UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
2100 RENAISSANCE BLVD., SUITE 100
KING OF PRUSSIA, PA 19406-2713

June 27, 2014

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: THREE MILE ISLAND NUCLEAR STATION, UNIT 1 – NRC PROBLEM IDENTIFICATION AND RESOLUTION INSPECTION REPORT 05000289/2014009

Dear Mr. Pacilio:

On May 23, 2014, the United States Nuclear Regulatory Commission (NRC) completed an inspection at your Three Mile Island Nuclear Station, Unit 1. The enclosed report documents the inspection results, which were discussed on May 23, 2014, with Mr. Mark Newcomer, Plant Manager, and other members of your staff.

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

Based on the samples selected for review, the inspectors concluded that Exelon was generally effective in identifying, evaluating, and resolving problems. Exelon 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 NRC-identified finding of very low safety significance (Green). The inspectors determined that this finding also involved a violation of NRC requirements. However, because of the 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, consistent with Section 2.3.2.a of the NRC Enforcement Policy. If you contest this non-cited violation, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the United States Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at Three Mile Island. In addition, if you disagree with the cross-cutting aspect assigned to the 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 Three Mile Island.

In accordance with Title 10 of the *Code of Federal Regulations* 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 Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Raymond J. Powell, Chief
Technical Support and Assessment Branch
Division of Reactor Projects

Docket No. 50-289
License No. DPR-50

Enclosure: Inspection Report 05000289/2014009
w/Attachment: Supplementary Information

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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 Three Mile Island.

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/RA/

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No.	50-289
License No.	DPR-50
Report No.	05000289/2014009
Licensee:	Exelon Generation Company
Facility:	Three Mile Island Nuclear Station, Unit 1
Location:	Middletown, PA 17057
Dates:	May 5 through May 23, 2014
Team Leader:	Leonard Cline, Senior Project Engineer
Inspectors:	Justin Heinly, Resident Inspector Thomas Setzer, Senior Project Engineer Brandon Pinson, Project Engineer
Approved by:	Raymond J. Powell, Chief Technical Support and Assessment Branch Division of Reactor Projects

SUMMARY

IR 05000289/2014009; 05/05/2014 – 05/23/2014; Three Mile Island Nuclear Station, Unit 1 (TMI); Biennial Baseline Inspection of Problem Identification and Resolution. The inspectors identified one finding in the area of effectiveness of corrective actions.

This NRC team inspection was performed by three regional inspectors and one resident inspector. The inspectors identified one finding of very low safety significance (Green) during this inspection and classified the finding as a non-cited violation (NCV). The significance of most findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," dated June 2, 2011. Cross-cutting aspects are determined using IMC 0310, "Aspects Within Cross-Cutting Areas," dated December 19, 2013. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated July 9, 2013. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 5.

Problem Identification and Resolution

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. 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 one violation of NRC requirements in the area of effectiveness of corrective actions.

The inspectors concluded that Exelon adequately identified, reviewed, and applied relevant industry operating experience to TMI operations. In addition, based on those items selected for review, the inspectors determined that Exelon's self-assessments and audits 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 could have had a negative impact on the site's safety conscious work environment.

Cornerstone: Barrier Integrity

Green. The inspectors identified a finding of very low safety significance involving an NCV of Title 10 of the *Code of Federal Regulations* (10 CFR) 50, Appendix B, Criterion XVI, "Corrective Action," because Exelon did not take adequate corrective actions to address a condition adverse to quality that caused the failure of two primary containment isolation valves. Specifically, the corrective actions implemented after the failure of CA-V-13 in 2010 and WDL-V-303 in 2013 did not ensure that the deficient basic work practices that resulted in the valve failures were corrected. Exelon documented this issue in the corrective action program as issue report (IR) 1664529 and took prompt actions to validate the operability of valves with similar actuators that had been worked since refueling outage T1R19. In addition, Exelon is performing

a cause evaluation to fully understand the causes of the issue and implement actions to correct the condition adverse to quality prior to the next valve maintenance window.

The finding is associated with the Barrier Integrity cornerstone and is more than minor because if left uncorrected it could lead to a more significant safety concern. Specifically, the uncorrected deficient basic work practices could result in additional primary containment isolation valve failures. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 3 of IMC 0609, Appendix A, "The Significance Determination Process for Findings At-Power," issued June 19, 2012, the inspectors determined that the finding was of very low safety significance (Green) because it does not represent an actual open pathway in the containment and did not impact the hydrogen igniters. The finding has a cross-cutting aspect of evaluation in the problem identification and resolution area because Exelon did not thoroughly evaluate the condition to ensure that corrective actions addressed the cause. Specifically, Exelon identified that deficient basic work practices during valve actuator reassembly were the probable cause of the WDL-V-303 failure in 2013 and had been previously identified as the cause of the CA-V-13 failure in 2010, but Exelon did not evaluate the effectiveness of the corrective actions completed after the CA-V-13 failure or the need for additional corrective actions to address the probable cause. [P.2 Evaluation] [Section 4OA2.1.c.(1)]

REPORT DETAILS

4. OTHER ACTIVITIES (OA)

4OA2 Problem Identification and Resolution (71152B – 1 sample)

This inspection constitutes one biennial sample of problem identification and resolution as defined by Inspection Procedure 71152. All documents reviewed during this inspection are listed in the Attachment to this report.

