (SDP).” The inspectors verified that:

- Individual failure rate on the operating test was less than or equal to 20%.
- Overall pass rate among individuals for the exam was greater than or equal to 75%.

This inspection activity represented one sample.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness (71111.12 - 2 samples)

a. Inspection Scope

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

- 2B low pressure coolant injection valve trip unit failure (A1431716)
- D24 emergency diesel generator loss of coolant accident trip bypass relay failure (A1434624)

b. Findings

No findings of significance were identified.

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

a. Inspection Scope

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

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

The inspectors compared the assessed risk configuration to the actual plant conditions and any in-progress evolutions or external events to evaluate whether the assessment was accurate, complete, and appropriate for the issue. The inspectors performed control room and plant walkdowns to verify whether the compensatory measures identified by the risk assessments were appropriately performed. This inspection activity represented six samples. The selected maintenance activities included:

- 2A residual heat removal system outage
- D21 emergency bus undervoltage testing (RT-2-092-321-2)
- U1 average power range monitor #1 out-of-service for testing
- 1B residual heat removal system outage
- toxic gas monitoring system replacement modification
- remote shutdown system division 2 residual heat removal and recirculation suction valve operability test (ST-2-088-324-2)

b. Findings

.1 D12 Bus and Emergency Diesel Generator (EDG) Unavailability During Testing

Introduction. The inspector identified a finding of very low safety significance (Green), that is also a non-cited violation of 10 CFR 50.65 (a)(4), because on August 5, 2003, Exelon performed testing on the Unit 1 D12 4 kV bus under-voltage relay without having properly assessed and managed the increase in risk associated with the test. Specifically, the risk was higher than Exelon originally determined since the test made the D12 4 kV bus and D12 EDG unavailable. As a result, based on the higher risk, the test should not have been performed with the plant at power.

Description. Every quarter, Exelon performs Routine Test (RT)-2-092-321-2/3/4-1/2; D* 4 kV Emergency Bus Under-voltage (UV) Relay 127-11* Diagnostic Test. The test conditions require the emergency diesel generator (EDG) to be running and sharing load with the offsite power source.

Exelon performed a risk assessment prior to the performance of the August 5 test, in accordance with Exelon procedure WC-AA-101, "Configuration Risk Management Criteria." Exelon's risk assessment indicated the core damage frequency (CDF) during the test would be greater than or equal to two times the zero-maintenance CDF. This condition only requires that Exelon limit the unavailability time or take compensatory measures to reduce plant risk. Exelon's risk assessment assumed that the plant was operating at power and the EDG and D12 bus were available during the test.

The inspectors observed that the test included steps which de-energized the bus loss-of-coolant-accident (LOCA) logic and removed the undervoltage relay for a brief period of time. The inspectors questioned whether the bus and associated EDG were available during these timeframes.

Exelon performed further analysis and determined that, during these timeframes, certain LOCA or loss-of-offsite power (LOOP) functions would not occur and the EDG could fail. Thus, the EDG and the D12 bus were actually unavailable. This unavailability with the plant operating at power increased the risk to greater than or equal to 20 times the zero-maintenance CDF. According to Exelon procedure WC-AA-101, it is unacceptable to voluntarily enter this condition. The inspector concluded that Exelon did not adequately assess the risk associated with the test and manage the increase in risk because the test as written should not have been performed with the plant operating at power.

Exelon also evaluated the effect of testing the under-voltage relays on the other busses and identified that the test should not have been performed for the D11, D13, D21, D22 and D23 busses. For the D11, D21 and D22 busses, the revised risk associated with this test was calculated to be greater than or equal to 20 times the zero-maintenance CDF. For the D13 and D23 safeguards busses, the revised risk was greater than or equal to 10 times the zero-maintenance CDF which is a condition which requires senior management review and approval. The revised risk for D14 and D24 was also more significant than originally calculated, but it was not high enough to require management

approval. The inspector concluded that Exelon did not adequately assess the risk associated with these tests and manage the increase in risk.

