



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

December 23, 2010

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

SUBJECT: LIMERICK GENERATING STATION - NRC PROBLEM IDENTIFICATION  
AND RESOLUTION INSPECTION REPORT 05000352/2010007 AND  
05000353/2010007

Dear Mr. Pacilio:

On November 19, 2010, the U. S. Nuclear Regulatory Commission (NRC) completed an inspection at your Limerick Generating Station Units 1 and 2. The enclosed report documents the inspection results, which were discussed on November 19, with Mr. W. Maguire and other members of your staff.

This inspection was an examination of activities conducted under your license as they relate to the identification and resolution of problems and compliance with the Commission's rules and regulations and the conditions of your license. Within these areas, the inspection involved examination of selected procedures and representative records, observations of activities, and interviews with personnel.

The inspectors concluded that Exelon was generally effective in identifying, evaluating, and resolving problems. Limerick personnel identified problems and entered them into the corrective action program at a low threshold. Exelon prioritized and evaluated issues commensurate with the safety significance of the problems and corrective actions were generally implemented in a timely manner.

This report documents one Severity Level IV non-cited violation and one NRC-identified finding of very low safety significance (Green). The two findings were determined to involve violations of NRC requirements. However, because each violation was of very low safety significance and because they were entered into your corrective action program, the NRC is treating these findings as non-cited violations (NCVs), in accordance with Section 2.3.2 of the NRC's Enforcement Policy. If you deny any of these NCVs, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C., 20555-0001, with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C., 20555-0001; and the NRC Resident Inspector at the Limerick Generating Station. In addition, if you disagree with the cross-cutting aspect assigned to any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region I, and the NRC Resident Inspector at Limerick Generating Station.

M. Pacilio

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



*Paul G. Krohn*  
*for via email*

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

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

Enclosure: Inspection Report 05000352/2010007 and 05000353/2010007  
w/Attachment: Supplemental Information

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M. Pacilio

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Sincerely,  
/RA by Raymond J. Powell Acting For/

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

Docket Nos: 50-352, 50-353  
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**U.S. NUCLEAR REGULATORY COMMISSION****REGION I**

Docket Nos: 50-352, 50-353

License Nos: NPF-39, NPF-85

Report No: 05000352/2010007 and 05000353/2010007

Licensee: Exelon Generation Company, LLC

Facility: Limerick Generating Station, Units 1 & 2

Location: Sanatoga, PA 19464

Dates: November 1-5 and 15-19, 2010

Inspectors Leader: G. Scott Barber, Senior Project Engineer, Division of Reactor Projects

Inspectors: Carey Bickett, Senior Project Engineer, Division of Reactor Projects  
Jeffrey Bream, Project Engineer, Division of Reactor Projects  
Richard Montgomery, Reactor Engineer, Division of Reactor Projects

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

Enclosure

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## SUMMARY OF FINDINGS

IR 05000352/2010007 and 05000353/2010007; 11/01/2010 - 11/19/2010; Limerick Generating Station Units 1 & 2 (LIM); Biennial Baseline Inspection of the Identification and Resolution of Problems (PI&R). Two violations were identified with respect to the implementation of the corrective action program (CAP).

This NRC inspection was performed by four regional inspectors. One Severity Level IV non-cited violation (NCV) and one finding of very low safety significance (Green) were identified during this inspection. Both findings were classified as non-cited violations (NCVs). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using NRC Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. Cross-cutting aspects associated with findings are determined using IMC 0310, "Components Within the Cross-Cutting Areas." The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

### Identification and Resolution of Problems

Overall, Exelon's program for identification and resolution of problems was evaluated to be generally effective. The inspectors concluded that Exelon was generally effective in identifying, evaluating, and resolving problems. Exelon personnel identified problems, entered them into the corrective action program at a low threshold, and prioritized issues commensurate with their safety significance. In most cases, Exelon appropriately screened issues for operability and reportability, and performed causal analyses that appropriately considered extent of condition, generic issues, and previous occurrences. The inspectors also determined that Exelon typically implemented corrective actions to address the problems identified in the corrective action program in a timely manner. However, the inspectors identified two violations of NRC requirements, both in the area of effectiveness of corrective actions which involved failure to update the final safety analysis report and unreliable residual heat removal unit cooler operation.

The inspectors concluded that, in general, Exelon adequately identified, reviewed, and applied relevant industry operating experience to Limerick Generating Station (Limerick) operations. In addition, based on those items selected for review, the inspectors determined that Exelon's audits and self-assessments were thorough.

Based on the interviews the inspectors conducted over the course of the inspection, observations of plant activities, and reviews of individual corrective action program and employee concerns program issues, the inspectors did not identify any indications that site personnel were unwilling to raise safety issues nor did they identify any conditions that had a negative impact on the site's safety conscious work environment.

### **Cornerstone: Mitigating Systems**

Severity Level IV. The inspectors identified a Severity Level IV (SLIV) NCV of 10 CFR Part 50.71(e) in that Exelon failed on multiple occasions to revise the Updated Final Safety Analysis Report (UFSAR) with information consistent with plant conditions. Specifically, Exelon personnel failed to incorporate four previously identified UFSAR inconsistencies into the September 2010 UFSAR update as required.

The inspectors determined that the failure to update the UFSAR in accordance with 10 CFR 50.71(e) was a performance deficiency that was reasonably within Exelon's ability to foresee and correct, and should have been prevented. Because the issue had the potential to affect the NRC's ability to perform its regulatory function, the inspectors evaluated this performance deficiency in accordance with the traditional enforcement process. Using example 6.1.d.3 from the NRC Enforcement Policy, the inspectors determined that the violation was a SLIV (more than minor concern that resulted in no or relatively inappreciable potential safety or security consequence) violation, because the information that was not updated in the UFSAR was not used to make an unacceptable change in the facility nor did it impact a licensing or safety decision by the NRC. (Section 40A2.1.c.(1))

Green. The inspectors identified a violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," in that Exelon failed to correct a condition adverse to quality for a safety-related support system that was essential to successful mitigating system operation. Specifically, for a six and one half day period during July 2008, three of four residual heat removal unit coolers were either unavailable or made unreliable due to a series of planned and unplanned conditions (silting).