.1 Assessment of Corrective Action Program Effectiveness

a. Inspection Scope

The inspectors reviewed the procedures that described Exelon's corrective action program at TMI. To assess the effectiveness of the corrective action program, the inspectors reviewed performance in three primary areas: problem identification, prioritization and evaluation of issues, and corrective action implementation. The inspectors compared performance in these areas to the requirements and standards contained in 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," and Exelon procedure LS-AA-125, "Corrective Action Program Procedure." For each of these areas, the inspectors considered risk insights from the station's risk analysis and reviewed IRs selected across the seven cornerstones of safety in the NRC's Reactor Oversight Process. Additionally, the inspectors attended plan-of-the-day, station ownership committee, and management review committee meetings. The inspectors selected items from the following functional areas for review: engineering, operations, maintenance, emergency preparedness, radiation protection, chemistry, physical security, and oversight programs.

(1) Effectiveness of Problem Identification

In addition to the items described above, the inspectors reviewed system health reports, a sample of completed corrective and preventative maintenance (PM) work orders, completed surveillance test procedures, operator logs, and periodic trend reports. The inspectors also completed field walkdowns of various systems on site, including reactor river water, decay heat closed cooling water, station blackout emergency diesel generator, and nuclear river water. Additionally, the inspectors reviewed a sample of IRs written to document issues identified through internal self-assessments, audits, emergency preparedness drills, and the operating experience program. The inspectors completed this review to verify that Exelon entered conditions adverse to quality into their corrective action program as appropriate.

(2) Effectiveness of Prioritization and Evaluation of Issues

The inspectors reviewed the evaluation and prioritization of a sample of IRs issued since the last NRC biennial problem identification and resolution inspection completed in May 25, 2012. The inspectors also reviewed IRs that were assigned lower levels of significance that did not include formal cause evaluations to ensure that they were properly 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 the issues.

(3) Effectiveness of Corrective Actions

The inspectors reviewed Exelon's completed corrective actions through documentation review and, in some cases, field walkdowns to determine whether the actions addressed the identified causes of the problems. The inspectors also reviewed IRs for adverse trends and repetitive problems to determine whether corrective actions were effective in addressing the broader issues. The inspectors reviewed Exelon's timeliness in implementing corrective actions and effectiveness in precluding recurrence for significant conditions adverse to quality. The inspectors also reviewed a sample of IRs associated with selected NCVs and findings to verify that Exelon personnel properly evaluated and resolved these issues. In addition, the inspectors expanded the corrective action review to five years to evaluate Exelon actions related to water and debris in safety-related electrical vaults, core flood containment isolation valves CF-V-19A/B not closing on engineered safeguard actuation system (ESAS) signal, and nuclear instruments (NI)-YY-11/11A/12/12A out of tolerance issues.

b. Assessment

(1) Effectiveness of Problem Identification

Based on the selected samples, plant walkdowns, and interviews of site personnel in multiple functional areas, the inspectors determined that Exelon identified problems and entered them into the corrective action program at a low threshold. Exelon staff at TMI initiated approximately 20,000 IRs between May 2012 and April 2014. The inspectors observed supervisors at the plan-of-the-day, station ownership committee, and management review committee meetings appropriately questioning and challenging IRs to ensure clarification of the issues. Based on the samples reviewed, the inspectors determined that Exelon trended equipment and programmatic issues, and appropriately identified problems in IRs. The inspectors verified that conditions adverse to quality identified through these reviews were entered into the corrective action program as appropriate. Additionally, inspectors concluded that personnel were identifying trends at low levels. In general, inspectors did not identify any issues or concerns that had not been appropriately entered into the corrective action program for evaluation and resolution. In response to several questions and minor equipment observations identified by the inspectors during plant walkdowns, Exelon personnel promptly initiated IRs and/or took immediate action to address the issues.

(2) Effectiveness of Prioritization and Evaluation of Issues

The inspectors determined that, in general, Exelon appropriately prioritized and evaluated issues commensurate with the safety significance of the identified problem. Exelon screened IRs for operability and reportability, categorized the IRs by significance, and assigned actions to the appropriate department for evaluation and resolution. The IR screening process considered human performance issues, radiological safety

concerns, repetitiveness, adverse trends, and potential impact on the safety conscious work environment.

Based on the sample of IRs reviewed, the inspectors noted that the guidance provided by Exelon corrective action program implementing procedures appeared sufficient to ensure consistency in categorization of issues. However, the inspectors identified 12 IRs that were not categorized in accordance with the guidance established by LS-AA-120, "Issue Identification and Screening Process," Attachment 2.

All 12 IRs were classified as severity level 4, but in accordance with the guidance in LS-AA-120, Attachment 2, these IRs should have been classified as severity level 3. The IRs were related to the following three areas as listed in Attachment 2: foreign material found or left in plant systems, management review committee rejection of a department generated document, and failure to meet a non-nuclear regulatory obligation. The inspectors determined that the incorrect categorization of these issues was a performance deficiency. This performance deficiency was considered minor because the difference in categorization only reduced the level of management review for the completed corrective actions and the inspectors reviewed the corrective actions completed for each of these IRs and did not identify concerns with the adequacy of the actions taken to correct the identified issues. Exelon initiated IR 1657192 to address this concern.

The inspectors concluded that operability and reportability determinations completed for the reviewed IRs were performed when conditions warranted and the evaluations supported the conclusion. In general, causal analyses used prescribed analyses methods and appropriately considered the extent of condition or problem, generic issues, and previous occurrences of the issue. However, for the apparent cause evaluations (ACEs) reviewed, the inspectors identified one observation related to the rigor applied to the documentation of the evaluation. For the three ACEs listed below, based on the quality of the documentation provided, the inspectors questioned the adequacy of the rigor of the evaluation performed.

