Exelon Generation®

Order No. EA-12-051

RS-13-036
TMI-13-005

February 28, 2013

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 Nos. 50-289

Subject: Overall Integrated Plan 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)

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 24, 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

On March 12, 2012, the Nuclear Regulatory Commission ("NRC" or "Commission") issued an order (Reference 1) to Exelon Generation Company, LLC (EGC). Reference 1 was immediately effective and directs EGC to have a reliable indication of the water level in associated spent fuel storage pools. Specific requirements are outlined in Attachment 2 of Reference 1.

Reference 1 requires submission of an Overall Integrated Plan by February 28, 2013. The NRC Interim Staff Guidance (ISG) (Reference 2) was issued August 29, 2012 which endorses industry guidance document NEI 12-02, Revision 1 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 3 provides direction regarding the content of this Overall Integrated Plan. The purpose of this letter is to provide the Overall Integrated Plan pursuant to Section IV, Condition C.1, of Reference 1. This letter confirms EGC has received Reference 2 and has an Overall Integrated Plan complying with the guidance for the purpose of ensuring a reliable indication of the water level in associated spent fuel storage pools capable of supporting identification of required wide range pool water level conditions by trained personnel.

Reference 4 provided the EGC initial status report regarding reliable spent fuel pool instrumentation, as required by Reference 1.

Reference 3, Appendix A-2 contains the specific reporting requirements for the Overall Integrated Plan. The information in the enclosure provides the Three Mile Island Nuclear Station, Unit 1 Overall Integrated Plan pursuant to Appendix A-2 of Reference 3. The enclosed Integrated Plan is based on conceptual design information. Final design details and associated procedure guidance, as well as any revisions to the information contained in the Enclosure, will be provided in the 6-month Integrated Plan updates required by Reference 1.

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 28th day of February 2013.

Respectfully submitted,

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Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Enclosure:

1. Three Mile Island Nuclear Station, Unit 1 Reliable Spent Fuel Pool Instrumentation (SFPI) Overall Integrated Plan

cc: Director, Office of Nuclear Reactor Regulation
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Enclosure 1

Three Mile Island Nuclear Station, Unit 1

Reliable Spent Fuel Pool Instrumentation (SFPI)

Overall Integrated Plan

(11 pages)

Three Mile Island Nuclear Station, Unit 1
Reliable Spent Fuel Pool Instrumentation
Overall Integrated Plan

Applicability:

This integrated plan applies to Three Mile Island Station, Unit 1 and is based on current conceptual design information and will be revised as detailed design engineering proceeds. Consistent with the requirements of Order EA-12-051[1] and the guidance in NEI 12-02[3], Exelon's six-month reports will delineate progress made, any proposed changes in compliance methods, updates to the schedule and, if needed, requests for relief and the basis.

General Description:

Three Mile Island Station is a two unit PWR Station, with Unit 2 permanently shutdown. The two units share a common Fuel Handling Building (FHB). The TMI-2 Spent Fuel Pool (SFP) is not in service, is not connected to the TMI-1 SFP and is out of scope for this plan. Unit 1 utilizes SFP A and SFP B for storage of used fuel. SFPs A and B are interconnected and are operated as a common pool. Normal SFP water level is approximate the 344' 6"[5] elevation. Top of the spent fuel racks is 319' 1"[6] for SFP A and 319' 4"[6] for SFP B and top of active fuel is slightly lower.

Note: In all subsequent discussions in this plan unless otherwise noted, dimensions will be conservatively referenced to the top of the higher spent fuel racks in either pool, that is, the racks in SFP B at elevation 319' 4".

Schedule:

The installation of reliable level instrumentation for the SFPs associated with Unit 1 is scheduled for completion by the end of T1R21 (Fall 2015) based on the end of the second refueling outage for Unit 1 following submittal of this integrated plan. Unit 1 discharges irradiated fuel to a set of two interconnected spent fuel storage pools. With the exception of limited time periods for maintenance or non-refueling operations, administrative controls maintain the gates between the following pools open: SFP A and SFP B. Thus, these pools are at the same level and are normally interconnected when the water level is at or above elevation 321' 0"[5,6] (nominally 1'-8" above the top of the racks).

