



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

February 7, 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  
05000289/2016004

Dear Mr. Hanson:

On December 31, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Three Mile Island, Unit 1 (TMI). On January 20, 2017, the NRC inspectors discussed the results of this inspection with Mr. E. Callan, TMI Site Vice President, and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented a licensee-identified violation which was determined to be of very low safety significance in this report. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2.a of the Enforcement Policy.

No NRC-identified or self-revealing findings were identified during this inspection.

If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement; and the NRC Resident Inspector at Three Mile Island.

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

B. Hanson

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Inspection Report 05000289/2016004  
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5000289/2016004 dated February 7, 2017

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**U.S. NUCLEAR REGULATORY COMMISSION****REGION I**

Docket No: 50-289

License No: DPR-50

Report No: 05000289/2016004

Licensee: Exelon Generation Company

Facility: Three Mile Island Station, Unit 1

Location: Middletown, PA 17057

Dates: October 1 through December 31, 2016

Inspectors: D. Werkheiser, Senior Resident Inspector  
B. Lin, Resident Inspector  
J. DeBoer, Emergency Preparedness Inspector  
L. Dumont, Reactor Inspector  
S. Elkhiamy, Project Engineer  
M. Henrion, Project Engineer  
D. Kern, Senior Reactor Inspector  
R. Rolph, Health Physicist

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

Enclosure

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## SUMMARY

IR 05000289/2016004, 10/01/2016-12/31/2016; Three Mile Island Unit 1 (TMI),  
Licensee-Identified Violations.

This report covered a three-month period of inspection by resident inspectors and announced inspections performed by regional inspectors. Inspectors documented a licensee-identified violation which was determined to be of very low safety significance (Green). 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 April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects Within Cross-Cutting Areas," dated August 1, 2016. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated November 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

### NRC-Identified and Self-Revealing Findings

No findings were identified.

### Other Findings:

A violation of very low safety significance that was identified by Exelon and was reviewed by the inspectors. Corrective actions taken or planned by Exelon have been entered into Exelon's corrective action program. This violation and corrective action tracking number are listed in Section 4OA7 of this report.

## REPORT DETAILS

### Summary of Plant Status

Unit 1 began the inspection period at 100 percent power. On December 1, 2016, operators reduced power and shutdown the unit for a planned maintenance outage to replace a degraded 'A' reactor coolant pump seal. Following repairs, operators brought the reactor critical on December 12 and returned the unit to 100 percent on December 13. 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 – 1 sample)

##### Readiness for Seasonal Extreme Weather Conditions

##### a. Inspection Scope

The inspectors performed a review of Exelon's readiness for the onset of seasonal low temperatures. The review focused on the borated water storage tank, interconnection piping, and condensate storage tanks. The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), technical specifications, control room logs, and the corrective action program to determine what temperatures or other seasonal weather could challenge these systems, and to ensure Exelon 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 performed walkdowns of the selected systems to ensure station personnel identified issues that could challenge the operability of the systems during cold weather conditions. Documents reviewed for each section of this inspection report (IR) are listed in the Attachment

##### b. Findings

No findings were identified.

#### 1R04 Equipment Alignment

#### .1 Partial System Walkdowns (71111.04Q – 4 samples)

##### a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

- Emergency feedwater during overhaul of an emergency river water suction isolation valve (EF-V-4) on October 12, 2016
- Protected system lineup during ORANGE-risk 'A' low pressure injection system outage window on October 25, 2016

- Protected system lineup during 'A' building spray system outage window on October 25, 2016
- Protected system lineup during 'A' control building ventilation system chiller on November 15, 2016

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.

1R05 Fire Protection

.1 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.

- Control building 285' elevation, FH-FZ-6 on October, 13, 2016
- Auxiliary building 281' elevation shield wall area, AB-FZ-4, adjacent to reactor building, and review of reactor coolant make-up valve (MU-V-18) issue identified in issue report 2727864 on October 17, 2016
- Auxiliary building 261' elevation 'A' decay heat vault, AB-FA-1 on October 26, 2016
- Auxiliary building 261' elevation 'A' building spray vault, AB-FA-1 on November 2, 2016
- Turbine Building 305' elevation, TB-FA-1 on November 10, 2016

b. Findings

No findings were identified.



1R06 Flood Protection Measures (71111.06 – 1 sample)Annual Review of Cables Located in Underground Bunkers/Manholesa. Inspection Scope

The inspectors conducted an inspection of underground manholes subject to flooding that contain cables whose failure could affect risk-significant equipment. The inspectors performed walkdowns of risk-significant areas, including the TMI inspection review of manhole E-18, containing safety-related class-1E power and instrumentation cables, to verify that the cables were not submerged in water, that cables and/or splices appeared intact, and to observe the condition of cable support structures. The inspectors also ensured that drainage was provided and functioning properly in areas where dewatering devices were not installed.

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07A – 1 sample)a. Inspection Scope

The inspectors reviewed the 'D' nuclear river service water system (NS-C-1D) 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 exchangers and/or reviewed the results of previous inspections of the heat exchanger reviewed. The inspectors discussed the results of the most recent inspection with engineering staff and reviewed pictures of the as-found and as-left conditions. 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 Regualification Program and Licensed Operator Performance (71111.11Q – 2 samples).1 Quarterly Review of Licensed Operator Regualification Testing and Traininga. Inspection Scope

The inspectors observed licensed operator simulator training for crew 'D' on November 22, 2016, which included a plant cooldown and depressurization after a postulated loss of coolant accident scenario and response to a loss of reactor coolant sub-cooling margin. 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 support of engineered safeguards actuation system testing as well as routine plant operations conducted on November 14, 2016. 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 Title 10 of the *Code of Federal Regulations* (CFR) 50.65 and verified that the (a)(2) performance criteria established by Exelon 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.

- Control rod drive system return to maintenance rule (a)(2) documented in issue reports 2500646-05 and 2698889 on November 17, 2016
- 'C' reactor protection system trip module functional failure documented in issue report 2730140 on November 21, 2016

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 4 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 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.

- Elevated station risk during emergent maintenance on nuclear service cooling water supply (NS-V-26B) to the 'B' control building chiller (AH-C-4B) on October 5, 2016
- Planned ORANGE station risk during 'A' train low pressure injection pump (DH-P-1A) maintenance outage on October 26, 2016
- Planned YELLOW station risk during 'A' train reactor building spray system maintenance outage on November 1, 2016
- Emergent YELLOW station risk to investigate (issue report 2735307) and clean the 'A' train nuclear river water strainer (NR-S-1A) on November 2, 2016

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 4 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' channel reactor trip module failure and extent of condition as documented in issue report 2722897 on October 4, 2016
- 'A' channel reactor protection system power supply out of tolerance and engineering evaluation documented in issue report 2724167 on October 11, 2016
- Reactor fuel defect declared in cycle 21 operating core documented in apparent cause evaluation 2715716 on November 9, 2016
- Potential weld failure of critical components, as described in 10 CFR 21 event report 52204, reviewed by TMI in issue report 2710030 on November 29, 2016

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 technical specifications 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, such as in the case of operator workarounds, 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)

.1 Temporary Modifications

a. Inspection Scope

The inspectors reviewed a temporary modification (TCCP 16-00349) in response to pressurizer level indication (RC-LT-777) divergence observed on September 9, 2016, to determine whether it affected the safety functions of systems that are important to safety. The inspectors reviewed 10 CFR 50.59 documentation and post-modification testing results, and conducted field walkdowns (reactor building entry during maintenance outage 1MO10) of the modification to verify that the temporary modification did not degrade the design bases, licensing bases, and performance capability of the affected system.

b. Findings

No findings were identified.

