July 28, 2006

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

SUBJECT: LIMERICK GENERATING STATION - PROBLEM IDENTIFICATION AND RESOLUTION INSPECTION REPORT NO. 05000352/2006006 AND 05000353/2006006

Dear Mr. Crane:

On June 23, 2006, the US Nuclear Regulatory Commission (NRC) completed a team inspection at the Limerick Generating Station, Units 1 and 2 (LGS) facility. The enclosed inspection report documents the inspection findings, which were discussed on June 23, 2006, with Mr. R. DeGregorio and other members of your staff during an exit meeting.

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.

On the basis of the sample selected for review, the team concluded that in general, problems were properly identified, evaluated, and corrected. There was one green finding identified by the team associated with the effectiveness of corrective actions. The deficiency was an inadequate residual heat removal shutdown cooling procedure change which resulted in a higher potential for water hammer to occur during a shutdown cooling pump start. This finding was determined to be a violation of NRC requirements. However, because it has very low safety significance and because it was entered into your corrective action program, the NRC is treating this finding as a Non-Cited Violation in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny this Non-Cited Violation, 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 DC, 20555-0001, with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC, 20555-0001; and the NRC Resident Inspector at the Limerick Generating Station facility.

In accordance with 10 CFR 2.390 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 Publically 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/**

James M. Trapp, Chief
Projects Branch 4
Division of Reactor Projects

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

Enclosure: Inspection Report Nos. 05000352/2006006 and 05000353/2006006
w/Attachment: Supplemental Information

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Plant Manager, Limerick Generating Station
Regulatory Assurance Manager - Limerick
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REGION I

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| Docket Nos: | 05000352, 05000353 |
| License Nos: | NPF-39, NPF-85 |
| Report Nos: | 05000352/2006006 and 05000353/2006006 |
| Licensee: | Exelon Generation Company, LLC |
| Facility: | Limerick Generating Station, Units 1 and 2 |
| Location: | Sanatoga, PA 19464 |
| Dates: | June 5 - June 23, 2006 |
| Team Leader: | C. Khan, Senior Project Engineer, Division of Reactor Projects (DRP) |
| Inspectors: | S. Hansell, Senior Resident Inspector, Limerick Generating Station, DRP<br>J. Krafty, Reactor Inspector, Division of Reactor Safety (DRS)<br>G. Ottenberg, Reactor Engineer, DRP |
| Trainees: | L. Casey, Reactor Engineer, DRP<br>G. Smith, Security Inspector, DRS |
| Approved by: | James M. Trapp, Chief<br>Projects Branch 4<br>Division of Reactor Projects |

Enclosure

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## SUMMARY OF ISSUES

IR 05000352/2006-006 and 05000353/2006-006; 06/05/2006 - 06/23/2006; Exelon Generation Company, LLC; Limerick Generating Station, Units 1 and 2; biennial baseline inspection of the identification and resolution of problems. A violation was identified in the area of effectiveness of corrective actions.

The inspection was conducted by three regional inspectors and one resident inspector. One green finding of very low safety significance was identified during this inspection and was classified as a non-cited violation. The finding was evaluated using the significance determination process (SDP). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process." Findings for which the SDP does not apply may be "Green" or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

Identification and Resolution of Problems

The team identified that Exelon was effectively implementing the corrective action program at the Limerick Generating Station. Exelon staff was routinely effective at identifying discrepant conditions at an appropriate threshold and entering them into the corrective action program. Identified issues were typically prioritized appropriately and were properly evaluated commensurate with the potential safety significance. The evaluations of issues identified the causes of the problem, the extent-of-condition, and provided for corrective actions appropriate to address the causes. Corrective actions were routinely implemented in a timely manner. The majority of the corrective actions reviewed were fully effective. Audits and self-assessments identified adverse conditions and negative trends, and were generally self-critical and consistent with the team's findings. Operating experience usage was also found to be effective. The team identified a few minor examples where the problem identification and corrective action aspects of the corrective action program were not fully effective. The team also identified one greater than minor example where corrective actions were ineffective regarding a residual heat exchanger procedure revision. Exelon took prompt actions to address the issues identified by the team.

A. NRC Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

Green: The team identified a non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," for the failure to implement effective corrective actions to correct a residual heat removal (RHR) system procedure deficiency. Specifically, a procedure change, implemented following a March 2003 high pressure condition, was ineffective in eliminating the potential for a high pressure condition (water hammer) in the RHR system, when placing the system inservice for alternate decay heat removal in May 2006. The licensee entered this deficiency into their corrective action program for resolution.

This finding is greater than minor because if left uncorrected, it would become a more significant safety concern. The finding was determined to be of very low safety significance in accordance with the shutdown SDP, because it did not increase the likelihood of a loss of reactor coolant system (RCS) inventory, it did not result in an inadvertent change in RCS temperature due to a loss of RHR, it did not result in an inadvertent RCS pressurization, and it did not degrade the ability to recover decay heat removal capability if lost. (Section 4OA2.3.b(1))

B. Licensee-Identified Violations

None.

## REPORT DETAILS

## 4. OTHER ACTIVITIES (OA)

4OA2 Problem Identification and Resolution (PI&R) (Biennial - IP 71152B)

.1 Effectiveness of Problem Identification

a. Inspection Scope

The inspection team reviewed the procedures describing the corrective action program (CAP) at Exelon's Limerick facility. Exelon identifies problems by initiating an Issue Report (IR) for a condition adverse to quality, plant equipment deficiency, industrial or radiological safety concern, or other significant issue. The IRs are subsequently screened for operability, categorized by priority (1 to 5) and significance (A through D), and assigned for evaluation and resolution.

