



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

August 8, 2017

Mr. Bryan Hanson  
Senior Vice President, Exelon Generation  
President and Chief Nuclear Officer, Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: THREE MILE ISLAND STATION, UNIT 1 – INTEGRATED INSPECTION REPORT  
05000289/2017002

Dear Mr. Hanson:

On June 30, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Three Mile Island, Unit 1. On July 17, 2017, the NRC inspectors discussed the results of this inspection with Mr. Ed Callan, Site Vice President, and other members of your staff. The results of this inspection are documented in the enclosed report.

The NRC inspectors did not identify any finding or violation of more than minor significance.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and the NRC's Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* (CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Silas R. Kennedy, Chief  
Reactor Projects Branch 6  
Division of Reactor Projects

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

Enclosure:  
Inspection Report 05000289/2017002  
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05000289/2017002 DATED AUGUST 8, 2017

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**U.S. NUCLEAR REGULATORY COMMISSION**

REGION I

Docket No: 50-289

License No: DPR-50

Report No: 05000289/2017002

Licensee: Exelon Generation Company

Facility: Three Mile Island Station, Unit 1

Location: Middletown, PA 17057

Dates: April 1 through June 30, 2017

Inspectors: D. Werkheiser, Senior Resident Inspector  
C. Roettgen, Senior Resident Inspector (Acting)  
B. Lin, Resident Inspector  
J. Brand, Reactor Engineer  
M. Henrion, Project Engineer  
D. Kern, Senior Reactor Inspector  
J. Kulp, Senior Reactor Inspector  
S. Pindale, Senior Reactor Inspector  
R. Rolph, Health Physicist

Approved by: S. Kennedy, Chief  
Reactor Projects Branch 6  
Division of Reactor Projects

Enclosure

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## **SUMMARY**

IR 05000289/2017002, 04/01/2017-06/30/2017; Three Mile Island, Unit 1, Integrated Inspection Report.

This report covered a three-month period of inspection by resident inspectors and announced inspections performed by regional inspectors. The Nuclear Regulatory Commission's (NRC) program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

No findings were identified.

## REPORT DETAILS

### Summary of Plant Status

Unit 1 began the inspection period at 100 percent power. On May 27, 2017, operators reduced power to approximately 89 percent for turbine valve testing. Operators returned the unit to 100 percent power the same day. The unit remained at or near 100 percent power for the remainder of the inspection period.

### 1. REACTOR SAFETY

#### **Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity**

#### 1R01 Adverse Weather Protection (71111.01 – 2 samples)

##### .1 Readiness for Seasonal Extreme Weather Conditions

###### a. Inspection Scope

The inspectors performed a review of Exelon's readiness for the onset of seasonal high temperatures. The review focused on safety related components located on the 322' and 355' elevations of the intermediate building which are known to be at elevated ambient temperatures due to added heat from the main steam and main feedwater piping and could be susceptible to extreme heat during the summer period. Components reviewed were parts of the containment isolation system, and heat sink protection system. The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), technical specifications (TS), applicable environmental qualification files, control room logs, and the corrective action program to determine what temperatures or other seasonal weather could challenge these components, and to ensure Exelon's personnel had adequately prepared for these challenges. The inspectors reviewed station procedures, including Exelon's seasonal weather preparation procedure and applicable operating procedures. The inspectors interviewed operations and engineering personnel, and performed walkdowns of the selected components to ensure station personnel identified issues that could challenge the operability of the systems during hot weather conditions. Documents reviewed for each section of this inspection report are listed in the Attachment.

###### b. Findings

No findings were identified.

##### .2 Summer Readiness of Offsite and Alternate Alternating Current Power Systems

###### a. Inspection Scope

The inspectors performed a review of plant features and procedures for the operation and continued availability of the offsite and alternate alternating current (AC) power system to evaluate readiness of the systems prior to seasonal high grid loading. The inspectors reviewed Exelon's procedures affecting these areas and the communications protocols between the transmission system operator and Exelon. This review focused on changes to the established program and material condition of the offsite and alternate AC power equipment.

The inspectors assessed whether Exelon established and implemented appropriate procedures and protocols to monitor and maintain availability and reliability of both the offsite AC power system and the onsite alternate AC power system. The inspectors evaluated the material condition of the associated equipment by reviewing issue reports and open work orders, and walking down portions of the offsite and onsite AC power systems including the 'A' and 'B' emergency diesel generators, substation relay house, 250 kilovolt (kV) switchyard, and 500 kV switchyard.

b. Findings

No findings were identified.

1R04 Equipment Alignment

.1 Partial System Walkdowns (71111.04Q – 3 samples)

a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

- Protected system lineup on 'B' train of high pressure injection on May 8, 2017
- Protected system lineup on 'B' emergency diesel generator on May 15, 2017
- Nuclear service cooling water system during NS-P-1A repair on May 24, 2017

The inspectors selected these systems based on their risk-significance relative to the reactor safety cornerstones at the time they were inspected. The inspectors reviewed applicable operating procedures, system diagrams, the UFSAR, technical specifications, work orders, issue reports, and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have impacted system performance of their intended safety functions. The inspectors also performed field walkdowns of accessible portions of the systems to verify system components and support equipment were aligned correctly and were operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no deficiencies. The inspectors also reviewed whether Exelon staff had properly identified equipment issues and entered them into the corrective action program for resolution with the appropriate significance characterization.

b. Findings

No findings were identified.

