Exelon Generation®

Order No. EA-12-051

RS-15-202

August 28, 2015

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

Dresden Nuclear Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-237 and 50-249

Subject: 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)

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, 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 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-13-030)
6. 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-13-118)
7. 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-14-020)
8. 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-14-198)

9. 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-15-028)
10. NRC letter to Exelon Generation Company, LLC, Dresden Nuclear Power Station, Units 2 and 3 – 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 Nos. MF1050 and MF1051), dated October 29, 2013

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 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 pursuant to Section IV, Condition C. Reference 2 endorses 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 Dresden Nuclear Power Station, Units 2 and 3 overall integrated plan.

Reference 1 requires submission of a status report at six-month intervals following submittal of the overall integrated plan. Reference 3 provides direction regarding the content of the status reports. References 6, 7, 8, and 9 provided the first, second, third, and fourth six-month status reports, respectively, pursuant to Section IV, Condition C.2, of Reference 1 for Dresden Nuclear Power Station. The purpose of this letter is to provide the fifth six-month status report pursuant to Section IV, Condition C.2, of Reference 1, that delineates progress made in implementing the requirements of Reference 1. The enclosed report provides an update of milestone accomplishments since the last status report, including any changes to the compliance method, schedule, or need for relief and the basis, if any. The enclosed report also addresses the NRC Interim Staff Evaluation Request for Additional Information Items contained in Reference 10.

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 August 2015.

Respectfully submitted,

Glen T. Kaegi
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Enclosure:

1. Dresden Nuclear Power Station, Units 2 and 3 Fifth Six-Month Status Report for the Implementation of Order EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation

cc: Director, Office of Nuclear Reactor Regulation
NRC Regional Administrator - Region III
NRC Senior Resident Inspector – Dresden Nuclear Power Station, Units 2 and 3
NRC Project Manager, NRR – Dresden Nuclear Power Station, Units 2 and 3
Ms. Jessica A. Kratchman, NRR/JLD/PMB, NRC
Mr. Stephen R. Monarque, NRR/JLD/JPMB, NRC
Mr. Robert L. Dennig, NRR/DSS/SCVB, NRC
Mr. Blake Purnell, NRR/DORL/LPL3-2, NRC
Mr. John Boska, NRR/JLD/MSD, NRC
Illinois Emergency Management Agency - Division of Nuclear Safety

Enclosure

Dresden Nuclear Power Station, Units 2 and 3

Fifth Six-Month Status Report for the Implementation of Order EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation

(25 pages)

Dresden Nuclear Power Station, Units 2 and 3

Fifth Six-Month Status Report for the Implementation of Order EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation

1 Introduction

Dresden Nuclear Power Station, Units 2 and 3, developed an Overall Integrated Plan (Reference 1), documenting the requirements to install reliable spent fuel pool level instrumentation (SFP LI), in response to Reference 2. This enclosure provides an update of milestone accomplishments since submittal of the fourth six month status report including any changes to the compliance method, schedule, or need for relief/relaxation and the basis, if any.

2 Milestone Accomplishments

The following milestones have been completed since the development of the fourth six month status report (Reference 9), and are current as of August 28, 2015.

- Complete and Issue SFPI Modification Package for Unit 2
- Complete and Issue SFPI Modification Package for Unit 3
- Begin SFPI Installation for Unit 2
- Begin SFPI Installation for Unit 3

3 Milestone Schedule Status

The following provides an update to the milestone schedule to support the Overall Integrated Plan. This section provides the activity status of each item, and the expected completion date noting any change. The dates are planning dates subject to change as design and implementation details are developed.

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Submit 60 Day Status Report	October 25, 2012	Complete	
Submit Overall Integrated Plan	February 28, 2013	Complete	
Submit Response to RAIs	July 18, 2013	Complete	
Submit 6 Month Updates:			
Update 1	August 28, 2013	Complete	
Update 2	February 28, 2014	Complete	
Update 3	August 28, 2014	Complete	

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Update 4	February 27, 2015	Complete	
Provide Final Safety Evaluation (SE) Info	April 30, 2015	Complete	
Update 5	August 28, 2015	Complete with this submittal	
Update 6	February 28, 2016	Not Started	
Update 7	August 28, 2016	Not Started	
Modifications:			
Conceptual Design	3Q2012	Complete	
Issue Exelon Fleet contract to procure SFPI Equipment	1Q2015	Complete	
Begin Detailed Engineering Design for Unit 2	3Q2014	Complete	
Complete and Issue SFPI Modification Package for Unit 2	1Q2015	Complete with this submittal	
Begin Detailed Engineering Design for Unit 3	3Q2014	Complete	
Complete and Issue SFPI Modification Package for Unit 3	1Q2015	Complete with this submittal	
Begin SFPI Installation for Unit 2	3Q2015	Complete with this submittal	2Q2015
Complete SFPI Installation for Unit 2 and Put Into Service	4Q2015	Started	
Begin SFPI Installation for Unit 3	3Q2016	Complete with this submittal	2Q2015
Complete SFPI Installation for Unit 3 and Put Into Service	4Q2016	Started	

4 Changes to Compliance Method

There are no changes to the compliance method as documented in the Overall Integrated Plan (Reference 1).

