



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

May 2, 2018

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

SUBJECT: THREE MILE ISLAND NUCLEAR GENERATING STATION – UNIT 1  
DESIGN BASES ASSURANCE INSPECTION (TEAM) REPORT  
05000289/2018010

Dear Mr. Hanson:

On March 29, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Three Mile Island, Unit 1. On March 29, 2018, the NRC inspectors discussed the results of this inspection with Mr. Ed Callan, Site Vice President, and other members of your staff. The results of this inspection are documented in the enclosed report.

The NRC inspectors did not identify any findings or more-than-minor violations.

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

Sincerely,

/RA/

Stephen M. Pindale, Chief  
Engineering Branch 1  
Division of Reactor Safety

Docket Number: 50-289  
License Number: DPR-50

Enclosure:  
Inspection Report 05000289/2018010

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SUBJECT: THREE MILE ISLAND NUCLEAR GENERATING STATION – UNIT 1 –  
 DESIGN BASES ASSURANCE INSPECTION (TEAM) REPORT  
 05000289/2018010 DATED MAY 2, 2018

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**U.S. NUCLEAR REGULATORY COMMISSION  
Inspection Report**

Docket Number: 50-289

License Number: DPR-50

Report Number: 05000289/2018010

Enterprise Identifier: I-2018-010-0038

Licensee: Exelon Generation Company, LLC (Exelon)

Facility: Three Mile Island, Unit 1 (TMI)

Location: Middletown, Pennsylvania

Inspection Dates: March 12 through March 29, 2018

Inspectors: K. Mangan, Senior Reactor Inspector, Division of Reactor Safety (DRS), Team Leader  
J. Brand, Reactor Inspector, DRS  
S. Elkhiamy, Reactor Inspector, DRS  
M. Orr, Reactor Inspector, DRS  
S. Kobylarz, NRC Electrical Contractor  
R. Waters, NRC Mechanical Contractor

Approved By: Stephen M. Pindale, Chief  
Engineering Branch 1  
Division of Reactor Safety

Enclosure

**SUMMARY**

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring Exelon's performance at Three Mile Island, Unit 1 by conducting a design bases assurance inspection in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/oversight.html> for more information.

No findings or more-than-minor violations were identified.

## INSPECTION SCOPES

This inspection was conducted using the appropriate portions of the inspection procedure in effect at the beginning of the inspection unless otherwise noted. Currently approved inspection procedures with their attached revision histories are located on the public website at <http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html>.

Samples were declared complete when the inspection procedure requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter 2515, "Light-Water Reactor Inspection Program - Operations Phase." The team reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

## REACTOR SAFETY

### 71111.21M - Design Bases Assurance Inspection (Teams)

The team evaluated the following components, permanent modifications, and operating experience during the weeks of March 12, 2018, and March 26, 2018.

For the components, the team reviewed the attributes listed in inspection procedure 71111.21M, Appendix A, *Component Review Attributes*. Specifically, the team evaluated these attributes as per 71111.21M, Appendix B, *Component Design Review Considerations* and 71111.21M, Appendix C, *Component Walkdown Considerations*.

### Components (5 Samples)

- DH-V-6B, 'B' Decay Heat Suction Isolation Valve. The team used Appendix B guidance for Valves and Electrical Loads and conducted a walkdown of the equipment.
- EED-PNL-1F, 'F' 125 Volt DC Distribution Panel. The team used Appendix B guidance for Electrical Loads and Motor Control Centers and conducted a walkdown of the equipment.
- AFRCCB, Heat Sink Protection System Transfer Relays. The team used Appendix B guidance for Instrumentation and conducted a walkdown of the equipment.
- EE-MCC-SH-1B, Motor Control Center 1B. The team used Appendix B guidance for Motor Control Centers and Circuit Breakers and Fuses and conducted a walkdown of the equipment.
- MU-V-0017, Normal Makeup to Reactor Coolant System Control Valve. The team used Appendix B guidance for Valves and conducted a walkdown of the equipment.

### Component, Large Early Release Frequency (1 Sample)

- MS-V-1C, Main Steam Isolation Motor-Operated Valve. The team used Appendix B guidance for Valves, Cables, and Electrical Loads and conducted a walkdown of the equipment.