.2 Permanent Modifications

a. Inspection Scope

The inspectors evaluated the equivalency evaluation (SCN 200 23405) for nuclear service valve disc (NS-V-26B) acceptability during the repair of the 'B' control building chiller (AH-C-4B) on September 5, 2016. This is a permanent modification to the 'B' control building chiller nuclear service valve (NS-V-26B) where its valve disk and stem were replaced under ECR 16-00366. The inspectors verified that the design bases, licensing bases, and performance capability of the affected systems were not degraded by the modification.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 6 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 points were performed and checked, and that results adequately demonstrated restoration of the affected safety functions.

- 'B' channel reactor trip module replacement on October 3, 2016
- Power operated relief valve calibration and setpoint check on October 4, 2016
- 'B' control building chiller (AH-C-4B) nuclear service valve (NS-V-26B) repair under work order C2037026 on October 6, 2016
- Emergency feedwater valve (EF-V-4) emergent actuator rebuild on October 12, 2016
- Emergency feedwater pump (EF-P-2B) system outage on October 19, 2016
- Emergency feedwater injection valve (EF-V-30C) adjustments and valve testing on October 21, 2016

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20 – 1 sample)a. Inspection Scope

The inspectors reviewed the station's work schedule and outage risk plan for the Unit 1 maintenance outage (1MO10), which was conducted December 1 through December 12, 2016, to replace the 'A' reactor coolant pump seal. The reactor vessel head was not removed and no fuel movements were conducted. The inspectors reviewed Exelon's development and implementation of outage plans and schedules to verify that risk, industry experience, previous site-specific problems, and defense-in-depth were considered. During the outage, the inspectors observed portions of the shutdown and cooldown processes and monitored controls associated with the following outage activities:

- Configuration management, including maintenance of defense-in-depth, commensurate with the outage plan for the key safety functions and compliance with the applicable technical specifications when taking equipment out of service
- Repair activities related to reactor coolant pump seal degradation, forensic disassembly of the degraded seal, extent of condition, and corrective actions
- Repair activities related to reactor coolant system leakage identified at a welded connection from the 'A' reactor coolant pump casing (see section 4OA3)
- Implementation of clearance activities and confirmation that tags were properly hung and that equipment was appropriately configured to safely support the associated work or testing

- Installation and configuration of reactor coolant pressure, level, and temperature instruments to provide accurate indication and instrument error accounting
- Status and configuration of electrical systems and switchyard activities to ensure that technical specifications were met
- Monitoring of decay heat removal operations
- Reactor water inventory controls, including flow paths, configurations, alternative means for inventory additions, and controls to prevent inventory loss
- Activities that could affect reactivity
- Maintenance of containment as required by technical specifications
- Fatigue management
- Tracking of startup prerequisites, walkdown of the reactor building/containment to verify debris had not been left which would block the emergency core cooling system suction strainer, and startup and ascension to full power operation
- Identification and resolution of problems related to outage activities

b. Findings

A licensee-identified violation is documented in section 4OA7.

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 technical specifications, 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-212-201, in-service test of 'A' decay heat pump (DH-P-1A) on October 26, 2016
- OP-TM-543-201, in-service test of 'A' decay closed-loop cooling pump (DC-P-1A) on October 26, 2016
- OP-TM-214-201, in-service test of 'A' reactor building spray pump (BS-P-1A) on November 2, 2016 (containment isolation valve)
- R2214093-02, Post-maintenance stroke timing of reactor building spray discharge isolation valve (BS-V-1A) on November 2, 2016 (containment isolation valve)
- Surveillance frequency changes for emergency feedwater flow testing (TM-15-003) and degraded grid relay calibrations (TM-16-001) on November 29, 2016 (surveillance frequency control program)

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP4 Emergency Action Level and Emergency Plan Changes (71114.04 – 1 sample)

a. Inspection Scope

Exelon implemented various changes to the TMI Emergency Action Levels (EALs), emergency plan, and implementing procedures. Exelon had determined that, in accordance with 10 CFR 50.54(q)(3), any change made to the EALs, emergency plan, and its lower-tier implementing procedures, had not resulted in any reduction in effectiveness of the plan, and that the revised plan continued to meet the standards in 50.47(b) and the requirements of 10 CFR 50, Appendix E.

The inspectors performed an in-office review of all EAL and emergency plan changes submitted by Exelon as required by 10 CFR 50.54(q)(5), including the changes to lower-tier emergency plan implementing procedures, to evaluate for any potential reductions in effectiveness of the emergency plan. This review by the inspectors was not documented in an NRC safety evaluation report and does not constitute formal NRC approval of the changes. Therefore, these changes remain subject to future NRC inspection in their entirety. The requirements in 10 CFR 50.54(q) were used as reference criteria.

b. Findings

No findings were identified.

**2. RADIATION SAFETY**

Cornerstone: Occupational and Public Radiation Safety

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01 - 1 sample)

a. Inspection Scope

The inspectors reviewed Exelon's performance in assessing and controlling radiological hazards in the workplace. The inspectors used the requirements contained in 10 CFR 20, technical specifications, applicable regulatory guides, and the procedures required by technical specifications as criteria for determining compliance.

Inspection Planning

The inspectors reviewed the performance indicators (PIs) for the occupational exposure cornerstone, radiation protection program audits, and reports of operational occurrences in occupational radiation safety since the last inspection.

Radiological Hazard Assessment (1 sample)

The inspectors conducted walkdowns of the facility and reviewed the radiological survey program, air sampling and analysis, continuous air monitor use, recent plant radiation surveys for radiological work activities, and any changes to plant operations since the last inspection to verify survey adequacy of any new radiological hazards for onsite workers or members of the public. The Pennsylvania Department of Environmental Protection Nuclear Safety Specialist accompanied the inspectors during the walkdowns.

b. Findings

No findings were identified.

2RS2 Occupational ALARA Planning and Controls (71124.02 - 3 samples)

a. Inspection Scope

The inspectors assessed Exelon's performance with respect to maintaining occupational individual and collective radiation exposures as low as is reasonably achievable (ALARA). The inspectors used the requirements contained in 10 CFR 20, applicable Regulatory Guides, technical specifications, and procedures required by technical specifications as criteria for determining compliance.

Inspection Planning

The inspectors conducted a review of TMI's collective dose history and trends, ongoing and planned radiological work activities, previous post-outage ALARA reviews, radiological source term history and trends, and ALARA dose estimating and tracking procedures.

Verification of Dose Estimates and Exposure Tracking Systems (1 sample)

The inspectors reviewed the current annual collective dose estimate; basis methodology; and measures to track, trend, and reduce occupational doses for ongoing work activities. The inspectors evaluated the adjustment of exposure estimates or re-planning of work. The inspector reviewed post-job ALARA evaluations of excessive exposure.

Source Term Reduction and Control (1 sample)

The inspectors reviewed the current plant radiological source term and historical trend, plans for plant source term reduction, and contingency plans for changes in the source term as the result of changes in plant fuel performance or changes in plant primary chemistry.

The inspectors observed radiological work activities and evaluated the use of shielding and other engineering work controls based on the radiological controls and ALARA plans for those activities.