Analysis. The performance deficiency is that Exelon did not properly assess and manage the increase in risk, when routine testing on the D12 4 kV bus under-voltage relay rendered the safeguards bus unavailable, as required by 10 CFR 50.65 (a)(4). Traditional enforcement does not apply because the issue did not have any actual safety consequences or potential for impacting the NRC's regulatory function and was not the result of any willful violation of NRC requirements. This issue is greater than minor because it is associated with the human performance attribute (incorrect assumption made in risk determination) and adversely affects the objective of the mitigating system cornerstone in that the EDG and associated bus were unavailable during the test and could not respond to certain initiating events. This finding is not suitable for analysis by a Significance Determination Process (SDP) because there is no current SDP to assess the significance of maintenance risk assessment findings. This finding was determined to be of very low safety significance (Green) and not greater than very low safety significance by management review because the performance deficiency did not result in a loss of the system safety function and the length of time that the D12 EDG and bus were unavailable was short (45 min).

Enforcement. 10 CFR 50.65 (a)(4) states, in part, "Before performing maintenance activities (including but not limited to surveillance, post-maintenance testing, and corrective and preventive maintenance), the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities." Contrary to the above, on August 5, 2003, Exelon did not adequately assess and manage the risk associated with testing of the Unit 1 D12 4 kV bus under-voltage relay. Since the CDF during the test was greater than or equal to 20 times the zero-maintenance CDF, this condition should not have been entered voluntarily while the plant was operating at power. Because this violation of 10 CFR 50.65 is of very low safety significance and has been documented in Exelon's corrective action program as Condition Report (CR) 177085, this is being treated as a NCV, consistent with Section VI.A. of the NRC Enforcement Policy: **NCV 05000352/2003005-01, Did Not Adequately Assess and Manage Risk of Testing the D12 4 kV Bus Under-Voltage Relay.**

.2 D21 Bus and Emergency Diesel Generator (EDG) Unavailability During Testing - Simple Operator Actions Inconsistent with Standard

Introduction. The inspector identified a finding of very low safety significance (Green), that is also a non-cited violation of 10 CFR 50.65 (a)(4), because on October 20, 2003, Exelon performed testing on the Unit 2 D21 4 kV bus under-voltage relay without having properly assessed and managed the increase in risk associated with the test. Specifically, Exelon did not establish appropriate actions in the test procedure to ensure D21 bus and D21 EDG availability. The risk was higher than Exelon originally determined since the actions in the test procedure did not ensure that the D21 4 kV bus and D21 EDG would be available. As a result, based on the higher risk, the test should not have been performed with the plant at power.

Description. On October 20, 2003, the inspectors observed a routine test of the D21 4 kV bus under-voltage relay. The test procedure incorporated actions that Exelon established to ensure the bus and associated EDG remained available. These actions were added following the finding discussed above (Section 1R13 .1 of this report) for the D12 4kV bus under-voltage relay test and Exelon's determination that prior 4 kV bus under-voltage testing had actually rendered the bus and EDG unavailable.

Exelon performed a risk assessment in accordance with Exelon procedure WC-AA-101, "Configuration Risk Management Criteria." This risk assessment assumed that the EDG and D21 bus were available based on operators and technicians performing the actions added to the test procedure to promptly restore the D21 bus to a normal configuration following a loss of offsite power. The inspectors questioned whether the number of restoration steps was consistent with Exelon's standards for maintaining system availability.

Exelon uses NUMARC 93-01, Section 11 as a standard for establishing and maintaining systems available during testing. This document states that systems and components out of service for testing are considered unavailable, unless the test configuration is automatically overridden by a valid starting signal, or the function can be promptly restored either by an operator in the control room or by a dedicated operator stationed locally for that purpose. Restoration actions must be contained in a written procedure, must be uncomplicated (a single action or a few simple actions), and must not require diagnosis or repair. The intent of this paragraph is to allow licensees to take credit for restoration actions that are virtually certain to be successful (i.e., probability nearly equal to 1) during accident conditions.

