



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

March 3, 2017

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 NUCLEAR GENERATING STATION, UNIT 1 –
TRIENNIAL FIRE PROTECTION INSPECTION REPORT 05000289/2017007

Dear Mr. Hanson:

On February 10, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed a triennial fire protection inspection at Three Mile Island, Unit 1 (TMI) facility. The enclosed inspection report documents the inspection results, which were discussed on February 10, 2017, with Mr. Ed Callan, Site Vice President, and other members of your staff.

The inspection examined activities conducted under your license as they related to safety and compliance with the Commission's rules and regulations, and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed station personnel. The inspectors also reviewed mitigation strategies for addressing large fires and explosions.

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

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

Sincerely,

/RA/

Glenn T. Dentel, Chief
Engineering Branch 2
Division of Reactor Safety

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

Enclosure: Inspection Report 5000289/2017007
w/Attachment: Supplemental Information

SUBJECT: THREE MILE ISLAND NUCLEAR GENERATING STATION, UNIT 1 –
 TRIENNIAL FIRE PROTECTION INSPECTION REPORT 05000289/2017007

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

Docket No. 50-289

License No. DPR-50

Report No. 05000289/2017007

Licensee: Exelon Generation Company, LLC

Facility: Three Mile Island Nuclear Generating Station, Unit 1

Location: Middletown, PA

Dates: January 23 to February 10, 2017

Inspectors: J. Patel, Acting Senior Reactor Inspector (Team Leader)
C. Cahill, Senior Reactor Analyst
K. Young, Senior Reactor Inspector
J. Ayala, Reactor Inspector
J. Rady, Reactor Inspector

Observers: D. Kern, Senior Reactor Inspector

Approved by: Glenn T. Dentel, Chief
Engineering Branch 2
Division of Reactor Safety

Enclosure

SUMMARY

IR 05000289/2017007; 01/23/2017 – 02/10/2017; Three Mile Island Nuclear Generating Station, Unit 1; Triennial Fire Protection Team Inspection.

This report covered a two week on-site triennial fire protection team inspection by specialist inspectors. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6, dated July 2016.

No findings were identified.

REPORT DETAILS

Background

This report presents the results of a triennial fire protection inspection conducted in accordance with U.S. Nuclear Regulatory Commission (NRC) Inspection Procedure (IP) 71111.05T, "Fire Protection (Triennial)." The objective of the inspection was to assess whether Exelon Generation Company, LLC (Exelon) had implemented an adequate fire protection program (FPP) and whether post-fire safe shutdown capabilities had been established and were properly maintained at Three Mile Island Nuclear Generating Station (TMI). The following fire areas (FA) and/or fire zones (FZ) were selected for detailed review based on prior inspection results, risk insights from the TMI Individual Plant Examination of External Events (IPEEE), and the TMI Fire Probabilistic Risk Assessment:

Fire Area / Fire Zone

- CB-FA-3B Control Building 4160V Switchgear 1E, 338' Elevation (Elev.)
- DG-FA-2 Diesel Generator 'B' Building Area, 305' Elev.
- IB-FZ-2 Turbine Driven Emergency Feedwater Pump Room, 295' Elev.
- TB-FA-SW Turbine Building Switchgear Room, 322' Elev.

Inspection of these fire areas/zones fulfilled the inspection procedure requirement to inspect a minimum of three samples.

The inspection team evaluated Exelon's FPP against applicable requirements which included plant Technical Specifications, Operating License Condition 2.c.(4), NRC Safety Evaluation Reports (SER), Title 10 of the *Code of Federal Regulations* (CFR) 50.48, and Branch Technical Position (BTP) Auxiliary and Power Conversion Systems Branch (APCSB) 9.5-1. The team also reviewed related documents that included the Updated Final Safety Analysis Report (UFSAR), Section 9.9, "Plant Fire Protection Program," the fire hazards analysis report (FHAR), and TMI post-fire safe shutdown analyses.

The team evaluated aspects of five mitigating strategies for responding to large fires and explosions, which are required by Operating License Condition 2.c.(17) and 10 CFR 50.54(hh)(2). Inspection of these strategies fulfills the inspection procedure requirement to inspect a minimum of one sample.

Specific documents reviewed by the team are listed in the attachment to this report.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R05 Fire Protection (IP 71111.05T)

.01 Protection of Safe Shutdown Capabilities

a. Inspection Scope

The team reviewed the FHAR, post-fire safe shutdown analyses, and supporting drawings and documents to determine whether the safe shutdown capabilities were properly protected from fire damage.

The team evaluated equipment and cable separation to determine whether the applicable separation requirements of the TMI design and licensing bases were maintained for the credited safe shutdown equipment and their supporting power, control, and instrumentation cables. The team's review included an assessment of the adequacy of the selected systems for reactivity control, reactor coolant inventory control, reactor pressure control, decay heat removal, process monitoring, and associated support system functions.

b. Findings

No findings were identified.

.02 Passive Fire Protection

a. Inspection Scope

The team walked down accessible portions of the selected fire areas to evaluate whether the material conditions of the fire area boundaries were adequate for the fire hazards in the area. The team compared the fire area boundaries, including walls, ceilings, floors, fire doors, fire dampers, penetration seals, electrical raceway and conduit fire barriers, and redundant equipment fire barriers to design and licensing basis requirements, industry standards, and TMI's FPP, as approved by the NRC, to identify any potential degradation or non-conformances.

The team reviewed selected engineering evaluations, installation and repair work orders, and qualification records for a sample of penetration seals to determine whether the fill material was properly installed and whether the as-left configuration satisfied design requirements for the intended fire rating. The team also reviewed similar records for selected fire protection wraps to determine whether the material and configuration was appropriate for the required fire rating and conformed to the engineering design requirements.

The team also reviewed recent inspection records for fire dampers, penetration seals, and fire barriers, to verify whether the inspection was adequately conducted, the acceptance criteria were met, and any potential performance degradation was identified.

b. Findings

No findings were identified.