### Permanent Modifications (6 Samples)

- Service Water P-1A/B Breaker Modification
- FLEX Reactor Coolant System and Spent Fuel Pool Makeup System
- Emergency Diesel Generator B Governor Tubing Improvement
- Replacing Existing Fuel Bridge Speed Controllers
- Replace Pressurizer Level Transmitter with 3000 PSIG Rated Model
- Replace Nuclear River Butterfly Valve and Actuator

### Operating Experience (3 Samples)

- 10 CFR Part 21 Notification - Foxboro Power Supply Potential Failures due to Defective Tie Wraps and Holders, dated 7/5/13
- NRC Generic Letter 2016-01, Monitoring of Neutron-Absorbing Materials in the Spent Fuel Pools, dated 4/7/16
- 10 CFR Part 21, Potential Defect Involving Failure of Westinghouse DB-25 Breakers, dated 5/2/07

### **EXIT MEETINGS AND DEBRIEFS**

The inspectors verified no proprietary information was retained or documented in this report.

- On March 29, 2018, the team presented the Design Bases Assurance Inspection (Teams) results to Mr. Ed Callan, Site Vice President, and other members of Exelon staff.

**DOCUMENTS REVIEWED****71111.21M - DESIGN BASES ASSURANCE INSPECTION (TEAMS)**Calculations

C-1101-200-5710-002, Qualified Life Analysis for Limitorque Valves, Revision 0  
 C-1101-200-5710-005, Effect of Energized Space Heaters on the Qualified Life of Limitorque Operators, Revision 0  
 C-1101-210-E610-011, LPI/BS Pump NPSH Margin Available Following a LBLOCA, Revision 9A  
 C-1101-700-E510-010, TMI-1 AC Voltage Regulation Study and Appendix 8.1 Load Tables for Steady State Operation, Revision 7  
 C-1101-733-5350-003, TMI-1 Class 1E 480V Unit Substation Settings, Revision 5  
 C-1101-734-5350-003, TMI-1 Battery Capacity Sizing and Voltage Drop for DC system, Revision 13  
 C-1101-823-5450-001, TMI-1 LBLOCA EQ Temperature Profile Using GOTHIC Computer Code (2016), Revision 10  
 C-1101-900-5450-005, TMI-1 Containment Response to a SBLOCA, Revision 0  
 C-1101-900-E410-039, MOV Delta P and Basis 07/18/08, Revision 9C  
 C-1101-900-E410-049, Weal Link Calc for TMI GL 89-13 Valves, Revision 7  
 HAGPU-08/98-052.7, Decay Heat Service Cooling River Water Pipe Support RWE-82 Evaluation, Revision 0  
 MS-V-0001C (TMI-1), MIDA Calculation, AC Motor-Operated GL 96-05 Globe Valve, Revision 4  
 NAI-1341-001, TMI GOTHIC LP1 and BS Pump NPSH and Sump Strainer Pressure Drop Analysis during Recirculation (2016), Revision 3

Corrective Action Documents (\*initiated in response to inspection)

AR01323415	AR01652619	AR02592570	AR04075459
AR01494443	AR01658782	AR02653735	AR04111741
AR01496437	AR01658795	AR02653884	AR04114893*
AR01499751	AR01675261	AR02718735	AR04115187*
AR01532653	AR01692695	AR03829260	AR04115286*
AR01570697	AR02313345	AR03829301	AR04119589*
AR01579471	AR02447062	AR03964783	AR04120057*
AR01579591	AR02566171	AR04035763*	AR04120224*
AR01579593	AR02581866	AR04040576	AR04123991*
AR01579595	AR02582872	AR04041355	
AR01603077	AR02586540	AR04047288	

Design and Licensing Basis

CY-TM-170-300, Offsite Dose Calculation Manual, Revision 5  
 EQ-T1-103-04, Environmental Qualification, Limitorque Valve SB and SMB Series Actuators with Class B, H, and RH Insulation, Revision 8  
 EQ-T1-118, Rosemount Inc. Pressure Transmitters and Remote Diaphragm Seals 1153, Revision 13  
 Exelon Corporate Regulatory Commitment Change Summary Report Commitment 2015-01, dated 12/15/15  
 N6100, N6101, N6102, Schulz Electric Motor Rewind, dated 10/18/04