Problem Identification and Resolution (1 sample)

The inspectors evaluated whether problems associated with ALARA planning and controls were identified at an appropriate threshold and properly addressed in the corrective action program.

b. Findings

No findings were identified.



## 2RS4 Occupational Dose Assessment (71124.04 - 4 samples)

### a. Inspection Scope

The inspectors reviewed the monitoring, assessment, and reporting of occupational dose. The inspectors used the requirements in 10 CFR 20, Regulatory Guides, technical specifications, and procedures required by technical specifications as criteria for determining compliance.

#### Inspection Planning

The inspectors reviewed: radiation protection program audits, National Voluntary Laboratory Accreditation Program (NVLAP) dosimetry testing reports, and procedures associated with dosimetry operations.

#### Source Term Characterization (1 sample)

The inspectors reviewed the plant radiation characterization (including gamma, beta, alpha, and neutron) being monitored. The inspector verified the use of scaling factors to account for hard-to-detect radionuclides in internal dose assessments.

#### External Dosimetry (1 sample)

The inspectors reviewed: dosimetry NVLAP accreditation, onsite storage of dosimeters, the use of "correction factors" to align electronic personal dosimeter results with NVLAP dosimetry results, dosimetry occurrence reports, and corrective action program documents for adverse trends related to external dosimetry.

#### Special Dosimetric Situations (1 sample)

The inspectors reviewed: Exelon's worker notification of the risks of radiation exposure to the embryo/fetus; the dosimetry monitoring program for declared pregnant workers; external dose monitoring of workers in large dose rate gradient environments; and dose assessments performed since the last inspection that used multi-badging, skin dose or neutron dose assessments.

#### Problem Identification and Resolution (1 sample)

The inspectors evaluated whether problems associated with occupational dose assessment were identified at an appropriate threshold and properly addressed in the corrective action program.

### b. Findings

No findings were identified.

#### 4. OTHER ACTIVITIES

##### 4OA1 Performance Indicator Verification (71151)

###### Occupational Exposure Control Effectiveness (1 sample)

###### a. Inspection Scope

The inspectors reviewed licensee submittals for the occupational radiological occurrences PI for the first quarter 2015 through the fourth quarter 2015. The inspectors used PI definitions and guidance contained in the Nuclear Energy Institute Document 99-02, Revision 7, "Regulatory Assessment Performance Indicator Guidance," to determine the accuracy of the PI data reported. The inspectors reviewed electronic personal dosimetry accumulated dose alarms, dose reports, and dose assignments for any intakes that occurred during the time period reviewed to determine if there were potentially unrecognized PI occurrences. The inspectors conducted walkdowns of various Locked High and Very High Radiation Area entrances to determine the adequacy of the controls in place for these areas.

###### b. Findings

No findings were identified.

##### 4OA2 Problem Identification and Resolution (71152 – 5 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 Part 21.

###### b. Findings

No findings were identified.

## .2 Annual Sample: Nuclear Services River Water System Pump Vibrations

### a. Inspection Scope

The inspectors performed an in-depth review of Exelon's equipment apparent cause evaluation and corrective actions associated with a non-cited violation (NCV) from TMI's IR 05000289/2015004-01. Specifically, Exelon did not identify and evaluate an adverse vibration trend on 'B' nuclear services river water system pump 1B (NR-P-1B), which resulted in exceeding its in-service test (IST) required action level and declaring the pump inoperable on October 10, 2015. Exelon documented this in issue report 2568763.

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 this issue and whether the planned or completed 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. In addition, the inspectors performed field walkdowns of monitored equipment, observed vibration sample collection, reviewed selected pump vibration data, work orders, and issue reports related to affected systems, and interviewed engineering and maintenance personnel to assess the implementation and effectiveness of the corrective actions.

### b. Findings and Observations

No findings were identified.

Exelon determined the apparent cause of not identifying and evaluating an adverse trend of vibration data was a lack of sensitivity to safety related equipment reliability issues, failure to seek a peer or manager review concerning negative trending vibration data for NR-P-1B, and failure on multiple levels of the organization to challenge the disposition of issue report 2520334 that initially showed negative trending vibration data for NR-P-1B.

Increased supervisory oversight has been implemented as a corrective action by utilizing peer and manager second checks for trends in data. Other corrective actions taken include increased communication of data trend analysis expectations between management and staff and monthly management updates of data by the IST program engineer. The inspectors found these corrective actions to be appropriate and timely, however, a weakness was identified in the peer check corrective action because a second check requirement has not been added to any procedures or work orders related to the IST program and no documentation of the peer checks exists. Although the inspectors did not identify any cases where this failure to add a peer check to a procedure or work order has affected safety related equipment, this concern was communicated to Exelon and issue report 2733851 was written with a recommended action to revise IST work order activities to include a documented peer check.

Exelon also conducted an extent of condition review of approximately 25 pumps and 500 valves that are regularly monitored as part of TMI's IST program. This review of selected data sets identified five components with potential adverse trends. Of the five identified components, two had work done to fix identified issues (issue reports 1590105 and 2568915), two were scheduled for future monitoring (issue reports 2568897 and 2498630), and one was scheduled for work to be completed in 2017 (issue report 1670834).

The inspectors determined Exelon's overall response to the issue was commensurate with the safety significance, was timely, and included appropriate extent of condition. The inspectors determined that the actions taken were reasonable to resolve both the specific failure to identify adverse trends in vibration data and potential future emergent issues related to equipment vibrations.

### .3 Annual Sample: Reactor Building Fan Motor Thermal Overload Adequacy

#### a. Inspection Scope

The inspectors performed an in-depth review of Exelon's corrective actions associated with issue report 02451855. This issue report was generated as a result of Exelon's failure to accurately verify the adequacy of the reactor building (RB) fan assembly calculations to ensure that RB fans were capable of performing their intended safety functions during a large break loss of coolant accident (LBLOCA) concurrent with a degraded grid voltage (DGV) condition (NCV 05000289/2015007-01, Deficient Design Control for Verifying Reactor Building Fan Assembly Capability to Perform Design Basis Function). Additional issue reports associated with RB cooling fan motors were also reviewed during this inspection. The NRC's assessment considered Exelon's maintenance practices, industry operating experiences, vendor and industry maintenance, and testing recommendations related to RB fan motors as well as comparable components.

The inspectors compared the actions taken to the requirements of Exelon's corrective action program and Criterion XVI of 10 CFR 50, Appendix B. Specifically, the inspectors assessed Exelon's problem identification threshold, compensatory actions, and the prioritization and timeliness of corrective actions to determine whether Exelon was appropriately identifying, characterizing, and correcting problems associated with RB fan motors. The inspectors also assessed Exelon's corrective actions to prevent recurrence. In addition, the inspectors reviewed documentation associated with RB cooling fan motors, assessed Exelon's engineering change program, and interviewed Exelon's engineering personnel at TMI in order to evaluate the effectiveness of the planned and implemented corrective actions.

#### b. Findings and Observations

No findings were identified.

The RB fans recirculate cleaned and conditioned air in the RB to maintain ambient temperature. The RB fans primary objective is to limit post-accident, e.g. loss of coolant accident, RB pressure and temperature to design values by removing heat from the RB and reducing pressure and driving force for leakage. The RB recirculation system is comprised of three RB fans: AH-E-1A, AH-E-1B, and AH-E-1C. The recirculation fans are two-speed motor-driven axial flow fans. The fan motors are rated at 75 horsepower (hp) in slow speed and 150 hp in fast speed.