.2 Full System Walkdown (71111.04S – 1 sample)

a. Inspection Scope

On June 29 and 30, 2017, the inspectors performed a complete system walkdown of accessible portions of the nuclear service closed cooling water system to verify the existing equipment lineup was correct. The inspectors reviewed operating procedures, surveillance tests, drawings, equipment line-up check-off lists, and the UFSAR to verify the system was aligned to perform its required safety functions. The inspectors also reviewed electrical power availability, component lubrication and equipment cooling, hangar and support functionality, and operability of support systems.

The inspectors performed field walkdowns of accessible portions of the systems to verify system components and support equipment were aligned correctly and operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no deficiencies. Additionally, the inspectors reviewed a sample of related issue reports and work orders to ensure Exelon appropriately evaluated and resolved any deficiencies. The inspectors confirmed that systems and components were aligned correctly, free from interference from temporary services or isolation boundaries, environmentally qualified, and protected from external threats. The inspectors also examined the material condition of the components for degradation and observed operating parameters of equipment to verify that there were no deficiencies. For identified degradation the inspectors confirmed the degradation was appropriately managed by the applicable aging management program. Additionally, the inspectors reviewed a sample of related issue reports and work orders to ensure Exelon appropriately evaluated and resolved any deficiencies.

b. Findings

No findings were identified.

1R05 Fire Protection

Resident Inspector Quarterly Walkdowns (71111.05Q – 5 samples)

a. Inspection Scope

The inspectors conducted tours of the areas listed below to assess the material condition and operational status of fire protection features. The inspectors verified that Exelon controlled combustible materials and ignition sources in accordance with administrative procedures. The inspectors verified that fire protection and suppression equipment was available for use as specified in the area pre-fire plan, and passive fire barriers were maintained in good material condition. The inspectors also verified that station personnel implemented compensatory measures for out of service, degraded, or inoperable fire protection equipment, as applicable, in accordance with procedures.

- Makeup pump -1A/B area, AB-FZ-2A/B, on April 18, 2017
- Auxiliary building, 331' elevation chemical addition room, AB-FZ-10, on May 2, 2017
- DG-FA-2, 'B' emergency diesel generator (EDG) room during a scheduled maintenance period on May 15, 2017
- Turbine building, 305' elevation (south), on May 25, 2017
- Intermediate building, 355' elevation, IB-FZ-7 on May 30, 2017

b. Findings

No findings were identified.



1R06 Flood Protection Measures (71111.06 – 1 sample)Internal Flooding Review - Removal of 'B' Decay Heat Vault Floor Plugsa. Inspection Scope

The inspectors reviewed the internal flooding protective measures and associated impact of licensee activities to remove the ceiling/floor plugs above the 'B' decay heat vault (pump room). Specifically, on February 13, 2017, Three Mile Island (TMI) personnel authorized removal of the 'B' decay heat vault shield plugs, located in elevation 281' of the auxiliary building, to support replacement of the decay heat removal cooler shell inlet control valve, DC-V-2B. The floor plugs were removed for approximately one week and station personnel initiated hourly fire watches per fire system impairment (FSI-99083611). The inspectors reviewed both, the fire system impairment and applicable plant barrier impairment permit (PBI-4185962), associated procedures, the UFSAR, interviewed operators and design and system engineers, consulted with NRC regional fire protection specialists, and performed field walkdowns to verify the floor plugs were properly re-installed and adequate caulking sealant had been applied. The inspectors also reviewed the corrective action program to determine if Exelon identified and corrected flooding problems and whether operator actions for coping with flooding were adequate.

b. Findings

No findings were identified.

1R07 Heat Sink Performance (711111.07A – 1 sample)a. Inspection Scope

The inspectors reviewed the 'C' nuclear services closed cooling heat exchanger to determine its readiness and availability to perform its safety functions. The inspectors reviewed the design basis for the component and verified Exelon's commitments to NRC Generic Letter 89-13, "Service Water System Requirements Affecting Safety-Related Equipment," were being maintained. The inspectors observed actual performance tests for the heat exchanger and/or reviewed the results of previous inspections of the heat exchanger. The inspectors discussed the results of the most recent inspection with engineering staff. The inspectors verified that Exelon initiated appropriate corrective actions for identified deficiencies. The inspectors also verified that the number of tubes plugged within the heat exchanger did not exceed the maximum amount allowed.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program and Licensed Operator Performance (71111.11Q – 2 samples)

.1 Quarterly Review of Licensed Operator Requalification Testing and Training

a. Inspection Scope

The inspectors observed licensed operator training for crew 'C' on June 13, 2017, which included a plant shutdown after an anticipated transient without a scram, and leak isolation after a reactor coolant system leak. The inspectors evaluated operator performance during the simulated event and verified completion of risk significant operator actions, including the use of abnormal and emergency operating procedures. The inspectors assessed the clarity and effectiveness of communications, implementation of actions in response to alarms and degrading plant conditions, and the oversight and direction provided by the control room supervisor. The inspectors verified the accuracy and timeliness of the emergency classification made by the shift manager and the technical specification action statements entered by the shift technical advisor. Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance problems.

b. Findings

No findings were identified.

