



Order No. EA-12-051

RS-16-013
TMI-16-003

January 20, 2016

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Three Mile Island Nuclear Station, Unit 1
Renewed Facility Operating License No. DPR-50
NRC Docket No. 50-289

Subject: Report of Full Compliance with March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)

References:

1. NRC Order Number EA-12-051, "Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," dated March 12, 2012
2. NRC Interim Staff Guidance JLD-ISG-2012-03, "Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation," Revision 0, dated August 29, 2012
3. NEI 12-02, Industry Guidance for Compliance with NRC Order EA-12-051, "To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," Revision 1, dated August 2012
4. Exelon Generation Company, LLC's Initial Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated October 25, 2012
5. Exelon Generation Company, LLC Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated February 28, 2013 (RS-13-036)
6. NRC letter to Exelon Generation Company, LLC, Request for Additional Information Regarding Overall Integrated Plan for Reliable Spent Fuel Pool Instrumentation, dated June 26, 2013
7. Exelon Generation Company, LLC letter to NRC, Response to Request For Additional Information - Overall Integrated Plan in Response to Commission Order Modifying License Requirements for Reliable Spent Fuel Pool Instrumentation (Order EA-12-051), dated July 24, 2013 (RS-13-095)
8. Exelon Generation Company, LLC First Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated August 28, 2013 (RS-13-130)

9. Exelon Generation Company, LLC Second Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated February 28, 2014 (RS-14-026)
10. Exelon Generation Company, LLC Third Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated August 28, 2014 (RS-14-204)
11. Exelon Generation Company, LLC Fourth Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated February 27, 2015 (RS-15-034)
12. Exelon Generation Company, LLC Fifth Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated August 28, 2015 (RS-15-205)
13. NRC letter to Exelon Generation Company, LLC, Three Mile Island Nuclear Station, Unit 1 – Interim Staff Evaluation and Request for Additional Information Regarding the Overall Integrated Plan for Implementation of Order EA-12-051, Reliable Spent Fuel Pool Instrumentation (TAC No. MF0866), dated November 13, 2013

On March 12, 2012, the Nuclear Regulatory Commission (“NRC” or “Commission”) issued Order EA-12-051, “Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation,” (Reference 1) to Exelon Generation Company, LLC (EGC). Reference 1 was immediately effective and directed EGC to install reliable spent fuel pool level instrumentation. Specific requirements are outlined in Attachment 2 of Reference 1.

Reference 1 required submission of an initial status report 60 days following issuance of the final interim staff guidance (Reference 2) and an overall integrated plan (OIP) pursuant to Section IV, Condition C. Reference 2 endorsed industry guidance document NEI 12-02, Revision 1 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided the EGC initial status report regarding reliable spent fuel pool instrumentation. Reference 5 provided the Three Mile Island Nuclear Station, Unit 1 OIP.

Reference 1 required submission of a status report at six-month intervals following submittal of the OIP. References 8, 9, 10, 11, and 12 provided the first, second, third, fourth, and fifth six-month status reports, respectively, pursuant to Section IV, Condition C.2, of Reference 1 for Three Mile Island Nuclear Station, Unit 1.

The purpose of this letter is to provide the report of full compliance with the March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051) (Reference 1) pursuant to Section IV, Condition C.3 of the Order for Three Mile Island Nuclear Station, Unit 1.

Three Mile Island Nuclear Station, Unit 1 has installed two independent full scale level monitors for the Spent Fuel Pool (SFP) in response to Order EA-12-051. Three Mile Island Nuclear Station, Unit 1 OIP Open Items have been addressed and closed as documented in References 8, 9, 10, 11, and 12, and are considered complete pending NRC closure. The information provided herein documents full compliance for Three Mile Island Nuclear Station, Unit 1 with Reference 1.

EGC's response to the NRC OIP Requests for Additional Information (OIP RAIs), and the NRC Interim Staff Evaluation (ISE) Open Items (ISE RAIs) identified in References 6 and 13 have been addressed and closed as documented in References 7, 8, 9, 10, 11, 12, and below, and are considered complete pending NRC closure. The following table provides completion references for each NRC OIP RAI and ISE RAI.

OIP Open Item No. 1 (RAI 1a)	Reference 12 and updated with this submittal as provided below
OIP Open Item No. 2	Reference 8
OIP RAI No. 1b	Reference 12 and updated with this submittal as provided below
OIP RAI Nos. 2, 3, 4, 5, 6, 7, 9, 10, and 11	Reference 12
OIP RAI No. 8	Reference 12 and updated with this submittal as provided below
ISE RAI No. 2, 5, 6, 8, 10, 13, and 14	Reference 12

Table Notes:

- ISE RAIs are not duplicated in the table above if previously issued as OIP RAIs in Reference 6.