The emergency mode of operation has all three fans running in slow speed. During LBLOCA environment conditions the RB cooling fans (AH-E-1A/B/C) slow speed break horsepower will increase to a value greater than under normal RB environmental conditions. That would require the RB fan to do more work (i.e. produce more horsepower). Therefore, the fan's contribution to the total emergency diesel generator kilo-watt load will increase during LBLOCA. During the last component design basis inspection (CDBI), a NCV was issued because Exelon did not accurately verify that the thermal overload (TOL) relay protection for the RB cooling fan was not subjected to spurious tripping under a LBLOCA concurrent with a DGV condition.

The inspectors concluded that Exelon took appropriate actions to resolve the performance deficiency identified during the last CDBI. During the CDBI, Exelon determined that the RB fan motor requirement was 85 hp based on unverified assumption that the power factor (PF) was 0.70. The power factor has a weighty effect on calculated power for the motor. A higher power factor will lead to a higher motor horsepower. Exelon calculated the current draw of the RB fan motor on slow speed to be 144 amps which was above the TOL of 141 amps. In order to verify this assumption, Exelon's corrective action included sending a spare RB fan motor offsite for testing. On November 13, 2015, the test data determined that the maximum calculated fan motor horsepower for each RB AH-E-1A/B/C fan during a LBLOCA event was 61 hp along with a PF measured at 0.61. As a result, the calculated motor current during a LBLOCA was 103.3 amps which was well below the TOL of 141 amps.

The inspectors determined Exelon's overall response to the issue was appropriate and timely, considering the safety significance. The actions taken by Exelon, specifically sending a spare RB fan motor offsite for testing to verify their assumptions, were reasonable to ensure that the increased current would not exceed the TOL protection settings and subsequently trip the supply breaker during a LBLOCA and DGV condition.

#### .4 Annual Sample: Corrective Actions Regarding Borated Water Storage Tank (BWST) and Related Piping Cold Weather Protection

##### a. Inspection Scope

The inspectors performed an in-depth review of Exelon's corrective actions regarding cold weather protection readiness of the BWST, a safety-related tank that supplies water to reactor coolant injection systems to mitigate design basis accidents, and interfacing piping systems. Two previous violations documented instances where one of two tank level indications became inoperable during cold weather due to Exelon's failure to properly protect vital piping from cold weather by maintaining vital heat tracing systems to support cold weather operation (NCV 05000289/2015007-02 and NCV 05000289/2016001-01).

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 BWST and associated piping cold weather protection 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. In addition, the inspectors performed field walkdowns of the BWST area, including pipe tunnel, connected piping and equipment, and observed heat trace testing. Inspectors also reviewed cold weather preparation maintenance activities as control by the work week process.

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 and Observations

No findings were identified.

The issue identified in 2015 was caused by lack of adequate insulation to the level transmitter sensing piping (issue reports 2445164, 2451342, 2452858, and 2454925). In addition, only one of two heat trace circuits were energized due to other heat trace deficiencies. These immediate deficiencies were corrected in 2015 and replacement of a heat trace circuit was completed in the subsequent refueling outage (November 2015) under work order C2033726. However, this activity introduced an unrecognized latent issue where the redundant heat trace circuits was of a non-compatible design. This resulted in neither the main nor backup circuits being capable of full heating when demanded under cold weather conditions. This was corrected in January 2016 under work order C2035545.

The inspectors reviewed the immediate and long-term corrective actions for both NCVs and determined appropriate and timely prompt corrective actions were taken during each event. Long-term corrective actions (for the 2015 issue) focused on the accountability of post-maintenance activities, since the lack of adequate insulation was mainly attributed to poor worker practices, a lack of sensitivity to the need for an insulation/heat-trace system to support BWST operability, and to a lesser extent, engineering ownership (i.e. plant walkdowns) and system health awareness. It is the inspectors' assessment that these corrective actions were sufficient to address the root issue. Additional preventive actions were planned to replace a degraded heat trace circuit in November 2015, but due to ambiguity in the heat trace inspection procedure (E-70, "Heat Trace Inspection," Revision 16) and less than adequate contractor oversight of this replacement activity, a non-compatible heat trace circuit was allowed to be placed in-service and is the essence of the 2016 issue and NCV (issue reports 2609417 and 2611119). The cause was lack of contractor oversight of work affecting safety-related equipment and insufficient clarity in the governing maintenance procedure for what are acceptable configurations for heat traces. Long-term corrective actions for these issues were to implement changes to the maintenance department contractor oversight process and procedure updates to include acceptable and compatible heat-trace configurations. Exelon also reviewed other safety-related, contractor-led work and heat trace replacements as part of their extent of condition. No issues were identified during their extent of condition review. An inspector review of deficiency tags indicates a continuing issue with heat tracing, especially where the panels are exposed to the weather. However, there has been a significant reduction of the number of deficiencies and no noted high-risk heat tracing issues. A trending issue report documenting continued heat trace issues was entered into Exelon's corrective action program (issue report 3945641). Inspectors determined heat tracing and insulation packages for the BWST and associated piping is in satisfactory condition. Actions in place by Exelon to address noted issues appear adequate and at the commensurate priority for the systems supported.

.5 Annual Sample: Operating Experience Review Regarding Dresser Electromatic Relief Valves (EMRV) and TMI's Pressurizer Pilot Operate Relief Valve (PORV)

a. Inspection Scope

On October 4, 2016, based on discussions with region-based inspectors regarding Dresser EMRVs and issues identified at Oyster Creek in 2014 and 2016, inspectors determined that TMI used a similar configuration Dresser EMRV, though a different model, as their PORV for the reactor coolant system pressurizer. Inspectors reviewed the details provided by the region-based (IRs 05000219/2015007 and 05000219/2015011) and Oyster Creek resident inspectors (Oyster Creek issue reports 2717363 and 1673665) for any immediate safety concerns and applicability to TMI. Additionally, the inspectors reviewed the 10 CFR 21 report submitted to the NRC (EN 50495, dated September 25, 2014) regarding EMRV actuator shaft excessive wear. The inspectors informed TMI and conducted interviews with engineering and regulatory personnel. Inspectors also reviewed TMI PORV technical information and maintenance history with respect to Oyster Creek and other EMRV operating experience records.

The inspectors assessed Exelon's problem identification threshold, operating experience review, and any extent of condition reviews. The inspectors compared the actions taken to the requirements of Exelon's corrective action program and 10 CFR 50, Appendix B. In addition, the inspectors performed field walkdowns of the PORV during the 1MO10 maintenance outage to verify operating conditions and hardware configuration. Associated work orders and issue reports related to PORV inspection, overhaul, and testing on-site and off-site were reviewed.

b. Findings and Observations

No findings were identified.

The inspectors determined that the TMI PORV is a Dresser EMRV Type 31533VX-30 and of similar configuration and assembly to that of the Oyster Creek Dresser EMRV Type 6" 1525-VX. The inspectors reviewed for similar degradation and TMI's assessment of EMRV operating experience. The primary cause of EMRV actuator degradation is vibration associated with plant operation, which based on initial discussions with plant staff and inspector plant knowledge and experience, is not evident at the TMI PORV location and is the basis for no immediate safety concerns. Set point testing, maintenance, and overhaul records document satisfactory condition, performance, and operation for the past three refueling cycles were reviewed by the inspectors. Engineering and NRC inspectors performed a walkdown of the installed PORV at the pressurizer in the reactor building during maintenance outage 1MO10 observed no vibration, secure mounting, and all visible hardware were intact and in good order.