.03 Active Fire Protection

a. Inspection Scope

The team evaluated manual and automatic fire suppression and detection systems in the selected fire areas to determine whether they were installed, tested, maintained, and operated in accordance with NRC requirements, National Fire Protection Association (NFPA) codes of record, and TMI's FPP, as approved by the NRC. The team also assessed whether the suppression systems' capabilities were adequate to control and/or extinguish fires associated with the hazards in the selected areas.

The team reviewed the as-built capability of the fire water supply system to verify whether the design and licensing basis, and NFPA code of record requirements were satisfied, and to assess whether those capabilities were adequate for the hazards involved. The team reviewed the fire water system hydraulic analyses to assess the adequacy of a single fire water pump to supply the largest single hydraulic load on the fire water system plus concurrent fire hose usage. The team evaluated the fire pump performance tests to assess the adequacy of the test acceptance criteria for pump minimum discharge pressure at the required flow rate, to verify whether the criteria was adequate to ensure that the design basis and hydraulic analysis requirements were satisfied. The team also evaluated the underground fire loop flow tests to determine whether the tests adequately demonstrated that the flow distribution circuits were able to meet design basis requirements. In addition, the team reviewed recent pump and loop flow test results to verify whether the testing was adequately conducted, the acceptance criteria were met, and any potential performance degradation was identified.

The team walked down accessible portions of the detection and water suppression systems in the selected areas and major portions of the fire water supply system, including motor and diesel driven fire pumps, interviewed system and program engineers, and reviewed selected issue reports (IRs) to independently assess the material condition of the systems and components. In addition, the team reviewed recent test results for the fire detection and suppression systems for the selected fire areas to verify whether the testing was adequately conducted, the acceptance criteria were met, and any potential performance degradation was identified.

The team assessed the fire brigade capabilities by reviewing training, qualification, and drill critique records. The team also reviewed Exelon's fire-fighting strategies (i.e., pre-fire plans) and smoke removal plans for the selected fire areas to determine if appropriate information was provided to fire brigade members and plant operators to identify safe shutdown equipment and instrumentation, and to facilitate suppression of a fire that could impact post-fire safe shutdown capability. The team independently inspected the fire brigade equipment, including personnel protective gear (e.g., turnout gear) and smoke removal equipment, to determine operational readiness for fire-fighting. In addition, the team reviewed Exelon's fire brigade equipment inventory and inspection procedures and recent inspection and inventory results to verify whether adequate equipment was available, and whether any potential material deficiencies were identified.

b. Findings

No findings were identified.

.04 Protection from Damage from Fire Suppression Activities

a. Inspection Scope

The team performed document reviews and plant walk downs to determine whether redundant trains of systems required for hot shutdown, located in the same or adjacent fire areas, would be subject to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems.

Specifically, the team evaluated whether:

- A fire in one of the selected fire areas would not indirectly, through production of smoke, heat or hot gases, cause unintended activation of suppression systems in adjacent fire areas that could potentially damage redundant safe shutdown trains; and
- A fire suppression system rupture, inadvertent actuation, or actuation due to a fire, in one of the selected fire areas, would not directly damage all redundant trains (e.g., sprinkler caused flooding of other than the locally affected train); and
- Adequate drainage was provided in areas protected by water suppression systems.

b. Findings

No findings were identified.

.05 Alternative Shutdown Capability

a. Inspection Scope

The team reviewed the safe shutdown analysis, operating procedures, piping and instrumentation drawings, electrical drawings, the UFSAR, and other supporting documents for the selected fire areas to determine whether Exelon had properly identified the systems and components necessary to achieve and maintain post-fire safe shutdown conditions. The team evaluated selected systems and components credited by the safe shutdown analysis for reactivity control, reactor coolant inventory control, reactor pressure control, decay heat removal, process monitoring, and associated support system functions to assess the adequacy of Exelon's alternative shutdown methodology. The team also assessed whether alternative post-fire shutdown could be performed both with and without the availability of off-site power. The team walked down selected plant configurations to verify whether they were consistent with the assumptions and descriptions in the FHAR. In addition, the team evaluated whether the systems and components credited for use during post-fire safe shutdown would remain free from fire damage.

The team reviewed the training program for licensed and non-licensed operators to verify whether it included alternative shutdown capability. The team also verified whether personnel, required for post-fire safe shutdown, using either the normal or alternative shutdown methods, were trained and available on-site at all times, exclusive of those assigned as fire brigade members.

The team reviewed the adequacy of procedures utilized for post-fire shutdown and performed an independent walk through of procedure steps (i.e., a procedure tabletop) to assess the adequacy of implementation and human factors within the procedures. The team also evaluated the time required to perform specific actions to verify whether operators could reasonably be expected to perform those actions within sufficient time to maintain plant parameters within specified limits.

Specific procedures reviewed for normal and alternative post-fire shutdown included:

- OP-TM-AOP-001, Fire, Revision 13
- OP-TM-AOP-001, C3B, Fire in 1E ES 4160V Switchgear Room, Revision 9
- OP-TM-EOP-020, Cooldown from Outside of Control Room, Revision 22

The team reviewed selected operator manual actions to verify whether they had been properly reviewed and approved and whether the actions could be implemented in accordance with plant procedures in the time necessary to support the safe shutdown method for each fire area. The team also reviewed the periodic testing of the alternative shutdown transfer and isolation capability, and instrumentation and control functions, to evaluate whether the tests were adequate to ensure the functionality of the alternative shutdown capability.

b. Findings

No findings were identified.