RS-16-207, Response to Generic Letter 2016-01  
 RS-18-007, Response to Request for Additional Information Regarding Generic Letter 2016-01  
 Safety Evaluation By The Office of Nuclear Reactor Regulation Related To Holtec International  
 Report HI-202287 Regarding Use of Metamic in Fuel Pool Applications, dated 6/17/03SE  
 08-00872, 50.59 Evaluation for SFP Project Rerack (Metamic), Revision 0  
 TDR-648, TMI Qualification for LBLOCA Environments Methodology and List of Electrical  
 Components Requiring Environmental Qualification for LBLOCA/HELB Mitigation,  
 Revision 0  
 TMI, Unit 1 – Conforming License Amendment to Incorporate the Mitigation Strategies Required  
 by Section B.5.b of Commission Order EA-02-026, dated 7/18/07

### Drawings

10001384-10, Sh. 1 and 2, 30-150 Tricentric Valve with Limitorque Motor SMB-1/HBC-4,  
 Revision 3  
 16200525, Sh. 1, Assembly – Booster (Governor), Revision 2  
 201-069, Sh. 2, 480 V Control Center, 1C, Engineered Safeguards Valves, Revision 41  
 201-254, 125/250V DC ENGD SFGD Distribution Panel 1F, Revision 21  
 206-051, Electrical One Line Diagram 250/125V DC sys & 120 AC Vital Instrumentation,  
 Revision 37  
 208-421, Sh. 3, 480 V Control Center 1C-ESV-Unit 1C, MSIV MS-V-1C, Revision 4  
 208-446, Sh. 1, Electrical Elementary Diagram 480V Control Center NR-SR System Tie Valve  
 NR-V-2, Revision 0  
 208-446, Sh. 2, Electrical Elementary Diagram 480V Control Center NR-SR System Tie Valve  
 NR-V-6, Revision 1  
 21804-31, Operational Schematic Main Fuel Handling MCC, Revision 3  
 21804-34, Motor Control Center Wiring Diagram Refueling Machine, Revision 6  
 21804-37, Interconnection Diagram Refueling Machine, Revision 5  
 21804-42, Control Console Assembly Refueling Machine, Revision 6  
 21804-43, Control Console Assembly Refueling Machine, Revision D  
 302-011, Main Steam Flow Diagram, Revision 26  
 302-082, Emergency Feedwater Flow Diagram, Revision 25  
 302-202, Nuclear Services River Water System Flow Diagram, Revision 82  
 D-84N35833-A2-C024, Train B, Revision 10  
 D-84N35833-FD-0000, Functional Diagram Elements, Revision 2  
 D-84N35833-FD-0003, Functional Drawing H.S.P. System Channels II & IV, Generator A Train B  
 EF/FW Control, Revision 8  
 D-84N35833-FD-0029, Functional Drawing H.S.P. System, OTSG A/EF Pumps EF Initiation –  
 Train B, Revision 5  
 E-201-063, Sh. 1 and 2, Electrical 480V Control Center 1B Engineered Safeguards Screen  
 House, Revision 29 and 26  
 E-206-011, Main One Line and Relay Diagram, Revision 57  
 E-206-032, One Line & Relay Diagram – ENGD. SFGDS. Screen HSE, Reactor BLDG. H&V,  
 480V SWGR, Revision 21  
 P-4464-472, Rockwell Edward Stop-Check Valve MSIV, 24", Revision 0

### Functional, Surveillance and Modification Acceptance Testing

1303-4.16, Emergency Power System, EG-Y-1A, performed 3/06/18  
 1303-4.16, Emergency Power System, EG-Y-1B, performed 3/13/18  
 MA-AA-723-300, Diagnostic Testing of Motor Operated Valves, performed 11/11/15  
 MA-AA-723-301, Periodic Inspection of Limitorque Model SMB/SB/SBD-000, Through 5 Motor  
 Operated Valves, performed 11/8/05  
 MA-AA-723-301, Periodic Inspection of Limitorque Model SMB/SB/SBD-000, Through 5 Motor  
 Operated Valves, performed 11/13/09