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The current milestone schedule is as follows:

• Complete Conceptual Design (CD) for Pilot Plant (Limerick)	Complete
• Complete CD Follow-up Walkdowns at Remaining 9 Exelon Sites	Complete
• Develop Request for Proposal for Detailed Engineering Design Services	Complete
• Submit Initial 60 day Status Report	Complete
• Submit Integrated Plan	Complete with this submittal
• Procure SFP Instrumentation	2Q2013
• Begin Detailed Engineering Design	1Q2014
• Complete and Issue SFPI Modification Package	2Q2014
• Begin SFPI Installation	3Q2015
• Complete SFPI Installation and Put Into Service	4Q2015

Identification of Spent Fuel Pool Water Levels:

Key spent fuel pool water levels will be identified as follows:

Level 1 - Level adequate to support operation of the normal fuel pool cooling system: Indicated level on either primary or backup instrument channel of greater than 21 feet (elevation 340' 4")[7] plus instrument channel accuracy above the top of the storage racks based on the design accuracy of the instrument channel (which is to be determined) and a resolution of 1 foot or better for both the primary and backup instrument channels is adequate for normal fuel pool cooling system operation. Any elevation above 340' 4"[7] will provide flow of water to fuel pool cooling system.

Level 2 - Level adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck: Indicated level on either the primary or backup instrument channel of greater than 10 feet (elevation 329' 4") plus instrument channel accuracy above the top of the storage racks based on

specification of this level as adequate in NRC JLD-ISG-2012-03[2] and NEI 12-02[3], the specified design accuracy of the instrument channel, and the relatively low sensitivity of dose rates to changes in water depth at this level. This monitoring level ensures there is an adequate water level to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck from direct gamma radiation from stored spent fuel.

Level 3 - Level where fuel remains covered: Indicated level on either the primary or backup instrument channel of greater than 0 feet (elevation 319' 4")[6] plus instrument channel accuracy above the top of the storage racks based upon the design accuracy (which is to be determined) of the instrument channel for both the primary and backup instrument channels. This monitoring level assures that water is covering the stored fuel seated in the racks.

Instruments:

The design of the instruments will be consistent with the guidelines of NRC JLD-ISG-2012-03[2] and NEI 12-02[3]. Specifically, the channels will be designed as discussed below:

Primary (fixed) instrument channel: The primary instrument channel level sensing components will be located and permanently mounted in the SFP A. The primary instrument channel will provide for SFP A continuous level indication over a minimum range of approximately 26 feet from the high pool level elevation of 345' 0"[8] to the top of the spent fuel racks at elevation 319' 1"[6] for SFP A and to elevation 321' 0"[5] for SFP B which is the bottom of the channel between the pools. This continuous level indication will be provided by a guided wave radar system, submersible pressure transducer, or other appropriate level sensing technology that will be determined during the detailed engineering design phase of the project.

Backup instrument channel: The backup instrument channel level sensing components will be located and permanently mounted in SFP B. The backup instrument channel will provide for SFP B continuous level indication over a minimum range of approximately 26 feet from the high pool level elevation of 345' 0"[8] to the top of the spent fuel racks at elevation 319' 4"[6] for SFP B and to elevation 321' 0"[5] for SFP A which is the bottom of the channel between the pools. This continuous level indication will be provided by the same level sensing technology as the primary instrument channel.

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As noted previously SFP A and SFP B are interconnected by a channel and normally open gate. The bottom elevation of the channel is 321' 0"[5]. This is a maximum 1 foot 11 inches[5,6] above the top of the fuel storage racks in either pool. Therefore, the primary or backup instrument channel will only measure level to this value for the pool in which it is **not** located. This value is considered to be within the definition of nominal water Level 3 per NEI 12-02[3].