- IR 1548630 – "Reactor coolant drain tank inboard isolation valve, WDL-V-303, failed to operate to the full closed position during surveillance test procedure 1303-5.1A"
- IR 1492840 – "The results of a February 2013 common cause analysis on the lack of sustained corrective action program performance improvement, a nuclear oversight audit of material management and procurement, a nuclear oversight audit of security, and performance as measured by site performance indicators showed gaps in corrective action program standards and compliance"
- IR 1554565 – "A nuclear service closed cooling water pump was removed from service due to high noise and vibration"

For these three ACEs, the inspectors questioned the completeness of the documentation for the responses to the questions posed by LS-AA-125-1003, "Apparent Cause Evaluation Manual," Attachments 5 and 6, which are the basis for the evaluation results. Specifically, the documentation for the responses to the questions in these attachments was minimal and did not provide the detail needed to enable the reader to understand the basis for the evaluation results. In addition, at times the documentation in these attachments appeared to conflict with information presented in other sections of the ACE documentation.

For IR 1492840 and IR 1554565, the inspectors' interviews with the individuals who completed the evaluations determined that the lack of documentation was the result of weak documentation practices and not an inadequate evaluation. The inspectors also confirmed through interviews and plant walkdowns that adequate corrective actions were completed for the conditions adverse to quality identified in both of these IRs. For the nuclear service closed cooling water pump issue, the bearing was replaced and vibration monitoring program improvements were initiated. For the correction action program performance gaps, management attention was increased through additional periodic meetings and performance indicators. The inspectors did not identify a performance deficiency related to the adequacy of the cause evaluation for these two IRs because LS-AA-125-1003 did not specify the level of detail required for documentation of the responses to Attachment 5 and 6. However, for the ACE completed for IR 1548630, the WDL-V-303 failure, the inspectors determined that the lack of rigor applied to the ACE contributed to the implementation of inadequate corrective actions, which was a performance deficiency that was determined to be a more than minor NCV of 10 CFR 50, Appendix B, Criterion XVI. The details of this NCV are documented in Section 4OA2.1(c) of this report. Exelon IR 1663097 will address the inspectors' concerns regarding ACE documentation rigor.

(3) Effectiveness of Corrective Actions

The inspectors concluded that corrective actions for identified deficiencies were generally timely and adequately implemented. For significant conditions adverse to quality, Exelon identified actions to prevent recurrence and corrective actions to address the sample of NRC NCVs and findings since the last problem identification and resolution inspection were also generally timely and effective. However, based on the scope of samples reviewed, the inspectors identified several observations regarding weaknesses in the implementation of corrective actions that are discussed below. The inspectors also identified one Green NCV of 10 CFR 50, Appendix B, Criterion XVI, because Exelon did not take adequate corrective actions to address a condition adverse to quality that caused the failure of two primary containment isolation valves. The details of this NCV are documented in Section 4OA2.1(c) of this report.

- IR 1264252: On July 7, 2011, the difference between NI 12 wide range (WR) and NI 6 exceeded the system engineering performance monitoring plan (PMP) alert level of 25%. When this difference exceeded 30%, NI 12 WR was considered inoperable, and the PMP required that an event-based calibration surveillance be performed. In response to IR 1264252, the system engineer recommended close monitoring of weekly surveillance checks for the affected NIs to ensure that the calibration surveillance was completed when required. On September 16, 2011, operations generated IR 1237450 when the delta reached 29.5% and an event-driven action request was generated to perform the calibration surveillance as a corrective action. However, because the work control organization assigned the wrong prioritization to the action request, the calibration was not performed. Then, on October 8, 2011, Exelon did not identify that the difference between NI 12 WR and NI 6 conclusively exceeded 30%, and did not take the actions specified by the PMP to restore NI12 WR to operable status in accordance with the technical specifications (TS). The inspectors determined that the inoperable NI 12 WR was a condition adverse to quality and not taking action to restore it to operable status in accordance with the PMP was a performance deficiency. This performance deficiency was considered minor because the station maintained the minimum

required operable NIs in accordance with TS despite exceeding the action level for NI 12, NI 12 was used for indication only during an accident scenario, and redundant and diverse indications were available to the operators during the time that NI 12 was inoperable. Exelon initiated IR 1662824 to address this concern.

- IR 1539778: The evaluation for this IR discussed repetitive failures of IA-Q-2, the instrument air dryer for one of the three instrument air compressors, IA-P-4. Exelon determined in this evaluation that one of the causes of repetitive dryer failures was repeated cartridge valve failures. The cartridge valves were used to control the air dryer cycles and failure or slow operation of these valves can cause a loss of air from the affected compressor and changes in dew point of the air supplied to the header. The inspectors determined that this was a condition adverse to quality as defined by Exelon procedure LS-AA-125, “Corrective Action Program Procedure.” The corrective actions identified to address this cause were an air dryer control system modification scheduled to be completed later in 2014 and a change to the PM frequency for cartridge valve replacements, which was intended to reduce the number of failures until the modification was completed. The change to the PM was initiated in 2010, but as of the date of this inspection, the inspectors identified that it was still not implemented because the action to change the PM frequency was incorrectly processed. LS-AA-125 states that corrective actions for conditions adverse to quality are typically completed within 90 days. The inspectors determined that the untimely PM change was an untimely corrective action and was a performance deficiency, but it was minor because the impact of the cartridge valve failures on instrument air availability and the long term reliability of safety-related components supplied by the air was negligible. Exelon initiated IR 16557064 to address this concern.