.2 Quarterly Review of Licensed Operator Performance in the Main Control Room

a. Inspection Scope

The inspectors observed control room operations in response to a tornado warning and high winds on June 19, 2017. Inspectors also observed control room operations during periodic surveillance testing on June 22, 2017 and June 26, 2017. The inspectors observed infrequently performed test or evolution briefings to verify that the briefings met the criteria specified in Exelon's Administrative Procedure HU-AA-1211, "Pre-Job Briefings," Revision 011. The inspectors observed licensed operators performance to verify that procedure use, crew communications, and coordination of activities between work groups met the criteria specified in Exelon's OP-AA-1, "Conduct of Operations," Revision 1. In addition, the inspectors verified that licensee supervision and management were adequately engaged in plant operations oversight and appropriately assessed control room operator performance and similarly met established expectations and standards.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12Q – 2 samples)a. Inspection Scope

The inspectors reviewed the samples listed below to assess the effectiveness of maintenance activities on structure, system, or component (SSC) performance and reliability. The inspectors reviewed system health reports, corrective action program documents, maintenance work orders, and maintenance rule basis documents to ensure that Exelon was identifying and properly evaluating performance problems within the scope of the maintenance rule. For each sample selected, the inspectors verified that the SSC was properly scoped into the maintenance rule in accordance with 10 CFR 50.65 and verified that the (a)(2) performance criteria established by Exelon's staff was reasonable. As applicable, for SSCs classified as (a)(1), the inspectors assessed the adequacy of goals and corrective actions to return these SSCs to (a)(2). Additionally, the inspectors ensured that Exelon staff was identifying and addressing common cause failures that occurred within and across maintenance rule system boundaries. Inspectors also reviewed Exelon's (a)(3) periodic evaluation and verified that Exelon staff had reviewed its (a)(1) goals, (a)(2) performance criteria, preventative maintenance activities, effectiveness of corrective actions, and assessed the balance between SSC unavailability and reliability.

- Main steam isolation valves preventive maintenance schedule and associated bases, on June 16, 2017
- Review of (a)(3) periodic evaluation covering the period of January 2015 through December 2016

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 5 samples)a. Inspection Scope

The inspectors reviewed station evaluation and management of plant risk for the maintenance and emergent work activities listed below to verify that Exelon performed the appropriate risk assessments prior to removing equipment for work. The inspectors selected these activities based on potential risk significance relative to the reactor safety cornerstones. As applicable for each activity, the inspectors verified that Exelon's personnel performed risk assessments as required by 10 CFR 50.65(a)(4) and that the assessments were accurate and complete. When Exelon performed emergent work, the inspectors verified that operations personnel promptly assessed and managed plant risk. The inspectors reviewed the scope of maintenance work and discussed the results of the assessment with the station's probabilistic risk analyst to verify plant conditions were consistent with the risk assessment. The inspectors also reviewed the technical specification requirements and inspected portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met.

- Planned maintenance outage on the turbine driven auxiliary feedwater pump (EF-P-1), on March 30, 2017
- Station 'Yellow' risk due to planned maintenance outage on the 'C' nuclear river water pump (NR-P-1C), on April 10, 2017

- Planned 'Yellow' station risk during 'B' reactor building spray pump (BS-P-1B) maintenance outage on April 12, 2017
- Station 'Orange' risk due to emergent repairs on a welded connection for the 'B' train of makeup system on May 7, 2017
- Planned 'Yellow' station risk during planned maintenance outage on the 'B' EDG on May 15, 2017

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 5 samples)

a. Inspection Scope

The inspectors reviewed operability determinations for the following degraded or non-conforming conditions based on the risk significance of the associated components and systems:

- 'B' decay heat removal pump (DH-P-1B) elevated in-service test (IST) vibration data documented in issue report 3986182, on March 16, 2017
- 'A' and 'B' safety related station batteries (EEB-B-1A and EEB-B-1B) 1/8" to 3/8" gaps between the battery cells and the support frame structure documented in issue report 3991041, on March 29, 2017
- Fire service pumps 1 and 3 functionality assessment after high particulate contamination in oil samples on April 19, 2017
- Leakage from a welded connection on the 'B' train of the high pressure injection system documented in issue report 4007601 on May 6, 2017
- Abnormal oil sample taken from EG-Y-1B emergency diesel generator end bearing after a scheduled maintenance documented in issue report 4012544 on May 19, 2017

The inspectors evaluated the technical adequacy of the operability determinations to assess whether technical specification operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the TSs and UFSAR to Exelon's evaluations to determine whether the components or systems were operable. The inspectors confirmed, where appropriate, compliance with bounding limitations associated with the evaluations. Where compensatory measures were required to maintain operability the inspectors determined whether the measures in place would function as intended and were properly controlled by Exelon.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 – 2 samples)Permanent Modificationsa. Inspection Scope

The inspectors evaluated modifications to install drain line/valve on EG-Y-1A/B and EG-Y-3 ring catchers implemented by engineering change package 16-00026, and CO-T-1B buried pipe replacement project implemented by engineering change package 16-00013. The inspectors verified that the design bases, licensing bases, and performance capability of the affected systems were not degraded by the modification. In addition, the inspectors reviewed modification documents associated with the upgrade and design change including plant barrier impairment permits, compensatory measures to protect against external hazards such as wind generated missiles, and quality assurance practices and records associated with new piping installation.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 7 samples)a. Inspection Scope

The inspectors reviewed the post-maintenance tests for the maintenance activities listed below to verify that procedures and test activities adequately tested the safety functions that may have been affected by the maintenance activity, that the acceptance criteria in the procedure were consistent with the information in the applicable licensing basis and/or design basis documents, and that the test results were properly reviewed and accepted and problems were appropriately documented. The inspectors also walked down the affected job site, observed the pre-job brief and post-job critique where possible, confirmed work site cleanliness was maintained, and witnessed the test or reviewed test data to verify quality control hold point were performed and checked, and that results adequately demonstrated restoration of the affected safety functions.