NEI 12-02[3] defines Level 3 as the level where fuel remains covered and actions to implement make-up water addition should no longer be deferred. Further, it clarifies that Level 3 corresponds nominally (i.e., +/- 1 foot) to the highest point of any fuel rack seated in the spent fuel pool.

At TMI, Unit 1, one instrument channel sensor is planned to be located in SFP A and one instrument channel sensor is planned to be located in SFP B. Both instrument channel sensors will be capable of monitoring level down to the nominal (i.e., +/- 1 foot) top of the spent fuel storage racks in the pool in which they are located. That is, for SFP A down to elevation 319' 1" and for SFP B down to elevation 319' 4". In the context of NEI 12-02[3], the sensor located in SFP A is considered the Primary Instrument Channel for SFP A and the Backup Instrument Channel for SFP B. Similarly, the sensor located in SFP B is considered the Primary Instrument Channel for SFP B and the Backup Instrument Channel for SFP A.

Spent Fuel Pools A and B both contain spent fuel, and are interconnected by a channel and normally open gate. The bottom of the channel is at elevation 321' 0". This is 1 foot 11 inches above the top of the fuel storage racks in SFP A and 1 foot 8 inches above the top of the fuel storage racks in SFP B. With this configuration the sensor in SFP A fully meets the Primary Instrument channel level measuring requirements for SFP A. Similarly, the sensor in SFP B fully meets the Primary Instrument channel level measuring requirements for SFP B. However, due to the depth of the interconnecting channel relative to the top of the fuel storage racks neither of these sensors, when considered as Backup Instrument Channels, will measure to the top of the fuel storage racks as defined by the parenthetical tolerance for this value given in NEI 12-02[3]. Exelon considers this situation acceptable for the following reasons.

- NEI 12-02[3] describes Level 3 as nominally the highest point of any fuel rack seated in the SFP. The bottom of the connecting channel is a maximum of 1 foot 11 inches above the top of the shortest rack (elevation 321' 0" – 319' 1" =

1 foot 11 inches). Considering the overall depth of the SFP, 1 foot 11 inches is essentially the same as the +/- 1 foot tolerance suggested by NEI 12-02[3].

- Level 3 is described as the level where fuel remains covered and actions to implement make-up water addition should no longer be deferred. In the extremely unlikely event that water addition to the SFP was to be deferred until Level 3 is reached, in the TMI, Unit 1, interconnected pool configuration, Level 3 would be reached in SFP B first at elevation 319' 4". Considering the difference in time to reach Level 3 based on the top of the SFP B fuel racks versus the bottom elevation of the interconnecting channel at 321' 0", it would take approximately 3% less time to reach Level 3 based on the bottom of the channel. This is considered a negligible time differential.

- In all likelihood, water addition to the SFP will commence between Levels 1 and 2 and be monitored to confirm success. As such this deviation from the reference point for Level 3 (i.e., top of fuel rack or bottom of channel) is insignificant relative to any follow-up decision making.

Therefore, this configuration provides adequate monitoring for beyond-design-basis external events and catastrophic events affecting TMI, Unit 1, Spent Fuel Pools, and provides plant personnel adequate level monitoring information to effectively prioritize emergency actions.

Reliability:

Reliability of the primary and backup instrument channels will be assured by conformance with the guidelines of NRC JLD-ISG-2012-03[2] and NEI 12-02[3] as discussed below under Design Features and Program Features. Both primary and backup level instrumentation channels will be functional at all times when there is fuel in the SFP. Reliability will be established through the use of an augmented quality assurance process (e.g., a process similar to that applied to the site fire protection program).

Design Features

Instrument Channel Design: Instrument channel design will be consistent with the guidance of NRC JLD-ISG-2012-03[2] and NEI 12-02[3].

