



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

November 7, 2016

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

SUBJECT: THREE MILE ISLAND STATION, UNIT 1 – INTEGRATED INSPECTION REPORT
05000289/2016003

Dear Mr. Hanson:

On September 30, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Three Mile Island, Unit 1 (TMI). On October 21, 2016, the NRC inspectors discussed the results of this inspection with Mr. B. Wunderly, Director of Site Engineering, and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented one finding of very low safety significance (Green) in this report. This finding involved a violation of NRC requirements. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2.a of the Enforcement Policy.

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 Public Document Room in accordance with 10 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

-2-

Enclosure:
Inspection Report 05000289/2016003
w/Attachment: Supplementary Information

cc w/encl: Distribution via ListServ

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Document Name: G:\DRP\BRANCH6\+++Three Mile Island\TMI Inspection Reports\2016\Third QUARTER
Report\TMI_Report_IR2016003 Final.docx ADAMS ACCESSION NUMBER: ML16313A365

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

Docket No: 50-289

License No: DPR-50

Report No: 05000289/2016003

Licensee: Exelon Generation Company

Facility: Three Mile Island Station, Unit 1

Location: Middletown, PA 17057

Dates: July 1 through September 30, 2016

Inspectors: D. Werkheiser, Senior Resident Inspector
A. Ziedonis, Senior Resident Inspector (Acting)
B. Lin, Resident Inspector
L. Cruz, Project Engineer
K. Mangan, Senior Reactor Inspector
H. Gray, Senior Reactor Inspector
E. Burket, Reactor Inspector
R. Rolph, Health Physicist

Approved by: S. Kennedy, Chief
Projects Branch 6
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Enclosure

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SUMMARY

IR 05000289/2016003, 07/01/2016-09/30/2016; Three Mile Island (TMI), Unit 1, Problem Identification and Resolution.

This report covered a three-month period of inspection by resident inspectors and announced inspections performed by regional inspectors. Inspectors identified one finding of very low safety significance (Green), which was a non-cited (NCV). The significance of most findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process", dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects Within Cross-Cutting Areas," dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated August 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.

Cornerstone: Mitigating Systems

- Green. The inspectors identified an NCV of Title 10 *Code of Federal Regulations* (CFR) 50, Appendix B, Criterion III, "Design Control," in that Exelon did not ensure the availability of the emergency diesel generator (EDG) following a seismic event. The inspectors reviewed the TMI licensing basis for internal flooding, associated evaluations and conditions reports, and walked down safety-related structures system and components (SSCs). During this review the inspectors determined that non-seismic piping failures in the EDG room were not properly evaluated. Specifically, the inspectors determined that pressurized fire water pipes in both EDG rooms were not classified as safety-related or seismically qualified. The inspectors reviewed Exelon's evaluation of the potential failure of the pipe, as assumed in the TMI design and licensing basis, and determined that operator actions were credited to mitigate the pipe failure in order to prevent water from affecting the operation of the EDGs. The inspectors determined that these operator actions could not be performed prior to water from the pipe break impacting the operation of the EDGs. Following identification of the issue, Exelon entered this issue into their corrective action program and performed an analysis on the structural loading on the fire water piping during a safe shutdown earthquake and concluded that the piping would not break during the design basis event and, therefore, the EDGs remained operable. The inspectors reviewed the analysis and found it reasonable.

The inspectors determined the failure to adequately evaluate the effects of a pipe failure in the EDG room in accordance with the design and licensing basis was a performance deficiency. The performance deficiency is considered more than minor because it is associated with the Protection Against External Factors attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Additionally, the performance deficiency is considered more than minor in accordance with Manual Chapter 0612, Appendix E - Question 3K, in that there was a reasonable doubt of operability for the EDGs requiring engineering calculations and analysis to resolve.

In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 2 of IMC 0609, Appendix A, "The Significance Determination Process for Findings At-Power," the inspectors determined the finding to be of very low safety significance (Green) because the finding was determined to be a design or qualification deficiency that did not result in an inoperability.

No cross-cutting attribute is assigned to this finding because the performance deficiency was not indicative of Exelon's current performance. Specifically, this issue was last identified and reviewed by Exelon in issue report 1201424 in 2010. (Section 4OA2.2)

REPORT DETAILS

Summary of Plant Status

Unit 1 began the inspection period at 100 percent power. On July 11, 2016, operators reduced power to approximately 85 percent to reduce vibrations observed on the main feedwater heater drain piping in the turbine building and returned to 100 percent power on July 12. On July 16, operators reduced power to 81 percent to perform repairs on a heater drain control valve (HD-V-3A). Following repairs, operators returned the unit to 100 percent on July 18. From September 2 through September 3, operators reduced power to 89 percent for planned turbine valve and control rod testing and then maintained 92 percent power in accordance with a load following agreement with the grid dispatcher. Operators returned the unit to 100 percent power on September 3. A similar power reduction to 92 percent power, for load following, was conducted by operators on September 26. 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 – 1 sample)

External Flooding

a. Inspection Scope

During the week of September 6, 2016, the inspectors performed an inspection of the external flood protection measures for TMI. The inspectors reviewed technical specifications; procedures; design documents; and the Updated Final Safety Analysis Report (UFSAR), Chapter 2.6.4, which depicted the design flood levels and protection areas containing safety-related equipment, to identify areas that may be affected by external flooding. The inspectors conducted a general site walkdown of all external areas of the plant, including the air intake tunnel, turbine building, auxiliary building, and berm to ensure that Exelon erected flood protection measures in accordance with design specifications. The inspectors also reviewed operating procedures for mitigating external flooding during severe weather to determine if Exelon planned or established adequate measures to protect against external flooding events. Documents reviewed for each section of this inspection report are listed in the Attachment.

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:

- Nuclear services river water system (NSRWS) following licensee-identified pinhole leakage in the suction header piping, on July 28, 2016
- Makeup system during infrequent operating line-up of suction and discharge header cross-connect valves, on August 3, 2016
- Emergency control room air treatment system following corrective maintenance to remove internal ducting debris buildup, on August 4, 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.

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

a. Inspection Scope

On August 17 and 18, 2016, the inspectors performed a complete system walkdown of accessible portions of the spent fuel cooling 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.

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.

- Auxiliary building heat exchanger vault, elevation 271', AB-FZ-1, on July 6, 2016
- Control building remote shutdown area, CB-FA-2C, on July 7, 2016
- Station blackout diesel, elevation 305', on July 18, 2016
- Auxiliary building general area, AB-FZ-5, elevation 281', on July 22, 2016
- Control building west battery area, CB-FA-2G, on August 10, 2016

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06 – 1 sample)

Internal Flooding Review

a. Inspection Scope

The inspectors reviewed the UFSAR, the site flooding analysis, and plant procedures to assess susceptibilities involving internal flooding. 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. The inspectors focused on the air intake tunnel and its flood barrier system to verify the

adequacy of equipment seals located below the flood line, floor and water penetration seals, watertight door seals, common drain lines and sumps, sump pumps, level alarms, control circuits, and temporary or removable flood barriers.

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07T – 3 samples)

a. Inspection Scope

Triennial Heat Sink and Heat Exchanger Sample Selection

Based on Exelon's risk ranking of safety-related heat exchangers, a review of past triennial heat sink inspections, recent operational experience, and resident inspector input, the inspectors selected the following two heat exchangers for detailed review: Unit 1 nuclear services closed cooling water cooler, NS-C-1B, and Unit 1 intermediate closed cooling water cooler, IC-C-1B. The inspectors also selected the decay heat river water system (DHRWS) as an ultimate heat sink sample.

For the samples selected the inspectors reviewed program/system health reports, self-assessments, and the methods (inspection, cleaning, maintenance, and performance monitoring) used to ensure heat removal capabilities for the safety-related heat exchangers and ultimate heat sink and compared them to the Exelon Three Mile Island Station, Unit 1 commitments made in response to Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment."