- IR 1295235: On November 29, 2011, instrument air compressor IA-P-4 tripped on motor overload. This was preceded by motor overload trips at the end of September 2011 and beginning of October 2011. Exelon determined that the apparent cause of the recurring trips was undetected excessive demand on the IA system due to deficiencies in monitoring the system for air leakage. Specifically, the use of the flow totalizer, IA-FI-1217, and trending of IA-P-4 compressor loaded and unloaded times to monitor leakage did not identify leakage between the compressor and the flow totalizer. A corrective action was assigned to require that acoustic monitoring and trending of IA-P-4 compressor loaded and unloaded times be added to the instrument air PMP to provide early indication of increased demand on the system. The PMP submitted to address this corrective action required that monitoring be completed weekly, but in January 2013 changes to Operations log taking resulted in Engineering not receiving the information needed to support weekly monitoring. The inspectors determined that Engineering did not identify this change as a concern and Operations did not discuss the change with Engineering before it was made. Exelon procedure LS-AA-125 requires that changes to corrective actions should be concurred upon with appropriate groups (Management Review Committee, Department head, etc). Based on discussions with Engineering about how the information provided by Operations was trended and monitored, the inspectors determined that the change in Operations log taking adversely affected Engineering’s ability to monitor the IA-P-4 compressor loading as required by the corrective action and, therefore, changed the intent of the corrective action without appropriate review. In addition, procedure ER-AA-2003, “System Performance Monitoring and Analysis," requires that plant engineering managers formally approve

revisions to PMPs. The inspectors determined that the unapproved change to the corrective action closure item for instrument air compressor trips was a performance deficiency that was considered minor because no additional compressor trips due to motor overload had occurred since January 2013. Exelon initiated IR 1657556 to address this concern.

c. Findings

(1) Inadequate Corrective Actions for a Condition Adverse to Quality that Caused the Failure of two Primary Containment Isolation Valves

Introduction. The inspectors identified a finding of very low safety significance involving an NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," because Exelon did not take adequate corrective actions to address a condition adverse to quality that caused the failure of two primary containment isolation valves. Specifically, the corrective actions implemented after the failure of CA-V-13 in 2010 and WDL-V-303 in 2013 did not ensure that the deficient basic work practices that resulted in the valve failures were corrected.

Description. On May 18, 2010, Exelon identified that containment isolation valve CA-V-13, a reactor coolant sample line inboard containment isolation valve, did not stroke to its closed position. Operators declared the valve inoperable; however, the penetration remained operable for containment isolation because the redundant isolation valve remained operable. During subsequent troubleshooting, Exelon identified that the most probable cause of the failure was interference between a wire bundle and limit switches inside the motor operated valve actuator housing. Exelon inspected the actuator internals and repaired the damaged wiring lugs, misaligned contacts, and wiring interferences that it discovered and returned the valve to service on May 26, 2010. The CA-V-13 motor-operated valve actuator model is an SMB-000 for which there is substantial operating experience about the failure of these actuators to reposition due to wire bundle and limit switch interference.

Exelon performed a work group cause evaluation after the CA-V-13 failure and determined the cause of the wire interference was deficient basic work practices by valve maintenance technicians during valve actuator PM performed during refueling outage T1R18 in the fall of 2009. Specifically, wire bundles in the limit switch compartment were not properly routed and secured and the compartment cover was not carefully installed when the actuator was restored after maintenance. The inspectors determined that these deficient basic work practices were a condition adverse to quality in accordance with Exelon procedure LS-AA-125, "Corrective Action Program," that defines a condition adverse to quality as an "all-inclusive term used in reference to the following: failures, malfunctions, deficiencies, defective items, and nonconformances." Exelon corrective actions for the deficient basic work practices included adding this event as operating experience to training for the valve team and adding a caution to the maintenance procedures to exercise care when routing and securing wire bundles and installing the limit switch compartment cover. These corrective actions were completed before refueling outage T1R19 in the fall of 2011.

On August 20, 2013, TMI operators performed ESAS surveillance testing during which containment isolation valve WDL-V-303, the reactor coolant drain tank discharge inboard isolation valve, failed to stroke closed to its safety position. Operators declared the valve

inoperable; however, this penetration also remained operable for containment isolation because the redundant isolation valve remained operable. The actuator model for this valve was also SMB-000. Exelon conducted troubleshooting and actuator internal inspections and did not identify degraded components or loose connections that could have led to the failure, but did determine that one wire bundle within the actuator had not been properly routed and secured and could have interfered with the valve limit switches when the limit switch compartment cover was installed. Based on these findings, Exelon concluded that more than likely, wire bundle and limit switch interference caused the WDL-V-303 failure to stroke. After troubleshooting was completed, Exelon carefully routed and secured the wire bundles within the actuator and carefully replaced the limit switch compartment cover. The valve was then successfully stroked from the control room and operations returned it to service on August 21, 2013. Exelon also performed extent of condition inspections to confirm that other valves worked in refueling outages T1R18 and T1R19 were not impacted by the deficient basic work practices. No additional concerns were identified.

Exelon initiated IR 1548630 and performed an ACE. Exelon identified that PM similar to what was performed on CA-V-13 in refueling outage T1R18 had been performed on the WDL-V-303 actuator during refueling outage T1R19. Exelon concluded in its ACE that the most probable cause of the limit switch interference for WDL-V-303 was the same deficient basic work practices that led to the CA-V-13 failure. Exelon based this conclusion on the fact that CA-V-13 and WDL-V-303 have an SMB-000 actuator, the same maintenance was performed on both valves prior to their failure, the two valves were configured and operated similarly, and one wire bundle was found not properly routed and secured during the inspection of the WDL-V-303 actuator after the failure.