Discussions with TMI staff indicated an awareness of Oyster Creek EMRV issues, mainly because Oyster Creek is in the Exelon nuclear fleet and that the 2014 EMRV issue resulted in an NRC Yellow notice of violation (IR 05000219/2015007), which is considered internal operating experience. However, TMI had not screened the Oyster Creek issue into their corrective action program for review, in part, that the issue was thought to only affect boiling water reactors since the affected EMRVs are installed on main steam lines. TMI is a pressurized water reactor and their PORV (EMRV) is installed on top of the pressurizer. Inspector review of the OC 10 CFR 21 report (EN 50495) annotates three boiler water reactors as plants with similar Dresser EMRVs.

TMI is not listed, but subsequently determined by the inspectors to have a similar Dresser EMRV. The inspectors determined that TMI's failure to enter the OC EMRV issue into their corrective action program for operating experience review is a performance deficiency since it would be expected to review relevant operating experience and basic component defects as part of the corrective action program and quality assurance program. However, since the operating experience was not unrecognized and there was no actual safety impact (no defect), in accordance with IMC 0612, Appendix B, this deficiency is considered minor. Exelon has entered this issue and the need to document an operating experience review of this issue into their corrective action program as issue report 2728382.

## .6 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 third and fourth second quarters of 2016 to assess condition reports written in various subject areas (equipment problems, human performance issues, etc.), as well as individual issues identified during the NRC's daily condition report review (Section 4OA2.1). The inspectors reviewed the Exelon quarterly trend report for the past two quarters 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 are required to provide input into the quarterly trend reports, which included maintenance and engineering departments. This review included a sample of issues and events that occurred over the course of the past two quarters to objectively determine whether issues were appropriately considered or ruled as emerging or adverse trends, and in some cases, verified the appropriate disposition of resolved trends. The inspectors verified that these issues were addressed within the scope of the corrective action program, or through department review and documented in the quarterly trend report for overall assessment. For example, the inspectors noted that consistent with the onset of unexpected voids in the make-up system suction headers and a consistent negative value for reactor coolant system unidentified leakage Exelon personnel had appropriately identified these issues as a monitored trend with ongoing corrective actions to address these two particular chronic issues. These issues were determined to be primarily caused by the degraded 'A' reactor coolant pump seal. Trending appropriately determined safe and stable conditions of the affected system. This was subsequently confirmed after the pump seal was replaced and the system void and unidentified leak rate calculations returned to normal values after the maintenance outage. Two noted trends by Exelon include an increased number of boric acid leaks identified by engineering (issue report 2721705) and an increase in non-consequential heat trace failures (issue report 3945641).



4OA3 Follow-Up of Events and Notices of Enforcement Discretion (71153 - 1 sample)Plant Eventsa. Inspection Scope

On December 7, 2016, the inspectors reviewed and/or observed plant parameters, reviewed personnel performance, and evaluated performance of mitigating systems regarding reactor coolant pressure boundary leakage identified during maintenance outage 1MO10. The inspectors communicated the plant events to appropriate regional personnel, and compared the event details with criteria contained in IMC 0309, "Reactive Inspection Decision Basis for Reactors," for consideration of potential reactive inspection activities. As applicable, the inspectors verified that Exelon made appropriate emergency classification assessments and properly reported the event in accordance with 10 CFR Parts 50.72 and 50.73. The inspectors reviewed Exelon's follow-up actions related to the events to assure that Exelon implemented appropriate corrective actions commensurate with their safety significance.

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

On January 20, 2016, the inspectors presented the inspection results to Mr. Edward 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.

4OA7 Licensee-Identified Violations

The following violation of very low safety significance (Green) was identified by Exelon and is a violation of NRC requirements, which meets the criteria of the NRC Enforcement Policy for being dispositioned as a non-cited violation:

Technical specification 3.2.12.1, "LTOP Protection", requires when the reactor vessel head is installed and indicated reactor coolant system temperature is  $\leq 313\text{F}$ , high pressure injection pump breakers shall not be racked in unless injection valves (MU-V16A/B/C/D and MU-V217) are closed with their associated breakers open and that pressurizer level is maintained  $\leq 100$  inches, or restore pressurizer level to  $\leq 100$  inches within 1 hour. Contrary to technical specification 3.2.12.1, during reactor coolant system filling with the vessel head installed and temperature  $< 313\text{F}$ , high pressure injection pump breakers were racked in while pressurizer level was  $>100$  inches for greater than 1 hour. The condition existed for 2 hours and 49 minutes until recognized by the operating crew when questioned by a senior reactor operator trainee, at which time the crew took immediate actions to reduce pressurizer level  $<100$  inches within 1 hour. Additional corrective actions included crew remediation, additional main control room supervisory oversight, and procedure changes. Exelon entered this issue into the corrective action program as issue report 3949713.

The inspectors determined that the finding was of very low safety significance (Green) in accordance with NRC IMC 0609, Appendix G, "Shutdown Operations," Attachment 1, Exhibit 4, since the finding did not represent an inadvertent safety injection and did not render the power-operated relief valve (LTOP Protection) unavailable or degraded.

**ATTACHMENT: SUPPLEMENTARY INFORMATION**

**SUPPLEMENTARY INFORMATION****KEY POINTS OF CONTACT**Licensee Personnel

E. Callan	Site Vice President
T. Haaf	Plant Manager
T. Alvey	Manager, Chemistry
D. Atherholt	Manager, Regulatory Assurance
M. Benson	Programs Engineer
P. Brady	Reactor Engineering Manager
R. Campbell	Manager, Site Security
J. Cavanaugh	Manager, Electrical Design Engineering
D. Divittore	Manager, Radiological Engineering
M. Fitzwater	Senior Regulatory Assurance Engineer
R. Ezzo	Senior Staff Engineer
T. Hall	System Engineer
R. Masoero	IST Program Engineer
G. McCarty	Radiological Engineering Manager
A. McGraw	System Engineer
R. Myer	Fire Marshall
S. Nowak	Senior Staff Engineer
L. Parlato	Radiation Protection Engineer
J. Piazza	Senior Manager, Design Engineering
J. Pickett	Emergency Preparedness Manager
C. Roeting	Electrical Technician
R. Shacklett	Fire Protection Engineer
B. Shumaker	Manager, Emergency Preparedness
R. Sievers	Engineer 3
C. Smith	Manager, Operations Support
G. Smith	Director, Maintenance
T. Stertz	Engineer
W. Stoner	Radiation Protection Supervisor
B. Waterbury	System Engineer
B. Wunderly	Engineering Director
B. Young	Component Maintenance Optimization Manager
V. Zeppos	Mechanical Engineer

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

\*Issue report generated based on inspection activities

### Section 1R01: Adverse Weather Protection

#### Procedures

1104-19, Control Building Ventilation Systems, Revision 84  
 E-70, Heat Trace Inspection, Revision 16  
 ER-AA-335-014-2004, VT-1 Visual Examination In Accordance with ASME 2004 Edition, Revision 000  
 ER-AA-335-015-2004, VT-2 Visual Examination In Accordance with ASME 2004 Edition, Revision 000  
 WC-AA-107, Seasonal Readiness, Revision 16

#### Miscellaneous

<u>IRs</u>	2572325	2570088	2457834	2471500	2574717	2585755
	2585029	2598648	2598029	2586912	2596013	2595956
<u>WOs</u>	R2227074	R2228465	R2250171			