The inspectors determined that the failure to correct a condition adverse to quality in accordance with 10 CFR 50 Appendix B, Criterion XVI, during the timeframe of June 1, 2008 to September 14, 2008, contributed to the unreliability of the 1C-V210 unit cooler and was a performance deficiency. Specifically, Exelon did not initiate bi-weekly flushing per RT-6-011-603-0 of the 1C-V210 unit cooler to minimize the effects of silt build up. This finding is more than minor because it affected the equipment performance attribute of the Mitigating System cornerstone and the associated cornerstone objective of ensuring the reliability and availability of systems that respond to initiating events to prevent undesirable consequences. This issue was also similar to example 3.j. in NRC IMC 0612, Appendix E, "Examples of Minor Issues," in that it resulted in a condition where there was a reasonable doubt on the operability of the 1C-V210 unit cooler. The inspectors assessed this finding in accordance with IMC 0609, Attachment 4, Phase 1, "Initial Screening and Characterization of Findings," and determined that it was of very low safety significance (Green) since it was determined that the error did not result in a loss of the system's safety function.

The inspectors determined that this violation had a cross-cutting aspect in the area of Problem Identification and Resolution, Corrective Action Program, in that Exelon did not take appropriate corrective actions to address a condition adverse to quality in a timely manner, commensurate with its safety significance and complexity. Specifically, Exelon failed to take appropriate actions to initiate bi-weekly flushes of the 1C-V210 unit cooler, upon discovery of conditions conducive to silt buildup during June through September 2008. [P.1 (d)] (Section 40A2.1.c.(2))

**REPORT DETAILS****4. OTHER ACTIVITIES (OA)****4OA2 Problem Identification and Resolution (PI&R) (Biennial - 71152B)****.1 Assessment of the Corrective Action Program (CAP)****a. Inspection Scope**

The inspectors reviewed the procedures that describe Exelon's CAP at Limerick. Exelon identified problems for evaluation and resolution by initiating issue reports (IRs) that were entered into the condition reporting system. The IRs were subsequently screened for operability, categorized by significance (highest 1 to lowest 5), assigned a level of evaluation (highest A to lowest D), and routed for resolution and/or trending. Issues requiring work were entered into the work request system (PIMS) as action requests (ARs) where they could be developed into work orders (WOs).

The inspectors evaluated the process for assigning and tracking issues to ensure that issues were screened for operability and reportability, prioritized for evaluation and resolution in a timely manner commensurate with their safety significance, and tracked to identify adverse trends and repetitive issues. In addition, the inspectors interviewed plant staff and management to determine their understanding of, and involvement with, the CAP.

The inspectors reviewed IRs selected across the seven cornerstones of safety in the NRC's Reactor Oversight Process (ROP) to determine if site personnel properly identified, characterized, and entered problems into the CAP for evaluation and resolution. The inspectors selected items from functional areas that included operations, maintenance, engineering, emergency preparedness, radiation safety, and oversight programs to ensure that Exelon appropriately addressed problems identified in these functional areas. The inspectors selected a risk-informed sample of IRs that had been issued since the last NRC PI&R inspection conducted in August 2008. The inspectors considered risk insights from the station's risk analyses to focus the sample selection and plant tours on risk-significant systems and components. Inspectors' samples focused on these systems, but were not limited to them. The corrective action review was expanded to five years for evaluation of issues associated with the Emergency Service Water (ESW) system and the Maintenance Rule (MR) Program.

The inspectors reviewed selected documents from other Limerick programs and processes to verify that they were appropriately considered for entry into the CAP. Specifically, the inspectors reviewed a sample of ARs in the work management system, operability determinations, and WOs.

The inspectors reviewed IRs to assess whether Exelon personnel adequately evaluated and prioritized identified problems. The inspectors observed daily IR screening meetings conducted by the Station Oversight Committee (SOC) in which Exelon personnel reviewed new IRs for prioritization and assignment. The issues and IRs reviewed encompassed the full range of evaluations, including root cause analyses (RCAs), apparent cause evaluations (ACEs), and common cause analyses (CCAs). IRs that were assigned lower levels of significance which did not include formal cause

evaluations were also reviewed by the inspectors to ensure they were appropriately classified. The inspectors' review included the appropriateness of the assigned significance, the scope and depth of the causal analysis, and the timeliness of resolution. The inspectors assessed whether the evaluations identified likely causes for the issues and developed appropriate corrective actions to address the identified causes. Further, the inspectors reviewed equipment operability determinations, reportability assessments, and extent-of-condition reviews for selected problems to verify these processes adequately addressed equipment operability, reporting of issues to the NRC, and the extent of problems. The inspectors observed a cross-disciplinary group of Limerick personnel screen newly identified issues at the SOC meetings. The inspectors also observed the Management Review Committee (MRC) meetings during which Exelon managers reviewed corrective action documents, including ACEs and corrective action assignments.

The inspectors reviewed IRs for adverse trends and repetitive problems to determine whether CAs were effective in addressing these broader issues. The selected sample of evaluation products reviewed also included trending reports and CCAs. The inspectors reviewed Exelon's timeliness in implementing corrective actions and effectiveness in precluding recurrence for significant conditions adverse to quality. The inspectors further reviewed IRs associated with selected NCVs and findings to determine whether Exelon personnel properly evaluated and resolved issues. The IRs and other documents reviewed, as well as key personnel contacted, are listed in the Attachment.

b. Assessment

Identification of Issues

The inspectors evaluated Exelon's performance in the area of identification of issues as adequate. Based on the samples selected, the inspectors determined that Exelon personnel consistently identified problems and entered them into the CAP at a low threshold. In most cases, problems were appropriately identified in IRs. The inspectors noted that the SOC routinely assigned some IRs for follow-up due to an insufficient problem description in the IR. The inspectors determined that this was evidence of ineffective issue identification by the IR writers in that many IRs did not contain enough information to properly identify and disposition an appropriate set of actions. However, the inspectors did not identify any issues where incomplete information led to an inappropriate or incomplete corrective action. Alternately, the SOC displayed a high threshold for quality and completeness of documentation by this practice.