.06 Circuit Analysis

a. Inspection Scope

The team reviewed Exelon's post-fire safe shutdown analysis for the selected fire areas to determine whether the analysis identified both required and associated electrical circuits and cables for the systems and components necessary to achieve and maintain safe shutdown. The team reviewed electrical schematics and cable routing data for power, control, and instrumentation associated with selected components. Specifically, the team evaluated the selected circuits and cables to determine whether they were (a) adequately protected from potential fire damage, or (b) analyzed to show that fire-induced faults (e.g., hot shorts, open circuits, and shorts to ground) would not prevent safe shutdown, or (c) analyzed to show that potential damage could be mitigated with approved operator manual actions, in order to determine whether fire-induced faults could adversely impact safe shutdown capabilities. The team's evaluations considered credible fire scenarios, cable insulation attributes, cable failure modes, cable routing, and common power supply or electrical bus configurations.

In addition, the team reviewed cable raceway drawings and cable routing database for a sample of components required for post-fire safe shutdown to determine whether those cables were routed as described in the safe shutdown analysis. The team also reviewed equipment important to safe shutdown, but not part of the success path, to assess whether Exelon's safe shutdown methodologies were appropriate, conformed to design and licensing basis requirements, and appropriately considered the guidance in NRC Regulatory Guide 1.189, "Fire Protection for Nuclear Power Plants," Revision 2.

Cable failure modes were reviewed for the following components:

- MU-P-1A, Make-up Pump 'A'
- MU-V-14A, Make-up Pump Suction Valve
- MU-V-16B, RCS Make-up Valve
- MU-V-16D, RCS Make-up Valve
- MS-PT-950, SG 'A' Pressurizer Instrument

The team reviewed a sample of circuit breaker and fuse over-current protection coordination studies to determine whether equipment needed for post-fire safe shutdown activities could be adversely affected due to a lack of coordination that could result in a common power supply or common electrical bus concern. The team also evaluated whether coordination studies appropriately considered multiple faults due to fire. In addition, the team reviewed a sample of circuit breaker maintenance records, for components required for safe shutdown, to determine whether the breakers were properly maintained.

The team assessed the transfer of control from the main control room to the alternative shutdown location to determine whether it would be adversely affected by fire-induced circuit faults (e.g., by the provision of separate fuses and power supplies for alternative shutdown control circuits).

b. Findings

No findings were identified.

.07 Communications

a. Inspection Scope

The team reviewed safe shutdown procedures, the safe shutdown analysis, and associated documents to verify whether an adequate method of communications would be available to plant operators following a fire. During this review, the team considered the effects of ambient noise levels, clarity of reception, reliability, and coverage patterns. The team inspected selected emergency storage lockers to independently verify whether portable communication equipment was available for the fire brigade and plant operators. In addition, the team evaluated whether radio or phone repeaters, transmitters, and power supplies would be reasonably unaffected by a fire.

b. Findings

No findings were identified.

.08 Emergency Lighting

a. Inspection Scope

The team observed the placement and coverage area of eight-hour emergency lights throughout the selected fire areas to evaluate their adequacy for illuminating access and egress pathways and any equipment requiring local operation or instrumentation monitoring for post-fire safe shutdown. The team also verified whether the battery power supplies were rated for at least an eight-hour capacity. Preventive maintenance procedures, the vendor manual, completed surveillance tests, and battery replacement practices were also reviewed to verify that the emergency lighting had been maintained consistent with the manufacturer's recommendations and in a manner that would ensure reliable operation.

b. Findings

No findings were identified.

.09 Cold Shutdown Repairs

a. Inspection Scope

Exelon did not identify any systems or components that would require repairs to achieve post-fire cold shutdown in the selected fire areas. The team assessed Exelon's determination that no dedicated repair procedures, equipment, or materials were needed to accomplish repairs of components required for cold shutdown which might be damaged by a fire; and whether cold shutdown could be achieved within the time frames specified in the design and licensing bases without performing any cold shutdown repairs.

b. Findings

No findings were identified.

.10 Compensatory Measures

a. Inspection Scope

The team verified whether compensatory measures were in place for out-of-service, degraded or inoperable fire protection and post-fire safe shutdown equipment, systems, or features (e.g., detection and suppression systems and equipment, passive fire barriers, or pumps, valves, or electrical devices providing safe shutdown functions or capabilities). The team also verified that the short term compensatory measures compensated for the degraded function or feature until appropriate corrective action could be taken and that Exelon was effective in returning the equipment to service in a reasonable period of time.

b. Findings

No findings were identified.

.11 Review and Documentation of FPP Changes

a. Inspection Scope

The team reviewed recent changes to the approved fire protection program to assess whether those changes had an adverse effect on the ability to safely shutdown.

b. Findings

No findings were identified.

.12 Control of Transient Combustibles and Ignition Sources

a. Inspection Scope

The team reviewed Exelon's procedures and programs for the control of ignition sources and transient combustibles to assess their effectiveness in preventing fires and in controlling combustible loading within limits established in the FHAR. A sample of hot work and transient combustible control permits were reviewed to assess the adequacy of Exelon's fire protection program administrative controls.

The team performed plant walk downs to verify that transient combustibles and ignition sources were being implemented in accordance with the administrative controls.

b. Findings

No findings were identified.

.13 Large Fires and Explosions Mitigation Strategies

a. Inspection Scope

The team reviewed selected mitigation strategies intended to maintain or restore core decay heat removal and spent fuel pool cooling capabilities under the circumstances associated with the loss of large areas of the plant due to explosions or large fires. The team assessed whether Exelon continued to meet the requirements of License Condition 2.c.(17) and 10 CFR 50.54(hh)(2). The team reviewed the following mitigation strategies:

- Spent Fuel Pool Spray;
- External Spent Fuel Pool Spray;
- Manual Operation of the Turbine Driven Emergency Feedwater Pump;
- Manual Depressurization of the Once Through Stream Generators (OTSG); and
- Makeup to the OTSG with the Portable Pump.