Exelon acknowledged in its ACE that the training and procedure changes completed as corrective actions after the CA-V-13 failure were in place when the PM was performed on WDL-V-303 during T1R19. However, the inspectors identified that Exelon did not evaluate the effectiveness of those corrective actions considering the WDL-V-303 failure or take additional action to more effectively address the deficient work practices. Exelon did initiate an action to evaluate the possibility of installing larger SMB-000 limit switch compartment covers to provide more room in the compartment and alleviate the potential for interference caused by improperly secured and routed wire bundles; however, Exelon determined that if this was deemed a necessary modification, it would need to be pursued on an individual valve basis due to the multiple valve configurations that existed in the plant. Exelon then closed this action with no additional action required and, as of the date of this inspection, the inspectors identified Exelon had not initiated actions to pursue this type of modification for any of the SMB-000 actuators at TMI.

In response to the inspectors' questions on the adequacy of the corrective actions for the WDL-V-303 failure, Exelon informed the inspectors that in January 2012, before the WDL-V-303 failure was identified, but after the work was performed on WDL-V-303 in T1R19, they had completed a common cause analysis regarding concerns with the performance of the valve team that had completed the PM on motor operated valves during T1R19 – including WDL-V-303. Exelon believed that the corrective actions initiated as a result of this January 2012 common cause analysis would address the issues that they identified as the cause of the WDL-V-303 failure through their August 2013 apparent cause. The corrective actions completed as a result of this common cause analysis included additional administrative guidelines and supervisory oversight for the valve team during future valve maintenance. The inspectors' review of these

corrective actions concluded that, although the actions were likely to improve the performance of the valve team during subsequent outages, they were not adequate to address the deficient basic work practices identified as the condition adverse to quality that caused the WDL-V-303 failure because:

(1) The common cause analysis was completed in January 2012 before the WDL-V-303 failure was identified in August 2013 and therefore the analysis could not have considered the factors that led to this failure when it identified corrective actions to address the valve team issues;
(2) The apparent cause evaluation completed in August 2013, after the WDL-V-303 failure was identified, did not discuss the corrective actions taken as a result of the common cause analysis completed in January 2012 and how the associated corrective actions would address the issues that led to the WDL-V-303 failure; and,
(3) The corrective action added by the common cause analysis, which Exelon believed would ensure that the deficient basic work practices that caused limit switch interference were corrected, was additional supervision; however, the new guidance provided to the valve team supervision did not require that the supervisor be present when technicians were actually putting the limit switch compartment back together.

The inspectors determined that not generating actions to address the deficient basic work practices that Exelon had identified in its August 2013 ACE as the most probable cause of the WDL-V-303 failure was a performance deficiency because Exelon procedure, LS-AA-125-1003, “Apparent Cause Evaluation,” required that appropriate corrective action be established for identified issues with clear linkage between the identified cause and the corrective actions created. The inspectors concluded that as a result of this standard not being met, Exelon did not take adequate corrective actions to address the identified condition adverse to quality that caused the failure of CA-V-13 and WDL-V-303.

Exelon documented this issue in the corrective action program as IR 1664529 and took prompt actions to validate the operability of valves with SMB-000 actuators that had been worked since refueling outage T1R19. In addition, Exelon is performing a cause evaluation to fully understand the causes of the issue and implement actions to correct the condition adverse to quality prior to the next valve maintenance window.

Analysis. The inspectors identified that Exelon’s failure to take adequate corrective actions to address the deficient basic work practices that lead to the failure of CA-V-13 and WDL-V-303 was a performance deficiency that was within Exelon’s ability to foresee and correct. This finding is associated with the Barrier Integrity cornerstone and is more than minor because if left uncorrected it could lead to a more significant safety concern. Specifically, the uncorrected deficient basic work practices could result in additional primary containment isolation valve failures. In accordance with IMC 0609.04, “Initial Characterization of Findings,” and Exhibit 3 of IMC 0609, Appendix A, “The Significance Determination Process for Findings At-Power,” issued June 19, 2012, the inspectors determined that the finding was of very low safety significance (Green) because it does not represent an actual open pathway in the physical integrity of reactor containment, containment isolation system, and heat removal components, and did not impact the function of the hydrogen igniters in the reactor containment.

The finding has a cross-cutting aspect of evaluation in the problem identification and resolution area because Exelon did not thoroughly evaluate the condition to ensure that

corrective actions addressed the cause. Specifically, Exelon identified that deficient basic work practices during valve actuator reassembly were the probable cause of the WDL-V-303 failure in 2013 and had been previously identified as the cause of the CA-V-13 failure in 2010, but Exelon did not evaluate the effectiveness of the corrective actions completed after the CA-V-13 failure or the need for additional corrective actions to address the probable cause. [P.2 Evaluation]

Enforcement. 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," requires that measures be established to assure that conditions adverse to quality are promptly identified and corrected. Contrary to the above, since May 18, 2010, the measures established by Exelon's corrective action program did not assure that the condition adverse to quality that caused two primary containment isolation valve failures was promptly corrected. Specifically, Exelon did not take adequate corrective actions to address deficient basic work practices that it had determined caused the CA-V-13 and WDL-V-303 valve actuator failures on May 18, 2010, and August 20, 2013, respectively. Since this deficiency was considered of very low safety significance (Green), and was entered into the corrective action program for resolution as IR 1664529, this violation is being treated as an NCV, consistent with the NRC Enforcement Policy. (**NCV 05000289/2014009-01, Inadequate Corrective Actions for a Condition Adverse to Quality that Caused the Failure of two Primary Containment Isolation Valves)**