The team reviewed IRs selected across the seven cornerstones of safety in the NRC's Reactor Oversight Program (ROP) to determine if problems were being properly identified, characterized, and entered into the CAP for evaluation and resolution. The team selected items from the maintenance, operations, engineering, emergency planning, security, radiological control, training, and oversight programs to ensure that the Limerick staff was appropriately considering problems identified in each functional area. The team used this information to select a risk-informed sample of IRs that had been issued since the last NRC PI&R inspection, which was conducted in June 2004.

The team also considered insights from risk analyses to focus the sample selection and system walkdowns on risk-significant components. The team reviewed the emergency service water (ESW) and reactor core isolation cooling (RCIC) systems in detail. For the selected systems, the team reviewed the applicable system health reports, work requests, engineering documents, plant log entries, and results from surveillance tests and maintenance tasks. For these selected systems, the team also interviewed cognizant station personnel and completed system walkdowns to assess material condition and system performance.

In addition to IRs, the team selected items from other processes at Limerick to verify that they appropriately considered problems identified in these areas for entry into the corrective action program. Specifically, the team reviewed a sample of work orders, operator log entries, system health reports and completed surveillance tests. The documents were reviewed to ensure that underlying problems associated with each issue were appropriately considered for resolution via the corrective action process. In addition, the team interviewed plant staff and management to determine their understanding of and involvement with the CAP. The IRs and other documents reviewed during this inspection, and a list of key personnel contacted, are listed in the Attachment to this report.

The team reviewed a sample of Exelon's Nuclear Oversight (NOS) audits and quarterly reports, Nuclear Safety Review Board reports, departmental self-assessments, and the

most recent NOS audit of the CAP. This review was performed to determine if problems identified through these evaluations were entered into the CAP, and whether the corrective actions were properly completed to resolve the deficiencies. The effectiveness of the audits and self-assessments was evaluated by comparing audit and self-assessment results against self-revealing and NRC-identified findings, and current observations during the inspection.

b. Assessment and Findings

No findings of significance were identified.

The team determined that Exelon appropriately identified discrepant conditions and initiated IRs where appropriate to document the issues. Audits and self-assessments identified adverse conditions and negative trends, and were self-critical and consistent with the team's findings.

The team noted several minor examples where Exelon did not identify deficiencies in a timely manner. In response to the team's observations, Exelon promptly included all these issues into the CAP. A total of 14 IRs were initiated based on the team's observations. The team independently evaluated the problem identification deficiencies noted above for potential significance. The team determined that none of the individual issues were findings of more than minor significance. Examples of these issues are as follows:

- On May 18, 2006, operators were performing a normal shutdown on Unit 1. Prior to starting the "B" RHR pump, operators throttled open the shutdown cooling discharge return valve for 5 seconds. Within a few seconds, the "1B RHR Pump Discharge Low Pressure" annunciated. The low pressure alarm was not an expected alarm or included in the procedure. Operators appropriately did not start the RHR pump and evaluated the low pressure alarm. A decision was made to open the condensate transfer keep fill valves to pressurize and vent the RHR loop piping to clear the low pressure alarm. Three more attempts were made to start the "B" RHR pump with the loop low pressure alarm annunciating each time. After the fourth attempt, the control room staff concluded that the RHR lines were full of water and there was no danger of water hammer. The "B" RHR pump was started with the discharge low pressure alarm energized. After the pump started, the discharge low pressure alarm cleared. The operators performed a system walkdown to verify that no damage occurred to the RHR system. The team identified that this issue was noted in the operator logs, but an IR was not documented to evaluate this event.

- The team identified that Exelon did not identify that the simulator response related to starting an RHR pump in shutdown cooling was different than the plant response to the same evolution. In the plant, the "RHR Pump Discharge Low Pressure" alarm annunciated when operators throttled open the shutdown cooling discharge return valve for 5 seconds prior to a pump start; at the simulator, the RHR low pressure alarm never annunciated when the shutdown

cooling return valve was throttled open. In the plant, the "RHR Pump Discharge Low Pressure" alarm cleared when the RHR pump was started; at the simulator, the RHR high pressure alarm annunciated when the pump was started.

- The team noted that a greater than 50 psig pressure on the 2A or 2B RHR heat exchanger RHR service water side, had been documented in operator logs five times between January 2005 and June 2006. Although steps had been taken on each occasion to restore pressure within its normal operating band as described in procedure S12.9.A, Rev. 7, "Routine Inspection of the Residual Heat Removal Service Water System," IRs were not written to address the cause of the pressure increase.

.2 Prioritization and Evaluation of Issues

a. Inspection Scope

The inspection team reviewed the IRs listed in the attachment to assess whether Exelon adequately evaluated and prioritized identified problems. The team selected the IRs to cover the seven cornerstones of safety identified in the NRC's Reactor Oversight Program. The team also considered risk insights from the Limerick Probabilistic Risk Analysis to focus the IR sample. The review was expanded to five years for Limerick's evaluation of problems associated with the emergency service water system.