### Section 1R04: Equipment Alignment

#### Procedures

1104-19, Control Building Ventilation System, Revision 85  
 OP-TM-108-117-1001, TMI Protective Equipment Program, Revision 2  
 OP-TM-AOP-034, Loss of Control Building Cooling, Revision 15  
 OP-TM-AOP-0341, Loss of Control Building Basis Document, Revision 7

#### Drawings

302-610, Nuclear Services Closed Cooling Water Flow Diagram, Revision 82  
 302-847, Control Building Chilled Water Flow Diagram, Revision 23

#### Miscellaneous

UFSAR – Three Mile Island, Section 9

### Section 1R05: Fire Protection

#### Procedures

990-1745, Three Mile Island Unit No.1 Fire Hazard Analysis Reports, Revision 26  
 1038, Administrative Controls-Fire Protection Program, Revision 76  
 1038, Administrative Controls-Fire Protection Program, Revision 83  
 1104-19, Control Building Ventilation System, Revision 85  
 OP-MA-201-007, Fire Protection System Impairment Control, Revision 6  
 CC-AA-309-101, Engineering Technical Evaluations, Revision 11  
 Three Mile Island Nuclear Station Unit No.1 Pre-Fire Plan #81, Revision 4  
 Three Mile Island Nuclear Station Unit No.1 Pre-Fire Plan #2, Revision 3  
 Three Mile Island Nuclear Station Unit No.1 Pre-Fire Plan #3, Revision 1  
 TMI-1 Fire Hazards Analysis Report 990-1745 Volume 1, Revision 26

#### Drawings

302-610, Nuclear Services Closed Cooling Water Flow Diagram, Revision 82  
 302-661, Make-up and Purification Flow Diagram, Revision 63  
 302-847, Control Building Chilled Water Flow Diagram, Revision 23

Miscellaneous

TMI Control Room Logbook, Dated October 14, 2016

TMI-1 Technical Specification 3.5.7, Amendment 216

Updated Final Safety Analysis Report 9.1, Makeup and Purification Systems, Revision 21

TMI Unit 1 Standing Order, MU-V-18 (normal makeup reactor building isolation valve) control  
from remote shutdown panel, Dated October 15, 2016

TMI-1 Fire Hazards Analysis Report 990-1745 Volume 1, Revision 26

Issue Reports

2739421\*

2725023

2723553

2726889

2727864

2736078\*

2736003\*

2733798\*

Work Order

R2125302

Section 1R06: Flood Protection Measures

Procedures

ER-AA-300-150, Cable Condition Monitoring Program, Revision 3

MA-TM-153-001, Inspection and Maintenance of TMI-1 Electrical and Telephone Manholes,  
Revision 7

Drawings

1E-133-07-010, Site Composite – Underground Facilities, Sht. 2, Revision 10

1E-133-07-019, Site Composite – Underground Facilities, Sht. 2, Revision 18

TMI-1 Informational Map: Electrical Manholes, Handholes, and Telephone Handholes,  
and Underground Duct Run Locations, dated November 2016

Miscellaneous

Preventative Maintenance Activity

PM220878

Work Order

R2188965

Section 1R07: Heat Sink Performance

Procedures

ER-AA-335-015-2004, VT-2 Visual Examination In Accordance with ASME 2004 Edition,  
Revision 0

OP-TM-541-570, Draining NS-C-1D, Revision 1

Drawing

1E-154-02-001, NS-C-1D General Arrangement, Revision 1

Miscellaneous

VT-2, Visual Examination NDE Report (NS-C1D), dated January 31, 2016

Action Request

A2349291

Work Orders

R2234971

R2234979

Section 1R11: Licensed Operator Regualification Program

Procedures

HU-AA-10, Human Performance Tools and verification Practices

HU-AA-1211-F-01, Pre-job Briefing Checklist, Revision 4

OP-AA-1, Conduct of Operations, Revision 1

OP-AA-103-102, Main Control Room Transient Brief, Revision 16

OP-TM-621-452, Defeating Smart Auto Signal Select Mismatch Alarm Inputs, Revision 1

OP-TM-211-485, Routine Mixed Batch Feed from 'C' RCBT to 'A' RCBT, Revision 1

OP-TM-AOP-046, Inadvertent ESAS action, Revision 6

OP-TM-EOP-002, Loss of 25F Subcooling Margin, Revision 9

OP-TM-EOP-006, LOCA Cooldown, Revision 12

OS-24, Conduct of Operations During Abnormal or Emergency Events, Revision 27

Miscellaneous

TQ-TM-106-E06-S008, Operator Training Scenario – LOCA Cooldown, Revision 0

Section 1R12: Maintenance Effectiveness

Procedures

ER-AA-310, Implementation of the Maintenance Rule, Revision 9

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

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

ER-TM-310-1002, Maintenance Rule Functions Safety Significance, Revision 3

ER-TM-310-1003, Maintenance Rule- Performance Criteria Selection, Revision 5

ER-AA-310-1006, Maintenance Rule – Expert Panel Roles and Responsibilities

Miscellaneous

Maintenance Rule Expert Panel meeting Minutes

System Health Report

Issue Reports

2500646

2494727

2378851

2698889

Work Order

C2035154

Section 1R13: Maintenance Risk Assessments and Emergent Work Control

Procedures

1082.1, TMI Risk Management Program, Revision 8  
WC-AA-101, On-Line Work Control Process, Revision 18

Miscellaneous

Issue Report

2735307

Work Orders

R2125302  
R2171408  
R2247958

Section 1R15: Operability Evaluations

Procedures

1303-4.1A and B, RPS Channel A and B Testing, Revision 25A  
E-IR-TMI1-20, Grid Corner Damage, Revision 1  
OP-AA-108-115, Operability Determinations, Revision 10  
OP-AA-108-115-1002, Supplemental Consideration for On-Shift Immediate  
Operability Determinations, Revision 2

Drawings

C-1101-641-E420-018, Calculation for margin of voltage tolerance in RPS RTM, Revision 0

Miscellaneous

NF151737, Three Mile Island Fuel Performance Update  
NRC Event Report 52204, dated August, 26, 2016  
Purchase Order 80-053409, for Aloyco 8" Swing Check Valve (Crane Nuclear Inc.), S/N E3352  
TMI-1 EOC 20, Grid Corner Damage Evaluation, Revision 1

Issue Reports

2715716  
2710030  
2724167  
2722897

Action Request

A2413209

Work Order

R2273591

Section 1R18: Plant Modifications

Procedures

1302-6.12, RC-LT-777 Pressurizer Level Calibration, Revision 19

Drawings

B-308-854, Piping Instrument Diagram Pressurizer Level Transmitter, Revision 8

Miscellaneous

Troubleshooting Log for RC-LT-777 level transmitter

CC-AA-102, Design Input and Configuration Change Impact Screening, Revision 20

CC-AA-103, Configuration Change Control, Revision 21

CC-AA-112, Temporary Configuration Changes, Revision 24

ECR 16-00349, Temporary Modification-Supply Alternate Reference Leg to RC-LT-777,  
Revision 0

WC-AA-104, Integrated Risk Management, Revision 24

Issue Reports

2718735

2713773

Action Request

2411291

Section 1R19: Post-Maintenance TestingProcedures

1104-19, Control Building Ventilation System, Revision 85

1303-11.45, PORV Setpoint Check, Revision 41

1410-P-3, Lube Oil Replacement, Revision 26

MA-AA-723-300, Diagnostic Testing of Motor Operated Vales, Revision 11

MA-AA-723-301, Periodic Inspection of Limitorque Model SMB/SB/SBD-000 thru -  
005 Motor Operated Valves, Revision 12