Arrangement: The current plan is to install SFP level sensors in the northwest corner of the SFP A and along the south wall of SFP B. These locations provide in

excess of 80' of separation between the sensors. The sensors themselves will be mounted, to the extent practical, near the pool walls and below the pool curb to minimize their exposure to damaging debris and not interfere with SFP activities. Instrument channel electronics and power supplies will be located in seismic and missile protected areas either below the SFP operating floor or in buildings other than the FHB. The areas to be selected will provide suitable radiation shielding and environmental conditions for the equipment consistent with instrument manufacturer's recommendations. Equipment and cabling for power supplies and indication for each channel will be separated equivalent to that provided for redundant safety related services.

Mounting: Design of the mounting of the sensors in the SFP shall be consistent with the seismic Class I criteria. Installed equipment will be verified to be seismically adequate for the seismic motions associated with the maximum seismic ground motion considered in the design of the plant area in which it is installed.

Qualification: Reliability of both instrument channels will be demonstrated via an appropriate combination of design, analyses, operating experience, and/or testing of channel components for the following sets of parameters:

- conditions in the area of instrument channel component use for all instrument components,
- effects of shock and vibration on instrument channel components used during and following any applicable event, and
- seismic effects on instrument channel components used during and following a potential seismic event.

Temperature, humidity and radiation levels consistent with the conditions in the vicinity of the SFP and the area of use considering normal operation, event and post-event conditions for no fewer than seven days post-event or until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049[4] will be addressed in the detailed design engineering phase of the project. Examples of post-event (beyond-design-basis) conditions to be considered are:

- radiological conditions for a normal refueling quantity of freshly discharged (100 hour) fuel with SFP water level 3 as described in Order EA-12-051,
- temperature of 212 degrees F and 100% relative humidity environment,

- boiling water and/or steam environment,
- a concentrated borated water environment, and
- the impact of FLEX mitigating strategies.

Components of the instrument channels will be qualified for shock and vibration using one or more of the following methods:

- components are supplied by manufacturers using commercial quality programs (such as ISO9001, "Quality management systems – Requirements") with shock and vibration requirements included in the purchase specification at levels commensurate with portable hand-held device or transportation applications;
- components have substantial history of operational reliability in environments with significant shock and vibration loadings, such as portable hand-held device or transportation applications; or
- components are inherently resistant to shock and vibration loadings, such as cables.

For seismic effects on instrument channel components used after a potential seismic event for only installed components (with the exception of battery chargers and replaceable batteries), the following measures will be used to verify that the design and installation is adequate. Applicable components are rated by the manufacturer (or otherwise tested) for seismic effects at levels commensurate with those of postulated design basis event conditions in the area of instrument channel component use using one or more of the following methods:

- instrument channel components use known operating principles and are supplied by manufacturers with commercial quality programs (such as ISO9001). The procurement specification and/or instrument channel design shall include the seismic requirements and specify the need for commercial design and testing under seismic loadings consistent with design basis values at the installed locations;
- substantial history of operational reliability in environments with significant vibration, such as for portable hand-held devices or transportation applications. Such a vibration design envelope shall be inclusive of the

effects of seismic motion imparted to the components proposed at the location of the proposed installation;

- adequacy of seismic design and installation is demonstrated based on the guidance in Sections 7, 8, 9, and 10 of IEEE Standard 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations", or a substantially similar industrial standard;

- demonstration that proposed devices are substantially similar in design to models that have been previously tested for seismic effects in excess of the plant design basis at the location where the instrument is to be installed (g-levels and frequency ranges); or

- seismic qualification using seismic motion consistent with that of existing design basis loading at the installation location.

Independence: The primary instrument channel will be independent of the backup instrument channel. This independence will be achieved through physical and electrical separation of each channels' components commensurate with hazard and electrical isolation needs.

Power Supplies: Each channel will be normally powered from a different 120Vac bus. Upon loss of normal ac power, individual channel installed batteries will automatically maintain continuous channel operation. The batteries will be replaceable and be sized to maintain channel operation until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049[4]. Additionally, each channel will have provisions for connection to another suitable power source.

