January 16, 2003

Mr. John L. Skolds
President and CNO
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
5th Floor
Warrenville, IL 60555

SUBJECT: LIMERICK GENERATING STATION - NRC INTEGRATED INSPECTION REPORT 50-352/02-06, 50-353/02-06

Dear Mr. Skolds:

On December 28, 2002, the Nuclear Regulatory Commission (NRC) completed an inspection at your Limerick Generating Station Units 1 and 2. The enclosed report documents the inspection findings which were discussed on January 7, 2003, with Mr. W. Levis 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 procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, the inspectors identified one issue of very low safety significance (Green).

The NRC has increased security requirements at the Limerick Generating Station in response to terrorist acts on September 11, 2001. Although the NRC is not aware of any specific threat against nuclear facilities, the NRC issued an Order and several threat advisories to commercial power reactors to strengthen licensee's capabilities and readiness to respond to a potential attack. The NRC continues to monitor overall security controls and verify by inspection the licensee's compliance with the Order and current security regulations.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure 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 50-352/02-06, 50-353/02-06

Attachment 1: Supplemental Information
Attachment 2: Observations from MSPI Pilot Verification (TI 2515/149)

cc w/encl.: Senior Vice President, Mid-Atlantic Regional Operating Group
President and CNO, Exelon Nuclear
Senior Vice President - Nuclear Services
Vice President - Mid-Atlantic Operations Support
Chairman, Nuclear Safety Review Board
Director - Licensing, Mid-Atlantic Regional Operating Group
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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos:	50-352; 50-353
License Nos:	NPF-39, NPF-85
Report No:	50-352/02-06, 50-353/02-06
Licensee:	Exelon Generation Company, LLC
Facility:	Limerick Generating Station, Units 1 and 2
Location:	Evergreen and Sanatoga Roads Sanatoga, PA 19464
Dates:	September 29, 2002 through December 28, 2002
Inspectors:	A. Burritt, Senior Resident Inspector B. Welling, Resident Inspector P. Bonnett, Project Engineer E. Cobey, Senior Reactor Analyst J. Noggle, Health Physicist G. Smith, Senior Physical Security Inspector J. Talieri, Reactor Inspector H. Williams, Operations Engineer A. Blamey, Senior Operations Engineer
Approved by:	Mohamed Shanbaky, Chief Projects Branch 4 Division of Reactor Projects

SUMMARY OF FINDINGS

IR 05000352-02-06, IR 05000353-02-06; Exelon Generation Company; 09/29-12/28/2002; Limerick Generating Station, Units 1 and 2; Operability Evaluations.

This inspection was conducted by resident inspectors, a project engineer, a senior reactor analyst, a health physicist, a reactor inspector, a security specialist, and an operations engineer. The inspection identified one Green finding. 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 Nuclear Regulatory Commission (NRC) management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

A. Inspector Identified Findings

Cornerstone: Mitigating Systems

- **Green.** The inspectors identified a finding of very low safety significance because the work order for preventive maintenance on the 10 Bus transformer load tap changer was deficient, in that, it did not address the impact on operations as required by Exelon procedures. This led to unplanned inoperability of the offsite power source.

  This finding was determined to be of very low safety significance by the Reactor Inspection Findings for At-Power Situations Significance Determination Process because it did not result in an actual loss of safety function of a system or train, and it did not screen as risk significant due to a seismic, fire, flooding, or severe weather initiating event. (Section 1R15)

Report Details

Summary of Plant Status

Units 1 and 2 began this inspection period operating at 100% power and remained at or near that power level except for brief periods of planned testing and control rod pattern adjustments.

1. REACTOR SAFETY [Reactor - R]
Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R01 Adverse Weather Protection (71111.01)

a. Inspection Scope

The inspectors reviewed the station's winter readiness preparations, toured the emergency diesel generator rooms, and reviewed work activities for the Unit 1 condensate storage tank heating steam. The inspectors verified the adequacy of cold weather protection for key components with these systems. The inspectors referred to the following documents:

- GP-7, Cold Weather Preparation and Operation
- Limerick Winter Readiness Updates
- Exelon Procedure OP-AA-108-109, Seasonal Readiness
- Action Request A1392389

b. Findings

No findings of significance were identified.