The IRs reviewed encompassed the full range of Exelon's evaluations, including root cause analyses, apparent cause evaluations, common cause evaluations and work group evaluations (i.e., no formal investigation is required). The review included the appropriateness of the assigned significance, the scope and depth of the causal analysis, and the timeliness of the resolutions. For significant conditions adverse to quality, the team reviewed Exelon's corrective actions to preclude recurrence. The team observed the Station Oversight Committee (SOC) in which Exelon managers reviewed incoming IRs to evaluate the prioritization, preliminary corrective action assignments, and investigation plans. In addition, the team observed Management Review Committee (MRC) meetings during which corrective actions and investigation results were reviewed and assessed.

The team reviewed Exelon's evaluation of industry operating experience information for applicability to their facility and reportability assessments, and extent-of-condition reviews for selected problems. The team further reviewed equipment performance results and assessments documented in completed surveillance procedures, operator log entries, and trend data to determine whether the equipment performance evaluations were technically adequate to identify degrading or non-conforming equipment. Lastly, the team also selected a sample of IRs associated with previous NRC findings to determine whether Exelon evaluated and resolved problems associated with compliance to regulatory requirements and standards.

b. Assessment

No findings of significance were identified.

The team concluded that Exelon appropriately prioritized and evaluated the issues that were entered into the corrective action program. The IRs were appropriately prioritized based on the safety significance. Both operability determinations and reportability assessments were routinely conducted in a timely manner. Exelon effectively classified and performed operability evaluations and reportability determinations.

The team noted one minor instance where an IR was not assigned the correct significance level. Plant procedure LS-AA-120, "Issue Identification and Screening Process," Rev. 4, requires a significance level of 2 be assigned when a Licensee Event Report (LER) is required to be submitted to the NRC. The issue associated with IR 309377 required an LER, but was assigned a significance level of 3. However, this was determined to be minor because a root cause analysis (RCA) was performed and the only effect of the mis-classification of the significance level was related to tracking and trending within the CAP. The licensee initiated an IR upon NRC identification of this issue to track the error and prompt a correction to the severity level of IR 309377.

The team noted that significant conditions adverse to quality received a formal RCA and an extent-of-condition review. Less significant conditions typically received an apparent cause evaluation (ACE). A common cause analysis (CCA) was performed to identify common failure modes for selected issues. The majority of the IRs written were for less significant issues that were fixed and trended or in some cases received work group evaluations. Additionally, the team determined that the SOC and MRC were effective in the initial review and prioritization IRs.

.3 Effectiveness of Corrective Actions

a. Inspection Scope

The team reviewed the corrective actions associated with selected IRs to determine whether the actions addressed the identified causes of the problems. The team reviewed IRs for repetitive problems to determine whether previous corrective actions were effective. The team also reviewed Exelon's timeliness in implementing corrective actions and their effectiveness in precluding recurrence for significant conditions adverse to quality. The team reviewed the IRs associated with selected non-cited violations and findings to determine whether Exelon properly evaluated and resolved these issues.

b. Assessment and Findings

The team determined that corrective actions were routinely implemented in a timely manner. The majority of the corrective actions reviewed were fully effective. However, the team identified one finding of very low safety significance (Green) associated with the effectiveness of corrective actions for a deficiency associated with residual heat

removal shutdown cooling procedure changes which resulted in a higher potential for water hammer to occur during a shutdown cooling pump start. In addition, the team noted some examples where Exelon's resolution of degraded conditions, documentation of actions, and completion of identified corrective actions were not properly documented and/or less than fully effective. Specifically:

- The inspectors identified a minor violation of TS 6.8.1.a, "Procedures and Programs," Regulatory Guide 1.33, Appendix A, 1.e, "Procedure Review and Approval," concerning an inadequate procedure review and approval process related to the development of procedure S12.9.A, Rev. 7, "Routine Inspection of the Residual Heat Removal Service Water System." Specifically, Exelon incorrectly determined that a 10 CFR 50.59 screen was not required for a change to a procedure as described in the updated final safety analysis report (UFSAR). The procedure change permitted RHR heat exchanger flow control valves HV-51-2F068A/B and HV-51-1F068A/B to be used to modify/control pressure in the residual heat removal service water (RHRSW) system. The UFSAR states that these valves can be adjusted to control RHRSW flows to each RHR heat exchanger (i.e., not pressure). Therefore, the procedure change affected the operation and control of the RHR heat exchanger flow control valves as described in the UFSAR, and a 10 CFR 50.59 screen should have been completed. The performance deficiency associated with this event is a failure to perform a 10 CFR 50.59 screen when one was required.

  The finding is minor because although there was a failure to meet the 10 CFR 50.59 screening requirements involving a change to a procedure as described in the UFSAR, the change would not have required NRC approval per 10 CFR 50.59. During the inspection, Exelon completed a 10 CFR 50.59 screen and determined a full 10 CFR 50.59 evaluation was not required.

- On January 30, 2005, a temporary procedure change was approved to relieve the high pressure on the RHRSW side of the 2A RHR heat exchanger. This temporary procedure change was used two times on January 30, 2005, to decrease the pressure on the 2A and 2B RHR heat exchangers. The temporary procedure change was subsequently cancelled on February 1, 2005, after action request (AR) 00296515 was generated stating that a 10 CFR 50.59 review must be completed in order to implement the procedure change and in order to make the change permanent. Contrary to Exelon procedure AD-AA-101, "Processing Procedures and T&RMs," the procedure change was inappropriately made permanent in procedure S12.9.A, Rev. 7, "Routine Inspection of the Residual Heat Removal Service Water System" on June 1, 2005, without completing a 10 CFR 50.59 screening for the procedure change.