The team's review included: a detailed assessment of the procedural guidance; a tabletop discussion with operators to discuss initial response actions; walk down of selected mitigation strategies with plant staff to assess the feasibility of the strategies and familiarity of the staff with plant equipment and implementing procedures; maintenance and surveillance testing of selected strategy equipment; and an inventory check of selected mitigation equipment to verify whether equipment storage and availability was appropriate.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems (IP 71152)

a. Inspection Scope

The team reviewed a sample of issue reports associated with the fire protection program, post-fire safe shutdown issues, and mitigation strategy issues to determine whether Exelon was appropriately identifying, characterizing, and correcting problems associated with these areas and whether the planned or completed corrective actions were appropriate. The IRs reviewed are listed in the attachment.

b. Findings

No findings were identified.

4OA6 Meetings, including Exit

The team presented the inspection results to Mr. Ed Callan, Site Vice President, and other members of Exelon's staff on February 10, 2017. The team verified that this report does not contain proprietary information.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

E. Callan, Site Vice President
T. Haaf, Plant Manager
R. Ezzo, Fire Safe Shutdown Engineer
M. Fitzwater, Licensing Engineer
J. Goldman, Manager, Regulatory Assurance
D. Herr, Fire Protection Systems Engineer
F. McGuire, Programs Engineer
D. Morneault, Mechanical Design Engineer
D. Myers, Site Fire Marshall
C. Pragman, Exelon Corporate Fire Protection
R. Shacklett, Fire Protection Engineer
C. Smith, Operations Manager
M. Torborg, Manager, Engineering Programs

NRC Personnel

D. Werkheiser, Senior Resident Inspector, Three Mile Island Nuclear Generating Station
B. Lin, Resident Inspector, Three Mile Island Nuclear Generating Station

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None.

Opened and Closed

None.

Closed

None.

LIST OF DOCUMENTS REVIEWED

Fire Protection Licensing and Design Basis Documents

1038, Administrative Controls – Fire Protection Program, Revision 83
Exelon letter to NRC B.5.b Submittal, dated 5/16/07
Facility Operating License, Unit 1, dated 10/1/15
NRC Letter, Exemption/SER-3 hour Fire Barrier, dated 7/11/97
Safety Evaluation Report (SER) TMI-1 Fire Protection, dated 9/19/78
SER Fire Protection for TMI-1 (5211-86-3333), dated 12/30/86
Three Mile Island, Unit 1, UFSAR, Section 9.9, Plant Fire Protection Program, Revision 22
TMI-1 Fire Hazards Analysis Report 990-1745, Volume 1, Revision 27
TMI-1 Fire Hazards Analysis Report 990-1745, Volume 2, Revision 27

Calculations, Analysis, and Engineering Evaluations

BM-TE-03, Upgrade of Element Nos. 118, 143, 399, 651, 652, 653, and 901 at TMI Unit 1 with Mecatiss MPF-60 for a 1-hour Fire Rating, Revision 2
 Door # C305, 338' Control 301 480V Switchgear, Revision 0
 Door # C306, 338' Control 302 480V Switchgear, Revision 0
 EC 618075, Technical Evaluation – Seismic Class 1 Verification of Air Accumulator Tanks IA-T-47 and IA-T-48, Revision 0
 GC 2734, Electrical System Study Short Circuit and Coordination Review Technical Report, Revision 0
 TM 02-00068, IEE for Big Beam Emergency Lights
 TM-07-00695, B.5.B Modifications
 TM-08-00886, Additional Hydraulic Evaluations Supporting B.5.B
 TM-08-0091, Updated B.5.B Computation for ECR 07-00695
 TMI-1 Fire Barrier Penetration Seal Evaluation Report, Revision 1
 TM-PRA-21.06, Three Mile Island Unit 1 Fire Probabilistic Risk Assessment, Revision 0
 WHI-495-0799, Report of Fire Endurance and Hose Stream Testing of Two Single, Fire Rated Door Assemblies with excessive Clearances Installed in Concrete Block Wall, dated 10/22/86
 WHI-495-0800, Report of Fire Endurance and Hose Stream Testing of a 6'x7' Fire Rated Door Assembly Installed with Excessive Clearances in Concrete Hose Stream Testing of a 6'x7' Fire Rated Door Assembly Installed with Excessive Clearances in Concrete Block Wall, dated 10/24/86

Drawings and Wiring Diagrams

1-FHA-001, Fire Area Layout, Legend & Notes, Revision 8
 1-FHA-005, Fire Area Layout, Turbine Building, Revision 7
 1-FHA-035, Fire Area Layout, Control Room Tower, Revision 17
 1-FHA-040, Fire Area Layout, Intermediate Building, Revision 5
 1-FHA-044, Fire Area Layout, Diesel Generator Building, Revision 5
 206-011, Electrical Main One Line and Relay Diagram, Revision 55
 206-022, Electrical One Line and Relay Diagram 4kV Engineered Safeguards Switchgear, Revision 21
 206-032, One Line and Relay Diagram 480V Switchgear, Revision 21
 208-213, Electrical Elementary Diag. 4160V Switchgear Make-Up Pump MU-P-1A, Revision 7
 208-215, Electrical Elementary Diag. 4160V Switchgear Make-Up Pump MU-P-1B, Revision 10
 208-216, Electrical Elementary Diag. 4160V Switchgear Make-Up Pump MU-P-1B, Revision 10
 208-440, Sheet 1, Electrical Elementary Diagram 480V Control Circuit for Borated Water Storage Tank Outlet Valve MU-V-14A, Revision 4
 208-442, Sheet 2, Electrical Elementary 480V Control Circuit for Emergency Make-Up Valve MU-V-16B, Revision 5
 208-442, Sheet 4, Electrical Elementary Diagram 480V Control Circuit for Emergency Make-Up Valve MU-V-14D, Revision 0
 209-022, Sheet 2, Electrical Elementary Diagram Normal Makeup Valve MU-V-18, Revision 7
 209-780, Electrical Elementary Diagram Reactor Coolant System, Revision 8
 210-616, Sheet 2, Elect, Wiring Diag. Remote Shutdown – Ch. B Signal Conditioning Cabinet B2, Revision 4
 AX-3649D, Air Balance Multi-Section Sleeve Configuration, Fire Dampers, TMI-1, dated 1/6/80
 AX-3649F, Air Balance Multi-Section Sleeve Configuration, Fire Dampers, TMI-1, dated 1/6/80
 B-1792-19, Fume Tight Wall Seal Assembly's for 5KV, 1200A, 2000A Bus Duct, Revision 1
 CB3B-5, Penetration Seal 946 Detail, Revision 2
 CB3B-8, Penetration Seal 972 Detail, Revision 2
 CD-14-3, Reactor Coolant System Saturation Margin Monitor Channel 'A', Revision 7