1R04 Equipment Alignment (71111.04)

.1 Partial Walkdowns

a. Inspection Scope

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 system 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. The partial walkdowns included the following systems:

- Unit 1 "A" residual heat removal (RHR) system, while the Unit 1 "C" RHR system was out of service for scheduled preventive maintenance
- Unit 1 "B" / 1 "D" RHR system, while the Unit 1 "C" RHR system was out of service for scheduled preventive maintenance
- Unit 2 "B" RHR system, while the Unit 2 "A" RHR system was out of service for scheduled preventive maintenance

The inspectors reviewed the appropriate system drawings (8031-M-51) and valve line-up procedures (1S51.A COL 1, 2, and 4 Equipment Alignment for Automatic Operation of the RHR System in the LPCI Mode) to walkdown and verify the correct system lineup.

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05)

.1 Tour Plant Areas Important to Reactor Safety

a. Inspection Scope

The inspectors toured high risk areas at Limerick 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 (UFSAR). The following fire areas were inspected:

- Remote Shutdown Room (Fire Area 26)
- Unit 1, Reactor Core Isolation Cooling (RCIC) Room (Fire Area 33)
- Unit 1, High Pressure Coolant Injection (HPCI) Pump Room (Fire Area 34)
- Unit 1, Reactor Enclosure Cooling Water Equipment Area (Fire Area 41)

b. Findings

No findings of significance were identified.

.2 Observe Plant Fire Drill

a. Inspection Scope

The inspector observed an unannounced fire drill in the auxiliary boiler enclosure on November 25, 2002. The inspector evaluated various aspects of the fire brigade response, including use of protective gear and fire fighting equipment, communications with the Main Control Room, and uses of the pre-fire plan procedure. The inspector reviewed the post-drill critique and discussed the results with the fire protection specialist and station management.

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures (71111.06)

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 document review included: (1) administrative, emergency operating, special event, surveillance, and maintenance procedures; (2) technical specifications; and (3) the final safety analysis report. The inspector also performed a walkdown that focused on the relevant components such as flooding instrumentation, watertight doors, and external valve pit inspections. The inspector verified the adequacy of flood mitigation and protection equipment to ensure adequate measures existed to mitigate:

- External flooding
- Internal flooding (Unit 1 and 2 HPCI and RCIC rooms)

The following documents were reviewed:

- Procedure SE-4, Flood
- Procedure SE-4-1, Reactor Enclosure Flooding
- Commitment #T01532
- System drawings 8031-M-116 and 8031- M-131

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification (71111.11)

a. Inspection Scope

On October 16, 2002, the inspector observed an annual exam simulator scenario to assess licensed operator performance and the evaluator's critique. The inspector discussed the results with operators, operations management, and instructors. The inspector referred to simulator scenario documents, LSES-3007 and LSES 5005, and the following off-normal plant procedures and emergency operating procedures:

- T-101, Reactor Pressure Vessel Control
- T-102, Primary Containment Control
- T-103, Secondary Containment Control
- T-112, Emergency Blowdown
- GP-4, Rapid Plant Shutdown
- T-290, Instrumentation for T-103/SAMP-2

An in office review was conducted of licensee requalification exam results for the biennial testing cycle. The inspection assessed whether pass rates were consistent with the guidance of NUREG-1021, Revision 8, Supplement 1 "Operator Licensing Examination Standards for Power Reactors" and NRC Manual Chapter 0609, Appendix

I, “Operator Requalification Human Performance Significance Determination Process (SDP).”

The inspector verified that:

- Crew pass rate was greater than 80%.
- Individual pass rate on the dynamic simulator exam was greater than or equal to 80%.
- Individual pass rate on the walk-through (JPMs) was greater than or equal to 80%.
- Overall pass rate among individuals for all portions of the exam was greater than or equal to 75%.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness (71111.12)

a. Inspection Scope

The inspectors evaluated the follow-up actions for selected system, structure, or component (SSCs) 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. The following issues were reviewed:

.1 2G-V210 RHR Unit Cooler - failure to start

- Action Request A1388910
- Condition report 00129359
- Maintenance Rule Basis Document for Reactor Enclosure HVAC Unit Coolers
- Semiannual Overview (10/1/02) for Reactor Enclosure HVAC and SGTS
- System Health Improvement Plant Summary Report, October 2002
- Work Orders over two-year period for Unit Coolers 2A-V210-DR through 2H-V210-DR

.2 1A RPS/UPS Inverter - failure to synchronize

- Action Request A1392605

b. Findings

No findings of significance were identified.