- Procedure S12.9.A, Rev. 7, "Routine Inspection of the Residual Heat Removal Service Water System," provides instructions to return RHRSW pressure to between 15 psig and 50 psig if the pressure is below 15 psig or greater than 50 psig. On September 23, 2005, the OP-LG-108-1001, "Simple Quick Act," procedure was used by operators to restore pressure on the 2A RHR Heat

Exchanger RHR Service water side rather than using the appropriate steps in procedure S12.9.A.

On June 22, 2006, the 2A and 2B RHR Heat Exchanger RHRSW side pressures were indicating 0 psig. This was brought to the attention of a different crew of operators by the resident inspector. When asked about increasing the pressure per the S12.9.A procedure, the operators stated that they did not know a procedure change had been implemented to provide steps to restore pressure within the desired band.

- In 2005, a foreign material exclusion (FME) bladder and cover were each blown off an open pipe after a local leak rate test (LLRT) had been completed. These events were due to inadequate system venting following the LLRT. Corrective actions identified in the original IR were to modify the procedure to enhance the procedural requirements for venting. The procedural changes that were implemented were not in accordance with those stated in the IR. It appeared that the procedural changes that were implemented caused the procedure to be less descriptive and would not have prevented a similar condition. Exelon indicated that the procedure was successfully used during the 2006 refueling outage and that additional actions were implemented to prevent recurrence. However, these actions were not documented in the original IR. Exelon initiated an IR when this issue was brought to their attention.

- The inspectors reviewed Exelon's corrective actions taken in response to NRC non-cited violation (NCV) 2004003-02 for "Failure to Follow Chemistry Procedure CY-LG-120-1102 for Spray Pond Chemistry." The finding concerned Exelon's failure to have engineering evaluate the effect of the high soluble manganese concentration on the 2B RHR heat exchanger and return spray pond chemistry to specification in a timely manner. The inspectors noted that Exelon's corrective actions documented in the associated IR focused on preventing a high soluble manganese concentration by installing aerators in the spray pond and did not address the failure to follow the chemistry procedure. Based on conversations with Exelon staff, it was evident that additional corrective actions were taken to prevent recurrence, but were not documented in the original IR. Exelon initiated an IR when this issue was brought to their attention.

(1) Residual Heat Removal Shutdown Cooling Procedure Changes

Introduction. The inspectors identified a Green, non-cited violation (NCV) because Exelon's corrective actions were ineffective for a condition adverse to quality associated with the residual heat removal (RHR) shutdown cooling procedure changes. The changes resulted in the increased potential for a water hammer event to occur during a RHR shutdown cooling pump start.

Description. In March 2003, issue report (IR) 148846 was written to address an unexpected high pressure spike at the RHR pump discharge when the pump was started in the alternate decay heat removal (ADHR) mode. The ADHR mode of RHR is

used during a refuel outage when the reactor vessel head is removed, reactor cavity water level is raised to the same level as the spent fuel pool (SFP), and the cavity and SFP water volumes are connected via a transfer canal. The RHR pump suction is aligned to the SFP skimmer surge tank and the discharge is returned to the reactor vessel. Prior to starting the RHR pump, the system piping is flushed with clean water to remove the stagnant water.

During the RHR pipe flush, the normal condensate transfer keep fill water system is isolated from the pump discharge pipe. The keep fill system normally maintains the RHR pipe full of water and pressurized to 150 psig. Following the 2003 event, the Exelon root cause evaluation noted that the condensate transfer system was isolated to the RHR system during and after the system flush. Exelon concluded that air pockets may form in portions of the RHR piping during the system flush evolution. Condition report 148846 included the corrective action to revise procedures to ensure the RHR piping is filled/vented and condensate transfer fill system is aligned prior to a pump start.

Operating procedure S51.5.C, "RHR Shutdown Cooling Piping Flushes," was revised in October 1, 2003, to include direction to re-open the RHR system condensate transfer supply manual valves. Procedure S51.5.C, Section 4.6, "Restoration" was revised to open the condensate transfer manual valves 51-1018A/B and 51-1031A/B. However, after the RHR loop is flushed in Section 4.1, "Normal Flush," step 4.1.26 directs the operators to procedure S51.8.B, "Shutdown Cooling/Reactor Coolant Circulation Operation Start-up and Shutdown," Section 4.3. The transition to the RHR pump start procedure bypassed the restoration section of the flush procedure and resulted in the condensate transfer valves remaining closed.

On May 18, 2006, operators were performing a normal shutdown on Unit 1. The "B" RHR loop was flushed and operators transitioned to the shutdown cooling start procedure S51.8.B. Condensate transfer supply manual valves were closed due to the inadequate procedure change in 2003. Prior to starting the "B" RHR pump, operators throttled open the shutdown cooling discharge return valve for 5 seconds. Within a few seconds, the "1B RHR Pump Discharge Low Pressure" annunciated. The low pressure alarm is set for 60 pounds and was not an expected alarm or included in the procedure.