5 Need for Relief/Relaxation and Basis for the Relief/Relaxation

Dresden Nuclear Power Station, Units 2 and 3, expects to comply with the order implementation date and no relief/relaxation is required at this time.

6 Open Items from Overall Integrated Plan and Draft Safety Evaluation

The following tables provide a summary of the open items documented in the Overall Integrated Plan or the Draft Safety Evaluation (SE) and the status of each item.

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
1	Open Item: 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 phase of the project.	Complete (Addressed in Reference 6)
2 (RAI-1, Ref. 3)	RAI Question: Please provide the following: a) 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. b) 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	Complete (Addressed in Reference 4)

	sensitive to measurement of the fuel pool level, with respect to the Level 1, Level 2, and Level 3 datum points.	
3 (RAI-2, Ref.3)	RAI Question: Please provide a clearly labeled sketch or marked-up plant drawing of the plan view of the SFP area, depicting the SFP inside dimensions, the planned locations/placement of the primary and back-up SFP level sensor, and the proposed routing of the cables that will extend from the sensors toward the location of the read-out/display device.	Complete See Attachment 1 for the requested sketch. The cable routing has been updated to achieve maximum practical separation between the two channel coax cables in the refuel floor area.
4 (RAI-3, Ref.3)	RAI Question: Please provide the following: a) The design criteria that will be used to estimate the total loading on the mounting device(s), including static weight loads and dynamic loads. Describe the methodology that will be used to estimate the total loading, inclusive of design basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces. b) A description of the manner in which the level sensor (and stilling well, if appropriate) will be attached to the refueling floor and/or other support structures for each planned point of attachment of the probe assembly. Indicate in a schematic the portions of the level sensor that will serve as points of attachment for mechanical/mounting or	Complete a) All SFPIS equipment will be designed in accordance with the Dresden Station Safe Shutdown Earthquake (SSE) design requirements. The vendor, Westinghouse, has evaluated the structural integrity of the mounting brackets in Calculation CN-PEUS-14-20 Pool-side Bracket Seismic Analysis. The GTSTRUDL model, proposed by Westinghouse to calculate the stresses in the bracket assembly, considers load combinations for the dead load, live load and seismic load on the bracket. The reactionary forces calculated from these loads will become the design inputs to design the mounting bracket anchorage to the refuel floor to withstand a Safe Shutdown Earthquake (SSE). Seismic The seismic loads were obtained from Dresden Station's response spectra curves (Reference TDBD-DQ-1 for Dresden Nuclear Generating Station). The following methodology was used in determining the stresses on the bracket assembly: • Frequency analysis, taking into account the dead weight and the hydrodynamic mass of the structure, is performed to obtain the natural frequencies of the structure in all three

	electrical connections. c) A description of the manner by which the mechanical connections will attach the level instrument to permanent SFP structures so as to support the level sensor assembly.	directions. • SSE (Safe Shutdown Earthquake) response spectra analysis is performed to obtain member stresses and support reactions. • Modal responses are combined using the Ten Percent Method per U.S. NRC Regulatory Guide 1.92, Revision 1, "Combining Modal Responses and Spatial Components in Seismic Response Analysis". • The seismic loads for each of the three directions are combined by the Square Root of the Sum of Squares (SRSS) Method. • Sloshing analysis is performed to obtain liquid pressure and its impact on bracket design. • The seismic results are combined with the dead load results and the hydrodynamic pressure results in absolute sum. These combined results are compared with the allowable stress values. <u>Sloshing</u> Sloshing forces were obtained by analysis. The TID-7024, Nuclear Reactors and Earthquakes, 1963, by the US Atomic Energy Commission, approach has been used to estimate the wave height and natural frequency. Horizontal and vertical impact force on the bracket components was calculated using the wave height and natural frequency obtained using the TID-7024 approach. Using this methodology, sloshing forces have been calculated and added to the total reactionary forces that would be applicable for bracket anchorage design. The analysis also confirms that the level probe can withstand a design basis seismic event. The following Westinghouse documents provide information with respect to the design criteria used, and a description of the methodology used to estimate the total loading on the device. a. CN-PEUS-14-20 Pool-side Bracket Seismic Analysis b. LTR-SEE-II-13-47, WNA-TR-03149-GEN - Sloshing Analysis c. EQ-QR-269, WNA-TR-03149-GEN, EQ-TP-353 - Seismic Qualification of other components of SFPI