Heat Exchangers Directly Cooled by Nuclear Services River Water System

The NSRWS takes suction from the ultimate heat sink, the Susquehanna River, and provides cooling to selected heat exchangers NS-C-1B and IC-C-1B. For the heat exchangers selected, the inspectors verified that inspection, maintenance, and monitoring of biotic fouling and macro-fouling programs were singularly or in combination adequate to ensure proper heat transfer and were in accordance with industry guidance. The inspectors reviewed the procedures and programs for maintaining the safety functions of the heat exchangers that were monitored by means of cleaning and inspection and discussed the activities with station personnel.

The inspectors reviewed the most recent inspections and cleaning results of the selected heat exchangers, the trending of tube plugging, and engineering calculations of tube plugging limits. The inspectors verified that the number of plugged tubes was within pre-established limits, based on heat transfer capability and design heat transfer assumptions, and are accounted for in the heat exchanger performance calculations. The inspectors walked down accessible portions of piping, pumps, valves, and heat exchangers to assess the material condition of the components.

Decay Heat River Water System

The inspectors reviewed the Unit 1 DHRWS that takes suction from the Susquehanna River and transfers heat from the decay heat removal system during plant shutdown and refueling operations. The inspectors reviewed the system design to evaluate the adequacy of system monitoring and performance testing. The inspectors reviewed procedures, calculations, and design drawings to verify they were consistent with the design and licensing basis. The inspectors verified that Exelon established maintenance and chemistry procedures to control, detect, and prevent system degradation due to macro-fouling of the DHRWS.

The inspectors performed a walk down of the intake building (including the trash racks, DHRWS pumps, traveling water screens, and structural supports), and the accessible areas of the auxiliary building containing DHRWS piping to assess the material condition of the components.

The inspectors verified that intake structure pump bay silt accumulation is monitored, trended, and maintained at an acceptable level. The inspectors interviewed the responsible Exelon engineering personnel, reviewed silt deposition inspection documentation, and the results of past completed bay silt cleaning work orders.

The inspectors reviewed a sample of DHRWS system health reports, maintenance history, non-destructive examination records, photographs, structural engineering evaluations of through-wall pipe leaks, and in-service testing (IST) results to determine whether component or piping degradation issues were being appropriately identified and dispositioned and to verify that the minimum calculated DHRWS flow rates were properly maintained to decay heat removal equipment and met the acceptance criteria in the UFSAR.

Problem Identification and Resolution

The inspectors selected and reviewed a sample of corrective action program reports related to the selected heat exchangers and the decay heat river water system. The review verified on a sampling basis that Exelon staff were appropriately identifying, characterizing, and correcting problems related to these systems and components, and that the corrective actions for the reported issues were appropriate.

b. Findings

No findings were identified.

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

.1 Quarterly Review of Licensed Operator Requalification Testing and Training

a. Inspection Scope

The inspectors observed crew 'B' licensed operator simulator training on September 20, 2016, which focused on abnormal and emergency operating procedures for loss of vital electrical buses and a coolant leak from the primary to secondary plant, which also involved an emergency classification. 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 an unplanned downpower of approximately 15 percent in response to heater drain system piping high vibrations on July 11, high and low pressure injection system logic testing on August 23, 'A' EDG testing and elevated station risk on August 30, and reactor coolant system (RCS) inventory changes (reactor coolant drain tank pump down and make-up tank addition) on August 31. 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 001. 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 – 3 samples)a. Inspection Scope

The inspectors reviewed the samples listed below to assess the effectiveness of maintenance activities on 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 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.

- Makeup system 'A' pump recirculation stop check valve (MU-V-193A) leakage during 'B' make-up system pump testing, on August 12, 2016 (quality control sample)
- Emergency control room air treatment system preventive maintenance schedule and associated bases, on August 29, 2016
- Procedure revision to correctly identify the loss of both safety-related 4 kilovolt busses as the start time for EOP-012 for a postulated station blackout, on September 23, 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 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.

- Emergent maintenance on the control building ventilation system on July 11, 2016
- Emergent maintenance on the feedwater heater drain system on July 13, 2016
- Makeup system troubleshooting and emergent ultrasonic testing associated with aggregate gas voiding on August 30, 2016
- Planned maintenance on the turbine driven emergency feed water pump relief valve (EF-V-35), on September 7, 2016
- Planned station blackout diesel engine and generator outage for work week 1638 on September 13, 2016

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 3 samples)

a. Inspection Scope

The inspectors reviewed operability determinations for the following degraded or non-conforming conditions:

- Out of tolerance readings during surveillance testing of the control building emergency ventilation system (AH-E-18A/B), on July 12, 2016
- NSRWS header piping through-wall leakage, as documented in issue report 2697048, on July 27, 2016
- Reactor coolant pump 1A (RC-P-1A) seal leakage and associated RCS inventory changes (reactor coolant drain tank pump downs and make-up tank additions), on August 2, 2016 (operator workaround [OWA] sample)

The inspectors selected these issues based on the risk significance of the associated components and systems. 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. Where compensatory measures were required to maintain operability, such as in the case of OWAs, the inspectors determined whether the measures in place would function

as intended and were properly controlled by Exelon. Based on the review of the selected OWA listed above, the inspectors verified that Exelon identified OWAs at an appropriate threshold and addressed them in a manner that effectively managed OWA-related adverse effects on operators and SSCs.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 – 2 samples)

Permanent Modifications

a. Inspection Scope

The inspectors evaluated a modification to safety-related conduit supports in the air intake tunnel implemented by engineering change package ECR 14-00174; and a modification to the makeup system operational lineup implemented by 50.59 evaluation SE-000211-015. 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 the replacement of the degraded conduit supports and associated fire service piping previously supported by hangers connected to the degraded supports. The inspectors performed a walk down of the affected areas and verified that all the steps were performed and verified in the as-left configuration.

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 ensured system operability and functional capability. The inspectors reviewed the test procedure to verify that the procedure adequately tested the safety functions that may have been affected by the maintenance activity, that the acceptance criteria in the procedure was consistent with the information in the applicable licensing basis and/or design basis documents, and that the procedure had been properly reviewed and approved. The inspectors also witnessed the test or reviewed test data to verify that the test results adequately demonstrated restoration of the affected safety functions.

- Heater drain level control valve '3A' (HD-V-3A) following valve internals replacement, on July 18, 2016
- Core flood system 'B' level transmitter (CF-LT-4) following replacement, on August 25, 2016
- Scheduled replacement and testing of the turbine driven emergency feedwater pump relief valve (EF-V-35), on September 6, 2016
- Fitting replacement on the decay heat pump suction isolation valve (DH-V-12A), on September 14, 2016
- Engineered safeguards actuation system universal relay (1X1-A/RC-B) replacement, on September 15, 2016
- Station blackout diesel engine system outage under work order R2246818, on September 11-16, 2016

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 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:

- 1303-4.16, Monthly test of the 'B' emergency diesel generator on July 5, 2016
- OP-TM-212-201, IST of decay heat pump 1A (DH-P-1A) on July 8, 2016 (in-service test)
- 1107-9, Station blackout diesel surveillance test on July 19, 2016
- OP-TM-533-201, IST of Decay river pump 1A (DR-P-1A) on July 28, 2016
- OP-TM-214-201, IST of Building spray pump 1A (BS-P-1A) on August 1, 2016

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness**1EP6 Drill Evaluation (71114.06 – 2 samples)****.1 Emergency Preparedness Drill Observation****a. Inspection Scope**

The inspectors evaluated the conduct of a routine Exelon emergency drill on September 27, 2016 to identify any weaknesses and deficiencies in the classification, notification, and protective action recommendation development activities. The inspectors observed emergency response operations in the simulator (crew E), technical support center, and emergency operations facility to determine whether the event classification, notifications, and protective action recommendations were performed in accordance with procedures.