After further investigation, Exelon concluded that the EDG and the D21 bus should have been considered unavailable because the steps necessary to restore the bus were not consistent with the NUMARC 93-01 standard for maintaining a system available. Specifically, they determined the number and complexity of the steps in the testing procedure were not "a few simple actions" and did not provide virtual certainty for prompt restoration of the bus. Further, during implementation of these steps the D21 bus protection circuits were disabled, increasing the potential for a bus or EDG failure. This unavailability with the plant operating at power increased the risk to greater than or equal to 20 times the zero-maintenance core damage frequency. According to Exelon procedure WC-AA-101, it is unacceptable to voluntarily enter this condition. The inspector concluded that Exelon did not adequately assess the risk associated with the test and manage the increase in risk because the test, as written, should not have been performed with the plant operating at power.

Analysis. The performance deficiency is that Exelon did not properly assess and manage the increase in risk, when routine testing on the D21 4 kV bus under-voltage relay rendered the safeguards bus unavailable, as required by 10 CFR 50.65 (a)(4). Traditional enforcement does not apply because the issue did not have any actual safety consequences or potential for impacting the NRC's regulatory function and was not the result of any willful violation of NRC requirements. This issue is greater than minor because it is associated with the human performance attribute (incorrect assumption

made in risk determination because operators and technicians actions added to the test procedure were not simple) and adversely affects the objective of the mitigating system cornerstone in that the EDG and associated bus were unavailable during the test and could not respond to certain initiating events. This finding is not suitable for analysis by a Significance Determination Process (SDP) because there is no current SDP to assess the significance of maintenance risk assessment findings. This finding was determined to be of very low safety significance (Green) and not greater than very low safety significance by management review because the performance deficiency did not result in a loss of the system safety function and the length of time that the D21 EDG and bus were unavailable was short (45 min).

The inspectors also identified that a contributing cause of this finding was related to the cross-cutting area of Problem Identification and Resolution. Exelon's corrective action for the finding (See Section 1R13.1) associated with the D12 bus under-voltage relay test was not adequate to assure that the associated bus and EDG would be considered available when other bus under-voltage relays were tested. The corrective actions were inadequate because the technical review to support the procedure changes did not adequately evaluate the procedure change against the NUMARC 93-01 standard to ensure the procedure change maintained the EDG and associated bus available.

Enforcement. 10 CFR 50.65 (a)(4) states, in part, that before performing maintenance activities (including but not limited to surveillance, post-maintenance testing, and corrective and preventive maintenance), the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities. Contrary to the above, on October 20, 2003, Exelon did not adequately assess and manage the risk associated with testing of the Unit 2 D21 4 kV bus under-voltage relay. Since the CDF during the test was greater than or equal to 20 times the zero-maintenance CDF, this condition should not have been entered voluntarily while the plant was operating at power. Because this violation of 10 CFR 50.65 is of very low safety significance and has been documented in Exelon's corrective action program as Condition Report (CR) 187475, this is being treated as a non-cited violation consistent with Section VI.A. of the NRC Enforcement Policy: **NCV 05000353/2003005-02, Did Not Adequately Assess and Manage Risk of Testing the D21 4 kV Bus Under-Voltage Relay.**

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

a. Inspection Scope

Non-routine/Transient Operations. The inspectors observed and reviewed licensed operator performance during the following non-routine evolution. This inspection activity represented one sample.

- Unit 1 fuel channel bow testing on November 3

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15 - 3 samples)

a. Inspection Scope

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

- 2B residual heat removal heat exchanger operability with pH outside of specifications
- U2 high pressure coolant injection exhaust line vacuum breaker pressure control isolation valve (A1406818)
- 2B residual heat removal heat exchanger operability after an event

The inspector reviewed the following documents:

- CRs 149191, 159169, 174978
- Chemistry/Operator Logs
- Exelon Procedure CH-1010, "Chemistry Sampling, Analysis, and Calibration Schedule"
- Exelon Procedure CH-1010, Appendix B, "Chemistry/ NPDES Related Sampling and Analysis Schedule"

b. Findings

Introduction. The inspectors identified a finding of very low safety significance (Green) that is also a non-cited violation of Technical Specification 6.8.1, "Procedures," because the chemistry staff did not follow procedures. Specifically, on several occasions since April 2003, Exelon staff did not perform the required daily sample and analysis of spray pond water and when pH in the spray pond water was outside of the specifications, did not take the actions described in the procedure within the specified time period.