- Turbine-driven emergency feedwater pump (EF-P-1) following a minor system overhaul for oil change, steam traps cleaning and inspection, and cooling valves EF-V-15A and B diaphragm replacement, on March 30, 2017
- 'C' nuclear river water pump (NR-P-1C) following planned system outage on April 14, 2017
- 'B' reactor building spray pump (BS-P-1B) system outage on April 13, 2017
- Retest of single rod power supply 'A' on rod 3-5 on April 20, 2017
- Post-replacement reactor coolant system loop 'B' pressure transmitter (RC3B-PT2) calibration using procedure 1302-5.2, high and low reactor coolant pressure channels, on April 27, 2017
- 'A' train of high pressure injection following weld repair on May 9, 2017
- 'B' Emergency diesel generator fuel oil transfer strainer (DF-S-1B) following clean and inspect on May 18, 2017

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 5 samples)a. Inspection Scope

The inspectors observed performance of surveillance tests and/or reviewed test data of selected risk-significant SSCs to assess whether test results satisfied TSs, the UFSAR, and Exelon procedure requirements. The inspectors verified that test acceptance criteria were clear, tests demonstrated operational readiness and were consistent with design documentation, test instrumentation had current calibrations and the range and accuracy for the application, tests were performed as written, and applicable test prerequisites were satisfied. Upon test completion, the inspectors considered whether the test results supported that equipment was capable of performing the required safety functions. The inspectors reviewed the following surveillance tests:

- OP-TM-541-233, IST of the 'C' nuclear river water pump, NR-P-1C, and Valves – Multiple Pump Operations on April 14, 2017
- OP-TM-212-201, IST of 'A' decay heat pump (DH-P-1A) on May 3, 2017
- 1303-12.11, Halon system testing in the air intake tunnel on April 18, 2017
- OP-TM-424-212, IST of emergency feedwater control valves and block valves, EF-V-30s and EF-V-52s, on May 4, 2017
- OP-TM-411-211, IST of the isolation valves to the turbine driven feedwater pump, turbine bypass valves, and atmospheric dump valves, MS-V-2A and MS-V-2B, on June 26, 2017

b. Findings

No findings were identified.

**4. OTHER ACTIVITIES**4OA1 Performance Indicator Verification (71151).1 Unplanned Scrams, Unplanned Power Changes, and Unplanned Scrams with Complications (3 samples)a. Inspection Scope

The inspectors reviewed Exelon's submittals for the following Initiating Events Cornerstone performance indicators for the period of January 1, 2016, through March 31, 2017.

- Unplanned Scrams
- Unplanned Power Changes
- Unplanned Scrams with Complications

To determine the accuracy of the performance indicator data reported during those periods, inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7. The inspectors reviewed Exelon's operator narrative logs, maintenance planning schedules, condition reports, event reports, and NRC integrated inspection reports to validate the accuracy of the submittals.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152 – 2 samples)

.1 Routine Review of Problem Identification and Resolution Activities

a. Inspection Scope

As required by Inspection Procedure 71152, "Problem Identification and Resolution," the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that Exelon entered issues into the corrective action program at an appropriate threshold, gave adequate attention to timely corrective actions, and identified and addressed adverse trends. In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the corrective action program and periodically attended issue report screening and management meetings. The inspectors also confirmed, on a sampling basis, that, as applicable, for identified defects and non-conformances, Exelon performed an evaluation in accordance with 10 CFR 21.

b. Findings

No findings were identified.

.2 Semi-Annual Trend Review

a. Inspection Scope

The inspectors performed a semi-annual review of site issues, as required by Inspection Procedure 71152, "Problem Identification and Resolution," to identify trends that might indicate the existence of more significant safety issues. In this review, the inspectors included repetitive or closely-related issues that may have been documented by Exelon outside of the corrective action program, such as trend reports, performance indicators, major equipment problem lists, system health reports, maintenance rule assessments, and maintenance or corrective action program backlogs. The inspectors also reviewed Exelon's corrective action program database for the first and second quarters of 2017 to assess issue reports written in various subject areas (equipment problems, human performance issues, etc.), as well as individual issues identified during the NRCs daily issue report review (Section 4OA2.1). The inspectors reviewed trends reported for the first and second quarters of 2017 to verify that Exelon personnel were appropriately evaluating and trending adverse conditions in accordance with applicable procedures.

b. Findings and Observations

No findings were identified.

The inspectors evaluated a sample of departments that provide input into the quarterly trend reports, including Emergency Planning and Maintenance. The station identified an adverse trend in emergency planning drill and exercise performance, specifically with simulated notification of local and state agencies during simulated events (issue report 04025781).

A corrective action program evaluation has been scheduled to be completed after the conclusion of the current licensed operator training and examination cycle. Additionally, the station identified a trend in lost or missing maintenance and test equipment (issue report 03959031). For each missing or lost piece of maintenance and test equipment, an out of tolerance report was generated to verify that all quality maintenance conducted with the missing equipment was still valid, or was performed again with calibrated equipment. The inspectors reviewed the issue report trends and determined that the trends were substantiated and that Exelon implemented appropriate corrective actions.

Additionally, the inspectors noted a trend in documented instances of inadequate testing. Issue reports 03997546, 04014099, 04016785, and 04020064 document inadequate post-maintenance testing, surveillance testing, and in-service testing, which was discovered either as a result of an unexpected testing failure, a review by the inspectors, or an internal review driven by corporate activities. These issues were considered minor performance deficiencies because in all cases the reliability and availability of the SSCs under test were not affected by the inadequate testing. In all cases appropriate corrective actions were put in place to ensure adequate testing of SSCs. Additionally, the inspectors identified a trend in issue reports documenting the discovery of inadequate testing or testing instructions during internal review processes prior to the execution of scheduled work. Examples issue report include 04018210, 04024831, and 04026498. In all cases testing work instructions were revised to ensure adequate testing prior to work execution. Exelon documented this trend in their corrective action program as issue report 04032912.