The inspectors also attended the station drill critique to compare inspector observations with those identified by Exelon staff in order to evaluate Exelon's critique and to verify whether the Exelon staff was properly identifying weaknesses and entering them into the corrective action program.

b. Findings

No findings were identified.

.2 Training Observations**a. Inspection Scope**

The inspectors observed a simulator training evolution for crew B licensed operators on September 20, 2016, which required emergency plan implementation by an operations crew. Exelon planned for this evolution to be evaluated and included in performance indicator data regarding drill and exercise performance. The inspectors observed event classification and notification activities performed by the crew. The inspectors also attended the post-evolution critique for the scenario. The focus of the inspectors' activities was to note any weaknesses and deficiencies in the crew's performance and ensure that Exelon evaluators noted the same issues and entered them into the corrective action program.

b. Findings

No findings were identified.

2. RADIATION SAFETY

Cornerstones: Occupational and Public Radiation Safety

2RS5 Radiation Monitoring Instrumentation (71124.05 - 3 samples)

a. Inspection Scope

The inspectors reviewed performance in assuring the accuracy and operability of radiation monitoring instruments used to protect occupational workers during plant operations and from postulated accidents. The inspectors used the requirements in 10 CFR 20, Regulatory Guides, ANSI 323A, N323D, and N42.14, and procedures required by technical specifications as criteria for determining compliance.

Inspection Planning

The inspectors reviewed TMI's UFSAR, radiation protection audits, records of in-service survey instrumentation, and procedures for instrument source checks and calibrations.

Walkdowns and Observations

The inspectors conducted walkdowns of plant area radiation monitors and continuous air monitors. The inspectors assessed material condition of these instruments and that the monitor configurations aligned with the UFSAR. The inspectors checked the calibration and source check status of various portable radiation survey instruments and contamination detection monitors for personnel and equipment.

Calibration and Testing Program

For the following radiation detection instrumentation, the inspectors reviewed the current detector and electronic channel calibration, functional testing results alarm set-points and the use of scaling factors: laboratory analytical instruments, whole body counter, containment high-range monitors, portal monitors, personnel contamination monitors, small article monitors, portable survey instruments, area radiation monitors, electronic dosimetry, air samplers and continuous air monitors. The inspectors reviewed the calibration standards used for portable instrument calibrations and response checks to verify that instruments were calibrated by a facility that used National Institute of Science and Technology traceable sources.

Problem Identification and Resolution

The inspectors verified that problems associated with radiation monitoring instrumentation (including failed calibrations) were identified at an appropriate threshold and properly addressed in the corrective action program.

b. Findings

No findings were identified.

2RS6 Radioactive Gaseous and Liquid Effluent Treatment (71124.06 - 1 sample)**a. Inspection Scope**

The inspectors reviewed the treatment, monitoring, and control of radioactive gaseous and liquid effluents. The inspectors used the requirements in 10 CFR 20, 10 CFR 50, Appendix I, technical specifications, Offsite Dose Calculation Manual (ODCM), applicable industry standards, and procedures required by technical specifications as criteria for determining compliance.

Calibration and Testing Program

The inspectors reviewed gaseous and liquid effluent monitor instrument calibration, functional test results, and alarm set-points based on National Institute of Standards and Technology calibration traceability and ODCM specifications.

4. OTHER ACTIVITIES**4OA1 Performance Indicator Verification (71151)****.1 Safety System Functional Failures (1 sample)****a. Inspection Scope**

The inspectors sampled Exelon's submittals for the Safety System Functional Failures performance indicator for TMI for the period of October 1, 2015 through June 30, 2016. To determine the accuracy of the performance indicator data reported during those periods, inspectors used definitions and guidance contained in the Nuclear Energy Institute (NEI) Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, and NUREG-1022, "Event Reporting Guidelines 10 CFR 50.72 and 10 CFR 50.73," Revision 3.

The inspectors reviewed Exelon's operator narrative logs, operability assessments, maintenance rule records, maintenance work orders, condition reports, event reports, and NRC integrated inspection reports to validate the accuracy of the submittals.

b. Findings

No findings were identified.

.2 Mitigating Systems Performance Index (5 samples)

a. Inspection Scope

The inspectors reviewed Exelon's submittal of the Mitigating Systems Performance Index for the following systems for the period of July 1, 2015 through June 30, 2016:

- [MS 06] Emergency Alternating Current Power System (Emergency Diesel Generators)
- [MS 07] High Pressure Safety Injection System (Makeup)
- [MS 08] Emergency Feedwater System
- [MS 09] Decay Heat Removal
- [MS 10] Cooling Water Support Systems (Decay Closed, Decay River, Nuclear Closed, Nuclear River)

To determine the accuracy of the performance indicator data reported during those periods, the inspectors used definitions and guidance contained in NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7. The inspectors also reviewed Exelon's operator narrative logs, condition reports, mitigating systems performance index derivation 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 – 1 sample)

.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: Internal Flooding Evaluation

a. Inspection Scope

The inspectors performed an in-depth review of Exelon's evaluation and corrective actions associated with the failure to implement actions described in communications between TMI and the NRC (letters dated September 26, 1972 and November 10, 1972). The letter from the NRC requested TMI to evaluate the effect internal flooding, assuming the failure of non-safety-related piping, would have on safety-related SSCs. Specifically, the Atomic Energy Commission (predecessor to the NRC in 1972) requested:

"...to determine whether the failure of any non-Category I (seismic) equipment, particularly in the circulating water system and fire protection system, could result in a condition, such as flooding or the release of chemicals, that might potentially adversely affect the performance of safety-related equipment required for safe shutdown of the facilities or to limit the consequences of an accident."

Metropolitan Edison (TMI's licensee in 1972) response to this request included corrective actions to address internal flooding hazards that were identified during the review. The inspectors reviewed the response and also reviewed flooding evaluations, issue reports, UFSAR, internal flooding probabilistic risk evaluations, plant drawings, and the Integrated Plant External Events Evaluation to determine the licensing basis of the plant, credited design features, and internal flooding hazard locations. Inspectors also reviewed over 20 corrective action reports including the issue report associated with NRC Finding 05000289/2015003-01, *Internal Flooding Licensing Basis Commitment Not Met*, to determine corrective actions to address non-conformances and weaknesses identified. Additionally, the inspectors performed an extent-of-condition review to evaluate whether other safety-related SSCs could be subjected to internal flooding hazards.

The inspectors assessed Exelon's evaluation, extent-of-condition review, completed and proposed corrective actions, and the prioritization and timeliness of actions to evaluate whether the corrective actions were appropriate. Related to internal flooding events in the turbine and auxiliary buildings, the inspectors evaluated whether the technical evaluations completed, additional maintenance activities performed, and revisions to control room operator alarm response procedures were adequate to confirm that the previous commitments made to the NRC were met, or revisions to the commitments ensured that internal flooding events required to be assumed in the TMI licensing and design basis would not impact safety-related SSCs. Additionally, the inspectors walked down float switch alarms, credited mitigation equipment, and credited control room

indications and switches to determine if any material deficiencies existed and to verify that assumptions made in internal flooding analysis were consistent with the plant configuration. Finally, the inspectors determined if Exelon adequately evaluated whether internal flooding concerns were present on other systems.