.2 Assessment of the Use of Operating Experience

a. Inspection Scope

The inspectors reviewed a sample of IRs associated with review of industry operating experience to determine whether Exelon appropriately evaluated the operating experience information for applicability to TMI and had taken appropriate actions, when warranted. The inspectors also reviewed evaluations of operating experience documents associated with a sample of NRC generic communications to ensure that Exelon adequately considered the underlying problems associated with the issues for resolution via their corrective action program. In addition, the inspectors observed various plant activities to determine if the station considered industry operating experience during the performance of routine and infrequently performed activities.

b. Assessment

The inspectors determined that Exelon appropriately considered industry operating experience information for applicability, and used the information for corrective and preventive actions to identify and prevent similar issues when appropriate. The inspectors determined that operating experience was appropriately applied and lessons learned were communicated and incorporated into plant operations and procedures when applicable. The inspectors also observed that industry operating experience was routinely discussed and considered during the conduct of plan-of-the-day meetings and pre-job briefs.

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 corrective action program, departmental self-assessments, and assessments performed by independent organizations. Inspectors performed these reviews to determine if Exelon entered problems identified through these assessments into the corrective action program, when appropriate, and whether Exelon initiated corrective actions to address identified deficiencies. The inspectors evaluated the effectiveness of the audits and assessments by comparing audit and assessment results against self-revealing and NRC-identified observations made during the inspection.

b. Assessment

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

c. Findings

No findings were identified.

.4 Assessment of Safety Conscious Work Environment

a. Inspection Scope

During interviews with station personnel, the inspectors assessed the safety conscious work environment at TMI. Specifically, the inspectors interviewed personnel to determine whether they were hesitant to raise safety concerns to their management and/or the NRC. The inspectors also interviewed the station Employee Concerns Program coordinator to determine what actions are implemented to ensure employees were aware of the program and its availability with regards to raising safety concerns. The inspectors reviewed the Employee Concerns Program files to ensure that Exelon entered issues into the corrective action program when appropriate.

b. Assessment

During interviews, TMI staff expressed a willingness to use the corrective action program to identify plant issues and deficiencies and stated that they were willing to raise safety issues. The inspectors noted that no one interviewed stated that they personally experienced or were aware of a situation in which an individual had been retaliated against for raising a safety issue. All persons interviewed demonstrated an adequate knowledge of the corrective action program and the Employee Concerns Program. Based on these limited interviews, the inspectors concluded that there was no evidence

of an unacceptable safety conscious work environment and no significant challenges to the free flow of information.

c. Findings

No findings were identified.

4OA6 Meetings, Including Exit

On May 23, 2014, the inspectors presented the inspection results to Mr. Mark Newcomer, Plant Manager, and other members of the TMI staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

ATTACHMENT: SUPPLEMENTARY INFORMATION

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

M. Newcomer	Plant Manager
T. Arnold	Manager, Corrective Action Program
D. Atherholt	Manager, Regulatory Assurance
M. Benson	Maintenance Rule Coordinator
P. Musselman	Manager, Site Security Ops
K. Coughlin	Shift Operations Superintendent
J. Dullinger	Director, Site Engineering
M. Fitzwater	Senior Regulatory Assurance Engineer
C. Six	Director, Operations
G. Smith	Director, Maintenance
B. Shumaker	Manager, Emergency Preparedness
M. Torborg	Manager – Programs Engineering
B. Young	Manager - CMO

LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED

Opened and Closed

05000289/2014009-01	NCV	Inadequate Corrective Actions for a Condition Adverse to Quality that Caused the Failure of Two Primary Containment Isolation Valves

LIST OF DOCUMENTS REVIEWED

Section 4OA2: Problem Identification and Resolution

Audits and Self-Assessments

AR 1606661, Preparation for NRC Problem Identification and Resolution (PI&R) Inspection per Inspection Procedure 71152, 3/17/14
AR 1309937, Performance Improvement, Three Mile Island, 2012 PI&R NRC Inspection
AR 1453687, Perimeter Intrusion Detection System Effectiveness, 5/31/13
AR 1343818, Radiation Monitor System Health Issues, 5/30/12
AR 1388509, Standards for Protected Equipment, 9/26/12
AR 1449386, Annual Clearance and Tagging CISA, 2/28/13
AR 1475249, Maintenance Functional Area Increased Frequency Audit Report, 3/20/13
AR 1346250, Annual Check-In Self-Assessment of the MI&E Program, 2/22/13

Issue Reports *(* indicates that IR was generated as a result of this inspection)*