### .3 Annual Sample

#### a. Inspection Scope

The inspectors performed an in-depth review of Exelon's corrective actions regarding the results of visual inspections and inservice testing performed to satisfy Technical Specification 4.16 "Reactor Internals Vent Valves Surveillance." The inspectors were on site from February 14, 2017, through February 16, 2017, and performed subsequent in-office review of documentation which was completed on May 18, 2017. During visual examinations during the 2015 refueling outage, Exelon staff identified damage to the retaining assembly on RC-V-144A which necessitated the replacement of the valve (IR 2585279). Additionally, Inservice testing conducted during the 2011 and 2013 outages identified two valves as having measured force values which exceeded technical specification limits. Exelon entered these test results into the corrective action program as issue report 1583961 for RC-V-144B and issue report 1285955 for RC-V-144D.

The inspectors assessed Exelon's problem identification threshold, cause analyses, extent of condition reviews, and the prioritization and timeliness of corrective actions to determine whether Exelon was appropriately identifying, characterizing, and correcting problems associated with the reactor vessel internal vent valves and whether the corrective actions were appropriate. The inspectors compared the actions taken to the requirements of Exelon's corrective action program and 10 CFR 50, Appendix B. Associated work orders and issue reports related to affected systems were reviewed and engineering and maintenance personnel were interviewed to assess the implementation and effectiveness of the corrective actions.



b. Findings

No findings were identified.

The inspectors determined that Exelon's identification of Reactor Vessel Internal Vent Valve problems was appropriate and their evaluations were sufficiently thorough to identify likely causes and provide for effective corrective actions. The damage to RC-V-144A was determined by Exelon staff to be caused by flow induced vibration of the locking collar on the left locking device and impact damage on the right locking device locking collar. In 2015, Exelon staff determined that the observed condition of the left locking device presented a potential loose parts concern which warranted the replacement of the valve. Exelon staff entered the observed condition into their corrective action program as issue report 2585279 and replaced the valve under work order C2034392. The replacement valve was equipped with modified locking devices which are not susceptible to flow induced vibration. The damage observed to the right locking device locking collar was attributed to the removal and installation of the plenum assembly during reactor vessel disassembly and reassembly operations during previous refueling outages. Difficulties in installing the plenum assembly during the 2009 and 2013 outages were documented in the corrective action program as issue reports 990534 and 1586734 respectively.

Corrective actions included changes to the reactor disassembly and reassembly procedures incorporating clarifications of existing procedural steps and addition of new steps to re-verify critical measurements and the status of locking devices on the rigging assembly to ensure that the plenum assembly is properly aligned during the disassembly and reassembly process.

The inspectors reviewed Exelon's corrective actions taken in regards to the internal vent valve surveillance test failures in 2011 and 2013. In 2011, RC-V-144D exceeded the technical specification surveillance acceptance criteria for the amount of force required to maintain the valve in the open position. Exelon staff entered this issue into the corrective action program as issue report 1285955. Exelon determined that the cause was most likely a buildup of oxidation products on the valve hinge assembly. The valve was exercised in accordance with the vendor's manual and re-tested satisfactorily. In 2013, RC-V-144B exceeded the technical specification surveillance acceptance criteria for the amount of force required to maintain the valve in the open position. Exelon staff entered this issue into the corrective action program as issue report 1583961. The valve was exercised in accordance with the vendor's manual and re-tested satisfactorily. Exelon staff noted that the lift test results were inconsistent with the observed valve condition and that testing inaccuracies were suspected to be the cause of the high readings. In response, Exelon staff developed an action item to work with the vendor to clarify test acceptance criteria and to add guidance to their test procedure in the event that the test criteria was not met. The Pressurized Water Reactor Owner's Group (PWROG) and the vendor produced the "B&W Plant RVVV Design Basis Reconstitution, Testing and Sensitivity Study" in response to the testing results obtained during the surveillance tests. The study recommended changes to the testing procedure to improve the accuracy of the test and Exelon staff were incorporating those changes to the site testing procedure (issue report 1583961 Assignment 4).

4OA6 Meetings, Including Exit

On July 17, 2017, the inspectors presented the inspection results to Mr. Ed Callan, Site Vice President, 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

E. Callan	Site Vice President
T. Haaf	Plant Manager
T. Alvey	Manager, Chemistry
G. Aston	Manager, Critical Skills
M. Benson	Senior Engineer IV
S. Burger	Senior Reactor Operator
R. Campbell	Manager, Site Security
J. Cavanaugh	Engineering Electrical Design Manager
D. DeAngelis	System Engineer
D. Divittore	Manager, Radiological Engineering
S. Fink	Project Manager
K. Heisey	Senior Engineer
J. Goldman	Manager, Regulatory Assurance
D. Kenny	Work Week Manager
M. Krause	Rotating Equipment Specialist
R. Masoero	IST Engineer
A. McGraw	System Engineer
W. McSorley	Senior Staff Engineer
R. Miller	Senior Regulatory Assurance Specialist
D. Morneault	Civil Structural Engineer
P. Mullens	Civil Structural Engineer
S. Norris	Oil, Lubricant, and Valve Specialist
T. Orth	Work Management Director
J. Piazza	Senior Manager, Design Engineering
R. Shacklett	Fire Protection Engineer
J. Sherk	Equipment Qualification Engineer
T. Sindlinger	Utility Supervisor
C. Smith	Manager, Operations Support
G. Smith	Director, Maintenance
B. Shumaker	Manager, Emergency Preparedness
M. Torburg	Programs Engineering Manager
D. Trostle	Senior Regulatory Assurance Specialist
J. Valent	Manager, Engineering Programs
G. Yokey	Shift Manager

Other Personnel

S. Martin	Nuclear Safety Specialist Pennsylvania Department of Environmental Protection Bureau of Radiation Protection
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**LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED**

None.