MA-AA-736-600, Torqueing and Tightening of Bolted Connections, Revision 3

MA-AA-743-310, Diagnostic Testing and Evaluation of AOV, Revision 6

OP-TM-AOP-34, Loss of Control Building Cooling, Revision 13A

OP-TM-220-503, Manual Control of Pressurizer Pressure, Revision 4

OP-TM-424-202, IST of EF-P-2B, Revision 10

Drawings

302-610, Nuclear Services Closed Cooling Water Flow Diagram, Revision 82

302-847, Control Building Chilled Water Flow Diagram, Revision 23

308-416, EFW Control Valve, Revision 3

302-273, EFW & MS Valve 2 Hour Backup Supply Air, Revision 24

302-182, EFW Flow Diagram, Revision 25

Miscellaneous

TMI-1 Technical Specification 3.3.1 and 3.1.12.1, Amendment 289

Updated Final Safety Analysis Report 9.8, Ventilation Systems, Revision 20

Issue Reports

2727097

2723553

2727090

2726889

2727083

2728522\*

2725023

1418103

2723538

Action Requests

A2411044

A2363163



Work Orders

C2036157	R2275419
C2037026	R2245250
R2280052	R2133011
R2245238	

Section 1R20: Refueling and Other Outage ActivitiesProcedures

1015, Equipment Storage Inside Class 1 Building—RB Sump Clogging Post-LOCA, Revision 7  
 1101-3, Containment Integrity and Access Limits, Revision 93A  
 1102-1, Plant Heatup to 525F, Revision 179A  
 1102-2, Plant Startup, Revision 163  
 1102-10, Plant Shutdown, Revision 099  
 1102-11, Plant Cooldown, Revision 153B  
 1103-8, Approach to Criticality, Revision 055  
 1103-11, RCS Water Level Control, Revision 072  
 ER-TM-470-1000, TMI-1 Transient Cycle Logbook Guideline, Revision 2  
 MA-AA-716-008, FME Program, Revision 011  
 MA-TM-460-001, Planned Containment Entry-TMI 1, Revision 2  
 OP-TM-220-261, Reactor Coolant System VT-2 Exam, Revision 010  
 OP-TM-220-567, Drain Cold Leg(s) to RCBT via RC Drain Pump, Revision 004A  
 OP-TM-226-101, Start RC-P-1A, Revision 9  
 OP-TM-300-205, Shutdown Margin for Hot Shutdown Conditions, Revision 004  
 OP-TM-300-206, Shutdown Margin for Low Temperature Conditions, Revision 003

Miscellaneous

32-9265475-000, P-T Limit Evaluation of December 1, 2016 Cooldown Transient at TMI-1, dated December 6, 2016 (Issue reports: 3948503 & 3948835)  
 EC 617476-000, Technical Evaluation to Support Start-up PORC from 1MO10  
 EC 617561-000, Engineering Assessment of RC-P-1A Thermal Barrier Flange, dated January 12, 2017  
 PORC Meeting 2016-13, dated December 10, 2016  
 PORC Meeting 2016-14, dated December 11, 2016  
 Prompt Investigation 3950464-02 RC-P-1A Leak at Blank Flange (NDE)  
 TMI-1 Plant Computer Plots for Cooldown, dated December 1 – 5, 2016  
 TMI-1 TS 3.1.2.1, Pressurization Heatup and Cooldown Limitations, Amendment 281

Issue Reports

2582909*	2583048	2583372*	2581030	2584645	2601214
2601327	2601086	2601031	2601026	2601022	2601016
2600103	2600026	2599896	2598950	2592809	2592706
2592776	2592711	2592311	2592250	2592649	2592586
2592628	2592661	2595746	2593902	2599173	2605522
2582373*	2582414*	2592131*	2592129*	2592128*	2591670*
2580079	3949650	3948503	3948835		
3948503	3948387	3948346	3948337		

Section 1R22: Surveillance Testing

Procedures

ER-AA-425, Implementation of the Technical Specification Surveillance Frequency Control Program, Revision 1  
LS-AA-1000, Surveillance Frequency Control Program (SFCP) List of Surveillance Frequencies Change Process, Revision 1  
OP-TM-212-201, IST of DH-P-1A, Revision 14  
OP-TM-214-201, IST of BS-P-1A and Valves, Revision 13  
OP-TM-543-201, IST of DC-P-1A, Revision 3  
WC-AA-111, Surveillance Program Requirements, Revision 4  
WC-TM-430, Surveillance Testing Program, Revision 0  
WC-TM-430-1001, Surveillance Testing Program Database Interface and Maintenance, Revision 1

Miscellaneous

NEI 04-10, Risk-Informed Method for Control of Surveillance Frequencies, Revision 1  
PORC Meeting 2016-04, Approval of TM-15-003, TM-16-001, dated June 14, 2016  
SFCP Change TM-15-003, EFW Flow Channel Testing, dated August 3, 2016  
SFCP Change TM-16-001, Degraded Grid Relay Calibration, dated August 3, 2016

Surveillance Test Intervals

ST005693 (31days to 92 days)  
ST005661 (365days to 92 days)  
ST203199 (365days to 92 days)

Work Orders

R2278518  
R2277933  
R2214093

Section 1EP4: Emergency Action Level and Emergency Plan Changes

Miscellaneous

EP-AA-110, Assessment of Emergencies, Revision 10  
EP-AA-112, Emergency Response Organization (ERO) / Emergency Response Facility (ERF) Activation and Operation, Revision 18  
EP-AA-1009, Addendum 3, Emergency Action Levels for Three Mile Island Station, Revision 1

Section 2RS2: ALARA Planning and Controls

Procedures

RP-AA-400, ALARA Program, Revision 13  
RP-AA-400-1004, Emergent Dose Control and Authorization, Revision 8  
RP-AA-400-2000, Department Dose Advocate, Revision 2  
RP-AA-401, Operational ALARA Planning and Controls, Revision 21  
RP-AA-401-1001, Dose Reporting Guidance, Revision 7  
RP-AA-401-1002, Radiological Risk Management, Revision 9

Miscellaneous

Standard Radiation Monitoring Points (SRMP) data for T1R20 and T1R21

Issue Reports

2467146	2517102	2533122	2571154	2574744	2582548
2622062	2662409	2678064	2721144	2721672	2730259

Section 2RS4: Occupational Dose Assessment

Procedures:

RP-AA-203, Exposure Control and Authorization, Revision 3  
 RP-AA-203-1001, Personnel Exposure Investigations, Revision 9  
 RP-AA-210, Dosimetry Issue, Usage, and Control, Revision 26  
 RP-AA-210-1001, Dosimetry Logs and Forms, Revision 10  
 RP-AA-220, Bioassay Program, Revision 12  
 RP-AA-222, Methods for Estimating Internal Exposure from IN VIVO and IN VITRO  
 Bioassay Data, Revision 5  
 RP-AA-223, Calculating and Crediting Dose from Tritium Exposure, Revision 1  
 RP-AA-250, External Dose Assessments from Contamination, Revision 6  
 RP-AA-270, Prenatal Radiation Exposure, Revision 7

Miscellaneous

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 Self-Assessment, Radiation Protection Dosimetry, May 27, 2016