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

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 management 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 field walk-downs to verify whether the compensatory measures identified by the risk assessments were appropriately performed.

The inspectors reviewed the Sentinel on-line risk assessment results, risk management activities, work control center planning and scheduling, and emergent work-related activities. The selected maintenance activities included:

Planned Work

- Unit 2 "A" residual heat removal system outage
- Unit 1 "C" residual heat removal system outage
- Unit 1 "B" residual heat removal system outage
- 10 Bus (Offsite Power Source) maintenance
- Unit 1 high pressure coolant injection system outage with cooling tower degradation/ leakage

Emergent Equipment Problems

- Unit 1 "A" reactor protection system inverter

b. Findings

No findings of significance were identified.

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

a. Inspection Scope

The inspectors observed licensed operator performance in the control room for a non-routine plant evolution for de-energizing the 1A RPS Inverter. The inspectors referred to the following documents:

- SP-211, "De-energize and Re-energize 1A-Y160 to Bypass 1A RPS UPS Inverter"
- E-1AY160, "Loss of 1A RPS UPS Power

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15)

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. The issues reviewed included:

.1 HPCI Operability and Flow Controller

- Action Requests A1390925, A1385905, and Condition Report (CR) 123874
- Troubleshooting Failure Mode/Cause Table
- Lab Report for Woodward Controller
- Retraction of Determination of Inoperable Condition
- Section 6.3 of UFSAR
- Inst. Calc. Sheets for HPCI Speed Control and HPCI Ramp Gen. Signal Converter
- Work Order C0202794

.2 Unit 2 "C" RHR Pump Motor Oil Cooler

- Action Request A1375748, and CR 115030
- Section 6.3 of the UFSAR

.3 Unit 2 Scram Discharge Volume Solenoid

- Action Request A1393066

.4 Offsite Power Source Inoperable

The inspectors reviewed the events related to the unplanned inoperability of the 10 Startup Bus offsite power source during preventive maintenance activities that manipulated the load tap changer on November 5, 2002. The startup bus load tap changers are among the components included in the scope of the offsite power source required to transmit power from the offsite transmission network to the vital buses. The bases for Technical Specification 3.8.1 specifically state that the load tap changers are to be in service and in automatic operation. The inspectors discussed this issue with operations, maintenance, and engineering personnel and reviewed the following documents:

- Operator log entries for November 5, 2002
- Maintenance Work Order R0818016
- Condition Reports 130448, 131935
- Exelon Procedure MA-MA-716-010-1005, Work Order Planning Process
- Exelon Procedure OP-AA-108-104, Technical Specification Compliance

b. Findings

Introduction

The inspectors identified a finding of very low safety significance (Green) because the work order for preventive maintenance on the 10 Bus transformer load tap changer was deficient, since it did not address the impact to operations as required by Exelon procedures. This led to unplanned inoperability of the offsite power source.

Description

On November 5, 2002, instrumentation and controls technicians performed a calibration of the 10 bus transformer load tap changer that included placing the tap changer in the manual position. Prior to the start of the job, the technicians and the control room supervisor reviewed the work order (R0818016) and incorrectly concluded that the offsite source remained operable, per Technical Specification 3.8.1, because the work order did not state the task affected system operability. Later, about 20 minutes after the load tap changer was placed in manual, the operations work control supervisor and the control room supervisor reviewed the bases for Technical Specification 3.8.1 and determined that the offsite source was inoperable. Subsequently, they directed that the load tap changer be placed back in automatic.

Exelon procedure MA-MA-716-010-1005, “Work Order Planning Process,” states that “work order activities shall address the impact to Operations.” The work order for this maintenance activity was deficient since it did not explicitly state that the tap changer would be placed in manual and the offsite power source would be inoperable. Consequently, the work order was approved and work started that resulted in the offsite source being in an unplanned inoperable condition. Exelon investigated the cause of this event and determined that the maintenance work order documents should have

been updated based on an engineering change associated with a Technical Specifications change approved in August 2000. Exelon concluded that the follow-up actions for the engineering change were untimely.