Accuracy: The instrument channels will be designed to maintain their design accuracy following a power interruption or change in power source without recalibration. Instrument channel accuracy, to be determined during detailed design, will consider SFP conditions (e.g., saturated water, steam environment, concentrated borated water), as well as, other applicable radiological and environmental conditions and include display accuracy. Instrument channel accuracy will be sufficient to allow trained personnel to determine when the actual level exceeds the specified lower level of each indicating range (levels 1, 2 or 3) without conflicting or ambiguous indications.

Testing: Instrument channel design will provide for routine testing and calibration consistent with the guidelines of NRC JLD-ISG-2012-03[2] and NEI 12-02[3]. Details will be determined during detailed design engineering.

Display: The primary and backup instrument displays will be located at the control room, alternate shutdown panel, or other appropriate and accessible location. The specific location will be determined during detailed design. An appropriate and accessible location will include the following characteristics:

- occupied or promptly accessible to the appropriate plant staff giving appropriate consideration to various drain down scenarios,
- outside the area surrounding the SFP floor (e.g., an appropriate distance from the radiological sources resulting from an event impacting the Spent Fuel Pool),
- inside a structure providing protection against adverse weather, and
- outside of any very high radiation areas or LOCKED HIGH RAD AREA during normal operation.

Program Features

Training: Personnel performing functions associated with these Spent Fuel Pool level instrumentation channels will be trained to perform the job specific functions necessary for their assigned tasks (maintenance, calibration, surveillance, etc.). This training will be consistent with equipment vendor guidelines, instructions and recommendations. The Systematic Approach to Training (SAT) will be used to identify the population to be trained and to determine the initial and continuing elements of the required training. Training will be completed prior to placing the instrumentation in service.

Procedures: Procedures will be developed using guidelines and vendor instructions to address the maintenance, operation and abnormal response issues associated with the primary and backup channels of Spent Fuel Pool instrumentation.

Procedures will also address the following situations:

- If, at the time of an event or thereafter until the unit is returned to normal service, an instrument channel ceases to function, its function will be

recovered within a period of time consistent with the emergency conditions that may exist at the time.

- If, at the time of an event or thereafter until the unit is returned to normal service, an instrument channel component must be replaced, it may be replaced with a commercially available component that may or may not meet all of the qualifications noted above to maintain instrument channel functionality.

Testing and Calibration: The testing and calibration of the instrumentation will be consistent with vendor recommendations or other documented basis. Calibration will be specific to the mounted instruments and the displays. A Maintenance Procedure (e.g., 1430 series) will be written to direct calibration and repair of the instruments. Database IISCP (Improved Instrument Setpoint Control Program) will be used to control the calibration and setpoint parameters. The PIMS PM system will be used to direct the calibration frequency of the instruments.

Need for Relief and Basis: Exelon is not requesting relief from the requirements of Order EA-12-051[1] or the guidance in NRC JLD-ISG-2012-03[2] at this time.

Consistent with the requirements of Order EA-12-051[1] and the guidance in NEI 12-02[3], Exelon's six-month reports will delineate progress made, any proposed changes in compliance methods, updates to the schedule, and if needed, requests for relief and their basis.

References:

1. NRC Order Number EA-12-051, Order Modifying 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, Order Modifying Licenses with Regard to 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 24, 2012

4. NRC Order Number EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events, dated March 12, 2012

5. TMI Unit 1 Drawing 1E-154-02-007, General Arrangement – Auxiliary and Fuel Handling Buildings Sections

6. TMI Unit 1 Drawing 21805-1, Fuel Storage Handling Bridge

7. TMI Unit 1 Drawing 304-632 Detail 3, Spent Fuel Cooling Plans, Sections and Details

8. TMI Unit 1 Procedure OP-TM-AOP-020, Loss of Station Power