Prioritization and Evaluation of Issues

The inspectors evaluated Exelon's performance in the area of prioritization and evaluation of issues as adequate with a few weaknesses being noted. The inspectors determined that, in general, Exelon appropriately prioritized and evaluated issues commensurate with the safety significance of the underlying problems. IRs were adequately screened for operability and reportability, categorized by significance, and assigned to a department for evaluation and resolution. The SOC and MRC considered human performance issues, radiological safety concerns, repetitiveness, and adverse trends during their review of IRs.

Items were generally categorized for evaluation and resolution commensurate with the significance of the issues. Guidance for categorization was sufficiently definitive for consistent implementation. Causal analyses appropriately considered extent-of-condition, generic issues, and previous occurrences. Notwithstanding the generally adequate performance in this area, the inspectors identified two observations that exhibited weaknesses in Exelon's prioritization and evaluation of issues. The first issue was related to use of the "Preliminary Approval" designation for maintenance rule evaluations while the second issue was related to a potentially non-conservative steam leak detection setpoint.

For the first issue, the inspectors observed a Maintenance Rule Expert Panel meeting on November 2, 2010, and noted that Maintenance Rule Expert Panel utilized a "preliminary approval" designation on some maintenance rule program evaluations, such as functional failure determinations, to ensure that the conclusions of these evaluations would agree with the conclusions of corrective action program documents (e.g., apparent cause evaluations and root cause reports). The inspectors determined that this process was not described in Limerick's guidance for implementation of the maintenance rule program. As a result, the station had not documented expectations for use of this designation, including its applicability, limitations, and expected method of resolution. During the inspection, the inspectors did not identify any examples where use of this designation resulted in any violations of regulations or station procedures.

Secondly, IR 958587, "Potentially Non-Conservative Steam Leak Detection Setpoint," discussed an engineering calculation that identified that the High Pressure Coolant Injection (HPCI) differential temperature isolation setpoint value contained in the Technical Specifications was non-conservative. This IR noted that a design basis steam leak of 25 gpm would not have elevated the room temperature such that the room differential temperature would reach the isolation setpoint if the HPCI unit coolers were running. The IR also documented an operability determination, based on an engineering calculation, which concluded that a new HPCI room differential temperature setpoint of 75°F was more appropriate than the Technical Specification allowable value of 126°F. In a subsequent revision, the operability basis contained in the IR was revised to establish a new HPCI room differential temperature setpoint of 104°F. However, the IR did not document the basis for the change in the acceptance criteria, nor was it clear why the change had been made. Through interviews with licensee engineering personnel, the inspectors determined that this subsequent revision reflected a later engineering calculation that was generated to support a permanent Technical Specification change. The revised calculation more accurately modeled the actual plant configuration. The inspectors determined that while the identified deficiency was appropriately evaluated, the level and rigor of documentation in the IR was not commensurate with the safety significance. The inspectors concluded that this discrepancy did not constitute a violation of NRC regulations or station procedures.

#### Timely and Effective Corrective Actions (CAs)

The inspectors evaluated Exelon's performance in the area of timely and effective CAs to be acceptable; however, two findings and one observation were identified. The inspectors noted that CAs for identified deficiencies were typically timely and adequately implemented. The inspectors also concluded that Exelon conducted in-depth effectiveness reviews for significant issues to determine if the CAs were effective in resolving the issue. For significant conditions adverse to quality, the inspectors noted that Exelon's actions were comprehensive and thorough and generally successful at

preventing recurrence. Notwithstanding the overall adequate performance in this area, the inspectors identified the following observation that constituted a weakness in Exelon's timely and effective corrective actions related to the (a)(1) Action Plan for Unit 2 Instrument Air Compressors.

Specifically, the inspectors noted that Exelon placed the Unit 2 instrument air system in (a)(1) status on June 4, 2010, per 10 CFR 50.65, due to exceeding the performance criteria for unavailability hours. The Maintenance Rule Expert Panel preliminarily approved the (a)(1) action plan on September 7, 2010, and all of the actions specified in the plan were completed with one exception. The remaining action involved receiving Plant Health Committee approval for a modification to address excessive turbine enclosure cooling water temperature variations for the instrument air compressors. This modification would enable operation of the compressors in the vendor-recommended temperature range. Operation of the compressor at too low of a temperature could eventually result in damage to, and subsequent failure of, the compressor. This mode of failure is more likely during colder weather when circulating water temperatures are lower. The inspectors noted that the station had yet to consider the need for any interim actions in the event the modification was not completed prior to the winter season. Additionally, the inspectors noted that there have not been any additional failures of the Unit 2 instrument air compressors since the system was placed in (a)(1) status. The inspectors did not identify any violations of regulations or station procedures associated with this issue.

c. Findings

(1) Failure to Update the UFSAR Consistent with Plant Conditions as Required

Introduction: The inspectors identified a Severity Level IV (SLIV) Non-Cited Violation (NCV) of 10 CFR Part 50.71(e) in that Exelon failed, on multiple occasions, to revise the UFSAR with information consistent with plant conditions. Specifically, Exelon personnel failed to incorporate four previously identified UFSAR inconsistencies into the September 2010 UFSAR update as required.