OP-TM-411-203, MS-V-1A/B/C/and D Full Stroke Test, performed 10/8/17  
 OP-TM-411-203, MS-V-1A/B/C/and D Full Stroke Test, performed 11/23/13 and 11/22/15  
 OP-TM-411-203, Stroke Timing MS Isolation Valves (Forced Outage), performed 12/3/16  
 OP-TM-541-252, Leakage Exam of NR System, performed 10/3/17

#### Miscellaneous

0420-104239, MU-V-17 Specification Sheet, Revision 3  
 1603077-02, Attachment 1, Technical Evaluation of Potential Adverse Localized Equipment Environment Identified for Intermediate Building 355' due to MSIVs, Revision 0  
 1614182-02, Technical Evaluation, TMI-Cable and Connection Inspection Summary Report, dated 1/9/14  
 A2298548-01, Technical Evaluation of Visual Cable Inspection of Non EQ Cables and Connection in Adverse Localized Environments, Revision 0  
 EQ-T1-103, LIMITORQUE SB AND SMB Actuators with Class B H and RH Insulation, Revision 8  
 ER-AA-410-1000, Air Operated Valve Categorization, Revision 3  
 MM-128087-157, Specification for Vertical Bus Bar Support Upgrade, Revision 0  
 Sargent and Lundy TMI NUC/SEC Service River Water Cross Connect Valve NR-V-6 Replacement Walkdown Reports, dated 6/09/14, 7/25/14, 1/07/15, 1/22/15 and 2/10/15  
 SDBD-T1-211, Makeup and Purification, Revision 9  
 SDBD-T1-212, Decay Heat Removal System, Revision 9  
 SDBD-T1-411, Main Steam System, Design Basis Document, Revision 7  
 SI 0-00616, SPEC200, Nuclear (N-2ARPS Series) and Commercial (2ARPS Series) Power Supply Cable Tie Replacement for Heatsink Mounted Cable Harness, dated May 2013  
 TMI Unit 1 Cycle 19 Core Loading Plan, Revision 0  
 TMI Unit 1 Cycle 20 Core Loading Plan, Revision 0  
 TMI Unit 1 Cycles 20-22 BOC SFP A Maps, Revision 0  
 TMI Unit 1 Refueling 20-22 Pre Offload SFP A Maps, Revision 0  
 TMI-14-S-0186, 50.59 Screening, Replacement of Nuclear Services River Water Valve NR-V-6 and Actuator, dated 8/22/14  
 TMI-15-S-303, 10CFR50.59 Screening ECR 15-00236 - Screen Wash Pump Motor Circuit Breaker Replacement, Revision 1  
 TMI-20128, Exelon Power Labs Failure Analysis of a DB-25E Breaker Auxiliary Switch, Revision 1  
 TM-MISC-02, AOV Program Risk Ranking Input, Revision 2  
 TM-MISC-03, MOV Risk Ranking, Revision 2

#### Modifications and Design Changes

EC 14-00032, FLEX RCS and SFP Makeup System, Revision 2  
 EC 593896, Replace Pressurizer Level Transmitter (RC-LT-777), with 3000 psig Rated Model, Revision 0  
 EC 593944, Replace Existing Fuel Bridge Speed Controllers, Revision 0  
 EC 620347, Modify Opto22 Interface to Encoders of Spent Fuel and Main Fuel Bridges, Revision 0  
 ECR 14-00155, EG-Y-1A Governor Booster, SS Tubing Improvement, Revision 0  
 ECR 14-00196, Replace NR-V-6 Valve and Actuator, Revision 3  
 ECR 15-00236, SW-1-A/B – BK Modification, Revision 2

#### Operating Procedures

1105-19, Heat Sink Protection System, Revision 30  
 1107-2A, Emergency Electrical – 4kV and 480 Volt, Revision 75  
 1107-4, Electrical Distribution Panel Listing, Revision 238

OP-TM-102-106-1001, Operator Response Time Master List at TMI, Revision 5  
 OP-TM-211-00, Makeup and Purification System, Revision 36  
 OP-TM-211-472, Manual Pressurizer Level Control, Revision 4  
 OP-TM-211-901, Emergency Injection (HPI/LPI), Revision 8  
 OP-TM-212-288, DH-V-6B and Associated Tests, Revision 10  
 OP-TM-411-000, Main Steam/OTSG, Revision 21  
 OP-TM-919-911, FSG-1 High Pressure Makeup Using FX-P-1A or FX-P-1B, Revision 6  
 OP-TM-EOP-005, OTSG Tube Leakage, Revision 9  
 OP-TM-PPC-L2204, Alarm Response Procedure, Main Steam Isolation MS-V1A (MS-V-1B, MS-V1C, MS-V1D), Revision 1