The inspectors interviewed engineers, reviewed Exelon's evaluation of the issue, and walked down safety-related SSCs to determine if other internal flooding concerns were present and evaluate if Exelon's scope of the review was adequate.

b. Observations

The inspectors determined that Exelon's evaluation and causes related to the previously identified finding were appropriately identified and the corrective actions to address identified deficiencies were completed. However, the inspectors noted some weakness in the effectiveness of some corrective actions, assumptions made in technical evaluations, and also operator response assumptions. Additionally, the inspectors also found the extent-of-condition review did not include all safety-related areas of the plant. The inspector's review was separated into three focus areas:

- Circulating pipe failure in the turbine building
- Non-safety-related and non-seismic Class 1 pipe failure in the auxiliary building
- Non-seismic fire water pipe failures in the EDG rooms

For an assumed turbine building flood due to circulating water pipe failure the inspectors found that the commitments, analysis, and operator response credited the operation of the master circulating water pump trip switch, condensate bay float switches, and the use of a roll up door in the turbine building. The inspectors found that issue reports related to the maintenance of these components had identified additional maintenance activities to ensure their proper operation. The inspectors reviewed the actions taken to correct the deficiencies identified and reviewed the results of the maintenance activities that had been performed. The inspectors found the actions taken were adequate and maintenance activity results acceptable to demonstrate the equipment would be capable of responding to the event. The inspectors did note that the internal flooding analysis credits operators opening a rollup door in order to remove water within the analyzed timeframe. The inspectors questioned whether operators would have access to the operating mechanism in a flooded turbine building. Exelon had not previously evaluated this concern and entered the issue into the corrective action program to enhance the procedure to provide additional guidance to operators. However, because this action was needed only if the door failed to open automatically, the inspectors did not consider this to be a more than minor performance deficiency.

For an internal flooding event caused by an assumed break in non-Category 1 (seismic) piping in the auxiliary building, the inspectors reviewed the actions taken by Exelon to assess breaks in the fire water and secondary river water piping. Specifically, the inspectors reviewed corrective actions associated with the NRC finding 05000289/2015003-01, *Internal Flooding Licensing Basis Commitment Not Met*. The inspectors determined that the actions taken by Exelon and associated previously performed evaluations had, in general, properly concluded that safety-related SSCs would not be impacted. However, the inspectors identified several assumptions and licensing requirements that had not been properly evaluated. The inspector's review of the analysis performed for the fire water and secondary river water pipe failures credited operator response to the event. However, the inspectors determined that the alarms credited to alert operators were not seismically qualified, safety-related, or supplied by safety-related power. The inspectors concluded that, in accordance with current NRC guidance (Standard Review Plan - Section 3.4.1-5) - "Only seismic qualified systems should be assumed to be available to mitigate the effects of the flooding from non-seismic systems," these alarms could not be credited for all flooding events.

The inspectors noted that Exelon had determined that the secondary river water piping in the auxiliary building had been designed to meet Seismic Class 1 qualifications but this information had not been incorporated into the current design and licensing basis for TMI. The inspectors concluded that, although not part of the current licensing basis, this analysis provided reasonable assurance that the secondary river water piping would not fail during a safe shutdown earthquake. The inspectors determined that for a fire water pipe failure following a seismic event, operator action to isolate a pipe failure prior to impacting safety-related SSCs could be credited as part of the actions performed in abnormal operating procedure AOP-03, "Earthquake," although some enhancements to the procedure could be made to aid operator response in order to isolate the potential pipe break. Finally, the inspectors reviewed corrective actions performed to aid operators in identifying the system in which a pipe failure had occurred. The inspectors found that actions performed (issue reports 02658006 and 02547232) to enhance the alarm response card to help operators identify the location of the leak were not effective for a failure of the nuclear river, decay river, or service river piping if the break occurred downstream of the heat exchangers. However, because of the seismic analyses performed for these systems this type of failure is beyond the design basis of the plant. Finally, as part of the extent-of-condition the inspectors reviewed the potential for failure of other fire water piping in safety-related structures. The inspectors identified fire water piping in the auxiliary building, intermediate building, control building and the EDG rooms. The inspectors noted that for the intermediate building and control building there were evaluations and a probabilistic risk assessment (PRA) Internal Flooding Evaluation that evaluated these events. However, for the EDG rooms there was no evaluation of a failure of the 4" pressurized fire water piping in the rooms, with the exception of a discussion of the event in issue report 01201424. The inspectors reviewed the condition report evaluation and found that it credited operator action to be able to mitigate the event prior to impacting the EDGs. However, following a walkdown of the EDG room and discussions with Exelon the inspectors concluded that operator actions could not be credited for this event.

c. Findings

Introduction: The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion III, "Design Control," in that Exelon did not ensure the availability of the EDGs following a seismic event. Specifically, the inspectors determined that the pressurized fire water pipes in both EDG rooms were not classified as safety-related or seismically qualified and Exelon did not have an evaluation that showed that failure of the pipe, as assumed in the TMI design and licensing basis, would not impact the operability and availability of the EDGs.

Description: The inspectors reviewed several documents including internal flooding PRA, corrective action documents, and an internal flooding design and licensing basis assessment to determine the design and licensing basis of TMI for internal flooding events. The inspectors noted that the PRA assessment did not include a review of the EDG rooms. The inspector's review of the internal flooding design and licensing basis assessment document found that Exelon's review had noted that there was a lack of programmatic controls for the assumptions associated with water removal in the EDG rooms following a fire system sprinkler head activation in the EDG room.

The inspectors also reviewed issue report 01201424 which was written to address a variety of internal flooding concerns and included an evaluation of the effects of a fire main pipe failure in the EDG room.

The inspectors reviewed the evaluation and determine that Exelon had credited operator actions to identify, respond to the rooms, and isolate the fire header before the water discharging from the break could impacting the operation of the EDGs. The inspectors noted that the evaluation determined that the operators would need to perform this action within 11 minutes.

The inspectors also reviewed a letter from the Atomic Energy Commission, dated September 26, 1972, (Accession No. 7904240637) which requested Metropolitan Edison (TMI 1 licensee) "determine whether the failure of any non-Category I equipment, particularly in the circulating water system and fire protection system, could result in a condition that might potentially adversely affect the performance of safety-related equipment required for safe shutdown of the units or to limit the consequences of an accident." The inspectors also reviewed the response to this request, dated November 10, 1972, (Accession No. 7911110094) in which the licensee stated they had reviewed the TMI Unit 1 design and identified some deficiencies. The TMI licensee also describe, in the letter, corrective action commitments that would address the deficiencies identified. The inspectors' review of these documents noted that the licensee did not describe any deficiencies and there were no corrective actions associated with the EDG rooms or equipment within the room. Therefore, the inspectors concluded that the licensee had either determined that there were no internal flooding hazards of non-seismic piping that could affect the EDGs, or the licensee had failed to identify the potential hazard of the pressurized fire main in the room.

Additionally, the inspectors performed a walkdown of the EDG and adjacent rooms to assess the impact of a potential pipe failure; the actions required by operators to identify and isolate the failure; and the alarms used to alert operators of the initiation of an internal flooding event.

Additionally, the inspectors reviewed alarm response procedures and applicable abnormal operating procedures to determine if the procedures were adequate to ensure timely operator response to a fire main pipe failure in the EDG room.

Following these reviews, inspectors questioned whether the current plant configuration, credited components, and procedures associated with internal flooding would be adequate to mitigate a failure of a fire pipe break in the EDG room following a seismic event, or a random failure of the pipe as described in the 1972 letters without impacting operation of the safety-related EDGs. Specifically:

- The inspectors found that the alarms credited (fire main system flow and fire pump start) to alert operators of potential flooding in the EDG rooms were not seismically qualified, were not safety-related, and were not powered by a safety-related power supply.
- The inspectors' review of the evaluation in the issue report that determined operators had 11 minutes to respond to the pipe failure was incorrect in that it assumed the depth of water must be 12 inches to impact the EDG function. However, subsequent inspection determined that the depth of water required to impact the EDG was 10 inches.
- The inspectors noted that the operator response evaluation also assumed that the EDG rooms would flood evenly and, therefore, used the entire floor area in the evaluation for flooding but, after walking down the EDG rooms, the inspectors determined that because of the compartmentalization of the room a much smaller area should have been assumed to assess the impact of flooding in the room.
- Finally, the inspectors review of the alarm response cards and the abnormal operating procedure for earthquake noted that there was no direction to send operators to the EDG rooms to complete this time critical action.