Description: The inspectors determined that the four IRs described below represented examples where Exelon did not implement UFSAR changes as required by 10 CFR 50.71(e). Exelon IR 864180, written in January 2009, identified that UFSAR section 6.4.4.2.3 described an offsite compressor for self-contained breathing apparatus (SCBA) replenishment that did not exist. The UFSAR described that the bottled air supply offsite replenishment was provided by compressors located at the Peach Bottom Atomic Power Station (PBAPS). However, the IR identified that PBAPS compressors were removed from service and that Limerick had a contract in place with a third party contractor to fulfill the requirement for a 30 cylinder per hour refill capacity.

Exelon IR 921398 identified that the description of the operation of plant heating steam contained in UFSAR sections 9.4.2.1.2.4 and 9.4.4.5 was inconsistent with plant operation. UFSAR section 9.4.2.1.2.4 described the normal operation of the reactor enclosure output of the steam heating coils as off-on, with face and bypass control. UFSAR section 9.4.4.5 described Turbine Enclosure heating, ventilation, and air conditioning instrumentation that will automatically open steam heating coils. However, the IR identified that due to equipment issues, the automatic operation of these systems was discontinued and that heating steam was manually throttled around the automatic valves using bypass valves to regulate plant heating.

Exelon IR 984331 identified that the values for nitrogen-16 concentrations contained in UFSAR tables 11.1-4 and 12.2-4 were not updated following the implementation of the Hydrogen Water Chemistry (HWC) modification. UFSAR tables 11.1-4 and 12.2-4 listed nitrogen-16 concentrations of  $4.0E+01$   $\mu\text{Ci/g}$  for reactor water and  $5.0E+01$   $\mu\text{Ci/g}$  for steam, without the implementation of HWC. However, the IR identified that based on HWC addition, a General Electric-Hitachi calculation applies an adjustment factor resulting in concentrations of  $4.8E+01$   $\mu\text{Ci/g}$  and  $2.5E+02$   $\mu\text{Ci/g}$  for reactor water and steam, respectively. IR 984331 was initially identified in October 2009; however, the processing of the necessary UFSAR change was incorporated into the power uprate project as opposed to being assigned separately. Therefore, the necessary actions were not completed until after the cutoff date for inclusion in the September 2010 UFSAR revision.

Exelon IR 1043794 identified that UFSAR section 8.2.1.2 described testing of the 220 kV and 500 kV substation control batteries that was not performed by Limerick personnel as described in the UFSAR. The IR identified that the batteries were owned and maintained by PECO; and that Limerick had no active commitment to perform the testing as described in the UFSAR. The IR writer determined that the battery testing and maintenance referenced in the UFSAR should be removed in order to reflect plant conditions consistent with the UFSAR. IR 1043794 was identified in March 2010; however, the completion date was assigned past the cutoff date for inclusion in the September 2010 UFSAR revision.

Exelon procedure LS-AA-107, "UFSAR Update Procedure," describes the process by which plant personnel identify necessary changes to the UFSAR. The inspectors identified that the procedure did not identify a timeliness requirement for the completion of change packages for identified UFSAR discrepancies. 10 CFR 50.71(e) requires UFSAR revisions to reflect all changes made up to 6 months prior to the date of filing the revision. In each of the items above, the discrepancy between plant configuration and the UFSAR was identified prior to April 2010; however, each issue was erroneously assigned a completion date for after the submittal of the September 2010 UFSAR update.

The inspectors identified that in November 2008, the Exelon Nuclear Oversight (NOS) department at Limerick identified a similar issue concerning the 2008 UFSAR revision. In IR 848142, NOS identified 20 additional IRs that cited UFSAR inaccuracies or necessary revisions that were not included in the 2008 UFSAR revision as required. The Apparent Cause Evaluation performed in response to the NOS finding determined that engineering personnel were not fully cognizant of the regulatory requirements that UFSAR revisions must reflect all changes identified up to a maximum of 6 months prior to the date of filing. The inspectors determined that the corrective actions to address the NOS finding failed to correct engineering personnel's lack of understanding of the 2 year period of collection and processing of changes to the UFSAR.

Exelon generated IR 1139033 to address the UFSAR discrepancies identified by the NRC, in order to identify any extent of condition, and to provide a supervisory briefing on the adherence to the UFSAR revision cycle and cutoff dates.

Analysis: The inspectors determined that the failure to update the UFSAR in accordance with 10 CFR 50.71(e) was a performance deficiency that was reasonably within Exelon's ability to foresee and correct, and should have been prevented. Because the issue had the potential to affect the NRC's ability to perform its regulatory

function, the inspectors evaluated this performance deficiency in accordance with the traditional enforcement process. Using example 6.1.d.3 from the NRC Enforcement Policy, the inspectors determined that the violation was a SLIV (more than minor concern that resulted in no or relatively inappreciable potential safety or security consequence) violation, because the information that was left out of the required UFSAR update did not result in an unacceptable change in the facility, nor did it impact a licensing or safety decision by the NRC. In accordance with inspection manual chapter 0612, appendix B, this issue was not assigned a cross-cutting aspect.

**Enforcement:** 10 CFR 50.71(e) requires that licensees periodically revise the Updated Final Safety Analysis Report (UFSAR), originally submitted as part of the application for the operating license, to assure that the information included in the report contains the latest information developed. In part, revisions must reflect all changes up to a maximum of 6 months prior to the date of filing. Contrary to the above, Exelon failed to update UFSAR sections 6.4.4.2.3, 8.2.1.2, 9.4.2.1.2.4, and 9.4.4.5 and tables 11.1-4 and 12.2-4 during the 2010 periodic update to reflect current plant conditions. The failure to adequately update the UFSAR as required by 10 CFR 50.71(e) is characterized as a Severity Level IV violation. However, because the violation was a Severity Level IV violation and was entered into Exelon's corrective action program (IR 1139033), this violation is being treated as an NCV consistent with section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000352, 353/2010007-01 Failure to Update the UFSAR Consistent with Plant Conditions as Required)**

(2) Three of Four RHR Unit Coolers Unreliable due various Planned and Unplanned Conditions (Silting)

**Introduction:** The inspectors identified a violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," in that Exelon failed to correct a condition adverse to quality for a safety-related support system that was essential to successful mitigating system operation. Specifically, for a six and one-half day period during July 2008, three of four RHR unit coolers were either unavailable or unreliable due to a series of planned and unplanned conditions (silting).