1664529*	1403366	1447940	1519212	1406190	804151
1548630	937256	1396635	1534589	1658058*	1558715
1295987	1262539	1534613	1542369	1658082*	1475245
1070603	1417085	1459950	1578516	1657556*	1639377
1658102*	1962158	1425235	1582968	1658097*	918927
1662515*	1633341	1617538	1583267	1657192*	845936
1400518	1385574	1383430	1583465	1663188*	1463562
1657138	1401601	1485678	1583874	1399544	1631181
1134790	1418750	1586571	1583900	1202038	1248189
1657064*	1515081	1546098	1584662	1656482	1262908
1539778	1577690	1369785	1584667	920420	926416
1571346	1503657	1391289	1584734	1444780	1618534
1594787	1364232	1482548	1584739	1392569	1548670
1597244	1452875	1510785	1615049	1299120	1404787
1602793	1564371	1410551	1638696	1658806	1523741
1624812	1412100	1547733	1369780	1370410	927870
1628066	1638202	1367447	1374619	1445088	1636675
1641028	1568047	1367450	1378651	1399510	1498182
1642014	1407100	1367408	1392805	1366102	1626498
1649620	1141576	1367429	1625456	1193403	1641688
1403179	1479797	1367434	1629333	1463821	930739
1658145*	1442994	1449198	1577100	1370207	1490274
1295235	1393627	1595868	1639284	1565775	1582416
1442515	1407085	1390219	1577437	1642613	1644090
1442074	354392	1395110	1352798	1439345	1648867
1442518	396595	1476826	924853	928120	1648871
1442997	688190	1405432	924872	1370187	1350809
1555843	688331	1415248	1156594	1363932	1350800
1413037	710872	1421678	1291005	1642650	1627028
620846	757506	1421743	1293997	1439999	1467101
1662824	998557	1434432	1306701	1250637	1538696
1264252	1390571	1443743	1367478	1527641	1548039
951476	1396453	1443745	1367746	1369965	1539741
913223	1396467	1498010	1396744	1641677	1410255
1143726	1403278	1442224	1442266	1513328	1416027
1189490	1416103	1359608	1498185	1461761	1416035
1237450	1582228	1293861	1498187	1369960	1418616
1368183	1321257	1375469	1562690	918356	1472198
1392801	1608625	1317525	1592429	1591943	1544573
1268852	1400723	1577895	1592953	1493109	1424074
1244594	1572877	1638188	1362275	1599752	1447460
1364596	1612178	1396854	126327	1369875	1454611
1535524	1622543	1442407	1379601	1399745	
872398	1487818	1448055	1411147	1592673	
1583483	1367437	1448185	1329167	1554565	
1453735	1459642	1449264	1399326	1347306	
1378335	1422856	1469607	1406189	1553603	

Drawings
DWG 32000-379D1, Flow Schematic, Rev A
P&ID 302-202, Nuclear Services River Water System Flow Diagram, Rev. 81
P&ID 302-711, Core Flooding System
P&ID 302-645, Decay Heat Flow Diagram Closed Cycle Cooling Water
DWG 209-024, Electrical Elementary Diagram DC and Miscellaneous CF Tank 'A' Makeup Isolation Valve CF-V-19A/B
DWG 209-007, Switch Development - Electrical Elementary Diagram DC and Miscellaneous CF Tank 'A' Makeup Isolation Valve CF-V-19A/B

Operating Experience
IN 2007-36, EDG Voltage Regulator Problems, issued 11/15/07
IER L3 12-41, Loss of Emergency Diesel Generator Excitation
Service Information Letter, 8-1/8 O.P. Fuel Control Linkage, used on 38D8-1/8, 38DD8-1/8, 38TD8-1/8, 38TDD & ETDD8-1/8 Engines, Rev. 2
1407100, IN 2012-16, Preconditioning of Pressure Switches Before Surveillance Testing
1479797, Part 21 - ENS 48745 Dresser-Rand Valve
1418186, MSIV Closure Time Failure
1393627, Stem Disc Separation

Violations, Non-Cited Violations and Findings
VIO 05000289/2013-046, Failure to Identify and Correct Missing Electrical Conduit Flood Seals in the Air Intake Tunnel
05000289/2013005-01, Improper Storage of Material in Reactor Building
05000289/2012007-03, Inadequate Design Control for Battery Sizing Calculation
05000289/2012403-02, Failure to Perform Realistic and Simulated Aspects of the Protective Strategy Prior to Engaging Targets During Tactical Qualification Course of Fire
05000289/2012005-02, Failure to Identify and Correct Licensing Basis Flood Barrier and Support Equipment Deficiencies in Intake Screen and Pump House
05000289/2012008-01. Inadequate Corrective Actions Associated with ESAS relay replacement
05000289/2012002-03, Inadequate System Monitoring Results in Multiple IA-P-4 Trips
05000289/2013005-02. Failure to Perform Leak Rate Testing on Close Loop Piping

LERs
05000289/2012-003-00, RCS Leakage Found at Pressurizer Upper Heater Bundle
05000289/2012-005-00, Reactor Trip Due to Trip of RC-P-1C
05000289/2012-001-00, Missing Seals in Air Intake Tunnel Conduits
05000289/2012-001-00, Single Condition Making Independent Trains Inoperable

Procedures
LS-AA-120, Issue Identification and Screening Process, Revision 15
LS-AA-125, Corrective Action Program Procedure, Revision 17
LS-AA-125-1001, Root Cause Analysis Manual, Revision 10
LS-AA-125-1003, Apparent Cause Evaluation Manual, Revision 10
EI-AA-101-1002, Employee Issues Trending, Revision 7
EI-AA-101-1001, Employee Concerns Program Process, Revision 12
OP-TM-731-510, De-energizing 1F 4160V SBO Switchgear, Revision 6
AD-TM-101-1002, Writers Guide for TMI Procedures, Revision 11
1067, Independent Verification Program, Revision 42
OP-TM-533-271, DC-C-2A Heat Transfer Test, Revision 7
TQ-TM-104-533-C001, Decay Heat Closed Cooling Water System #543, Revision 0