Analysis

The unplanned inoperability of the offsite power source involved a performance deficiency since the work order did not address the impact on operations as required by Exelon procedures. Traditional enforcement does not apply, because the issue did not have any actual safety consequences or potential for impacting the NRC's regulatory function and was not the result of any willful violation of NRC requirements or Exelon procedures. The finding was considered more than minor, in that, the issue was associated with the Configuration Control attribute of the Mitigating Systems cornerstone, and it affected the cornerstone objective. The Mitigating System cornerstone objective was affected because the unplanned inoperability of the offsite power source would impact the reliability of the vital buses to carry mitigating systems loads using offsite power under certain postulated events, such as a partial loss of offsite power and loss of coolant accident. This finding was determined to be of very low safety significance (Green) by Phase 1 of the Reactor Inspection Findings for At-Power Situations Significance Determination Process because it did not result in an actual loss of safety function of a system or train, and it did not screen as risk significant due to a seismic, fire, flooding, or severe weather initiating event.

Enforcement

The inspectors concluded that the performance deficiency discussed above did not constitute a violation of regulatory requirements because the maintenance and work order planning activities were not on safety related components. Additionally, the inspectors identified no violations of 10 CFR 50.65, Maintenance Rule, related to these activities. This issue is documented in Exelon's corrective action program as Condition Reports (CR) 130448 and 131935. **(FIN 50-352/02-06-01)**

1R19 Post Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors reviewed the effectiveness of maintenance and 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 the 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 maintenance activities reviewed included:

- Unit 2 HPCI repairs
- Unit 1 HPCI repairs

- 2A RHR vent valve repairs
- 1C RHR preventive maintenance

The inspectors referred to testing procedures and work order documents, including:

- ST-6-051-223-1, 1C RHR Pump, Valve, and Flow Test
- Action Request A1397235
- Work Order C0202633

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors reviewed and observed portions of 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. The surveillance tests included:

- ST-2-051-106-1, Unit 1, Div. II RHR Logic System Functional Test

b. Findings

No findings of significance were identified.

1R23 Temporary Plant Modifications (71111.23)

a. Inspection Scope

The inspector reviewed the following temporary changes:

- Installation of a recorder on the Unit 1 “C” reactor feed pump speed control circuitry
- Unit 1 “A” main control room chiller jumpers
- Unit 2 emergency service water (ESW) pipe support
- Installation of a Unit 2 main turbine thrust bearing wear detector jumper assembly

The inspector verified that the temporary changes 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. The inspectors compared the actual installations against the temporary modification documents to verify that the implemented changes were consistent with the approved documents.

Documents Reviewed

- Engineering change request (ECR) LG 02-00362-000
- ECR LG 02-00456-000 with Attachments 1, 2, 3, and 4
- ECR LG 02-00480-000
- Action Requests A1376922 and A1389925
- Work order M1389925

b. Findings

No findings of significance were identified.

EMERGENCY PREPAREDNESS [EP]

1EP6 Drill Evaluation (71114.06)

a. Inspection Scope

The inspectors observed the Emergency Preparedness drill on December 10, 2002, at the Technical Support Center (TSC) and the main control room simulator. The inspectors reviewed the scenario to identify the timing and location of classification, notification and Protective Action Recommendation (PAR) development activities and for Exelon expectations of response. During the drill, the inspector's reviewed checklists and forms used for classification, notification and PAR development activities.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES [OA]

4OA1 Performance Indicator Verification (71151)

a. Inspection Scope

The inspectors reviewed the accuracy and completeness of the supporting data for the following Limerick performance indicators. The data was compared against the criteria contained in Nuclear Energy Institute (NEI) 99-02, Regulatory Assessment Performance Indicator Guideline, Revision 2, to verify that all conditions that met the NEI criteria were recognized, correctly identified, and recorded in the Performance Indicators.

- RCIC Unavailability (July 2001 to September 2002)
- HPCI Unavailability (July 2001 to September 2002)
- RHR Unavailability (October 2001 to September 2002)
- Safety System Functional Failures October 2001 to September 2002)
- Reactor Coolant System (RCS) Activity (October 2001 to September 2002)
- RCS Leakage (October 2001 to September 2002)
- Emergency AC Power (October 2001 to September 2002)

- Radiological Effluents (RETS/ODCM) (October 2001 to September 2002)

The inspector reviewed the following documents to ensure Exelon correctly identified all of the radiological effluent performance indicator occurrences:

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
associated procedures.