Operators did not start the RHR pump and evaluated the low pressure alarm. A decision was made to open the condensate transfer manual valve 51-1031B, pressurize and vent the RHR loop piping to clear the low pressure alarm, then re-close the 51-1031B valve. Three more attempts were made to start the "B" RHR pump with the loop low pressure alarm annunciating each time. After the fourth attempt, the control room staff concluded that the RHR lines were full of water and there was no danger of water hammer. The "B" RHR pump was started with the discharge low pressure alarm energized. After the pump started, the discharge low pressure alarm cleared. The operators performed a system walkdown to verify that no damage occurred to the RHR system.

The team reviewed the evolution and requested a copy of the condition report for the abnormal occurrence. After review, Exelon concluded that the event was not entered

into their corrective action program. The team concluded that the ineffective procedure change in 2003 and shutdown cooling pump start procedure change in 2005 resulted in a higher potential for water hammer to occur during a shutdown cooling pump start. These issues were entered into Exelon's corrective action program as IRs 500109, 502283, 500111, and 498297.

Analysis. The team identified a performance deficiency related to Exelon's ineffective actions to correct a Residual Heat Removal (RHR) system procedure deficiency, identified in a 2003 event. The change to open the condensate transfer valves was located at the end of the RHR flush procedure and was bypassed because an earlier step had the operators exit the revised procedure and start the RHR shutdown cooling pump. 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.

This finding is more than minor because if left uncorrected, it would become a more significant safety concern. Specifically, an RHR procedure change was initiated in 2005 that requires operators to throttle open the RHR shutdown cooling pump discharge valve to the reactor vessel, prior to a pump start. When used in May 2006, the 2005 change resulted in a de-pressurization of the RHR loop to the reactor vessel. With the condensate transfer keep fill valves closed, due to the ineffective corrective action from 2003, there was a greater potential for the RHR system to experience a water hammer condition and damage system components during a shutdown cooling pump start.

The team concluded that this issue affected the Mitigating Systems cornerstone. The team assessed this finding using Phase 1 of Appendix "G", "Shutdown Operations Significance Determination Process." The team determined this finding to be of very low safety significance (Green), because it did not increase the likelihood of a loss of reactor coolant system (RCS) inventory, it did not result in an inadvertent change in RCS temperature due to a loss of RHR, it did not result in an inadvertent RCS pressurization, and it did not degrade the ability to recover decay heat removal capability if lost.

Enforcement. 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that measures be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected. Contrary to the above, on October 1, 2003, residual heat removal (RHR) flush procedure S51.5.C, Section 4.6, "Restoration" was revised to open the condensate transfer manual valves 51-1018A/B and 51-1031A/B prior to a shutdown cooling pump start. However, after the RHR loop is flushed in Section 4.1, "Normal Flush," step 4.1.26 directs the operators to procedure S51.8.B, "Shutdown Cooling/Reactor Coolant Circulation Operation Start-up and Shutdown." The transition to the RHR pump start procedure bypassed the restoration section of the flush procedure and resulted in the condensate transfer valves remaining closed. The closed valves increased the possibility of the formation of air pockets in the RHR system prior to a pump start. This would result in RHR system damage due to high pressure surges when the pump is started. Because this issue is of very low safety

significance and has been entered into Exelon's corrective action program (IRs 500109, 502283, 500111, and 498297), this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. **(NCV 05000352/353/2006006-01, Failure to Implement Effective Procedure Changes)**

.4 Assessment of Safety Conscious Work Environment

a. Inspection Scope

The team members interviewed station personnel, observed activities throughout the plant, and attended a cross section of meetings to assess the safety conscious work environment (SCWE) at Limerick. Specifically, the team interviewed station personnel to assess whether they were hesitant to raise safety concerns to their management and/or the NRC due to a fear of retaliation. The team also reviewed Limerick's Employee Concerns Program (ECP) to determine if employees were aware of the program and had used it to raise concerns

b. Assessment and Findings

No findings of significance were identified.

The team determined that the plant staff were aware of the importance of having a strong SCWE and expressed a willingness to raise safety issues. No one interviewed had experienced retaliation for safety issues raised or knew of anyone who had failed to raise issues. All persons interviewed had an adequate knowledge of the CAP and ECP. The threshold for entering concerns in the program appeared appropriately low and the program administrator willingly accepted not only safety concerns but also other work place concerns. Based on these limited reviews and interviews, the team concluded that there was no evidence of an unacceptable SCWE.

4OA6 Meetings, including Exit

On June 23, 2006, the team presented the inspection results to Mr. Ron DeGregorio, Limerick Generating Station, Units 1 and 2 Site Vice President, and other members of the Limerick staff who acknowledged the findings. The inspectors confirmed that no proprietary information reviewed during the inspection was retained.