D-1792-10, 4160V, 4000, 3000, 2000, 1200A, 3P 3W Bar Duct Layout for Run 5
TMI Nuclear Plant, Revision 4
D-1792-11B, 4160V, 3000, 2000, 1200A, 3P, 3W Bar Duct Layout for Run 6, TMI Nuclear Plant,
Revision 3
D-1792-12, 4160V, 3P, 3W Bar Type Bus Duct Layout for Run 7, TMI Nuclear Plant, Revision 2
D-215-161, Emergency Generators Power & Control Duct Run, Revision 11
E-206-011, Main One Line & Relay Diagram, Revision 55
E-206-032, ENGD. SFGDS., Screen HSE., Reactor BLDG., H&V, 480V SWGR, Revision 21

Piping and Instrumentation Diagrams

302-011, Main Steam Flow Diagram, Revision 76
302-081, Feedwater Flow Diagram, Revision 58
302-082, Emergency Feedwater Flow Diagram, Revision 25
302-101, Condensate Flow Diagram, Revision 70
302-231, Sheet 1, Fire Service Water Flow Diagram, Revision 112
302-231, Sheet 2, Fire Service Water Flow Diagram, Revision 17
302-273, Emergency Feedwater and Main Steam Valve Flow Diagram, Revision 24
302-279, Sheet 9, Instrument Air Flow Diagram, Revision 20
302-620, Intermediate Cooling Flow Diagram, Revision 51
302-640, Decay Heat Removal Flow Diagram, Revision 86
302-645, Decay Heat Flow Diagram, Revision 39
302-650, Reactor Coolant System Flow Diagram, Revision 63
302-660, Makeup and Purification Flow Diagram, Revision 47
302-661, Makeup and Purification Flow Diagram, Revision 63
302-842, Sheet 1, Control Building and Machine Shop Ventilation Flow Diagram, Revision 57
302-842, Sheet 2, Control Building and Machine Shop Ventilation Flow Diagram, Revision 8

Fire Protection Evaluations of Modifications and Design Changes

ECR 16-00309, 10CFR50 Appendix R Emergency Light Upgrade, Revision 0
ECR 16-00390, MU-V-18 Control Circuit RSD Isolation Issue, Revision 0
ECR-08-01051, Revise FHAR w/ CR Evacuation & Loss of Seal Cooling Strategy, Revision 0
ECR-12-00350, FHAR/UFSAR Changes for Fire Protection Passport Items, Revision 0
ECR-12-00395, FHAR Change for Letdown Manual Actions, Revision 0

Quality Assurance Audits and Self Assessments

2620123, Three Mile Island Focused Area Self-Assessment, dated 9/30/16
NOSA-TMI-16-06, Fire Protection Audit Report, dated 10/12/16

System Health Reports

480V Power Systems, 1st and 2nd Quarters 2016
4kV and 7kV Power Systems, 1st and 2nd Quarters 2016
Remote Shutdown Panel, 1st and 2nd Quarters 2016
TMI-1, 680-Fire Detection Systems, 2nd Quarter 2016
TMI-1, 680-Fire Detection Systems, 4th Quarter 2015
TMI-1, 762-Emergency Lighting System, 2nd Quarters 2015 and 2016
TMI-1, 775-Walls Openings and Fire Stops, 4th Quarters 2014 and 2015
TMI-1, Fire Protection Program, 1st and 2nd Periods 2016

Procedures

1038, Administrative Controls for Fire Protection Program, Revision 83
 1104-45B, Fire Service Water System, Revision 107
 1104-45E, Fire Service Preaction System, Revision 13
 1104-45K, Ionization Detectors, Revision 42
 1104-45N, Non Suppression Fire Protection Equipment, Revision 19
 1104-45S, Incipient Fire Detector (IFD), Revision 1
 1302-14.1, Calibration of IST Related Instruments, Revision 68
 1302-5.26F.A1, Calibration of Heat Sink Protection System Once Through Steam Generator 'A' Pressure Transmitter MS-PT-950, Revision 1
 1302-5.30A, EG-Y-1A Diesel Generator Protection Relaying, Revision 17A
 1302-5.30B, EG-Y-1B Diesel Generator Protection Relaying, Revision 15
 1303-13.3, Remote Shutdown Readiness Checks, Revision 7
 1303-13.4, Section 8.1.1, Remote Shutdown System Functional Test of MS-V-4A, Revision 12A
 1303-13.4, Section 8.1.4, Remote Shutdown System Functional Test of MU-V-3(14A)(36), Revision 12
 1303-13.4, Section 8.13, Remote Shutdown System Functional Test of 1CESVMCC Auto Transfer Switch, Revision 11
 1303-13.4, Section 8.2.1, Remote Shutdown System Functional Test of MS-V-4B(8A)(8B), Revision 12A
 1303-13.4, Section 8.2.2, Remote Shutdown System Functional Test of DC-P-1B, Revision 11
 1303-13.4, Section 8.2.3, Remote Shutdown System Functional Test of RC-V-2(3), Revision 11
 1303-13.4, Section 8.2.4, Remote Shutdown System Functional Test of MU-P-1C(3C), Revision 12
 1303-13.4, Section 8.2.6, Remote Shutdown System Functional Test of DR-P-1B and DR-V-16, Revision 12
 1303-13.4, Section 8.2.7, Remote Shutdown System Functional Test of Communications, Revision 12
 1303-13.4, Section 8.3, Remote Shutdown System Functional Test of MU-P-1B, Revision 12
 1303-13.4, Section 8.6.1, Remote Shutdown System Functional Test of EE-1SA-E2-BK, Revision 12
 1303-13.4, Section 8.6.2, Remote Shutdown System Functional Test of EE-1SB-E2-BK, Revision 12
 1303-13.4, Section 8.6.3, Remote Shutdown System Functional Test of EE-S1-02-BK, Revision 12
 1303-13.4, Section 8.6.4, Remote Shutdown System Functional Test of EE-T1-02-BK, Revision 12
 1303-13.4, Section 8.9.1, Remote Shutdown System Functional Test of DH-P-1B, Revision 12
 1450-001, 4160V Motor Feeder Breaker Relay Functional Test, Revision 13
 1450-002.1, 4160 / 480V Transformer Feeder Breaker Protective Relay Functional Test, Revision 1
 1450-025, 4160V 'D' and 'E' Bus Overvoltage Relay Calibration, Revision 13
 3303-M1, Fire Periodic Operation, Revision 48
 CC-AA-1001, Fire Protection Engineering Evaluations, Revision 1
 CC-AA-206, Fuse Control, Revision 10
 CC-AA-211 Fire Protection Program, Revision 7
 E-142, 4160V Vacuum Circuit Breaker Inspection and Testing, Revision 8B
 E-5.2, Westinghouse 480V DB-50 Circuit Breaker Maintenance and Testing, Revision 9
 ER-TM-390, Control Room Envelope Habitability Program, Revision 0
 OP-AA-201-001, Fire Marshal Tours, Revision 6
 OP-AA-201-003, Fire Drill Performance, Revision 15
 OP-AA-201-004, Fire Prevention for Hot Work, Revision 13
 OP-AA-201-005, Fire Brigade Qualification, Revision 9