### Procedures

1107-2C, Vital DC Electrical System, Revision 12  
 1107-4, Electrical Distribution Panel Listing, Revision 238  
 1302-5.12, Pressurizer Temperature and Level Channel Calibration, Revision 30C  
 1302-5.2, Surveillance Procedure, RPS High and Low RC Pressure Channels, Revision 38  
 1302-6.2, RC-LT-777, Pressurizer Level Calibration, Revision 20A  
 1303-11.39A, HSPS – EFW Auto Initiation, Revision 47  
 1410-Y-72, Bolt/Nut Torqueing and Sequences, Revision 28  
 1420-LTQ-1, Limitorque Valve Operator Maintenance, Revision 31  
 CC-AA-102, Design Input and Configuration Change Impact Screening, Revision 28  
 CC-AA-103, Configuration Change Control for Permanent Physical Plant Changes, Revision 29  
 E-21, Thermal Overload Devices Inspection and Testing, Revision 43  
 E-4, Switchgear, Bus Duct, MCC Transformer, Inspection and Cleaning, Revision 41  
 E-5.2, Westinghouse 480 Volt DB-50 Circuit Breaker Maintenance and Testing, Revision 8  
 E-5.3, 480 Volt Eaton DB-25-LV-VSR Vacuum Starter Maintenance and Testing, Revision 1  
 E-62.1, Molded Case Circuit Breaker Testing Thermal Magnetic Trip, Revision 13  
 ER-AA-300, MOV Program Administrative Procedure, Revision 11  
 ER-AA-302-1009, Final JOG MOV Periodic Verification Program Implementation, Revision 3  
 ES-010T, TMI-1 Environmental Parameters, Revision 8  
 MA-AA-723-300, Diagnostic Testing of Motor Operated Valves, Revision 12  
 MA-AA-723-300-1004, Quiklook Diagnostic Test Equipment/Sensor Guideline, Revision 4  
 MA-AA-723-301, Periodic Inspection of Limitorque Model SMB/SB/SBD-000 through 5 Motor Operated Valves, Revision 13  
 MA-AA-723-500, Inspection of Non EQ Cables and Connections for Managing Adverse Localized Environments, Revision 9  
 MA-MA-716-010-1008, Work Order Work Performance, 5  
 NF-AA-301, Special Nuclear Material and Core Component Movement, Revision 1  
 NF-AA-310, Special Nuclear Material and Core Component Movement, Revision 8  
 NF-TM-310-1001, PWR Generation of Fuel Moves using SHUFFLEWORKS Revision 2  
 NF-TM-600-1000, TMI Spent Fuel Rack Boral/Metamic Coupon Program, Revision 5

### Vendor Manuals

VM-TM-0029, Limitorque SMB Actuators, Revision 0  
 VM-TM-0069, Rockwell Edwards-Pressure Seal and Univalve Valves, dated 11/30/17  
 VM-TM-0191, Fairbanks Morse (Colt Industries) Emergency Diesel Generators, Volumes 1&2, Revision 70  
 VM-TM-0193, Conax Buffalo Corporation, Electric Conductor Seal Assemblies with Long Body for Pipe Thread Equipment Interface, Revision G  
 VM-TM-0255, EIM Co., Inc. Valve Operators, Revision 5  
 VM-TM-2962, Vendor Technical Manual, Revision 8  
 VM-TM-3014, Weir Valves and Controls USA, Instruction Manual for 30 Inch Class 150 TCBV w/ Gear Operator, Revision 2

Work Orders

C2033049	R2154245	C2029069	04367361	04593610
C2033743	R2157073	03502097	04373451	04598030
C2033849	R2157486	03503764	04373780	04599420
R2010207	R2188444	04185481	04373807	04662196
R2076951	R2190519	04186464	04374384	04682875
R2078373	R2192586	04190782	04376201	04685682
R2141555	R2230884	04353591	04382571	04718509
R2142407	R2236081	04364504	04581170	04744773