Following identification of these concerns Exelon reviewed the issues identified and concluded there was not enough time for operators to respond to a failure and there were no safety-related alarms to alert operators of a failure. Exelon then performed an analysis to determine whether the magnitude of the structural loading on the piping during a safe shutdown earthquake was large enough to break the piping in the EDG room. The analysis concluded that the fire water piping would not break during the design basis event and, therefore, Exelon concluded the EDGs remained operable. The inspectors reviewed the analysis and concluded the EDGs were operable but non-conforming with the current licensing basis because, although analysis had been performed on the adequacy of the fire main to withstand a seismic event, the licensing basis considered the fire water system a non-seismic, non-safety-related system and therefore was assumed to fail during a seismic event.

Analysis: The inspectors determined the failure to adequately evaluate the effects of a pipe failure in the EDG rooms in accordance with the design and licensing basis was a performance deficiency and within Exelon's ability to foresee and correct. The performance deficiency was considered more than minor because it is associated with the Protection Against External Factors attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage).

Additionally, the performance deficiency is considered more than minor in accordance with Manual Chapter 0612, Appendix E - Question 3K, in that there was a reasonable doubt of operability for the EDGs requiring engineering calculations and analysis to resolve. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 2 of IMC 0609, Appendix A, "The Significance Determination Process for Findings At-Power," the inspectors determined the finding to be of very low safety significance (Green) because the finding was determined to be a design or qualification deficiency that did not result in an inoperability.

No cross-cutting attribute is assigned to this finding because the performance deficiencies were not indicative of Exelon's current performance. Specifically, this issue was last identified and reviewed by Exelon in issue report 01201424 in 2010.

Enforcement: 10 CFR 50, Appendix B, Criterion III, "Design Control," states, in part, that "Measures shall be established to assure that applicable regulatory requirements and the design basis, as defined in § 50.2 and as specified in the license application, for those structures, systems, and components to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions. These measures shall include provisions to assure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled."

Contrary to the above, prior to August 18, 2016, Exelon's design control measures for the EDGs did not include provisions to ensure that appropriate quality standards were specified in design documents and that deviations from such standards were controlled. Specifically, the pressurized fire water pipes in both EDG rooms were not classified as safety-related or seismically qualified and Exelon did not have an evaluation or design document that showed that failure of the pipe, as assumed in the TMI design and licensing basis, would not impact EDG operability and availability. Immediate corrective actions included performing an analysis on the structural loading on the fire water piping during a safe shutdown earthquake. Because this issue was determined to be of very low safety significance (Green) and Exelon entered the issue into their corrective action program (issue report 02705855) this violation is being treated as an NCV, consistent with Section 2.3.2a of the Enforcement Policy. **(NCV 05000286/2016003-01, Emergency Diesel Generator Internal Flooding Risk Not Evaluated)**

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

For event notification #52049 on June 28, 2016 associated with gas voids in the high pressure injection system, the inspectors reviewed and/or observed plant parameters, reviewed personnel performance, and evaluated performance of mitigating systems. 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 October 21, 2016, the inspectors presented the inspection results to Mr. B. Wunderly, Director of Site Engineering, 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
P. Bennett	Manager, Design Engineering
R. Campbell	Manager, Site Security
K. Coughlin	Manager, Engineering
D. Divittore	Manager, Radiological Engineering
J. Dullinger	Director, Site Operations
M. Fitzwater	Senior Regulatory Assurance Engineer
D. Ford	Radiation Protection Technician
J. Goldman	Manager, Regulatory Assurance
T. Hall	Programs Engineer
G. McCarty,	Radiation Protection Support Manager
B. McSorley	Mechanical Design Engineer
D. Morneault	Systems Engineer
L. Parlato	Radiation Protection Engineer
J. Piazza	Senior Manager, Design Engineering
G. Smith	Director, Maintenance
B. Shumaker	Manager, Emergency Preparedness
T. Stertzel	Systems Engineer
M. Torborg	Manager, Engineering Programs
J. Valent	Manager, Engineering
B. Waterbury	Systems Engineer
B. Wunderly	Director, Site Engineering

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 UPDATEDOpened/Closed

05000289/2016003-01	NCV	Emergency Diesel Generator Internal Flooding Risk Not Evaluated (Section 4OA2)
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LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

Procedures

3301-SA1, Dike Inspection, Revision 17
 CC-AA-201, Plant Barrier Control Program, Revision 10
 OP-TM-AOP-002, Flood, Revision 6A
 SDBD-T1-122, System Design Basis Document for Flood Protection Systems, Revision 3

Drawings

1E-122-01-1008, Sheet 1 and 2, TMI Flood Barrier System RB Seismic Gap Flood Seal,
 Revision 0

Miscellaneous

Issue Reports	1399510	1433792	1473088	108970	2702459
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WO

C2036481

Section 1R04: Equipment Alignment

Procedures

1104-6, Spent Fuel Cooling, Revision 48
 OP-TM-211-000, Makeup and Purification System, Revision 31
 OP-TM-541-000, Primary Component Cooling, Revision 22

Drawings

302-202, Nuclear Services River Water System, Revision 81
 302-630, Spent Fuel Cooling System flow diagram, Revision 34
 302-661: Makeup and Purification Flow Diagram, Revision 63

Miscellaneous

Issue Reports

1685330
 2574777

Section 1R05: Fire Protection

Procedures

1038, Administrative Controls-Fire Protection Program, Revision 82
 1301-12.3, Fire System Hose Station Inspection and Functional Test, Revision 30
 1301-12.22, Fire Door Inspection, Revision 22
 OP-MA-201-007, Fire Protection System Impairment Control, Revision 6
 TMI Pre-Fire Plan #4 for the Heat Exchanger Vault, Revision 1
 TMI Pre-Fire Plan #10 for the Auxiliary Building Elevation 281', revision 3
 TMI Pre-Fire Plan #22 for the Remote Shutdown Area, Revision 6
 TMI Pre-Fire Plan #26 for the 'B' Battery Room, Revision 7
 TMI Pre-Fire Plan #70 for the SBO Diesel Generator, Revision 2

Miscellaneous

990-1745, Three Mile Island Unit no. 1 Fire Hazards Analysis Reports, Revision 26
CC-AA-309-101, Engineering Technical Evaluations, Revision 11
Technical Evaluation of Transient Combustible Loading for Various Plant Areas, 2425505-06

Issue Reports

2425505
2691873*
2697014
1361413
2303365

*Issue report as a result of inspection activities.

Section 1R06: Flood Protection Measures

Drawings

1E-122-01-1007, Sheet 1 and 2, TMI Flood Barrier System Air Intake Tunnel, Revision 3

Miscellaneous

Engineering Change Request 12-00402, Revision of the AIT Flood Boundary, Revision 1
NEI 12-07, Guidelines for Performing Verification Walkdowns of Plant Flood Protection
Features, Revision 1

SDBD-T1-122, System Design Basis Document for Flood Protection Systems, Revision 3
WO C2024206

Section 1R07: Heat Sink Performance

Procedures

ER-AA-340-1002, Service Water Heat Exchanger Inspection Guide, Revision 6
ER-TM-340-1002, Guidance for Heat Exchanger Inspections and Cleaning at TMI,
performed 5/10/2016, 2/25/2014

Calculations

C-1101-541-5360-021, Effect of Shedding Heat Loads on NS/NR Temperatures, Revision 1A
SE-115302-050, Impact of 92F River Water Temperature, Revision 0

Work Orders

R2217140-05, IC-C-1B Eddy Current Examination Report, dated 2/12/2015
R2176636-05, IC-C-1B Eddy Current Examination Report, dated 2/21/2013
R2198402-05, NS-C-1B Eddy Current Examination Report, dated 2/28/2014
R2235651-05, NS-C-1B Eddy Current Examination Report, dated 5/12/2016
R2160008, NS-C-1B PM/Heat Exchanger Inspection and Clean, dated 12/11/12