Description. An operability evaluation (CR 149191) for the 2B residual heat removal (RHR) heat exchanger discussed a corrosion mechanism associated with manganese in the spray pond water that had caused significant pitting of the heat exchanger tubes. The operability evaluation documented that maintaining spray pond chemistry parameters within the limits of procedure CH-1010 ensures the reliability of the RHR heat exchanger post accident." By keeping pH within operating goals, the deposition of soluble manganese on the heat exchangers is minimized, decreasing the possible corrosion of the RHR heat exchangers. Procedure CH-1010, "Chemistry Sampling, Analysis, and Calibration Schedule," specifies a daily frequency for the sampling and analysis of spray pond water for pH, and specifies corrective action to be taken within 24 hours if pH is above/below the operating goals of 8.0-9.5.

The inspector determined that, on several occasions since April 1, 2003, the Chemistry staff did not perform the required daily sample and analysis of the spray pond water and when the initial spray pond analysis, on September 8, 2003, indicated that the pH was below the operating goal, technicians did not take actions to return this parameter to within goal within 24 hours as specified by CH-1010. As a result of not taking required action, on September 9, 2003, Exelon operated with pH in the spray pond water outside of the specifications of CH-1010, which would have led to more deposition of manganese on the RHR heat exchangers reducing the long term reliability of the RHR heat exchanger during post-accident conditions.

Analysis. The finding is a performance deficiency because the chemistry staff did not properly implement a chemistry procedure for sampling and analysis of the spray pond water. This procedure is within the scope of procedures described in Regulatory Guide 1.33, as required by Technical Specification 6.8.1. Traditional enforcement does not apply, because the issue does not have any actual safety consequences or potential for impacting the NRC's regulatory function and is not the result of any willful violation of NRC requirements or Exelon procedures. The finding is greater than minor because it is similar to example 4. a " Insignificant Procedural Errors" in Appendix E of NRC Inspection Manual Chapter 0612, "Power Reactor Inspection Reports." By not following the chemistry sampling and analysis procedure, Exelon adversely affected the safety-related 2B RHR heat exchanger, in that, the reliability of the 2B RHR heat exchanger under post-accident conditions was reduced. The finding impacts the Mitigating System Integrity Cornerstone because it is associated with the reliability of the 2B RHR subsystem, a mitigating system. This finding is determined to have very low safety significance (Green) by Phase 1 of the Reactor Inspection Findings for At-Power Situations Significance Determination Process because the performance deficiency

does not result in a loss of safety function and is not potentially risk significant due to a seismic, flood, fire, or severe weather initiating event.

The inspectors identified that a contributing cause of this finding involved a human performance error because neither the chemistry technicians nor the technicians' supervisor followed steps prescribed by procedure CH-1010 for daily sampling and analysis of spray pond water and for spray pond pH outside of the required band.

Enforcement. Technical Specification 6.8.1 requires, in part, that written procedures be established, implemented, and maintained covering the applicable procedures in Appendix "A" of Regulatory Guide 1.33, Revision 2, February 1978. Appendix "A" of Regulatory Guide 1.33 includes chemical control procedures that specify the frequency for sampling and analysis and instructions for maintaining water quality within the prescribed limits. Exelon Procedure CH-1010, "Chemistry Sampling, Analysis, and Calibration Schedule," Attachment B, Section 19, specifies a daily frequency for the sampling and analysis for pH and specifies "Action Code 400" if pH is above/below operating goals and limits. Attachment 3, "Action Code 400," states, in part, that when a limit is exceeded, technicians must immediately notify their supervisor. CH-1010 specifies that exceeding a goal initiates a corrective action to be taken within 24 hours to restore a system parameter to meet the goal. Contrary to the above, since April 1, 2003, on several occasions technicians did not perform daily sampling and analysis for spray pond pH and on September 8, 2003, when the initial spray pond water analysis indicated that the pH was below the operating goal of 8.0, technicians did not take corrective actions within the 24 hours specified in procedure CH-1010. Because the failure to properly implement Exelon Procedure CH-1010 is of very low safety significance and has been documented in Exelon's corrective action program as CR 184919, this violation is being treated as a non-cited violation (NCV), consistent with Section VI.A of the NRC Enforcement Policy: **NCV 05000352,353/2003005-03, Did Not Follow Chemistry Procedure CH-1010.**