- Occupational Exposure (October 2001 to September 2002)

The inspector reviewed the following documents and data, against the specified criteria:

radiological controlled area personnel exit dose data;
dosimetry evaluation reports pertaining to the applicable time period;
technical specification high radiation area violations for occurrences involving locked high radiation areas, very high radiation areas, and unplanned personnel exposures;
and associated procedures.

b. Findings

No findings of significance were identified.

.1 Limerick Units 1 and 2, TI 2515/149, "Mitigating Systems Performance Index (MSPI) Pilot Verification"

a. Inspection Scope

The inspectors and the Region I Senior Reactor Analyst performed the Temporary Instruction (TI) 2515/149 MSPI pilot verification audit during the week of November 18, 2002. MSPI data and supporting information for the following systems were reviewed:

Unit 1: Heat Removal System (Reactor Core Isolation Cooling System)
Cooling Water Support Systems

Unit 2: Emergency AC Power System
Cooling Water Support Systems

The inspection included interviews with Exelon risk analysts and engineers, and reviews of various documentation, including operating logs, maintenance records, condition reports, system drawings, and probabilistic risk information.

b. Findings

No findings of significance were identified. Observations are documented in Attachment 2 and were discussed with Exelon following the audit.

4OA2 Problem Identification and Resolution (71152)

a. Inspection Scope

Selected Issue Follow-up Inspection - Plant Page System Problems

The inspectors reviewed several condition reports and maintenance action requests related to degraded conditions of the plant page (onsite public address) system. The plant page system is an important part of the on-site communications systems used for station emergencies and personnel evacuation.

During 2000 and 2001, the station documented at least eight instances of plant page system problems, inaudible plant announcements, or the need for formal testing of the public address system. Some of these items involved multiple speakers or areas.

In November 2002, Exelon evaluated the condition of the plant page system, when they performed the first comprehensive test of the system. At this time, they found approximately one-third of the plant page speakers inaudible. It took two years to fully evaluate and understand the extent of the degraded conditions. Once the system deficiencies were identified, Exelon addressed the speaker problems in a timely manner. They also determined that the ability to accomplish a station evacuation was not adversely affected due to sufficient overlap between the plant page system and site evacuation alarms in the areas affected by the degraded speakers.

b. Findings

No findings of significance were identified.

4OA3 Event Follow-Up (71153)

.1 LER 1-02-004 - Reactor Enclosure Recirculation System Inoperable

Unit 1 Reactor Enclosure Recirculation System Train Potentially Inoperable for a Period Exceeding the Technical Specifications Allowed Outage Time. The inspectors reviewed the LER and identified no findings of significance. The issue is documented in Condition Report 120325. It constituted a violation of minor significance that is not subject to enforcement action in accordance with Section IV of the NRC Enforcement Policy. This LER is closed.

4OA5 Other Activities

a. Inspection Scope

An audit of Exelon's performance of the interim compensatory measures imposed by the NRC's Order Modifying Licensee, issued February 25, 2002, was completed in accordance with the specifications of NRC Inspection Manual Temporary Instruction 2515/148, Revision 1, Appendix "A," dated September 13, 2002.

b. Findings

No findings of significance were identified.

4OA6 Meetings, Including Exit

.1 Exit Meetings

The inspectors presented the inspection results to Mr. W. Levis and other members of station management on January 7, 2003.

The inspectors asked Exelon whether any materials examined during the inspections should be considered proprietary. No proprietary information was identified.

Attachment 1

SUPPLEMENTAL INFORMATION

a. Key Points of Contact

Exelon Generation Company

R. Braun	Plant Manager
E. Callan	Director - Operations
W. Harris	Radiation Protection Manager
W. Levis	Site Vice President
C. Mudrick	Director - Engineering
J. Perry	Director - Maintenance
J. Stone	Director - Outage Management

b. List of Items Opened, Closed, and Discussed

Opened

None

Closed

LER 1-02-004	Reactor Enclosure Recirculation System Inoperable

Opened and Closed

FIN 50-352/02-06-01	Unplanned Inoperability of Offsite Power Source

c. List of Acronyms

AR	Action Request
CFR	Code of Federal Regulations
CR	Condition Report
ECR	Engineering Change Request
EDG	Emergency Diesel Generator
F-V/UR	Fussell-Vesely Unreliability Factor
UFSAR	Updated Final Safety Analysis Report
HPCI	High Pressure Coolant Injection
HVAC	Heating, Ventilation, Air Conditioning
LER	Licensee Event Report
MSPI	Mitigating Systems Performance Index
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
PAR	Protective Action Recommendation
PRA	Probabilistic Risk Assessment