4OA7 Licensee-identified Violations

None

ATTACHMENT: Supplemental Information

## ATTACHMENT - SUPPLEMENTAL INFORMATION

## KEY POINTS OF CONTACT

Licensee Personnel:

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G. Curtain, LERT Engineer
S. Dixon, Instrumentation and Controls (I&C) Manager
J. George, Emergency Core Cooling System (ECCS) Engineer
B. Sauers, Emergency Diesel Generator System Manager
W. Astbury, Reactor Core Isolation Cooling System Manager
B. Whitman, Site Security Supervisor
O. Becker, Director of Nuclear Security
D. Waldman, Outage Manager
E. Purdy, High Pressure Coolant Injection System Manager
C. Markle, Operations CAPCO
S. Breeding, Operations Support Manager
M. Arnosky, Shift Manager
D. Monahan, LOR Instructor
J. Brittain, Operations Service Manager
J. Weissinger, Operations Clearance and Tagging Supervisor
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J. Hunter III, Manager- Operations Training
P. Colgan, Director of Maintenance
J. Kerhoska, Manager- Corporate Emergency Preparedness
L. Baker, Emergency Preparedness Specialist
D. Horne, Maintenance Supervisor
M. Evans, ECCS Engineer
R. Kreider, Manager Regulatory Assurance
R. Harding, Regulatory Assurance Engineer
P. Orphanos, Director of Operations
R. DeGregorio, Limerick Vice President
E. Callan, Director of Engineering
T. Dougherty, Director of Work Management

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

**Opened and Closed**:

| | | |
|---|---|---|
| 05000352/353/2006006-01 | NCV | Failure to Implement Effective Procedure Changes (Section 4OA2.3.b.(1)) |

## LIST OF DOCUMENTS REVIEWED

**Drawings**

8031-M-50 P&ID RCIC Pump Turbine (Unit 1), Rev. 36
8031-M-49 P&ID Reactor Core Isolation Cooling (Unit 1), Rev. 52
8031-M-55 P&ID High Pressure Coolant Injection (Unit 1), Rev. 55
8031-M-55 P&ID, High Pressure Coolant Injection (Unit 2), Rev 49
8031-M-49 P&ID, Reactor Core Isolation Cooling (Unit 2), Rev 49
Elementary Diagram M-1-E51-1040-E-036, Sheet 1, Rev 5, Reactor Core Isolation Unit 2
Elementary Diagram M-1-E51-1040-E-035, Sheet 1, Rev 9, Reactor Core Isolation Unit 2
Elementary Diagram M-1-E51-1040-E-029, Sheet 1, Rev 6, Reactor Core Isolation Unit 2
Schematic Diagram E-626, Rev 14, Main Control Room Annunciator Panel C847, HPCI 1 & 2

**Modifications**

| | |
|---|---|
| LG 04-00419 001 | RCIC Suction Vents Unit 2 |
| LG 04-00428 002 | HPCI Suction Valve Bonnet Vents Both Units |
| LG 04-00437 000 | RCIC Suction Vent Unit 1 |

**Temporary Modifications**:

TC# 1-06-293-1, ST-2-041-800-1, Rev 10, Unit 1, May 15, 2006

**Nuclear Oversight Assessments and Audits**:

NOS Audit NOSA- LIM-05-01 (AR# 309905), Audit Report Limerick Corrective Action Program

**Self Assessments**:

Check-in Self-Assessment Report - 5/22 - 6/7/06, Radioactive Material Processing and Transportation (AT#439642)
Check-In Self-Assessment Report - Operations Log Keeping (AR#279632)

Focused Area Self Assessment Report, Pre-NRC PI&R FASA (FASA AT#431837)
Focused Area Self Assessment Report, Ops Procedure Adherence (FASA AR#436843)
Focused Area Self Assessment Report, Control of Radioactive Material (FASA AR#195661)

**Issue Reports**:

| | | | | | | |
|---|---|---|---|---|---|---|
| 139941 | 256948 | 285118 | 312046 | 370575 | 470038 | 492131 |
| 212084 | 258160 | 286486 | 312124 | 376267 | 470302 | 495951 |
| 214759 | 258996 | 288872 | 313841 | 382242 | 470345 | 497757 |
| 215727 | 259452 | 290550 | 314910 | 425042 | 470818 | 498297* |
| 220816 | 260360 | 291731 | 317437 | 425069 | 473549 | 498477* |
| 235586 | 261798 | 293274 | 321168 | 425074 | 473553 | 498715* |
| 237091 | 265872 | 296515 | 329264 | 425652 | 474659 | 498717* |
| 238075 | 266253 | 302653 | 331115 | 425691 | 475487 | 499503* |
| 238163 | 270738 | 302658 | 333832 | 426220 | 475533 | 500109* |
| 241302 | 274332 | 302786 | 340394 | 427961 | 476089 | 500111* |
| 241772 | 276405 | 303966 | 348594 | 429580 | 482347 | 501451 |
| 241778 | 276638 | 305025 | 349592 | 429654 | 483294 | 501810 |
| 242838 | 277730 | 305341 | 352899 | 431837 | 484221 | 502283* |
| 243789 | 278902 | 307798 | 353359 | 433194 | 486274 | 502294* |
| 247140 | 279167 | 308624 | 354285 | 437320 | 487019 | 502435* |
| 248310 | 279632 | 309377 | 362307 | 437423 | 487199 | 502597* |
| 250115 | 283277 | 309552 | 363184 | 441530 | 487228 | 502608* |
| 252784 | 283451 | 309571 | 363188 | 441686 | 487372 | 502966* |
| 254545 | 283698 | 309942 | 365113 | 462259 | 487801 | 503013* |
| 254625 | 284050 | 311779 | 365459 | 469441 | 490107 | |