OP-AA-201-006, Control of Temporary Heat Generation Equipment, Revision 8
OP-AA-201-008, Pre-Fire Plan Manual, Revision 3
OP-AA-201-009, Control of Transient Combustible Material, Revision 17
OP-AA-201-010-1001, B.5.B Mitigating Strategies Equipment Expectations, Revision 4
U-10, Portable Fire Extinguisher Inspection, Revision 34
U-22, Door Maintenance and Inspection, Revision 28
U-29, Structural Steel Fire Proofing Inspection, Revision 8

Operations Procedures

Alarm Response Procedure HVB, Heating and Ventilation Panel Annunciator B, Revision 59
OP-TM-102-106-1001, Operator Response Time Master List at TMI, Revision 4
OP-TM-211-950, Restoration of Letdown Flow, Revision 7
OP-TM-220-206, Pressurizer Heaters Emergency Power Functional Test, Revision 3A
OP-TM-220-901, Emergency Power Supply for Pressurizer Heaters, Revision 6
OP-TM-251-902, Spent Fuel Pool Spray, Revision 8
OP-TM-251-904, Spent Fuel Pool Building (External Spray), Revision 6
OP-TM-421-574, Manual Operation of CO-V-6, 7, 8, Revision 2
OP-TM-424-248, Remote Shutdown Test of EF-P-2B, Revision 1
OP-TM-AOP-001, Fire, Revision 13
OP-TM-AOP-0011, Fire Basis Document, Revision 14
OP-TM-AOP-0011-C3B, Fire in 1E ES 4160V Switchgear Room Basis Document, Revision 9
OP-TM-AOP-001-C3B, Fire in 1E ES 4160V Switchgear Room, Revision 9
OP-TM-AOP-009, Loss of Plant Control Facilities, Revision 10
OP-TM-AOP-0091, Loss of Plant Control Facilities Basis Document, Revision 3
OP-TM-AOP-034, Loss of Control Building Cooling, Revision 18
OP-TM-AOP-035, Loss of Spent Fuel Cooling, Revision 8
OP-TM-AOP-041, Loss of Seal Injection, Revision 8
OP-TM-AOP-043, Loss of Pressurizer (Solid OPS Cooldown), Revision 6
OP-TM-AOP-0431, Loss of Pressurizer Basis Document, Revision 5
OP-TM-EOP-001, Reactor Trip, Revision 16
OP-TM-EOP-020, Cooldown from Outside of Control Room, Revision 22
OP-TM-EOP-0201, Cooldown from Outside of Control Room Basis Document, Revision 15

Operator Safe Shutdown Training

N-TM-B5B-REQUIREMENTS, B.5.B Requirements, dated 3/4/16
TQ-TM-104-A43-C001, Loss of Pressurizer (Solid Ops Cooldown), Revision 4
TQ-TM-106-220-C001, RCS and Pressurizer including Loose Part Monitoring System,
Revision 4

Fire Fighting Strategies (i.e., Pre-Fire Plans)

CB-FA-3B, Control Building, Elev. 338'6". 1E Switchgear Room, Revision 7
DG-FA-2, Diesel Generator Building, EF-Y-1B Room and Control Panel, Revision 5
IB-FZ-2, Intermediate Building, Elev. 295', IB 295' EF-P-1 Area, Revision 4
TB-FA-1 (3), Electrical Equipment Room, Turbine Building Elev. 322', Revision 3

Fire Brigade Training

11.4.01.038, Module 7: Fire Ground Evolutions Retraining, Revision 14
11.4.01.052, Module 4: Fire Detection and Suppression Systems, Revision 13
FBP01, Introduction/Orientation, Revision 7
FBP02, Protective Clothing, Revision 6
FBP04, Fire Barrier and Essentials, Revision 11
FBP07, Hose Streams, Appliance Tools, Revision 7
FBP09, Extinguishers and Agents, Revision 9
FBP11, Tactics and Strategy, Revision 9
FBP15, Pre-Fire Plans, Revision 7
FBP17, Foam/Multi-Agent Operations, Revision 3
IMS-01, Incident Management System, Revision 2