RCIC	Reactor Core Isolation Cooling
RCS	Reactor Coolant System
RHR	Residual Heat Removal Service Water
SDP	Significance Determination Process
SSCs	System, Structure, or Component
TI	Temporary Instruction
UFSAR	Updated Final Safety Analysis Report

Attachment 2

Results of TI 2515/149 MSPI Pilot Verification - Limerick 1 and 2

Inspection Requirements

The inspectors performed Temporary Instruction (TI) 2515/149, "Mitigating Systems Performance Index (MSPI) Pilot Verification," at Limerick on November 18 through 22, 2002. The inspectors verified the MSPIs for the reactor core isolation cooling (RCIC) system and the cooling water support systems on Unit 1 and the emergency AC power system and the cooling water support systems on Unit 2. The results were as follows (paragraph numbers correspond to the inspection requirements sections of TI 2515/149).

03.02 Risk Significant Functions

Exelon correctly identified the risk significant functions for the selected systems. However, the MSPI basis documentation did not include all of these functions. The inspectors noted the following specific examples.

- The basis document only included the RCIC inventory control function. It did not include the decay heat removal function as required by the MSPI guidance.

- The basis document for the cooling water support systems specified that the function of the emergency service water (ESW) system included cooling the residual heat removal (RHR) unit coolers and only applied to the A and B RHR pumps contrary to the MSPI guidance. Specifically, unit coolers are not within the scope of the MSPI. ESW is needed to cool the C and D RHR pumps, which are MSPI monitored components.

03.03 Success Criteria

Exelon had not identified a complete list of parameter-based success criteria for the monitored systems. The inspectors noted the following specific examples.

- For the emergency AC power system, the success criterion was to start and load. The parameter success criteria that would be used to determine whether or not the start and load were successful (e.g., voltage, frequency, KW loading, response time, etc.) had not been identified.

- For the RCIC system, parameter success criteria had not been identified for the condensate storage tank level, and valve stroke times, etc.

In addition, some of the parameter success criteria that Exelon had identified were apparently incorrect. The inspectors noted the following specific examples.

- For the ESW system, the flow rate needed to cool an emergency diesel generator (EDG) was 450 gallons per minute; however, the flow rate needed to cool an EDG could be as high as 610 gallons per minute. Therefore, a higher ESW flowrate for each EDG should have been used.
- For the RCIC system, the mission time was identified as eight hours; however, the

licensee's probabilistic risk assessment (PRA) assumed that the RCIC system was needed for 24 hours in some accident scenarios. Therefore, the mission time used for the MSPI should have been 24 hours.

- The RCIC flow success criterion was 295 gallons per minute. This flow was based on the flow needed to mitigate a small break Loss of Coolant Accident. However, Exelon was unable to demonstrate that this was the limiting scenario for which RCIC was credited. Therefore, the flow required to mitigate other initiating events where RCIC was credited (e.g., inadvertent opening of a relief valve or an anticipated transient without scram, etc.) may be larger.

- The MSPI guidance states that mission times of less than 24 hours can be used provided that they are justified by analysis and are modeled in the PRA. The Exelon assumed a mission time of six hours for the emergency AC power system. The six-hour mission time was selected using engineering judgement accounting for competing factors, the running failure rate of the EDGs and the recovery of AC power. While there is no specified methodology for determining mission times, the American Society of Mechanical Engineers (ASME) Standard RA-S-2002, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," states, in part, that mission times for individual systems, structures, and components (SSCs) that function during accident sequences may be less than 24 hours as long as an appropriate set of SSCs and operator actions are modeled to support full sequence mission time. Because there are losses of offsite power accident sequences that rely solely on the EDGs for up to 24 hours (e.g., weather related loss of offsite power events), this standard implies that a 24-hour mission time should be used for the emergency AC power system.

There were differences between the functional success criteria for the MSPI, Exelon's PRA, the NRC's Standardized Plant Analysis Risk (SPAR) model, and the NRC's significance determination process (SDP) notebook. The inspectors noted the following specific examples.