Drawings

302-202, Nuclear Services River Water System, Revision 81
302-203, Screen Wash and Sluice System Flow Diagram, Revision 69
302-610, Nuclear Services Closed Cycle Cooling Water, Revision 82
302-620, Intermediate Cooling Flow Diagram, Revision 51
302-640, Decay Heat Removal Flow Diagram, Revision 85

Issue Reports

2378422	1621297	2485852	2572126	2646377
2258102	1626542	2489316	2582324	2667596
1542811	1660281	2515562	2582582	2668814
1545442	2402447	2558940	2619729	2671892
1598625	2457540	2570405	2620167	

Miscellaneous

990-3073, 2005 TMI Emergency Canal Depth Verification, dated 8/8/2008
 990-3074, 2011 TMI Emergency Canal Depth Verification, dated 9/30/2011
 Apparent Cause Investigation Report, CR2515562, "A" Decay River through-Wall Leak, dated 7/16/2015
 AR 2620167, Generic Letter 89-13 Program Assessment, dated 5/5/2016
 System Health Report, Decay Heat River Water System, dated 1/1/2016-3/31/2016
 System Health Report, Intermediate Closed Cooling Water System, dated 1/1/2016-3/31/2016
 System Health Report, Nuclear Services River Water System, dated 1/1/2016-3/31/2016

Section 1R11: Licensed Operator Regualification ProgramProcedures

1303-4.16, Emergency Power System, Revision 138
 1303-4.19, HPI/LPI Analog Channel Test, Revision 35
 OP-AA-1, Conduct of Operations, Revision 1
 EP-AA-112, Control Room Operations, Revision 14
 EP-AA-114, Notifications, Revision 13
 OS-24, Conduct of Operations during Abnormal and Emergency Events, Revision 27

Issue Report

2717803*

*Issue report as a result of inspection activities.

Section 1R12: Maintenance EffectivenessProcedures

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
 OP-TM-211-206, IST of MU-P-1B, Revision 20

Drawings

302-661, Make-up and Purification Flow Diagram, Revision 63
 ID-ISI-FD-017, ISI Boundary Sketch, Make-up and Purification System, Revision 25

Miscellaneous

C-1101-211-E540-061, Operability Assessment of Makeup and Purification Pump Suction
 C-1101-211-E410-062, MU Pump Suction Valve Stresses due to Overpressurization, dated 5/31/1997
 MNCR 970003, issued 10/14/1997

Issue Reports

2707195
 2703597
 2703605
 2704519
 2704522
 2709443
 2709622

WOs

CREL data sheets, MU-V-193A R2270613

Section 1R13: Maintenance Risk Assessments and Emergent Work ControlProcedures

1082.1, TMI Risk Management Program, Revision 8
 1102-4, Power Operation, Revision 131
 1300-4H, IST of ASME Class 2 and 3 Relief Valves, Revision 18
 CC-AA-5001, Post Transient or Scram Walkdowns, Revision 4 & 5
 ER-AA-200, Preventative Maintenance Program, Revision 2
 ER-AA-200-1001, Equipment Classification, Revision 1
 ER-AA-335-015-2004, VT-2 Visual Exam in accordance with ASME 2004 Edition, Revision 0
 OP-TM-431-408, Remove HD-P-1B from Service, Revision 6a
 WC-AA-101, On-Line Work Control Process, Revision 18
 WC-AA-120, Preventative Maintenance Database Revision Requirements, Revision 2

Drawings

302-082, Emergency Feedwater flow diagram, Revision 25
 302-111, Feedwater Heater Drains flow diagram, Revision 52

Miscellaneous

EPRI HVAC and Dampers Maintenance Guide, dated December 6, 2006
 FMCT: TMI-1 Gas Accumulation Support/Refute Matrix
 Heater Drain System Vibration troubleshooting plan, dated July 14, 2016
 NES-MS-01.3, Water Hammer Transient Evaluation, Revision 3
 TR-106857-V20, Preventative Maintenance Program Basis HVAC –Dampers & Ducting,
 dated July 1997
 WW1638 Technical Rigor and Station Risk Profile, dated September 12, 2016

Issue Reports

2689565	2689529	2691223	2692291	2691518
2691540	2691939	2692067	2693558	2693733
2694198	2695390	2697721	2709688	2688569
2721822	2708286			

ARs: A2407781 A2407737 A2040197

WOs: R2246818 R2199643 R2132296

Section 1R15: Operability Evaluations**Procedures**

ER-AA-330-009, ASME Section XI Repair/Replacement Program, Revision 10
 ER-TM-390-1000, Control Room Envelope Habitability Program, Revision 0
 ER-TM-390-1001, Control Room Habitability Program Implementation, Revision 4
 MA-TM-141-100, Control Room 'A' Train Envelope Boundary Differential Pressure Testing
 Procedure, Revision 4
 OP-AA-102-103, Operator Work-Around Program, Revision 4
 OP-AA-108-115, Operability Determinations, Revision 10
 OP-AA-108-115-1002, Supplemental Consideration for On-Shift Immediate Operability
 Determinations, Revision 2

Drawings

302-202, Nuclear Services River Water System, Revision 81
 302-842, Control Building and Machine Shop Ventilation flow diagram, Revision 57
 SK-NR-0002, Nuclear Services Piping Remediation Project Isometric, Revision 0
 SK-NR-0003, Nuclear Services Piping Remediation Project Isometric, Revision 0

Miscellaneous

ECR 16-00291, Code Case N-513-3 Analysis of NR Leak, dated 07/28/2016
 NRC Generic Letter 90-05, Guidance for Performing Temporary Non-code repair of ASME
 Code Class 1, 2, and 3 Piping (Generic Letter 90-05)
 Operability Evaluation 16-001, MIC Leak on NUC River Piping
 UT Erosion/Corrosion Examination Report No. BOP-UT-2016-066, 24" NR Inlet Header Leak,
 dated 07/27/2016
 UT Erosion/Corrosion Examination Report No. BOP-UT-2016-067, 24" NR Inlet Header Leak,

Issue Reports

2702276	2702275	2701529	2701673	2701652
2707006	2707210	2700737	2697048	2697554
2697693	2697551	2697162	2697165	2688916
2689348	2689886	2698886		

AR

A2407175

WOs

R2242525 M24007175

Section 1R18: Plant Modifications**Procedures**

OP-TM-211-000, Makeup and Purification System, Revision 31
 OP-TM-MAP-D0302: MU Tank Level HI/LO, Revision 5
 OP-TM-MAP-D0303: MU Tank Pressure HI/LO, Revision 4
 OP-TM-211-208, IST of MU-P-1C, Revision 7A for High Flow Data Collection

Calculation

C-1101-211-E610-066: Makeup Tank Level and Pressure Limits, Revisions 9 and 1

Drawing

302-661: Makeup and Purification Flow Diagram, Revision 63

Miscellaneous

B31.I, Power Piping Code (1967 Edition)

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

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

CC-AA-209, , Fire Protection Configuration Change Review, Revision 4

EACE 2686804, Air Void Found in Suction Line for MU-P-1A, dated 08/25/2016 (MRC package)

EN 52049, Both A&B Trains HPI Inoperable due to Void in Common Suction Line Resulting in
Loss of Safety Function, dated 06/28/2016; and associated Retraction, dated 08/22/2016

Engineering Change Request 14-00174, Revision 1

Exelon Technical Evaluation 2686804-14:MUP Suction Piping Void Evaluation, Revision 0

NFPA-13, Standard for Installation of Sprinkler System, 13th Edition

MPR Evaluation of Cause of TMI-1 Makeup System Gas Accumulation, dated 07/22/2016

Safety Evaluation and 50.59 Review SE-000211-015, Operation with MU Suction X-Connect
valves OPEN, dated 08/19/1997