Fire Brigade Drills and Critiques

1/1/A/15, TMI-1 Control Building, 1D 4160 Volt E.S. Bus, Electrical Fire, dated 1/26/15
1/1/E/17, TMI-1 Turbine Building, 2nd Floor (322' Elevation), South End in the Switchgear Room, dated 1/23/17
2/1/E/16, TMI-1, Diesel Generator Building, EG-Y-1B Diesel, dated 5/18/16
3/1/A/16/#2, TB-FA-1 – TMI-1, Turbine Building, Turbine Driven Main Feedwater Pumps, dated 9/30/16
3/1/B/15/#2, TMI-1, Control Building, Fire Area CB-FA-2B, 322' Elevation, 1S 480 Volt Switchgear Room (West), at the 1B MCC-Electrical Fire, dated 9/8/15
3/1/D/14/#2, TMI-1, Turbine Building 2nd Floor (322' Elevation), South End in the Switchgear Room, dated 9/23/14
3/1/E/16, TMI-1, Flex Storage Building, dated 9/28/16
4/1/A/16, TMI-1, Diesel Generator Building Electrical Fire in Panel 2DCC-1B, dated 10/10/16
4/1/C/15, TMI-1, Control Building 1E 4160 Volt E.S. Bus, Electrical Fire, dated 10/1/15
4/1/D/16, Oil Storage Building, dated 11/17/16
4/2/D/16, TMI-2, Control Building Electrical Fire in Panel 2DCC-1B, dated 10/17/16

Transient Combustible, Hot Works, and Ignition Source Permits and Evaluations

264, Station Blackout Diesel Generator Building, dated 11/16/16
266, Control Building, dated 11/21/16
267, Control Building, dated 11/21/16
268, Fuel Handling Building, dated 11/21/16
269, Fuel Handling Building, dated 11/21/16
A2407392, Refrigerant Leak on South Office Building, First Floor Condenser, dated 7/6/16
C2034815, Switchyard Relay House (1092-2), dated 9/27/16
C2036713, AH-E-11 Permit Activity, dated 9/30/16
C2036838, Trash Compactor 2 Special Work Permit Activity, dated 8/12/16

Completed Tests and Surveillances

1104-45R, Fire Protection System Operations Surveillance, Performed 10/8/16
1301-12.1, Fire System Header/Nozzle Inspection, Performed 10/17/16
1302-5.26F.A1, Calibration of Heat Sink Protection System Once Through Steam Generator 'A' Pressure Transmitter MS-PT-950, Revision 1, Performed 11/12/15
1303-12.13, Fire System Flush at 2" Drains-Deluge/Sprinkler Systems, Performed 10/20/16
1303-12.17, Fire System Testing Miscellaneous Deluge Functional Test, Performed 8/1/15 and 11/18/15
1303-12.18.1, Fire System Nozzle Flow Test-Diesel Generator Cooling Air Intake Deluge, Performed 7/22/14
1303-12.18.2, Fire System Nozzle Flow Test-Diesel Generator Combustion Air Intake Deluge, Performed 7/18/14

- 1303-12.23, Fire Damper Inspection, Performed 7/6/15
- 1303-12.24, Raceway Fire Barrier System, Performed 11/7/11, 9/29/12, 9/1/13 and 1/2/16
- 1303-12.25, Technical Requirements Fire Door Inspection and Maintenance, Performed 7/6/16 and 8/30/16
- 1303-12.8.11, Fire Protection Instrumentation Functional Test (Intermediate Building), Performed 2/17/16 and 8/13/16
- 1303-12.8B, Fire Protection Instrumentation Functions Test (Control Building Elevation 338'), Performed 5/31/15 and 6/23/16
- 1303-12.8D, Visual Inspection of Diesel Generator FS Instrument, Performed 3/4/16 and 8/22/16
- 1303-12.9, Fire Barrier Seal Inspection, Performed 8/11/07 and 3/20/13
- 1303-13.1, Appendix R Portable Emergency Lights Functional Test, Performed 6/29/16 and 7/27/16
- 1303-13.1C, D.C. Emergency Lighting Water Level and Function Checks Intermediate Building, Performed 9/8/16 and 11/10/16
- 1303-13.1D, D.C. Emergency Lighting Water Level and Function Checks Control Building, Performed 6/7/16 and 11/11/16
- 1303-13.1E, D.C. Emergency Lighting Water Level and Function Checks Control Building, Performed 6/15/16 and 10/21/16
- 1303-13.1F, D.C. Emergency Lighting Water Level and Function Checks Diesel Generator Building, 7/23/16 and 10/21/16
- 1303-13.4, Section 8.1.1, Remote Shutdown System Functional Test of MS-V-4A, Revision 12A, Performed 11/21/15
- 1303-13.4, Section 8.1.4, Remote Shutdown System Functional Test of MU-V-3(14A)(36), Revision 12, Performed 10/31/15
- 1303-13.4, Section 8.13, Remote Shutdown System Functional Test of 1CESVMCC Auto Transfer Switch, Revision 11, Performed 9/18/15
- 1303-13.4, Section 8.2.1, Remote Shutdown System Functional Test of MS-V-4B(8A)(8B), Revision 12A, Performed 11/21/15
- 1303-13.4, Section 8.2.2, Remote Shutdown System Functional Test of DC-P-1B, Revision 11, Performed 1/6/15
- 1303-13.4, Section 8.2.3, Remote Shutdown System Functional Test of RC-V-2(3), Revision 11, Performed 9/18/15
- 1303-13.4, Section 8.2.4, Remote Shutdown System Functional Test of MU-P-1C(3C), Revision 12, Performed 11/22/15
- 1303-13.4, Section 8.2.6, Remote Shutdown System Functional Test of DR-P-1B and DR-V-16, Revision 12, Performed 11/7/15
- 1303-13.4, Section 8.2.7, Remote Shutdown System Functional Test of Communications, Revision 12, Performed 5/26/16
- 1303-13.4, Section 8.3, Remote Shutdown System Functional Test of MU-P-1B, Revision 12, Performed 11/4/15
- 1303-13.4, Section 8.6.1, Remote Shutdown System Functional Test of EE-1SA-E2-BK, Revision 12, Performed 11/16/15
- 1303-13.4, Section 8.6.2, Remote Shutdown System Functional Test of EE-1SB-E2-BK, Revision 12, Performed 11/6/15
- 1303-13.4, Section 8.6.3, Remote Shutdown System Functional Test of EE-S1-02-BK, Revision 12, Performed 11/8/15
- 1303-13.4, Section 8.6.4, Remote Shutdown System Functional Test of EE-T1-02-BK, Revision 12, Performed 11/9/15
- 1303-13.4, Section 8.9.1, Remote Shutdown System Functional Test of DH-P-1B, Revision 12, Performed 11/14/15