- Exelon's PRA did not explicitly specify functional success criteria for the emergency AC power system. Both the SPAR model and the SDP notebook assumed success given any one of four EDGs per unit performed their function. However, this did not correctly account for asymmetries in the electrical distribution system. Apparently, the emergency AC power system is successful if either the A or B EDG is available or the C or D EDG is available and the operators successfully crosstie required loads.

- Exelon's PRA has a dependency for successful RCIC/high pressure coolant injection (HPCI) operation on subsequent low pressure injection in an inadvertent opening of a relief valve event to fulfill the inventory control function for 24 hours. The SDP notebook logic assumed that RCIC alone would fulfill the inventory control function for 24 hours.

- Exelon's PRA credited RCIC in some but not all anticipated transient without scram (ATWS) events; however, the SDP notebook credited RCIC in all ATWS events.

03.04 Boundary Definitions

Exelon did not include all required active components for the monitored train or system in the MSPI calculation. The inspectors noted the following specific examples.

- The RCIC suction valves from the condensate storage tank (CST) and the suppression pool were not included as active components. These valves should have been included because the auto-transfer from the CST to the suppression pool was needed to fulfill the RCIC function.

- The RCIC minimum flow valve was not included as an active component; however, the valve opened upon the start of the pump and closed once pump discharge flow exceeded 150 gallons per minute. In the event that the valve did not close, the RCIC system would have not been able to fulfill its function. Therefore, it should have been treated as an active component. In addition, Exelon's PRA did not model the RCIC minimum flow valve; consequently, Exelon did not have a Fussell-Vesely (F-V) importance measure for the valve to be used in the MSPI calculation.

- The spray pond inlet valves (HV-012-032A/B/C/D) were not included as active components in the cooling water support system performance indicator; however, these valves should have been included because they were required to reposition open upon the start of the ESW or residual heat removal service water (RHRSW) systems.

- Exelon incorrectly included the RHR heat exchanger RHRSW inlet and outlet isolation valves in the cooling water support system performance indicator instead of the RHR performance indicator. The MSPI guidance specifies that the last valve which connects the cooling water support system (RHRSW) to the other monitored system (RHR) is included in the other monitored system (RHR).

03.05 Train/Segment Unavailability Boundary Definition

No discrepancies were noted.

03.06 Entry of Baseline Data - Planned Unavailability

No discrepancies were noted.

03.07 Entry of Baseline Data - Unplanned Unavailability

No discrepancies were noted.

03.08 Entry of Baseline Data - Unreliability

No discrepancies were noted.

03.09 Entry of Performance Data - Unavailability

Exelon made some minor data entry errors. For example, the MSPI quarterly critical hours' data differed slightly from the critical hours reported in the Scrams per 7000 Critical Hours PI. Also, the unavailability baseline data for the cooling water support system (RHRSW) was not

correctly entered into the spreadsheet due to some recent changes in Exelon's accounting for system unavailability.

03.10 Entry of Performance Data - Unreliability

No discrepancies were noted.

03.11 MSPI Calculation

The MSPI F-V coefficients were not able to be verified against Exelon's PRA that was qualified for use by the staff because Exelon had not identified all of the F-V coefficients and the staff had not qualified Exelon's PRA.

Incorrect F-V values were used for several components (e.g., B and D ESW pumps and B ESW loop unavailability).

Exelon did not include all of the failure modes of the super components (e.g., RCIC turbine-driven pump) in the evaluation to determine the limiting F-V/UR ratio for the super component. For example, the RCIC pump cooling water valve (MOV-046) was included within the boundary of the RCIC turbine-driven pump. However, the valve was treated as an independent component within Exelon's PRA. In accordance with the MSPI guidance, the F-V/UR ratio that is used in the MSPI calculation is the maximum F-V/UR ratio for each of the basic events that fail the train. In this particular case, the F-V/UR ratio for the valve was greater than the ratios of the basic events that had been evaluated.

The F-V coefficients for the A loop ESW pump trains were zero because of Exelon's PRA truncation value, whereas the F-V coefficients for the B loop pump trains were greater than zero. This was attributable to inconsistencies with Exelon's modeling of the ESW loops within their PRA.

General Comments

The MSPI for the emergency AC power system required approximately 50 failures over the three-year period covered by the indicator before the Green/White threshold would have been crossed. This result was not consistent with the MSPI being capable of discerning significant departures from expected performance that warranted additional attention.