## LIST OF DOCUMENTS REVIEWED

### **Section 1R01: Adverse Weather Protection**

#### Procedures

OP-AA-108-107, Switchyard Control, Revision 4  
OP-AA-108-107-1001, Station Response to Grid Capacity Conditions, Revision 7  
OP-TM-108-107-1002, TMI Transmission Interactions That Impact Operations, Engineering, Work Management, and Maintenance That Includes First Energy Interface Agreement and NERC Standards, Revision 9  
WC-AA-107, Seasonal Readiness, Revision 17  
WC-TM-8003-1009, Three Mile Island Unit 1, Nuclear Plant Interface Requirements (NPIRs), Revision 2

#### Miscellaneous

Certification of 2017 Three Mile Island Generating Station Summer Readiness Memorandum, May 15, 2017  
EQ-T1-110, Environmental Qualification File for, Invensys (Foxboro) Model N-E10 Series Pressure Transmitters, Revision 10  
EQ-T1-113, Environmental Qualification File for ASCO solenoid operated valves (SOV's), Model 206-381-4RVU, NPEF8300381RVU, NP8320A184E, NP8321A8E, and NPEF8300383ERG, Revision 10  
Memorandum 5211-84-3184, Staff Review of TMI-1 Environmental Qualification Program, dated May 25, 1984  
TDR No. 648, Technical Data Report- Methodology and List of Electrical Components Requiring Environmental Qualification for LBLOCA & HELB Mitigation, Revision 0

#### Issue Reports:

02596309  
4016888  
4018634

### **Section 1R04: Equipment Alignment**

#### Procedures

OP-TM-541-000, Primary Component Cooling, Revision 24  
OP-TM-541-440, Remove NS-P-1A from Service, Revision 1  
OP-TM-541-461, IC & NS Temperature Control, Revision 10

#### Drawings

302-610, Nuclear Services Closed Cooling Water, Revision 82  
302-661, Make-up and Purification, Revision 63  
B-308-814, Reactor Coolant Pumps Seal Injection Flow and Filter – Pressure Transmitter, Revision 7  
04636207-WM-1, Isometric Weld Map for MU-V-1033, Revision 1

#### Miscellaneous

Clearance for MU-V-1033 Weld Repair

**Section 1R05: Fire Protection**

Procedures

1038, Administrative Controls-Fire Protection Program, Revision 83  
OP-MA-201-007, Fire Protection System Impairment Control, Revision 6  
Three Mile Island Nuclear Station Unit No. 1 Pre-Fire Plan #16, Revision 2

Miscellaneous

CC-AA-309-101, Engineering Technical Evaluations, Revision 11  
TMI Nuclear Station Pre-Fire Plan #5, Revision 2  
TMI Nuclear Station Pre-Fire Plan #6, Revision 3  
TMI Nuclear Station Pre-Fire Plan #53, Revision 3  
TMI Nuclear Station Pre-Fire Plan #54, Revision 2

Issue Report:

4016701

**Section 1R06: Flood Protection Measures**

Procedures

CC-AA-201, Plant Barrier Control Program, Revision 11  
1420-FB-1, Fire Barrier penetration fire seal repairs, Revision 34  
1440-Y-22, Removal and Installation BS or DH vault shield Plug, Revision 3b

Miscellaneous

FSI-99083611, Fire System Impairment, DC-V-2B Permit Activity, dated 3/17/17  
PBI-4185962, Plant Barrier Impairment Permit, dated 2/13/17  
93-0078, Plant Engineering Evaluation Request EER 93-078, BS and DH Vault Shield/Access  
Plugs-Lifting Provisions, Revision 1  
990-1745, Three Mile Island Unit no. 1 Fire Hazards Analysis reports, Revision 26  
NRC TMI-Integrated Inspection Report 05000289/2016003, dated 11/7/16  
50.59 Review Coversheet Form, ECR 07-702, Add CO Valves to the FHAR and Change MU  
Valve Action Times, Revision 0

Issue Reports:

00565524    02705855    03950376    03987936    4000921

**Section 1R07: Heat Sink Performance**

Miscellaneous

NS-C-1C, Nuclear Services Closed Cooler, Eddy Current Examination Report, January 21, 2016

Issue Report:

02615792

Work Order:

R2234979

### **Section 1R11: Licensed Operator Requalification Program**

#### Procedures

1303-5.2B, 'B' Emergency Loading Sequence and HPI Logic Channel/Component Test, Revision 018

HU-AA-1211, Pre-Job Briefings, Revision 011

OP-AA-103-102, Watch-standing Practices, Revision 016

OP-TM-AOP-004, Tornado/High Winds, Revision 007

### **Section 1R12: Maintenance Effectiveness**

#### Procedures

ER-AA-310, Implementation of the Maintenance Rule, Revision 10

ER-AA-310-1005, Maintenance Rule – Dispositioning between (a)(1) and (a)(2), Revision 7