It is EGC's understanding that the NRC Site Audit Report contains no remaining audit open items regarding Three Mile Island Nuclear Station, Unit 1 compliance with NRC Order EA-12-051.

The table below documents the completion of the final remaining open actions as identified in Reference 12. As stated above, EGC provides the response for the following items and considers them to be complete for Three Mile Island Nuclear Station, Unit 1.

Item	Description	Reference
OIP Item 1 (RAI-1a, Ref. 6)		
<u>RAI Question:</u> For Level 1, specify how the identified location represents the higher of the two points described in the NEI 12-02 guidance for this level.	NEI 12-02, Section 2.3.1 identifies that Level 1 will be the HIGHER of two levels. The first level is the suction loss due to uncovering of the Spent Fuel (SF) cooling suction pipe. This level was initially identified by TMI as elevation 340' 4". Further investigation under Calculation C-1101-251-E410-012, "Available NPSH for SF Coolant Pumps", revealed that loss of suction by vortexing is as high as 341' 11" at the design flow	<u>Complete</u> With this Compliance submittal.

	<p>of 1000 gpm.</p> <p>The second level is the loss of SF cooling pump NPSH under saturated conditions. According to the Calculation C-1101-251-E410-012, at design flow (1,000 gpm) and 212°F fluid, adequate NPSH exists and suction line voiding will not occur at 343' 6".</p> <p>Both these levels have been finalized and the required Level 1 per NEI 12-02 guidance is 343' 6", based on SFP worst case (212°F) scenario per Calculation C-1101-251-E410-012.</p>	
<p>OIP Item 3 (RAI-1b, Ref. 6)</p> <p><u>RAI Question:</u> A clearly labeled sketch depicting the elevation view of the proposed typical mounting arrangement for the portions of the instrument channel consisting of permanent measurement channel equipment (e.g., fixed level sensors and/or stilling wells, and mounting brackets). Indicate on this sketch the datum values representing Level 1, Level 2, and Level 3 as well as the top of the fuel. Indicate on this sketch the portion of the level sensor measurement range that is sensitive to measurement of the fuel pool level, with respect to the Level 1, Level 2, and Level 3 datum points.</p>	<p>See Attachment 1 for the sketch that clearly defines the following:</p> <p>The top of the highest fuel is 319' 4" elevation. This is the 0.00' indication for both SF level indication systems.</p> <p>Level 1 represents loss of SF cooling suction. This point is at 343' 6" elevation and a SFPI indicated level of 24.17'.</p> <p>Level 2 represents 10' of water over the fuel. This point is 329' 4" elevation and a SFPI indicated level of 10.00'.</p> <p>Level 3 at TMI is 321' 3" and a SFPI indicated level of 1.92'. This level is 3" above the weir for the gate that separates the two SF pools to demonstrate that both the primary and backup SFP level instrument channels can measure the same Level 3 elevation in both SFPs. The 3" above the weir allows for instrument accuracy.</p>	<p><u>Complete</u></p> <p>With this Compliance submittal.</p>
<p>OIP Item 10 (RAI-8, Ref. 6)</p> <p><u>RAI Question:</u> Provide the following: a) A description of the capability and provisions</p>	<p>a) Westinghouse provided test equipment that provides the capability to enable periodic testing and calibration of the proposed level sensing</p>	<p><u>Complete</u></p> <p>With this Compliance submittal.</p>

<p>the proposed level sensing equipment will have to enable periodic testing and calibration, including how this capability enables the equipment to be tested in-situ.</p> <p>b) A description of how such testing and calibration will enable the conduct of regular channel checks of each independent channel against the other, and against any other permanently-installed SFP level instrumentation.</p> <p>c) A description of how functional checks will be performed, and the frequency at which they will be conducted. Describe how calibration tests will be performed, and the frequency at which they will be conducted. Provide a discussion as to how these surveillances will be incorporated into the plant surveillance program.</p> <p>d) A description of what preventive maintenance tasks required to be performed during normal operation, and the planned maximum surveillance interval that is necessary to ensure that the channels are fully conditioned to accurately and reliably perform their functions when needed.</p>	<p>equipment. Westinghouse calibration procedure WNA-TP-04709-GEN and functional test procedure WNA-TP-04613-GEN provide instructions to use the test equipment to perform periodic testing and calibration, including in-situ testing. TMI in-situ test methodology is based on the Westinghouse Two Point Verification Method, LTR-SFPIS-14-55.</p> <p>b) The level displayed by the channels will be verified per the TMI operating procedures, as recommended by Westinghouse vendor technical manual WNA-GO-00127-GEN. If the level is not within the required accuracy per Westinghouse recommended tolerance in WNA-TP-04709-GEN, channel calibration will be performed.</p> <p>c) The functional test and calibration are combined in the same procedure, MA-TM-145-251. The TMI procedure is associated with a PM that establishes the required performance of the procedure 60 days prior to a scheduled refueling outage. These procedures are based on the Westinghouse Two Point Verification Method and WNA-TP-04709-GEN Spent Fuel Pool Instrument System Calibration Procedure. The procedure establishes the current water level by measuring the distance to the water referenced from the bottom of the launch plate. This measured distance is then compared to the level indication obtaining the As-Found indication value. The probe is then lifted out of the water to a predetermined mark on the probe. The water level at the predetermined mark is then recorded. The probe is lowered back into the water freely</p>	
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	<p>suspended from the launch plate. The level indication is recorded. If all three As-Found Level indications are within the tolerance specified, the procedure is exited. If the As-Found values are not within tolerance the calibration is performed to bring the indication within the calibration requirements. The calibration steps of the TMI procedures were taken from Westinghouse document WNA-TP-04709-GEN Spent Fuel Pool Instrument System Calibration Procedure.</p> <p>d) TMI has developed preventive maintenance tasks for the SFPI per Westinghouse recommendation identified in the technical manual WNA-GO-00127-GEN to assure that the channels are fully conditioned to accurately and reliably perform their functions when needed.</p>	
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MILESTONE SCHEDULE – ITEMS COMPLETE