Issue Reports

2634601  
 2640136  
 2649087  
 2652352

Section 4OA2: Problem Identification and Resolution

Procedures

1302-6.16, Setpoint and Remote Position Check of the PORV (RC-V-2), Revision 18A  
 1420-AH-1, AH-E-1A/B/C Motor Maintenance, revision 24  
 1410-Y-72, Bolt/Nut Torquing and Sequences, Revision 28  
 E-70, Heat Trace Inspection, Revision 16  
 ES-024T, Overload Heater Selection for Electric Motor, Revision 5  
 HU-AA-101-1002, Human Performance Review Board, Revision 2  
 M-132, Electromatic Relief Valve (PORV) Inspection, Revision 009  
 M-143, Air Handling Equipment Maintenance, Revision 25  
 MA-AA-716-230-1002, Vibration Analysis/Acceptance Guideline, Revision 4  
 OP-TM-212-201, IST of DH-P-1A and Valves from ES Standby Mode, Revision 14  
 OP-TM-220-203, IST PORV RC-RV-2, Revision 006:  
     Performed on March 31, 2016, WO R2237555  
     Performed on November 23, 2015, WO R2230752  
     Performed on April 9, 2014, WOs R2192329 / R2200281  
 OP-TM-541-232, IST of NR-P-1B and Valves – Multiple Pump Operations, Revision 9  
 OP-TM-823-250, AH-E-A/B/C cooling Fan Testing, Revision 3  
 PI-120, Issue Identification and Screening Process, Revision, 6  
 PI-AA-115-1004, Processing of NERs, ICES OEs, and Root Cause Report Transmittals to  
 INPO, Revision 3  
 PI-AA-125, Corrective Action Program Procedure, Revision 4  
 PI-AA-125-1003, Apparent Cause Evaluation Manual, Revision 3T1-700-15-003, RB Fan Motor  
 Load, Revision 0ER-TM-321-1041, TMI-1 IST Program Requirements, Revision 5

### Calculations

C-1101-700-E510-010, TMI-1, AC Voltage Regulation Study, Revision 7  
C-1101-733-E420-022, TOL/Ampektor and MOV Confirmation for Degraded Grid Voltage, Revision 5  
C-1101-741-E510-005, Loading Summary of Emergency Diesel Generators & Engineered Safeguards Buses, Revision 6  
C-1101-823-5310-004, RB Emergency Cooling Fan motor Horsepower during LOCA Event, Revision 2

### Drawings

201-043, Sht. 1, 480V Control Center, Revision 45  
302-202, Nuclear Services River Water System Flow Diagram, Revision 81  
302-650, Reactor Coolant System, Revision 62  
Dresser Industries – Consolidated Electromatic Relief Valve, Type 6" 1525-VX, (January 1986); Oyster Creek Vendor Technical Manual #392, Revision 1 and DWGs  
Dresser Industries – Consolidated Electromatic Relief Valve, Type 31533VX-30 with Bellows, Revision 5 (Original-August 1978, dated 09-04-1990); TMI Vendor Technical Manual and DWGs  
E-206-011, Main one Line and Relay Diagram, Revision 55  
E-206-032, One line & Relay Diagram – ENG D SFGDS, Screen HSE, Reactor Bldg. H&V, 480V SWGR, Revision 21  
SHW-D-10058, SHW-P5184 Backdraft Damper, Revision B  
SS-209-034, Electrical Elementary Diagram – Pressurizer Electromatic Relief Valve RC-RV-2, Revision 4  
SS-209-069, Electrical Elementary Diagram – R.C. Pressurizer Pressure Switch RC3-PS8 Auxiliary Relay 63X/RC3-PS8, Revision 10D

### Miscellaneous

#### Completed Surveillance Tests

AH-E-1A/B/C Cooling Fan Testing, Completed on 1/22/10  
AH-E-1A Air Handling Damper Maintenance, Completed on 11/08/15  
AH-E-1B Air Handling Damper Maintenance, Completed on 11/08/15  
AH-E-1C Air Handling Damper Maintenance, Completed on 11/08/15  
N-TM-ENG-RBEC-2013, Reactor Building Emergency Ventilation – Eng. System Training  
NCV 05000289/2015007-02, Untimely Identification and Correction of Degraded BWST Level Transmitter Cold Weather Protection Equipment  
NCV 05000289/2016001-01, Deficient Design Control of ECCS Level Transmitter Instrument Line Heat Trace Causes Freezing and Inoperability  
NRC Event Notification 50495, 10CFR 21 Defect Report (Oyster Creek EMRV), dated September 25, 2014  
NRC IR 05-219 / 2014009 and EA-14-178, dated February 11, 2015  
Prompt Investigation 2607617, BWST Level Indication DH-LT-809 Failed High, dated January 4, 2016  
TMI-16-S-0004, Temp Config Change – BWST Level Instrument Freeze Protection (10CFR50.59 Screen), Revision 0, dated January 6, 2016  
TMI UFSAR Section 4.2.4.2, Pilot (Electromatic) Operated Relief Valve (PORV), Revision 21  
VT-TM-00133, Reactor Building Cooling System vendor Manual, Revision 9  
Updated Final Safety Analysis Report 9.6, Cooling Water Systems, Revision 21

Issue Reports

2451855	1670834	2734052
2458929	1590105	3949102
2458932	2714417	3943097
2532476	2717995	3943095
2520334	2733851*	3943066
2661010	948647	3943065
2680377	2722560	2717363
2634708	2730768	2728382*
2568763	2733078	2710562
2568897	2733083	3947281
2568915	3945641	
2498630	2729805	

Work Orders

R2278518	R2235421
GA204004	R2250171
R2112737	R2228465
R2230476	R2227074

Section 4OA3: Followup of Events and Notices of Enforcement Discretion

Procedures

OP-TM-AOP-050, Reactor Coolant Leakage, Revision 5

Miscellaneous

NRC Event Notification 52415, dated December 7, 2016  
TMI-1 TS 3.1.6, Leakage, Amendment 271

Section 4OA7: Licensee-Identified Violations

Procedures

OP-TM-211-101, Shifting MU System From Shutdown to Low Temperature Overpressure Mode, Revision 14  
OP-TM-220-555, Fill RCS From RCBT Via Waste Transfer Pump, Revision 5

Drawings

N-TM-TQ-TM-106-11.2.01.117, Reactor Coolant System Level Diagram, Revision 11

Miscellaneous

Apparent Cause Evaluation 3949713, Low Temperature Over-Pressurization (LTOP)  
Technical Specification Requirements Were Not Met, Dated January 11, 2017  
Plant Computer Plot for Pressurizer Level (C4017), dated December 5, 2016  
TMI-1 Operation Shift Logs, Dated December 5-6, 2016  
TMI-1 TS 3.1.12.1, LTOP Protection, Amendment 281

**LIST OF ACRONYMS**

ALARA	as low as reasonably achievable
BWST	borated water storage tank
CDBI	component design basis inspection
CFR	Code of Federal Regulations
DGV	degraded grid voltage
EAL	Emergency Action Level
EMRV	electromatic relief valve
HP	horsepower
IMC	Inspection Manual Chapter
IR	inspection report
IST	in-service test
LBLOCA	large-break loss-of-coolant accident
LTOP	low temperature over pressure
NCV	non-cited violation
NRC	Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
PARS	publicly available records
PF	power factor
PI	performance indicator
PORV	pilot operated relief valve
RB	reactor building
SSC	structure, system, and component
TOL	thermal overload
TMI	Three Mile Island Unit 1
UFSAR	Updated Final Safety Analysis Report