1R16 Operator Workarounds (71111.16 - 1 sample)

a. Inspection Scope

The inspector reviewed Unit 1 and 2 documented operator work-arounds and challenges, control room instrument trouble tags, and sampled active condition reports. The inspector evaluated the cumulative effects of these items on the ability of operators to respond to plant parameters in a correct and timely manner. The inspector reviewed these items to determined if there were any items that complicated the operators' ability to implement emergency operating procedures, but were not identified as operator work-arounds. This inspection activity represented one sample.

The inspector referred to the following Exelon procedure:

- OP-AA-102-103 “Operator Work-Around Program,” Revision 0

b. Findings

No findings of significance were identified.

1R19 Post Maintenance Testing (71111.19 - 4 samples)

a. Inspection Scope

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

- 1B residual heat removal pump motor oil cooler maintenance (R0916307)
- 1B residual heat removal shutdown cooling suction valve maintenance (R0943624)
- 1B residual heat removal 1F090B valve maintenance (R0747682)
- 1C residual heat removal pump maintenance (R0922907)

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing (71111.22 - 6 samples)

a. Inspection Scope

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

- ST-6-092-322-2, D22 diesel generator loss-of-coolant-accident/load reject testing and fast start operability test run
- D21 4 kV emergency bus undervoltage relay 127-115 diagnostic test.

- ST-6-092-111-2, D21 diesel generator 24-hour endurance test
- ST-6-051-234-2, 2D residual heat removal pump, valve, and flow test
- ST-6-051-233-1, 1C residual heat removal pump, valve, and flow test
- ST-6-055-230-2, high pressure coolant injection pump, valve, and test

b. Findings

No findings of significance were identified.

1R23 Temporary Plant Modifications (71111.23 - 2 samples)

a. Inspection Scope

The inspector reviewed the following temporary plant modifications:

- 0B-K112 Control Room Chiller Surging. This temporary modification maintained the chiller hot gas bypass valve (normally open on low loads) in the open position to prevent surging.
- D22 Diesel Generator RTD Installation. This temporary modification was performed to support heat transfer testing of diesel generator D22.

The inspector verified that the temporary change did not adversely affect system or support system availability, or adversely affect a function important to plant safety. The inspector verified that the applicable design and licensing bases were considered and that 10 CFR 50.59 reviews were appropriate. This inspection activity represented two samples.

Documents Reviewed

- Engineering Change Request LG 03-00539-000, 0B-K112 Control Room Chiller Surging
- Action Request A1436607, 0B-K112 Control Room Chiller Surging
- 50.59 Screening No. LG2003S108, 0B-K112 Control Room Chiller Surging
- Action Request A1418731, Control Enclosure Chiller 0AK112
- Engineering Change Request LG 94-06299-000, D22 Diesel Generator RTD Installation
- Work Order C0205170, Perform D22 Heat Transfer Testing

b. Findings

No findings of significance were identified.