Milestone	Completion Date
Submit 60 Day Status Report	October 25, 2012
Submit Overall Integrated Plan	February 28, 2013
Submit Responses to RAIs	July 24, 2013
Submit 6 Month Updates:	
Update 1	August 28, 2013
Update 2	February 28, 2014
Update 3	August 28, 2014
Update 4	February 27, 2015
Update 5	August 28, 2015
Modifications:	
Conceptual Design	3Q2012
Issue Exelon Fleet contract to procure SFPI Equipment	2Q2013
Begin Detailed Design Engineering	4Q2013
Complete and Issue SFPI Modification Package	1Q2015
Begin Installation	2Q2015
Complete SFPI Installation and Put Into Service	November 24, 2015

ORDER EA-12-051 COMPLIANCE ELEMENTS SUMMARY

The elements identified below for Three Mile Island Nuclear Station, Unit 1, as well as the site overall integrated plan response submittal (Reference 5), and the 6-Month Status Reports (References 8, 9, 10, 11, and 12), demonstrate compliance with Order EA-12-051.

IDENTIFICATION OF LEVELS OF REQUIRED MONITORING - COMPLETE

Three Mile Island Nuclear Station, Unit 1 has identified the three required levels for monitoring SFP level in compliance with Order EA-12-051. These levels have been integrated into the site processes for monitoring level during events and responding to loss of SFP inventory.

INSTRUMENT DESIGN FEATURES - COMPLETE

The design of the instruments installed at Three Mile Island Nuclear Station, Unit 1 complies with the requirements specified in the Order and described in NEI 12-02 "Industry Guidance for Compliance with NRC Order EA-12-051". The instruments have been installed in accordance with the station design control process.

The instruments have been arranged to provide reasonable protection against missiles. The instruments have been mounted to retain design configuration during and following the maximum expected ground motion. The instruments will be reliable during expected environmental and radiological conditions when the SFP is at saturation for extended periods. The instruments are independent of each other and have separate and diverse power supplies. The instruments will maintain their design accuracy following a power interruption and are designed to allow for routine testing and calibration.

The instrument display is readily accessible during postulated events and allows for SFP level information to be promptly available to decision makers.

PROGRAM FEATURES - COMPLETE

Training for Three Mile Island Nuclear Station, Unit 1 has been completed in accordance with an accepted training process as recommended in NEI 12-02, Section 4.1.

Operating and maintenance procedures for Three Mile Island Nuclear Station, Unit 1 have been developed and integrated with existing procedures. Procedures have been verified and are available for use in accordance with the site procedure control program.

Site processes have been established to ensure the instruments are maintained at their design accuracy.

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact David P. Helker at 610-765-5525.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 20th day of January 2016.

Respectfully submitted,



James Barstow
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Attachment 1: TMI-1 Spent Fuel Pool Elevation Sketch

cc: Director, Office of Nuclear Reactor Regulation
NRC Regional Administrator - Region I
NRC Senior Resident Inspector – Three Mile Island Nuclear Station, Unit 1
NRC Project Manager, NRR – Three Mile Island Nuclear Station, Unit 1
Mr. John D. Hughey, NRR/JLD/JOMB, NRC
Director, Bureau of Radiation Protection – Pennsylvania Department of Environmental Resources
Chairman, Board of County Commissioners of Dauphin County, PA
Chairman, Board of Supervisors of Londonderry Township, PA
R. R. Janati, Chief, Division of Nuclear Safety, Pennsylvania Department of Environmental Protection, Bureau of Radiation Protection

ATTACHMENT 1 - TMI-1 SPENT FUEL POOL ELEVATION SKETCH