1303-14.2, Inspection of Fire Brigade Vehicle Equipment, Performed 9/15/16
 3303-A2, Fire System Main Header Flush and Loop Test, Performed 3/4/14, 10/9/14, 4/16/15
 and 8/27/16
 3303-A3, Section 8.1, FS-P-1, Fire Pump Capacity Testing, Performed 6/26/14 and 6/24/16
 3303-A3, Section 8.2, FS-P-2, Fire Pump Capacity Testing, Performed 11/6/14 and 9/30/15
 3303-A3, Section 8.3, FS-P-3, Fire Pump Capacity Testing, Performed 11/6/14 and 9/30/15
 3303-M1, FS-P-1, Fire Pump Periodic Operation, Performed 5/10 16 and 5/17/16
 3303-M1, FS-P-2, Fire Pump Periodic Operation, Performed 3/28/16 and 5/3/16
 3303-M1, FS-P-3, Fire Pump Periodic Operation, Performed 4/23/16, 5/3/16 and 5/17/16
 3391-SA1, Fire Hydrant Inspection, Performed 10/9/14
 OP-TM-220-206, Pressurizer Heaters Emergency Power Functional Test, Revision 3A,
 Performed 11/22/15
 OP-TM-424-248, Remote Shutdown Test of EF-P-2B, Revision 1, Performed 10/12/15

Issue Reports

(* denotes NRC identified during this inspection)

00657398	00657399	00657920	01201424	01490606
01522563	01620202	01627751	01642539	01657931
01668438	02386737	02388714	02393295	02408007
02410173	02442595	02442967	02501459	02507785
02544387	02556128	02562891	02583341	02590806
02591349	02627033	02627516	02638765	02640815
02661938	02686234	02703997	02705855	02707471
02709261	02727864	03965625*	03965725*	03966128*
03966508*	03967366*	03969483*	03971561*	03971591*
03971681*	03971683*	03971801*	03972054*	03972083*
03972487*				

Work Orders

R2072869	R2072882	R2077619	R2082089	R2148814
R2163810	R2226492	R2226598	R2226965	R2226966
R2228305	R2229136	R2229554	R2229592	R2229593
R2229637	R2229711	R2229788	R2229801	R2230009
R2230010	R2230358	R2230486	R2230535	R2230794
R2230794	R2236165	R2239832	R2253718	R2258750
R2261761	R2267071	R2269690	R2407281	

Vendor Manuals

2AO-130, Instruction Manual for 2AO-VAI Series Voltage-to-Current Converter, dated 5/78
 Air Balance Model 319, 3 hour, Static Fire Damper, dated 2/13

Miscellaneous Documents

5211-86-2124, TMI Letter to NRC, Re: 10CFR50 Appendix R Clarification of Compliance,
 dated 7/22/86
 5211-86-3333, NRC Letter to H. Hukill, Re: Fire Protection for TMI-1, dated 12/30/86
 Electrical Cable and Conduit Routing Information Database
 ER-TM-600-1069, TMI-1 Site List of High Risk Fire Areas, Revision 0
 IR 01492237, NRC IN 2013-02, Issues Potentially Affecting Nuclear Fire Safety, dated 3/21/13
 IR 01493129, NRC IN 2013-06, Corrosion in Fire Protection Piping due to Air and Water
 Interaction, dated 3/26/13

IR 01521603, NRC IN 2013-09, Compressed Flammable Gas Cylinders and Associated Hazards, dated 12/12/13
IR 02426548, NRC IN 2014-15, Inadequate Controls of Respiratory Protection Accessibility, Training, Maintenance, dated 12/1/14
IR 02501459, NRC IN 2015-02, Antifreeze Agents in Fire Water Sprinkler Systems, dated 5/14/15
NRC Letter to Charles Pardee, Re: Three Mile Island Nuclear Station, Unit 1: Request For Exemption from Title 10 of the Code of Federal Regulations Part 50, Appendix R Requirements (TAC No. MD8081), dated 3/30/09
Three Mile Island Unit 1, Fire Impairment Log, dated 1/24/17
Three Mile Island Unit 1, Operations Shift Roster, dated 1/22/17
TMI-09-008, Response to Request for Additional Information Request for Exemption from 10 CFR 50, Appendix R, Section III.G, "Fire Protection of Safe Shutdown Capability", dated 1/28/09

LIST OF ACRONYMS

ADAMS	Agencywide Documents Access and Management System
APCSB	Auxiliary and Power Conversion Systems Branch
BTP	Branch Technical Position
CFR	Code of Federal Regulations
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
Elev.	Elevation
Exelon	Exelon Generation Company, LLC
FA	Fire Area
FHAR	Fire Hazards Analysis Report
FPP	Fire Protection Program
FZ	Fire Zone
IP	[NRC] Inspection Procedure
IPEEE	Individual Plant Examination of External Events
IR	Issue Report
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
OTSG	Once Through Steam Generator
SER	Safety Evaluation Report
TMI	Three Mile Island Nuclear Station, Unit 1
UFSAR	Updated Final Safety Analysis Report