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

a. Inspection Scope (7111404 - 1 sample)

A regional in-office review was conducted of licensee-submitted revisions to the emergency plan, implementing procedures and EALs which were received by the NRC during the period of July - December 2003. A thorough review was conducted of plan aspects related to the risk significant planning standards (RSPS), such as classifications, notifications and protective action recommendations. A cursory review was conducted for non-RSPS portions. These changes were reviewed against 10 CFR 50.47(b) and the requirements of Appendix E and they are subject to future inspections to ensure that the combination of these changes continue to meet NRC regulations. The inspection was conducted in accordance with NRC Inspection Procedure 71114, Attachment 4, and the applicable requirements in 10 CFR 50.54(q) were used as reference criteria. This inspection activity represented one sample.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151 - 15 samples)

a. Inspection Scope

Reactor Safety Cornerstone (10 samples)

The inspectors sampled licensee submittals for the Performance Indicators (PIs) listed below to verify the accuracy of the PI data recorded during that period. PI definitions and guidance contained in NEI 99-02, “Regulatory Assessment Indicator Guideline,” Rev. 2, were used to verify the basis in reporting for each data element. The inspectors reviewed selected portions of operator logs, monthly operating reports, and LERs. Additionally, the inspectors discussed the PI data with Exelon personnel responsible for collection of the data.

The inspectors reviewed the accuracy and completeness of the supporting data for the following Limerick PIs. This inspection activity represented ten samples:

- Unit 1 and 2 reactor core isolation cooling (October 2002 - August 2003)
- Unit 1 and 2 residual heat removal (January 2003 - August 2003)
- Unit 1 and 2 safety system functional failures (October 2002 - September 2003)
- Unit 1 and 2 reactor coolant system activity (October 2002 - September 2003)
- Unit 1 and 2 reactor coolant system leakage (October 2002 - September 2003)

Physical Security Cornerstone (3 samples)

The inspector performed a review of performance indicator (PI) data submitted by the licensee on the physical protection cornerstone. A review was conducted of the licensee’s programs for gathering, processing, evaluating, and submitting data for the Fitness-for-Duty, Personnel Screening, and Protected Area Security Equipment

Performance Indicators (PIs) to verify these PIs had been properly reported as specified in Nuclear Energy Institute (NEI) 99-02, Regulatory Assessment Performance Indicator Guideline, Rev. 1 and Rev 2 to verify that all occurrences that met the NEI criteria were identified and reported as performance indicators.

The review included the licensee's tracking and trending reports, personnel interviews, and security event reports for the PI data collected from the third quarter of 2002 through the third quarter of 2003. The inspector reviewed one reportable failure to properly implement the requirements of 10 CFR 26 during the entire reporting period. This inspection activity represented three samples relative to this inspection area. The following documents were reviewed:

- Performance Indicator Report, Third Quarter of 2002 - Third Quarter of 2003
- Safeguards Event Logs, January 2003 - September 2003

Occupational Exposure Control Effectiveness (1 sample)

The inspector reviewed implementation of the licensee's Occupational Exposure Control Effectiveness Performance Indicator (PI) Program. Specifically, the inspector reviewed Condition Reports (CRs), radiological controlled area (RCA) dosimeter exit logs, and internal and external dose evaluation records for the past four (4) calendar quarters. These records were reviewed for occurrences involving locked high radiation areas, very high radiation areas, and unplanned exposures against the criteria specified in Nuclear Energy Institute (NEI) 99-02, Regulatory Assessment Performance Indicator Guideline, Revision 2, to verify that all occurrences that met the NEI criteria were identified and reported as performance indicators.

This inspection activity represents one sample.

RETS/ODCM Radiological Effluent Occurrences (1 sample)

The inspector reviewed a listing of relevant effluent release reports for the past four (4) calendar quarters for issues related to the public radiation safety performance indicator, which measures radiological effluent release occurrences per site that exceed 1.5 mrem/qtr whole body or 5.0 mrem/qtr organ dose for liquid effluents; 5mrads/qtr gamma air dose, 10 mrad/qtr beta air dose, and 7.5 mrads/qtr for organ dose for gaseous effluents.

This inspection activity represents the completion of one sample.

The inspector reviewed the following documents to ensure the licensee met all requirements of the performance indicator from the fourth quarter 2002 through the third quarter 2003:

- monthly projected dose assessment results due to radioactive liquid and gaseous effluent releases;

- quarterly projected dose assessment results due to radioactive liquid and gaseous effluent releases; and
- dose assessment procedures.

b. Findings

No findings of significance were identified.