**Description:** On April 25, 2008, Exelon completed a flow balance of the emergency service water system which was intended to establish adequate flows to all four Unit 1 RHR unit coolers (1A-, 1C-, 1E-, 1G-V210) in the A & C RHR pump rooms. Due to a calculation error, flow through the 1A-V210 unit cooler was erroneously set at approximately 11 gpm, which was less than its design minimum flow requirement of approximately 25 gpm. This condition, as documented in IR 1006912 was not discovered until July 18, 2009. Thus, this unit cooler was inoperable for a period of approximately 15 months.

On July 20, 2008, at 2:34 a.m., the 1E-V210 unit cooler was removed from service due to planned feeder breaker maintenance. The maintenance was completed and the unit cooler was returned to service approximately six and half days later at 4:46 p.m., on July 26. During this period of time the 1E-V210 unit cooler was inoperable. Thus, two of the four unit coolers were inoperable during this time frame.

The inspectors reviewed the operation of the other two unit coolers (1C-V210 & 1G-V210) during this July 2008 time frame to determine if they were capable of providing their intended safety-related support function. The inspectors determined that the reliability of the 1C-V210 unit cooler was degraded due to an unplanned condition.

Specifically, in January 2008, an operator noted that a temperature indicator which controlled the inlet valve for the 1C-V210 unit cooler was reading 95°F, while the actual local temperature was 72°F. The operator documented this condition in IR 720965 and also noted that if the temperature continued to rise the unit cooler would start and biweekly flushing would be necessary per RT-6-011-603, Revision 9, "A Loop ESW Unit Cooler Throttle Valve Flush." The inspectors noted that as the temperature rises through 100°F, the unit cooler inlet valve would open, which would allow service water with a high concentration of silt to flow through the cooler and buildup on the slightly open throttled outlet valve.

The inspectors found that IR 824617 described a condition on June 1, 2008, in which the indicated temperature was 118°F and 1C-V210 unit cooler was in operation. In this IR, Exelon concluded that if a unit cooler inlet valve opened, service water flow would be reduced by two gpm/day due to exposing the throttled outlet valve to a continuous build-up of silt. The inspectors questioned Exelon to determine if bi-weekly flushing began at this time, as required by RT-6-011-603-0, to prevent this silting condition. Exelon was unable to provide any record that demonstrated bi-weekly flushing was initiated; however, they did produce records that showed that a routine quarterly flush had been completed on June 15, 2008, which reestablished a reference flow of 70 gpm through this unit cooler. This IR also documented that the next flush did not occur until September 14, 2008.

Given the estimated 2gpm/day reduction in flow due to silting, the inspectors determined that the unit cooler would have surpassed the minimum flow requirement of approximately 25 gpm, and thus became inoperable by July 8, 2008, approximately 23 days after the June 15 flush. This, along with the fact that two other unit coolers were already inoperable, would have resulted in one of the two RHR pumps becoming inoperable.

Analysis: Failure to correct a condition adverse to quality in accordance with 10 CFR 50 Appendix B, Criterion XVI, during the timeframe of June 1, 2008 to September 14, 2008, contributed to the unreliability of the 1C-V210 unit cooler and was a performance deficiency. Specifically, Exelon did not initiate bi-weekly flushing per RT-6-011-603-0 of the 1C-V210 unit cooler to minimize the effects of silt build up. This made the 1C-V210 unit cooler unreliable because the reduced flow condition adversely affected its heat removal capability. This finding is more than minor because it affected the equipment performance attribute of the Mitigating System cornerstone and the associated cornerstone objective of ensuring the reliability and availability of systems that respond to initiating events to prevent undesirable consequences. The issue was also compared to the examples in IMC 0612, Appendix E, "Examples of Minor Issues." The issue was similar to example 3.j. in that it resulted in a condition where there was a reasonable doubt on the operability of the 1C-V210 unit cooler. The inspectors assessed this finding in accordance with NRC IMC 0609, Attachment 4, Phase 1, "Initial Screening and Characterization of Findings," and determined that it was of very low safety significance (Green) since it was determined that the error did not result in a loss of the system's safety function.

The inspectors determined that this violation has a cross-cutting aspect in the area of Problem Identification and Resolution, Corrective Action Program, in that Exelon did not take appropriate corrective actions to address a condition adverse to quality in a timely manner, commensurate with its safety significance. Specifically, Exelon failed to take appropriate actions to initiate bi-weekly flushes of the 1C-V210 unit cooler, from June to September 2008, upon discovery that the cooling water intake valve was open. [P.1 (d)]

**Enforcement:** 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action" requires, in part, that conditions adverse to quality such as equipment deficiencies and malfunctions shall be promptly identified and corrected. To minimize the effects of silting, RT-6-011-603 requires that biweekly flushes be initiated whenever an RHR inlet valve opened. Contrary to this requirement, on June 1, 2008, Exelon did not initiate bi-weekly flushes of the 1C-V210 unit cooler when its inlet valve opened. Because bi-weekly flushing was not initiated, Exelon was unable to ensure the operability of the 1C-V210 unit cooler during a six and one half day period in July 2008 and subsequently had to perform an extensive technical evaluation to prove its operability. Because this violation was of very low safety significance and was entered into Exelon's corrective action program as IR 1141675, this violation is being treated as a non-cited violation consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000352/2010007-02, Three of Four RHR Unit Coolers Unreliable due to Various Planned and Unplanned Conditions (Silting))**