* IR Generated as a result of PI&R Inspection

**Maintenance Work Orders**:

C0128927
R0460595
R0483298
R0532786
R0620226
R0868091
C0128887
R0458202
R0487514
R0562752
M1565154
C0213924
C0209466

**Action Requests**:

A1483562 U/2 RCIC Interrelationship with HPCI During PV&F Run
A1569474 Bearing Insulation Test Brass Plate Could Not Be Located
A1547139 Pipe Wall Thickness Measured Below Min Wall Allowable
A1565154 RCIC Turb Oil Sight Glass Leak LG-050-150
A1461507 EDG Heat Exchanger Channel Assembly Fastener Torque Value
A1257024 M-011-001 Revise Procedure for D-22 Improvements

A1543315 D24 Diesel Has Damaged Piston Rings and Cylinder
A1495598 HV-049-1F031 Failed to Fully Stroke Closed from RSP
A1518267 HV-49-1F031 Did Not Stroke During ST-2-088-320-1
A1495879 HV-055-2F054 Will Not Stroke Full Open When Required
A1465114 HV-055-2F054 Has a Small packing Leak
A 308670 Main Wedge Damaged Identified On Jet Pump #8
A 1407922 "A" LPCI To Reactor Test Check Valve Lifted at 550 PSIG

**Non-Cited Violations and Findings Reviewed:**

NCV 50-352 & 50-353 / 2004-03-01
NCV 50-352 & 50-353 / 2004-03-02
NCV 50-352 / 2004-04-01
NCV 50-352 / 2004-05-01
NCV 50-352 & 50-353 / 2004-06-02
NCV 50-352 / 2005-03-01
NCV 50-352 / 2005-03-02
NCV 50-353 / 2005-04-01
NCV 50-352 & 50-353 / 2005-09-01
Licensee ID NCV - NRC Inspection Report 05000352/05000353/2005004
Licensee ID NCV - NRC Inspection Report 05000352/05000353/2005005
Licensee ID NCV - NRC Inspection Report 05000352/05000353/2006002
NCV 50-353 / 2006-02-01

**System Health Indicator Program (SHIP) Reports**:

System Health Overview Report, March 2006, Reactor Core isolation Cooling (RCIC)
System Health Overview Report, March 2006, Main Steam Safety Relief Valves
System Health Overview Report, Emergency Service Water (ESW)

**Technical Data Reports**:

Maintenance Rule Expert Panel Meeting April 27, 2006
Maintenance Rule Expert Panel Meeting

**Procedures and Training and Resource Manuals**

Reactor Protection System (RPS) Failures (OT-117, Rev. 8)
Control Rod Drive System Problems (ON-107, Rev. 14)
Scram Discharge Volume High Level (OT-105, Rev. 10)
Procedure Use and Adherence (HU-AA-104-101, Rev. 0)
Autolog Administrative T&RM (OP-AA-111-1001, Rev. 0)
Operating Narrative Logs and Records (OP-AA-111-101, Rev. 5)
Check-in Self-assessments (LS-AA-126-1005, Rev. 2)
Routine Inspection of the Residual Heat Removal Service Water System (S12.9.A, Rev. 7)
RHR Service Water System Starting (S12.1.A, Rev. 44)
Exelon 50.59 Review Process (LS-AA-104, Rev. 5)
Exelon 50.59 Resource Manual (LS-AA-104-1000)
Processing of Procedures and T&RMs (AD-AA-101, Rev. 15)

Simple Quick Acts/ Transient Acts (OP-LG-101-1001, Rev. 1)
Exelon Corrective Action Program (CAP) procedure (LS-AA-125, Rev. 9)
Operating Experience Procedure (LS-AA-115)
RPS MSIV- Closure; Div IA, Channel A1 Response Time Test (HV-41-1F022A, B; HV-41-1F028A, B) (ST-2-041-800-1, Rev. 10)
Routine Inspection of RCIC System (S.49.9.A, Rev. 23)
Preventive Maintenance Procedure for Diesel Generator Heat Exchanger Cleaning and Examination (M-011-001, Rev 11)
Control of Bolting/Torquing/Tensioning (MAG-CG-301, Rev. 4)
RPS and NSSSS- Drywell Pressure- High; Div IB, Channel B Functional Test (PIS-42-1N650B) (ST-2-042-654-1, Rev. 18)
Human Performance Tools and Verification Practices (HU-AA-101, Rev. 3)
1B RHR Pump Disch Hi/Lo Press (ARC-MCR-115 F3, Rev. 0)
Calibration of Main Turbine Stop Valve and the MSIV RPS Limit Switches. NAMCO Series EA170 (IC-11-00345, Rev. 0)
RCIC Fill and Vent (S49.3.A, Rev. 14)
RHR Shutdown Cooling Piping Flushes (S51.5.C, Rev. 22)
HPCI Fill and Vent (S55.3.A, Rev. 14)
Shutdown Operations - Refueling, Core Alteration and Core Off-Loading (1GP-6 1, Rev. 7)
Periodic Byproduct Material Leakage Test and Inventory (ST-0-107-493-0, Rev. 7)
Periodic Byproduct Material Leakage Test and Inventory (ST-0-107-493-0, Rev. 8)
Source Control and Handling (RP-LG-800-1001, Rev. 2)
Outside Chemistry/NPDES Related Sampling and Analysis Schedule (CY-LG-120-1102, Rev. 2)
Outside Chemistry/NPDES Related Sampling and Analysis Schedule (CY-LG-120-1102, Rev. 3)
RHR Shutdown Cooling Supply (ST-4-LLR-121-1, Rev. 12)
RHR Shutdown Cooling Supply (ST-4-LLR-121-1, Rev. 11)
'B' RHR LPCI (ST-4-LLR-461-1, Rev. 13)
'B' RHR LPCI (ST-4-LLR-461-1, Rev. 12)
'B' RHR LPCI (ST-4-LLR-461-2, Rev. 7)
Feedwater (ST-4-LLR-084-1, Rev. 9)
Low Pressure ECCS Keep Fill System High Point Venting (ST-6-107-370-2, Rev. 6)
'A' Loop RHR Cold Shutdown Valve Test (ST-6-051-202-2, Rev. 18)