4OA2 Problem Identification and Resolution

1. Daily Screening of Corrective Action Program Items

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 performed a daily screening of items entered into Exelon's corrective action program. This review was accomplished by either reviewing hard copies of the condition report, attending daily screening meetings, or reviewing the items on Exelon's computerized database.

b. Findings and Observations

No findings of significance were identified.

2. Annual Sample Review (71152 - 1 sample)

a. Inspection Scope

Unplanned Entry into Operational Condition 3 During Unit 1 Start-up

On May 21, 2002, during a Unit 1 forced outage, an unplanned change from Cold Shutdown to Hot Shutdown occurred after the RHR shutdown cooling system was secured. Unit operators had used a degraded temperature instrument to monitor coolant temperature and did not recognize that actual coolant temperature had exceeded 200 degrees, resulting in the inadvertent operational condition change. The inspector reviewed the root cause analysis and the corrective actions related to the resulting Condiiton Report, CR 108974, "Reactor Coolant Temperature on DAS Reading High," to ensure that classification and disposition of the issue were completed in a timely manner and that actions taken to prevent recurrence were appropriate. The inspector review of the report and associated corrective actions included confirmation that necessary procedure changes were made and that Exelon had adequately addressed the human performance and equipment issues of the event.

This inspection activity represents the completion of one sample relative to this inspection area.

b. Findings and Observations

No findings of significance were identified.

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

Section 1R13 of the report describes a contributing cause of the finding that was related to PI&R. Exelon's corrective action associated with the D12 bus under-voltage relay test was not adequate to assure that the associated bus and EDG would be considered available when other bus under-voltage relays were tested.

4OA4 Cross Cutting Aspects of Findings

In Section 1R15, the inspectors identified that a contributing cause of a finding involved a human performance error because neither a chemistry technicians nor the technicians' supervisor followed steps prescribed by procedure CH-1010 for daily sampling and analysis of spray pond water and for spray pond pH outside of the required band.

4OA6 Meetings, Including Exit

Exit Meetings

On January 7, 2004, the resident inspectors presented the inspection results to Mr. DeGregorio and other members of his staff, who acknowledged the findings. The inspectors confirmed that proprietary information was not provided or examined during the inspection.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Exelon Generation Company

E. Callan, Director - Operations
C. Fritz, Lead LSRO Exams
R. Devlin, Operations Corrective Action Program Coordinator
B. Hanson, Plant Manager
D. Hart, Radiological Technical Support Manager
C. Mudrick, Director - Engineering
P. Orphanos, Shift Operations Superintendent or Assistant Operations Manager
J. Krais, Senior Manager - Design Engineering
P. Supplee, Security Manager
C. Rich, Supervisor Operations Training
A. Wasong, Nuclear Training Manager

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000352/2003005-01	NCV	Did Not Adequately Assess and Manage Risk of Testing the D12 4 kV Bus Under-voltage Relay
05000353/2003005-02	NCV	Did Not Adequately Assess and Manage Risk of Testing the D21 4 kV Bus Under-voltage Relay
05000352,353/2003005-03	NCV	Did Not Follow Chemistry Procedure CH-1010

LIST OF ACRONYMS

ADS	Automatic Depressurization System
AR	Action Requests
CDF	Core Damage Frequency
CFR	Code of Federal Regulations
CR	Condition Report
EAL	Emergency Action level
EDG	Emergency Diesel Generator
EP	Emergency Plan
HPCI	High Pressure Coolant Injection
LGS	Limerick Generating Station
LOCA	Loss of Coolant Accident
LSRO	Senior Reactor Operator Limited to Fuel Handling
NCV	Non-cited Violation
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
PI	Performance Indicator
RCIC	Reactor Core Isolation Cooling
RHR	Residual Heat Removal
RSPS	Risk Significant Planning Standards
RT	Routine Test
SDP	Significance Determination Process
SRO	Senior Reactor Operator
SSC	System, Structure, or Component
UFSAR	Updated Final Safety Analysis Report
UV	Under-voltage