2. Assessment of the Use of Operating Experience (OE)

a. Inspection Scope

The inspectors selected a sample of industry OE issues to confirm that Exelon evaluated the OE information for applicability to Limerick and took appropriate actions when warranted. The inspectors reviewed OE documents to verify that Exelon appropriately considered the underlying problems associated with the issues for resolution via their CAP. The inspectors also observed plant activities to determine if industry OE was considered during the performance of routine and infrequently performed activities. A list of the documents reviewed is included in the Attachment.

b. Assessment

The inspectors determined that Exelon's performance in the area of use of OE was adequate. The inspectors determined that Exelon appropriately considered industry OE information for applicability and used the information for corrective and preventive actions to identify and prevent similar issues. The inspectors assessed that, in general, the use of OE was effective. The inspectors observed Exelon demonstrating effective use of OE in pre-job briefs and routine management meetings. The inspectors also observed that Exelon effectively utilized OE during development of the Maintenance Rule (a)(1) action plans, RCAs, and ACEs. The inspectors independently verified that a sample of industry OE and NRC generic communications had been entered into their CAP, evaluated, and corrective actions developed as needed. OE was appropriately applied and lessons learned were communicated and incorporated into plant operations. The inspectors also observed plant activities and determined industry OE was being considered during the performance of routine and infrequently performed activities.

c. Findings

No findings were identified.

.3 Assessment of Self-Assessments and Audits

a. Inspection Scope

The inspectors reviewed a sample of audits, including the most recent audit of the CAP, departmental self-assessments, NOS organization audits and assessments, and assessments performed by independent organizations. These reviews were performed to determine if problems identified through these assessments were entered into the CAP, when appropriate, and whether CAs were initiated to address identified deficiencies. The effectiveness of the audits and assessments was evaluated by comparing audit and assessment results against self-revealing and NRC-identified observations made during the inspection. A list of documents reviewed is included in the Attachment to this report.

b. Assessment

The inspectors concluded that self-assessments, audits, and other internal Exelon assessments were critical, probing, thorough, and effective in identifying issues. The inspectors observed that these audits and self-assessments were completed in a methodical manner by personnel knowledgeable in the subject. The audits and self-assessments were completed to a sufficient depth to identify issues that were entered into the CAP for evaluation. In general, CAs associated with the identified issues were implemented commensurate with their safety significance.

c. Findings

No findings were identified.

.4 Assessment of Safety Conscious Work Environment (SCWE)

a. Inspection Scope

The inspectors reviewed the SCWE at Limerick through a variety of methods including conducting focus group interviews with selected plant staff, reviewing employee concerns files, and by review of IRs. The inspectors questioned individuals regarding their willingness to raise safety concerns, knowledge of the avenues available for raising safety concerns, the effectiveness of actions taken by management to foster a SCWE at the site, and any knowledge of personnel who had experienced a negative reaction for raising a safety concern.

The inspectors also reviewed implementation of the site employee concerns program (ECP) by reviewing site procedures for conducting ECP investigations and then reviewing a sample of ECP files for the period August 2008 through November 2010 to assess the program's effectiveness at addressing potential safety issues.

b. Assessment

Based on focus group interviews with selected operations, security, and radiological protection personnel and reviews of the CAP and the ECP, the inspectors did not identify any reluctance to raise safety issues. Most of those interviewed demonstrated an adequate knowledge of the avenues available for raising safety concerns including use of the CAP and the ECP.

All of those interviewed stated that they would initially raise issues to their supervisors and would use the CAP if their concerns could not be immediately resolved. These same individuals indicated that they would raise their concerns up the management chain if they did not get satisfactory resolutions at the supervisory levels. Many were also aware that they could raise their concerns through ECP and could also bring them to the NRC.

Notwithstanding this conclusion, the inspectors did identify one weakness related to the staff's familiarity with ECP personnel and processes. Specifically, some of the focus group personnel interviewed were not familiar with how to raise a concern using the ECP. The inspectors noted that lack of visibility of the ECP personnel and their program activities may have been a contributor to this observation. The ECP office is in a remote on-site location, there are no signs external to the building indicating the office is inside, nor are there any directions posted around the site showing the location of the office. Additionally, some of those interviewed did not know either employee concerns representative (ECRs) by name nor where they were located. The pamphlets circulated to raise awareness of the ECP did not list the site ECRs by name and were primarily focused on corporate Exelon ECP. The inspectors reviewed this issue and determined that it did not involve violations of regulatory requirements or station procedures.

c. Findings

No findings were identified.

4OA6 Meetings, Including Exit

On November 19, 2010, the inspectors presented the inspection results to Mr. W. Maguire, Site Vice President, and to other members of the Limerick staff. The inspectors verified that no proprietary information was documented in the report.

ATTACHMENT: SUPPLEMENTAL INFORMATION

Enclosure

**SUPPLEMENTAL INFORMATION**

**KEY POINTS OF CONTACT**

Licensee personnel

W. Maguire, Site Vice President  
M. Barth, System Manager  
J. Bendyk, System Manager  
S. Bobyock, Manager, Engineering Programs  
J. Brittan, Fire Protection Engineer  
F. Coffey, Manager, Operations Support  
M. Crim, Cycle Manager  
E. Dennin, Shift Operations Superintendent  
M. Gillin, Senior Manager, Plant Engineering  
E. Hosterman, Senior Staff Engineer  
S. Luessenhop, System Manager  
L. MacDonald, Senior Regulatory Specialist  
P. Marvel, Shift Manager  
M. McGill, System Manager  
J. Quinn, Manager, Balance of Plant Engineering  
J. Thoryk, System Manager  
M. Trexler, Maintenance Rule Coordinator  
G. Weiss, System Manager  
D. Zaharchuk, System Manager

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened and Closed

05000352&353/2010007-01	NCV	Failure to Update UFSAR Consistent With Plant Conditions as Required (Section 40A2.1.c.(1))
05000352/2010007-02	NCV	Three of Four RHR Unit Coolers Unreliable due to Planned and Unplanned Conditions (Siltng) (Section 40A2.1.c.(2))