ER-AA-310-1001, Maintenance Rule Functions-Safety Significance Classification, Revision 3

ER-AA-310-1002, Maintenance Rule Scoping, Revision 4

ER-TM-310-1001, TMI Guidance for Maintenance Rule Unavailability Monitoring, Revision 5

#### Miscellaneous

Three Mile Island Unit 1, Maintenance Rule Periodic Assessment per 10 CFR 50.65 (a)(3), January 2015 to December 2016, Revision 0

### **Section 1R13: Maintenance Risk Assessments and Emergent Work Control**

#### Procedures

1082.1, TMI Risk Management Program, Revision 8

OP-TM-108-117-1001, Attachment 7.1 Protected Equipment Schemes, Revision 3

OP-TM-214-000, Building Spray System, Revision 11

WC-AA-101, On-Line Work Control Process, Revision 18

WC-AA-104, Risk Screening/Mitigation Plan, Revision 24, completed 1/19/17

#### Drawings

302-712, Reactor Building Spray Flow Diagram, Revision 49

#### Miscellaneous

TMI Station Risk Report for Work Week 1713, Revision 0

TMI Work Week 1713, Paragon Snapshot

USFAR Section 6.2, Reactor Spray System, Revision 20

#### Work Order:

4350199

### **Section 1R15: Operability Evaluations**

#### Procedures

1038, Administrative Controls-Fire Protection Program, Revision 83

MA-AA-716-230-1001, Oil Analysis Interpretation Guideline, Revision 20

OP-AA-108-115, Operability Determinations, Revision 19

OP-AA-108-115-1002, Supplemental Consideration for On-Shift Immediate Operability Determinations, Revision 2

Drawings

K-5629, C&D Batteries Outline of LA, LC-13 Thru 25 Batteries, Revision 1, dated 3/9/82  
 M-8883, C&D Power Systems, Frame 2 Step "L" EP 3 Rack With Dual Side Rails (Special),  
 Revision 0, dated 1/16/86  
 M-8884, C&D Power Systems, Assembly, Rack 2 Step EP 3 for (6) LC-21 Cells, Revision 0,  
 dated 1/16/86

Miscellaneous

DH-P-1A IST Database Historical Trends  
 DH-P-1B IST Database Historical Trends  
 DH-P-1A, Motor Bearing Lubricating Oil Analysis Report 2584564, completed 11/23/16  
 DH-P-1B, Motor Bearing Lubricating Oil Analysis Report 1839310, completed 1/19/15  
 SQ-T1-1A-Battery, Seismic Qualification, Revision 1, dated 11/19/93  
 SQ-T1-1B-Battery, Seismic Qualification, Revision 1, dated 11/19/93  
 VM-TM-0021, TMI-1 Vendor Technical Manual, C & D Power Systems Station Batteries,  
 Revision 0, dated 3/1/98  
 VM-TM-0021, TMI-1 Vendor Technical Manual, C & D Power Systems Station Batteries,  
 Revision 17, dated 6/21/10  
 Engineering evaluation discussing effect of elevated particulate concentration in FO-T-3 and 4,  
 Revision 1  
 Engineering input to support operability determination for EG-Y-1B documented in issue report  
 04012544, Revision 1  
 Engineering Safety Evaluation for Small Leak on the 'B' train of HPI system documented in  
 IR 4007601  
 Exelon Power Labs Condition Monitoring Oil Analysis for the 1B Emergency Diesel Generator  
 End Bearing for Samples Drawn on 5/18 and 5/19  
 Immediate Investigation for MU-V-1033, Leak on Weld to Pipe, Revision 1  
 Oil sample reports for EG-Y-1B, generator end bearing, report date May 21 and 23, 2017  
 Prompt investigation for issue documented in issue report 04012771  
 Standard Practice for Inservice Monitoring of Lubricating Oil for Auxiliary Power Plant  
 Equipment, D6224-16, approved October 1, 2016  
 Trico Condition Report Oil Analysis for the 1B Emergency Diesel Generator End Bearing for  
 Samples Drawn on 5/18, 5/19, 5/20, and 6/14  
 UFSAR Section 8.2, Description of Power Sources, Revision 22

Issue Reports:

01401981	03999905	03986182	03986402	03986396
03986245	03991041	04012544	04016378	04016147
04016715	04007601	04015943	01680680	

Work Order:

4636207

**Section 1R18: Plant Modifications**Procedures

CC-AA-102, Design Input and Configuration Change Impact Screening, Revision 29  
 CC-MA-102-1001, Design Inputs and Impact Screening Implementation, Revision 13  
 CC-AA-103, Configuration Change Control for Permanent Physical Plant Changes, Revision 29

Drawings

302-351, Emergency Diesel Generator Services Flow Diagram, Revision 22  
 302-355, SBO Diesel Generator Services Flow Diagram, Revision 7

Miscellaneous

C-1101-861-E410-007, Stress Analysis for Emergency Diesel Generator Ring-Catcher Drains, Revision 0  
Engineering Change 16-00026, Install Drain Line/Valve on EG-Y-1A/B and EG-Y-4 Ring Catchers, Revision 1  
Engineering Change 16-00013, CO-T-1B, Buried Pipe Replacement Project – CMT 614135, Revision 0  
50.59 Screening No. TMI-16-S-0051, Revision 1

Issue Reports:

3998286  
3993994

**Section 1R19: Post-Maintenance Testing**

Procedures

ER-AA-321-1007, Inservice Testing (IST) Program Corporate Technical Positions, Revision 1  
ER-TM-321-1041, TMI-IST Program Requirements, Revision 7  
OP-TM-108-117-1001, Attachment 7.1, Protected Equipment Schemes, Revision 3  
OP-TM-214-000, Building Spray System, Revision 11  
OP-TM-214-202, IST of BS-P-1B and Valves, Revision 15  
OP-TM-424-000, Emergency Feedwater System, Revision 13  
OP-TM-424-203, IST of EF-P-1 and Valves, Revision 17  
OP-TM-424-203, IST of EF-P-1 and Valves, Revision 17, completed 1/3/17  
OP-TM-424-203, IST of EF-P-1 and Valves, Revision 17, completed 3/30/17  
OP-TM-424-241, IST of MS-V-10A and MS-V-10B, Revision 1  
OP-TM-424-261, Overspeed Trip Test of EF-U-1, Revision 3  
OP-TM-541-233, IST of NR-P-1C and Valves – Multiple Pump Operation, Revision 11

Drawings

302-011, Main Steam Flow Diagram, Revision 76  
302-283, Fuel Oil Unloading Flow Diagram, Revision 30  
302-351, Emergency Diesel Generator Services Flow Diagram, Revision 22  
302-712, Reactor Building Spray Flow Diagram, Revision 49

Miscellaneous

1302-5.2, RPS High and Low Pressure Channels, Revision 36B  
EQ-T1-113, TMI-1, Environmental Qualification, Revision 10  
IST-DF-BDOC-V-11, TMI-Inservice Testing Bases Document, Revision Date 10/25/13  
UFSAR Section 6.2, Reactor Building Spray System, Revision 20

Action Reports:

04016785  
04012347

Issue Reports:

3997543      3997546      3997942

Work Orders:

04348212      04365496      04619629      R2112539      04360009      04590224  
R2112538



**Section 1R22: Surveillance Testing**Procedures

OP-TM-108-115, Functionality Assessment for Flood Barrier System Degradation, Revision 1  
 OP-TM-212-201, IST of DH-P-1A and Valves from ES Standby Mode, Revision 14  
 OP-TM-411-204, Stroke Test of MS-V-4A and MS-V-4B, Revision 013  
 OP-TM-411-211, IST MS-V-2A and MS-V-2B, Revision 004  
 OP-TM-424-212, "IST of EF-V-305 and EF-V-525, Revision 9  
 OP-TM-541-233, IST of NR-P-1C and Valves – Multiple Pump Operation, Revision 11  
 WC-TM-430, Surveillance Testing Program, Revision 0  
 WC-TM-430-1001, Surveillance Testing Program Database Interface and Maintenance,  
 Revision 1  
 1303-12.11, Halon System Test, Revision 53

Drawings

302-640, Decay Heat Removal Flow Diagram, Revision 86  
 215-162, Air Intake Tunnel Conduit & Cable Layout, Revision 22  
 215-162 IA, Air Intake Tunnel Conduit & Cable Layout, Revision 0  
 215-163, Air Intake Tunnel Electrical Conduit, Revision 20

Miscellaneous

TMI-IST-Plan-INT5, TMI-1 Inservice Testing Program Plan- Fifth 10 Year Interval, Revision 1  
 Prompt Investigation for CRD System Fault documented in IR 03999009.

Issue Reports:

03999009      03999188      04000355

Work Orders:

04382329      04391359      04597297      04598377      04621303      4621306

**Section 4OA1: Performance Indicator Verification**Procedures

LS-AA-2011, Collecting and Reporting of NRC Performance Indicator Data, Revision 14  
 SY-TM-1019, Collection of NRC Performance Indicator Information, Revision 7  
 NEI 99-02, Regulatory Assessment Performance Indicator Guideline, Revision 7

Miscellaneous

Consolidated Data Base (TMI), dated January 28, 2017

**Section 4OA2: Problem Identification and Resolution**Procedures

1301-10.1, Reactor Vessel Internal Vent Valve Inspection and Exercise, Revision 18  
 1301-10.1, Reactor Vessel Internal Vent Valve Inspection and Exercise, Revision 19  
 1301-10.1, Reactor Vessel Internal Vent Valve Inspection and Exercise, Revision 20

Drawings

20762-1H, 14" Internals Vent Valves, Sheet 1, Revision 0

MiscellaneousCondition Reports:

990534	990616	1285955	1583961	1586734	1586757
2585279	3978103	2468089	2607617	2454874	2491122
2539099	264510	3962955	3976088	4012767	4020064
4024831	2614047	2639666	2720510	4014099	4018210
4024831	3969461	4026948	4024831	4018210	4014099
4009577	3986481	4024275	3997546	3988970	4025781
4014473	4029191	4032912			

Work Orders:

A2348136	C2034392	R2011147	R2111702	R2153538
R2191244	R2229858			

Three Mile Island "Top Equipment Issues" list, dated June 28, 2017

Three Mile Island Plant IQ database on June 28, 2017

Corrective Action Program Audit Report, NOSA-TMI-17-04 (AR 3977095), March 24, 2017

**LIST OF ACRONYMS**

AC	alternating current
ADAMS	Agencywide Documents Access and Management System
CFR	<i>Code of Federal Regulations</i>
EDG	emergency diesel generator
IST	in-service testing
kV	kilovolt
NRC	Nuclear Regulatory Commission
SSC	structure, system, and component
TMI	Three Mile Island Unit 1
TS	technical specifications
UFSAR	updated final safety analysis report