Standing Order 2016-009 (2701535), Makeup Tank Pressure Control, dated 08/06/2016

UFSAR Section 6.1.3.1: Makeup and Purification System (Includes High Pressure Injection),
Updates-15 and 16

Issue Reports

2702459	2704929	2701677	2707605	2699240
2708388	2707400	2706596	2706182	2704439
2701535	2706246	2706245	2703094	2693485

AR

A2409554

WOs

C2036832

R2274923

Section 1R19: Post-Maintenance TestingProcedures

1107-9, SBO Diesel Generator Surveillance Run, Revision 77

1300-4H, IST of ASME Class 2 and 3 Relief Valves, Revision 18

1303-5.2B, High Pressure Injection/Low Pressure Injection Load Sequence and Component
Tests – Train B, Revision 22

1450-030, Station Blackout Diesel Generator Protective Relaying, Revision 7

ER-AP-331-1002, Boric Acid Corrosion Control Program Identification, Selection, and
Evaluation, Revision 9

OP-TM-212-901, Emergency DHR Operations, Revision 6

MiscellaneousIssue Reports

2716031	2715534	2715980	2715960	2715959	2716012
2716426	2716123	2716887	2716726	2716720	2716599
2555091	2702440	2691518	2691540	2691577	2689565
2707604	2708097	2708952	2707370	2707110	2611291
2611532	2612125	2628645	2707736	2314027	2398726

WOs

C2036581	C2036518	C2036410	M2398726	R2182795	R2210339
R2246818	R2070151				

Section 1R22: Surveillance TestingProcedures

1107-3, Diesel Generator, Revision 145
 1107-9, SBO Diesel Generator Surveillance Run, Revision 77
 1303-4.16, Emergency Power System, Revision 138
 OP-TM-212-000, Decay Heat Removal System, Revision 22
 OP-TM-212-201, IST of DH-P-1A and Valves from ES Standby Mode, Revision 13
 OP-TM-214-000, Building Spray System, Revision 11
 OP-TM-214-201, IST of BS-P-1A and Valves, Revision 13
 OP-TM-533-201, IST of DR-P-1A and Valves, Revision 18A
 WC-TM-430, Surveillance Testing Program, Revision 0
 WC-TM-430-1001, Surveillance Testing Program Database Interface and Maintenance, Revision 1

Miscellaneous

C-1101-212-E540-075, IST Acceptance Criteria for LPI Pumps, Revision 0
 C-1101-212-5310-050, IST Acceptance Criteria for LPI Valves, Revision 2
 C-1101-214-E410-019, Building Spray Flow Basis and LPI RB Sump Recirculation Mode LIP NPSH Throttling Basis, Revision 2B
 C-1101-533-E410-013, Decay River Hydraulic Performance Using Field Test Data, Revision 4
 TMI Technical Specifications 3.3.1

Issue Reports

2595583	2551077	2608103	2595577	2536189
2473412	2698134	2274056		

WOs

R2273702	R2276146	R2273202	R2274340	R2274056
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Section 1EP6: Drill EvaluationProcedures

EP-AA-122, Drill and Exercise Program, Revision 18
 EP-AA-122-200, Drill and Exercise Execution, Revision 2
 EP-AA-1009, Emergency Action Levels for Three Mile Island (TMI)
 EP-AA-1009, Exelon Nuclear Radiological Emergency Plan Annex for Three Mile Island
 EP-AA-112 F-01, Command and Control Turnover Briefing Form, Revision G

Miscellaneous

TQ-TM-LRU-106-S047, TMI Operational Simulator Exam Scenario OBE based on
CPE 2015-005, Revision 00

Issue Reports

2717803* 2722325* 2722271 2722274 2722354 2722366

*Issue report as a result of inspection activities.

Section 2RS5: Radiological Monitoring InstrumentationProcedures

1101-2.1, Radiation Monitoring System Set-points, Revision 86
 RP-AA-700, Controls for Radiation Protection Instrumentation, Revision 4
 RP-AA-700-1204, Operation of the Eberline SAC-4 Alpha Counter, Revision 2
 RP-AA-700-1205, Calibration of the Eberline SAC-4 Alpha Counter, Revision 2
 RP-AA-700-1213, Operation and Calibration of PCM-2 Whole Body Frisking Monitor, Revision 1
 RP-AA-700-1214, Operation and Calibration of PCM-1B Personnel Monitor, Revision 3
 RP-AA-700-1215, Calibration of Low-Vol Air Samplers, Revision 1
 RP-AA-700-1216, Calibration of HI-Vol Air Samplers, Revision 3
 RP-AA-700-1224, Operation and Source Check of the Portean MPC-2000 Alpha/Beta
 Instrument, Revision 0
 RP-AA-700-1235, Operation and Calibration of PM-12 Gamma Portal Monitor, Revision 3
 RP-AA-700-1239, Operation and Calibration of the Modwel SAM-12 Small Article Monitor,
 Revision 3
 RP-AA-700-1240, Operation and Calibration of the Canberra ARGOS-5 Personnel
 Contamination Monitor, Revision 6
 RP-AA-700-1246, Operation of Air Samplers, Revision 3
 RP-AA-700-1300, Calibration, Operation, and Source Check of the Eberline Beta Air Monitor,
 AMS-3, Revision 3
 RP-AA-700-1301, Calibration, Operation, and Source Check of the Eberline Beta Air Monitor,
 AMS-4, Revision 3
 RP-AA-700-1401, Operation and Calibration of Eberline Model PM-7 Personnel Contamination
 Monitor, Revision 3
 RP-AA-700-1500, Operation and Source Check of the Ludlum 3030P Alpha/Beta Sample
 Counter, Revision 3
 RP-AA-700-1501, Operation and Calibration of the Model SAM-9/11 Small Article Monitor,
 Revision 4
 RP-TM-700-1020, Calibration of Tritium Grab Sampler, Revision 0
 RP-TM-700-1023, Calibration and Operation of the Ludlum Model 2000, Revision 3
 RP-TM-700-1028, Calibration and Operation of the Gillian GIL-AIR Sampler, Revision 0a

Other

Self-Assessment, Radiation Protection Instrumentation, June 21, 2016

Calibration Records for the following portal and portable instruments & Calibration dates:

<u>Model</u>	<u>ID #</u>	<u>Previous</u>	<u>Current</u>
Argos-5	710078	01/27/15	01/27/16
SAM-11	714484	09/04/14	09/15/15
SAM12	714562	10/21/14	10/20/15
PCM-1B	710927	05/11/15	05/11/16
PCM-2	714558	04/23/15	05/10/16
PM-12	710613	Initial Cal	10/29/15
Air Sampler	1301	05/06/15	09/17/15
AMS-4	714489	01/26/15	01/26/16
AMS-3	710241	02/12/15	02/12/16
Bicron micro Rem	077457	03/19/15	03/14/16
Bicron RSO 50E	078530	12/05/14	01/07/16
RM-14	333189	10/13/14	11/30/15
RM-25	073404	02/13/15	02/16/16
RO-20	079344	05/12/15	06/01/16
RO-2A	332427	12/01/14	10/16/15
RO-20AA	0015821	01/30/16	06/05/16
E-140	078898	01/22/15	03/21/16
E-140N	079238	05/08/14	12/28/15
Ludlum 177	0016973	11/17/14	10/19/15
Ludlum 3	0012095	Initial Cal	03/11/15
Ludlum 3/43-92	0016737	09/25/14	09/10/15
Ludlum 3030P	0012311	02/04/15	10/20/15
Ludlum 3	0014321	09/12/14	09/16/15
AMP-100	078640	11/21/14	02/23/16
AMP-200	079176	04/28/15	04/28/16
BAK-4280	0018241	Initial Cal	05/02/16
RAD GAM 1	0010598	12/09/14	12/26/15
TELEPOLE WR	0016808	10/10/14	02/17/15
H-810 DC	077673	09/16/14	09/26/15
RO-20	078625	11/10/14	01/08/16