## LIST OF DOCUMENTS REVIEWED

### Section 40A2: Identification and Resolution of Problems

#### Procedures

ARC-MCR-118 B1, 1A Instrument Air Compressor Trouble, Revision 0  
 ARC-MCR-118 C1, 1B Instrument Air Compressor Trouble, Revision 1  
 ARC-MCR-118 C4, 1B Instrument Air Dryer Trouble, Revision 1  
 ARC-MCR-218 B4, 2A Instrument Air Dryer Trouble, Revision 2  
 CY-LG-120-110, Chemistry Sampling and Analysis, Revision 10  
 CY-LG-120-1102, Outside Chemistry/NPDES Related Sampling and Analysis Schedule, Revision 28  
 CY-LG-120-168, Spray Pond Treatment Activities, Revision 2  
 E1-AA-101, Employee Concerns Program Process, Revision 9  
 E1-AA-101, Employee Concerns Program Trending Tools and Reporting, Revision 5  
 E1-AA-101, Employee Concerns Program, Revision 9  
 ER-AA-310, Implementation of the Maintenance Rule, Revision 8  
 ER-AA-310-1001, Maintenance Rule – Scoping, Revision 4  
 ER-AA-310-1002, Maintenance Rule Functions – Safety Significance Classification, Revision 3  
 ER-AA-310-1003, Maintenance Rule – Performance Criteria Section, Revision 3  
 ER-AA-310-1004, Maintenance Rule – Performance Monitoring, Revision 8  
 ER-AA-310-1005, Maintenance Rule – Dispositioning Between (a)(1) and (a)(2), Revision 5  
 ER-AA-310-1006, Maintenance Rule – Expert Panel Roles and Responsibilities, Revision 3  
 ER-AA-310-1007, Maintenance Periodic (a)(3) Assessment, Revision 4  
 ER-LG-310-1010, Maintenance Rule Implementation – Limerick Generating Station, Revision 14  
 HU-AA-1212, Technical Task Risk/Rigor Assessment, Pre-Job Brief, Independent Third Party Review and Post-Job Review  
 LS-AA-1003, NRC Inspection Preparation and Response, Revision 12  
 LS-AA-107, UFSAR Update Procedure Revision 6  
 LS-AA-120, Issue Identification & Screening Process, Revision 12  
 LS-AA-125-1001, Root Cause Analysis Manual, Revision 7  
 LS-AA-125-1002, Common Cause Analysis Manual, Revision 6  
 LS-AA-125-1003, Apparent Cause Evaluation Manual, Revision 9  
 LS-AA-126-126, Self-Assessment Program, Revision 6

LS-AA-127, Passport Action Tracking Management Procedure, Revision 10  
M-023-00119, Pneumatic Products Corporation Instrument Air Dryer, Installation, Operation,  
and Maintenance Manual X779  
MA-AA-716-004, Conduct of Troubleshooting, Revision 10  
MA-AA-716-210, Performance Centered Maintenance (PCM) Process, Revision 10  
MA-AA-746-1001, Electronic Circuit Card Refurbishment/Replenishment Process, Revision 2  
MA-MA-716-009, Preventive Maintenance (PM) Work Order Process, Revision 5  
ON-119, Loss of Instrument Air – Attachment, Revision 38  
ON-119, Loss of Instrument Air – Bases, Revision 23  
ON-119, Loss of Instrument Air, Revision 23  
OP-AA-108-103, Locked Equipment Program, Revision 2  
OP-AA-108-115, Operability Determinations, Revision 9  
RT-6-000-360-1, Unit 1 Accessible Locked Valve Walkdown, Revision 17  
RT-6-000-904-0, Inspection of Emergency Equipment, Revision 7  
RT-6-011-603-0, 'A' Loop ESW Unit Cooler Throttle Valve Flush, Revision 9  
S15.9.A, Instrument Air, Service Air, Back-up Service Air Compressors and Instrument Air Dryer  
Package Routine Inspection, Revision 22  
ST-2-055-601-2, ECCS – Condensate Storage Tank Level – Low, Div 2 (HPCI) Functional Test  
(LIS-55-2N661B)  
ST-6-060-460-1, Primary Containment Isolation Capability Check, Revision 43  
ST-6-076-250-1, SGTS and RERS Flow Test, Revision 38  
ST-6-076-250-1, SGTS and RERS Flow Test, Revision 46  
ST-6-107-590-1, Daily Surveillance Log/OPCONS 1, 2, 3, Revision 155  
T-102, Primary Containment Control, Revision 22

Work Orders

R1164880  
R1110302

Self-Assessments

IR 698077, Confined Space Program Check-In Self Assessment  
IR 833277, Configuration Control Check-In Self Assessment  
IR 833307, Transient Combustible Material Control Functional Area Self Assessment  
IR 981690, Operating Experience Program Check-In Self Assessment  
IR 993143, LHRA/HRA Key Control Check-In Self Assessment  
IR 964770, NOSA-LIM-09-07 Operations Functional Area Audit Report  
IR 1045058, NOSA-LIM-10-03 Emergency Preparedness Audit Report, Limerick, April 26 –  
May 5, 2010  
NOSA-LIM-10-04, Chemistry, Radwaste, Effluent, and Environmental Monitoring Audit Report,  
Limerick, May 17 – May 27, 2010

Miscellaneous Documents

(a)(1) Action Plan for U1 Instrument Air System  
(a)(1) Action Plan for U2 Instrument Air System  
'C' Emergency Service Water Pump Upper Motor Bearing Oil Sample Results dated  
29 October 2010  
0630 Work Status and Coordination Meeting Agenda dated 11/02/2010  
0C-P458 – Emergency Service Water Pump Drive Upper Motor Bearing Oil Sample Trend Data  
10 CFR 50.65(a)(3) Maintenance Rule Periodic Assessment – March 1, 2004 through  
February 28, 2006