ER-TM-321-1041, IST Program Requirements, Revision 3
MA-TM-125-031, SBO Battery Load Test, Revision 0a
1107-9, SBO Diesel Generator, Revisions 68, 69, 73a
HU-AA-104-101, Procedure Use and Adherence, Revision 004
OS-24, Conduct of Operations During Abnormal and Emergency Events, Revision 25
1303-5.1A, 'A' RB Emergency Cooling and Isolation System Logic Channel/Component Test, Revision 10
1303-5.1B, 'B' RB Emergency Cooling and Isolation System Logic Channel/Component Test, Revision 11
OP-TM-244-901, Containment Isolation, Revision 003
OP-TM-213-206, IST of CF-V-19A/19B, Revision 004
HU-AA-101, Human Performance Tools and Verification Process, Revision 8
OP-TM-543-282, Vent of DC Train B, Revision 1
SY-AA-152, Tactical Course Development Approval and Conduct, Revision 4
1301-4.1, Weekly Surveillance Check, Rev. 90
1301-8.2, Diesel Generator Major Inspection (Mechanical), Rev. 94
MA-AA-723-301, Periodic Inspection of Limitorque Model SMB/SB/SBD-000 Through 5 Motor Operated Valves, Rev. 9
MA-AA-1000, Conduct of Maintenance Manual, Rev. 16
MA-TM-1020-1001, Outage Valve Maintenance Organization, Rev. 0
ER-AA-2003, System Performance Monitoring and Analysis, Rev. 10
MA-TM-153-001, Inspection and Maintenance of TMI-1 electrical and Telephone Manholes, Revision 4A
Procedure E-29, Electrical Heaters – Maintenance, Revision 12
OP-AA-102-102, General Area Checks and Operator Field Rounds, Revision 12
OP-AA-101-111, Roles and Responsibilities of On-Shift Personnel, Revision 6
OP-AA-111-1001, Operations Standards and Expectations, Revision 14
OP-TM-541-252, Leakage Exam of NR System, Revision 4
OP-AA-101-113, Operator Fundamentals, Revision 7
WC-AA-106, Work Screening and Processing, Revision 13
WC-AA-101, On-line Work Control Process, Revision 21
WC-AA-101-1002, On-line Scheduling Process

Action Requests

A2076844	A2240934	A2310468	A2311619	A2319320
A2225282	A2290681	A2311610	A2317797	A2327749

Work Orders

C2024406	R2077299	R2188641	R2190047	R2229087
C2030889	R2078040	R2188954	R2190384	
R2025398	R2155592	R2189051	R2191888	
R2045127	R2155592	R2189305	R2192113	
R2049800	R2181816	R2189701	R2228927	

Completed Surveillances

OP-TM-533-271, DC-C-2A Heat Transfer Test, completed 10/28/13
1303-5.1A, 'A' RB Emergency Cooling and Isolation System Logic Channel/Component Test, completed 2/19/14
1303-5.1B, 'B' RB Emergency Cooling and Isolation System Logic Channel/Component Test, completed 2/20/14
MA-TM-244-205C, Penetration 348 LLRT of CF-V-12A, CF-V-19A, completed 11/14/11

OP-TM-213-206, IST of CF-V-19A/19B, completed 12/24/12
OP-TM-213-206, IST of CF-V-19A/19B, completed 9/23/13
OP-TM-213-206, IST of CF-V-19A/19B, completed 3/24/14
DH-P-1B Quarterly IST Group A Vibration Data, completed 1/1/09-1/1/14
DC-P-1A Vibrations (Quarterly IST Surveillance), completed 3/28/09-3/2/14
DC-P-1B Vibrations (Quarterly IST Surveillance), completed 3/28/09-3/2/14
System Health Report LPI/Decay Heat Removal System, completed Q4/2013
ST203564 (OP-TM-212-212), 'B' LPI Flow Test, Revision 9, completed 11/17/13
ST202948 (OP-TM-212-202), IST of DH-P-1B and Valves from ES Standby Mode, Revision 12, completed 10/17/13
ST221443 (OP-TM-212-230), Leakage Test of DH-V-1 and DH-V-2, Revision 1A, completed 10/28/13
ST203556 (OP-TM-212-217), DH-V-6A and Associated Tests, Revision 9, completed 11/13/13
ST202946 (OP-TM-212-201), IST of DH-P-1A and Valves from ES Standby Mode, Revision 12, completed 11/24/13

Miscellaneous
MA Plants Plan of the Day, 0830 Special Topic POD, Thursday, April 10, 2014
MRC Meeting 04/10/14, 0900-0930 OOB
TMI Station Ownership Committee Agenda for 4/10/14TMI EM Group Cyclic Training Schedule, 8/12/11
Human Performance Tools for Managers and Supervisors, December 2007
Maintenance Rule Expert Panel Meeting Minutes, May 19, 2014
Maintenance Rule Expert Panel Meeting Minutes, October 14, 2013
TQ-TM-104-623, Nuclear Instrumentation, Rev. 4
Instrument Air system Performance Monitoring Plan, March 15, 2012
TMI PowerLabs Report TMI-66177, Failure Analysis of a Basler Electric BE 10619001 Current Transformer, 8/30/05
MPR Associates Report MPR-3814, TMI RC-P-1C Pump Trip – Root Cause Investigation, October 2012
Exelon PowerLabs Calibration Sheet Certificate sequence numbers 0010748656, 0010741322, 0010741320, 0010741318, 0010762607, 0010766439, 0010748656

LIST OF ACRONYMS

10 CFR	Title 10 of the *Code of Federal Regulations*
ACE	Apparent cause evaluation
ADAMS	Agency-wide Documents Access and Management System
CFR	Code of Federal Regulations
ESAS	Engineered safeguards actuation system
IMC	Inspection Manual Chapter
IR	Issue report
NCV	Non-cited violation
NI	Nuclear Instrument
NRC	Nuclear Regulatory Commission
PARS	Publicly Available Records System
PM	Preventative maintenance
PMP	Performance monitoring plan
TS	Technical Specification
TMI	Three Mile Island Nuclear Station, Unit 1
WR	Wide range