Calibration records for the plant installed instruments

RMG-22, 1302-15, High Range RMS Containment Monitor Calibration, Revision 11,

Calibrated 10/27/11, 11/08/13, 11/05/15

RMG-25, 1302-17.2B, RMG-25 Calibration, Revision 3, Calibrated: 03/23/12, 12/07/13,

12/04/15

RMG-27, 1302.17.3B, Calibration of RM-G-27, Revision 3, Calibrated: 08/11/12, 03/17/14,

12/05/15

RM-A-4G, 1302-3.1A.4, Calibration of Victoreen Effluent Gas Channel RM-A-4G,

Calibrated 06/22/14 Revision 0, 04/21/16 Revision 1a and 1b

RM-A-6G, 1302-3.1A.6, Calibration of Victoreen Effluent Gas Channel RM-A-6G,

Calibrated 04/19/14 Revision 0, 01/09/16 Revision 1

AH-FT-148A, AH-FT-148B, AH-FT-149, 1302-3.4C, AH-FT-148 A, 148B, 149, and 150 FlowLoop

Calibration, Revision 3, Calibrated: 06/22/14, 06/14/16

Issue Reports

2427486	2452235	2453924	2517782	2525439
2525483	2664140	2680232	2642464	2629480

Section 2RS6 Radioactive Gaseous and Liquid Effluent TreatmentOther / Calibration Records for the following instruments

RM-A-5, 1302-17.1A, RM-A-5 Gas High Calibration, Calibrated: 3/13/10 Revision 0, 1/13/12 Revision 0, 8/19/13 Revision 1, 6/4/15 Revision 1
 RM-A-7G, 1302-3.1.A7, Calibration of Victoreen Effluent Gas Channel RM-A-7G, Calibrated: 9/10/13 Revision 0, 6/4/15 Revision 0
 RM-A-8, 1302-17.1B, RM-A-8 Gas High Calibration, Calibrated: 5/3/10 Revision 1, 4/20/12 Revision 1a, 1/12/14 Revision 2, 8/30/15 Revision 2
 RM-A-9, 1302-17.1C, RM-A-9 Gas High Calibration, Calibrated: 4/12/10 Revision 0, 4/7/12 Revision 1, 1/3/14 Revision 2, 8/29/15 Revision 2
 RM-L-6, 1302-3.1B, RM-L-6 and RM-L-7 Liquid Monitor Calibration, Calibrated: 11/23/14 Revision 12

Section 4OA1: Performance Indicator VerificationProcedures

LS-AA-2001, Collecting and Reporting of NRC Performance Indicator Data, Revision 014
 ER-AA-2008, Mitigating System Performance Indicator Monitoring and Margin Evaluation, Revision 4
 LS-AA-2200, Mitigating System Performance Indicator Data Acquisition and Reporting, Revision 5

Miscellaneous

LER Search for Docket 289, for review period cited under report section 4OA1
 List of Maintenance Rule System Functional Failures for review period cited under report Section 4OA1
 MSPI Raw data System Notebook for High Pressure Safety Injection System
 MSPI Indicator Margin Report – June 2016
 MSPI Derivation Report – Residual Heat Removal System – June 2016
 MSPI Derivation Report – Emergency AC Power System – June 2016
 MSPI Derivation Report – Heat Removal System – June 2016
 MSPI Derivation Report – Cooling Water System – June 2016

Issue Reports

2388770	1654405	1658922	2470410	2566102
2586588	2585958	2588080	2621041	

Section 4OA2: Problem Identification and ResolutionProcedures

OP-TM-AOP-003, Earthquake, Revision 5
 PLA, Panel Left Annunciator A, Revision 72
 OP-TM-LWDS-0101, Aux. Bldg. Sump Lvl. Above Norm, Revision 2A
 OP-TM-LWDS-0103, Aux bldg.. Sump Lvl. Hi-Hi, Revision 2
 OP-TM-LWDS-0206, Hx. Vault Sump Level Hi, Revision 1
 OP-TM-LWDS-0205, Hx. Vault Both Sump Pumps On, Revision 0A
 OP-TM-AOP-002, Flooding, Revision 14

Drawings

302-231, Sht. 2, Fire Service Water Flow Diagram, Revision 17

Miscellaneous

Motor Driven Fire Pump (FS-P2) Pump Curve, Revision 1

Diesel Driven Fire Pump (FS-P3) Pump Curve, Revision 1

Diesel Driven Horizontal Fire Pump (FS-P1) Pump Curve, Revision 6

MPR Associates Inc, Review of Internal Flooding Licensing and Design Bases for TMI Unit 1, dated 5/6/09

Accession Number 7904240637, Ltr from R.C. DeYoung (Atomic Energy Commission) to J. G. Miller (Metropolitan Edison Company), dated 9/26/72

Accession Number 8001270249, Ltr from A Giambusso (AEC) to J.G. Miller (Metropolitan Edison Company), General Information Required for Consideration of the Effects of a Piping System Break Outside Containment, dated 12/15/72

Accession Number 7911110094, Ltr from J.G. Miller (Metropolitan Edison Company) to Mr. R.C. DeYoung (Atomic Energy Commission), Three Mile Island Units 1 and 2 Circulation water Expansion Joint Failure, dated 11/10/72

HAGPU-08/98-052, Nuclear River Piping and Nuclear Service Cooler Nozzles Evaluation, Revision 1

U-22, Door Maintenance and Inspection, Revision 28

ERC 14-00006, Att 6, Markup of UFSAR Section 9.6.2.1, Revisions 0

Technical Evaluation 1198202-02, Evaluation of Circ. Water system Failure in Turbine Building, Revision 0

TMI-PRA-012, Internal Flooding Evaluation Summary Notebook, Revision 1

EG-Y-1A and EG-y-1B Fire Service Piping Stress Verification, dated 8/18/16

ME-138, Feedwater from 30 Inch Header to Penetration 103 Computer Analysis, Revision 0

ME-139, Feedwater from 30 Inch Header to Penetration 227 Computer Analysis, Revision 0

Issue Reports

817422	881153	1198202	1198507	1200158
1200162	1200165	1201424	1586151	2544387
2547246	2550707	2563298	2567920	2568432
2580465	2590046	2594850	2658006	2705855*
2707471*				

WOs

C2035218 R2078758 R2070975

*** Issue report as a result of inspection activities**

Section 4OA3: Follow-up of Events and Notices of Enforcement DiscretionProcedures

ER-AA-335-007, Ultrasonic Inspection for Determination of Sedimentation in Piping Systems or Component and Fluid Level Measurement, Revision 4

OP-TM-211-000, Makeup and Purification System, Revision 31

Drawings

ID-ISI-MU-035, Makeup Pump Suction, Revision 1

ID-ISI-MU-038, Makeup Pump Discharge, Revision 1

Miscellaneous

NRC Event Notification #52049

TMI Gas Accumulation Support/Refute Matrix, dated September 12, 2016

Calculation of Air Void Size in 'B' MU Suction, dated June 29, 2016

Issue Reports

2686803	2686804	2686946	2687348	2687841	2690835
2690845	2690849	2708286	2709719		

WOs

R2276996

R2276083

LIST OF ACRONYMS

ADAMS	Agencywide Documents Access and Management System
CFR	<i>Code of Federal Regulations</i>
DHRWS	decay heat river water system
EDG	emergency diesel generator
IMC	Inspection Manual Chapter
IST	in-service testing
NCV	non-cited violation
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
NSRWS	nuclear services river water system
ODCM	Offsite Dose Calculation Manual
OWA	operator workaround
PRA	probabilistic risk assessment
SSC	structure, system, and component
TMI	Three Mile Island Unit 1
UFSAR	updated final safety analysis report