10 CFR 50.65(a)(3) Maintenance Rule Periodic Assessment – March 1, 2006 through February 29, 2008  
 10 CFR 50.65(a)(3) Maintenance Rule Periodic Assessment – March 1, 2008 through February 28, 2010  
 8031-JR G-43, Exhibit X, Gap Seal Schedule, Revision 0  
 Clinton Power Station Unit 1 LER 2005-001-00  
 Corrective Action Program Quality and Management Review Committee Improvement Plan  
 Limerick CAP Investigation Guide, June 2010  
 Limerick Generating Station Technical Specifications  
 Limerick Generating Station, Units 1 and 2 Generic Letter 89-12, "Service Water Problems Affecting Safety – Related Equipment" Implementation of Actions  
 Limerick Plan of the Day Meeting  
 Limerick Updated Final Safety Analysis Report Revision 14  
 Maintenance Rule Expert Panel Meeting Agenda 1014 (dated November 2, 2010)  
 Maintenance Rule Expert Panel Meeting Minutes (dated June 29, 2010)  
 Management Review Committee Agenda (dated November 3, 2010)  
 Performance Centered Maintenance Template for Instrument Air Dryers (dated August 6, 2007)  
 Plan of the Day Agenda (dated November 3, 2010)  
 Station Ownership Committee Agenda (dated November 1, 2010)

NRC Generic Communications and Industry Operating Experience

IR 935420, NRC Information Notice 2009-09 – Improper Flow Controller Settings Renders Injection Inoperable and Surveillance Did Not Identify  
 IR 941761, NRC Information Notice 2009-11 – Configuration Control Errors  
 IR 975069, NRC Information Notice 2009-14 – Painting Activities and Cleaning Agents Render Diesel Generators and Other Plant Equipment Inoperable

Drawings

8031-A-309, Sheet 2, Architectural Air/Sinspectors/Fire & Water Boundaries Floor Plan Elevation 283'-0" & 269'-0" Unit 2, Revision 5  
 8031-FSK-C-1194, Reactor Building Gap Location Plan, Revision A  
 8031-M-1081, heating and Ventilation Reactor BLDG. Unit No 1 Plan at EL. 177'0" Area 15, Revision 20  
 8031-M-76, P&ID Reactor Enclosure and Refueling Area HVAC (Unit 1), Revision 27

Issue Reports

60497	766310	811448	839064
201983	772873	812344	843591
511117	791656	812934	845148
513723	793332	814453	848142
552648	806537	821145	849599
586882	807193	824617	853914
604128	807442	824657	854006
656882	807446	825317	854330
666193	807964	826565	855952
689269	808030	830174	862202
689271	810576	830177	864180
698077	810720	830181	864892
707564	810724	832495	867003
720965	810727	833277	874599
749650	810729	833307	878394

879267	958587	1044292	1079941
885515	967049	1046545	1080088
886670	967060	1048155	1080954
887946	967831	1048320	1083692
890540	970924	1048926	1084172
893730	972214	1049178	1086314
895483	973472	1049323	1086740
897029	979516	1051283	1086984
897130	980816	1051654	1088856
897831	980988	1052887	1089373
897831	981690	1053946	1092720
899072	984331	1053999	1093046
899103	985061	1055485	1097330
899504	987832	1055499	1098120
904946	993066	1055886	1100910
905220	993143	1056174	1129556
905351	994636	1058454	1131470
907296	994672	1058483	1132485
909450	995425	1059100	1134169
910234	996453	1060112	1139033
920108	996461	1062519	1141675
920567	1002735	1062949	
921398	1003611	1063035	
921398	1003769	1063308	
924627	1006608	1063344	
924857	1006912	1063778	
924940	1008266	1065343	
925006	1008755	1066042	
925387	1009340	1066601	
925395	1010305	1066618	
925928	1011819	1066627	
926581	1011891	1067015	
927125	1014292	1067240	
928002	1015213	1068163	
929762	1017906	1068630	
932636	1021388	1069080	
933745	1022712	1070100	
933787	1023344	1070386	
935272	1023642	1072908	
938441	1024309	1072908	
939658	1024460	1072920	
942767	1025734	1073556	
945609	1030753	1073583	
945616	1031938	1073932	
945631	1033728	1074042	
950685	1034423	1074047	
950921	1037346	1074049	
952352	1037694	1074058	
954614	1041732	1074084	
955010	1042771	1074439	
958406	1043794	1077744	

## LIST OF ACRONYMS

ACE	Apparent Cause Evaluation
ACITs	Action Tracking Item
ADAMS	Agency-wide Documents Access and Management System
AOP	Abnormal Operating Procedure
AR	Action Request
CA	Corrective Action
CAP	Corrective Action Program
CAQ	Condition Adverse to Quality
CCAs	Common Cause Analyses
CFR	Code of Federal Regulations
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
ECP	Employee Concerns Program
ECR	Engineering Change Request
ESW	Emergency Service Water
UFSAR	Final Safety Analysis Report
HPCI	High Pressure Coolant Injection
HWC	Hydrogen Water Chemistry
IMC	NRC Inspection Manual Chapter
IR	Issue Report
IST	In-service Testing
LIM	Limerick Generating Station
MRC	Management Review Committee
NCV	Non-Cited Violation
NOS	Nuclear Oversight
NRC	Nuclear Regulatory Commission
OE	Operating Experience
OM	Operation and Maintenance
PARS	Publicly Available Records System
PBAPS	Peach Bottom Atomic Power Station
PI&R	Problem Identification and Resolution
QA	Quality Assurance
QHPI	Quick Human Performance Investigation
RCA	Root Cause Analysis
RG	Regulatory Guide
RHR	Residual Heat Removal
SCBA	Self Contained Breathing Apparatus
ROP	Reactor Oversight Program
SCWE	Safety Conscious Work Environment
SDP	Significance Determination Process
SLIV	Severity Level IV
SOC	Station Oversight Committee
SSC	System, Structure, or Component
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
WO	Work Order