**Miscellaneous Documents**:

Security Excellence Plan presentation slides
Individualized Instruction Guide, ST Work Practices, NMC10064, Rev. 3
August 3, 2005, Memorandum from Darrell G. Eisenhut, NSRB Chairman, to Christopher M. Crane, President and Chief Nuclear Officer, Subject: Limerick Nuclear Safety Review Board Meeting July 19 and 20, 2005
Licensed Operator Requalification Simulator Training Module LLOR0602A
Engineering Department Fundamentals Management System (FMS) Observations March 2005 thru March 2006
Engineering Department IRs Generated 2005 - 2006
RHR HV-051-F016 and F021 Drywell Spray Containment Isolation Valve Leak Rate Testing
Radiation Protection SARB Minutes for June 2, 2006 Meeting
Radiation Protection SARB Minutes for April 26, 2006 Meeting

FMS Observation #294537
FMS Observation #302858
LGS Performance Trending - 1st Quarter 2006
LGS Performance Trending - 3rd Quarter 2005
Memorandum, "LGS Actions to Address Nuclear Safety Review Board Meeting, October 31 - November 1, 2005, Executive Summary Contents," dated February 10, 2006
Memorandum, "Limerick Nuclear Safety Board Meeting, July 19 and July 20, 2005," dated August 3, 2005
Memorandum, "Limerick Nuclear Safety Board Meeting, October 31 and November 1, 2005," dated November 11, 2005
6:30 Work Status and Coordination Meeting Package on 6/19/2006
LGS List of Emergency Operating Procedures (EOP's) Attachment 3 of ERG-LG-310-1010
Limerick Generating Station Maintenance Rule Scope and Performance Monitoring Document
Maintenance Rule Expert Panel Meeting Minutes on February 16, 2006
Temporary Procedure Change 1-05-0084-0
Simulator Training Outline, LLOR0601A, Rev. 1
L.O. Requalification Training, Outage Procedure Review, LLOR0601D, Rev.0
Simulator Training Scenario, Refueling Operations - Fuel Moves with Inadvertent Criticality, LSTS6303, Rev. 5

**Operating Experience**

NER NC-05-017
NER OC-05-031
NER LI-04-071
OPEX Review of NRC Information Notice 2005-11, Internal Flooding/Spray-Down of Safety Related Equipment Due to Unsealed Equipment Hatch Floor Plugs and or Blocked Floor Drains (AR 253533)
OPEX Review of NRC Information Notice 2005-28, Criticality Monitor Audible Alarms (AR 396863)
OPEX Review of NRC Information Notice 2005-30, Internal Flood Design Deficiencies

## LIST OF ACRONYMS

| | |
|---|---|
| ACE | Apparent Cause Evaluation |
| ADAMS | Agencywide Documents Access and Management System |
| ADHR | Alternate Decay Heat Removal |
| AR | Action Request |
| CAP | Corrective Action Program |
| CAPCO | Corrective Action Program Coordinator |
| CCA | Common Cause Analysis |
| CFR | Code of Federal Regulations |
| ECCS | Emergency Core Cooling System |
| ECP | Employee Concerns Program |
| EOP | Emergency Operating Procedure |
| ESW | Emergency Service Water |
| FASA | Focused Area Self Assessment |
| FME | Foreign Material Exclusion |
| FMS | Fundamentals Management System |
| HPCI | High Pressure Coolant Injection |
| I&C | Instrumentation and Controls |
| IMC | NRC Inspection Manual Chapter |
| IR | Issue Report |
| LER | Licensee Event Report |
| LGS | Limerick Generating Station |
| LLRT | Local Leak Rate Test |
| LPCI | Low Pressure Coolant Injection |
| MRC | Management Review Committee |
| MSIV | Main Steam Isolation Valve |
| NCV | Non-Cited Violation |
| NER | Nuclear Event Report |
| NOS | Nuclear Oversight |
| NRC | Nuclear Regulatory Commission |
| OA | Other Activities |
| OPEX | Operating Experience |
| PARS | Publically Available Records |
| PI&R | Problem Identification & Resolution |
| PV&F | Pump, Valve, and Flow |
| RCA | Root Cause Analysis |
| RCIC | Reactor Core Isolation Cooling |
| RCS | Reactor Coolant System |
| RHR | Residual Heat Removal |
| RHRSW | Residual Heat Removal Service Water |
| ROP | Reactor Oversight Process |
| RPS | Reactor Protection System |
| SARB | Self Assessment Review Board |
| SCWE | Safety Conscious Work Environment |
| SDP | Significance Determination Process |
| SFP | Spent Fuel Pool |
| SOC | Station Oversight Committee |
| T&RM | Training and Reference Manual |
| UFSAR | Updated Final Safety Analysis Report |