		Dresden Station specific Calculation DRE14-0048, Seismic Qualification of the SFPLI System Components, has been developed to address the seismic qualification of the readout display in the Turbine Building. The design criteria in this calculation will meet the requirements to withstand a SSE. The methods used in the calculation follow IEEE Standard 344-2004 and IEEE Standard 323-2003 for seismic qualification of the instrument. b) The level sensor, which is one long probe, will be suspended from the launch plate via a coupler/connector assembly. The launch plate is a subcomponent of the bracket assembly, which will be mounted to the refuel floor via anchors or welded to existing embedded plates on the refuel floor. A sketch showing the portions of the level sensor that will serve as points of attachment for mechanical/mounting or electrical connections is provided in Attachments 2 and 3. c) The bracket assembly that supports the sensor probe and launch plate will be mechanically connected to the SFP structure. One type of mechanical connection that will be used consists of four concrete expansion anchors that will bolt the bracket assembly to the SFP structure via the base plate. The other type of mechanical connection is a welded connection between the base plate and existing embedded plates on the SFP structure. The concrete expansion anchors and welds will be designed to withstand SSE and will meet the Dresden Station safety related installation requirements. The qualification details of the bracket are provided in a Pool-side bracket Seismic Analysis and the qualification of the anchorage to the floor are provided in a Dresden Station specific Calculation – DRE14-0046, SFPI Sensor Mounting Detail Anchorage.
5 (RAI-4, Ref.3)	RAI Question: Please provide the following: a) A description of the specific method or combination of methods you intend to apply to demonstrate the reliability of the permanently installed equipment under beyond-	Complete a) Beyond Design Basis Environment – Westinghouse qualified the components (probe, connector, cable) of the SFPIS located in the SFP area to the beyond design basis environment. Components of the system will be subjected to beyond design basis conditions of heat and humidity, thermal and radiation aging mechanisms. This testing confirmed

	design-basis ambient temperature, humidity, shock, vibration, and radiation conditions. b) A description of the testing and/or analyses that will be conducted to provide assurance that the equipment will perform reliably under the worst-case credible design basis loading at the location where the equipment will be mounted. Include a discussion of this seismic reliability demonstration as it applies to a) the level sensor mounted in the SFP area, and b) any control boxes, electronics, or read-out and re-transmitting devices that will be employed to convey the level information from the level sensor to the plant operators or emergency responders. c) A description of the specific method or combination of methods that will be used to confirm the reliability of the permanently installed equipment such that following a seismic event the instrument will maintain its required accuracy.	functionality of these system components under beyond design basis environmental conditions. Westinghouse performed testing to ensure aging of the components in the SFP area will not have a significant effect on the ability of the equipment to perform following a plant design basis earthquake. Exelon has reviewed the documents and found them acceptable. Reference Westinghouse document WNA-TR-03149-GEN for a description of the specific qualification methods. Mild Environment – Westinghouse qualified the system components (display panel, sensor) that reside in the mild environment conditions to determine that the components can satisfactorily perform to those conditions. Westinghouse has determined that aging does not have a significant effect on the ability of the equipment to perform following a plant design basis earthquake. Exelon has reviewed the documents and found them acceptable. Reference Westinghouse documents EQ-QR-269, WNA-TR-03149-GEN for description of specific methods. Display – The methods used by the vendor to qualify the readout display follow IEEE Standard 344-2004 and IEEE Standard 323-2003 for seismic qualification of the instrument. Temperature and humidity qualification of the displays follows the guidance provided in IEEE 344-2004, IEEE 323-2003, NRC Regulatory Guides 1.100, Revision 3; 1.209, March 2007; and EPRI TR-107330 guidance. The readout display will be located in the Turbine Building and is not expected to be subject to harsh environmental or radiological conditions seen in the Reactor Building. Shock and Vibration – SFPIS pool side brackets were analyzed for Safe Shutdown Earthquake design requirements per NRC Order EA-12-051 and NEI 12-02 guidance. As required by the NRC Order EA-12-051, NEI 12-02 guidance, and as clarified by the NRC interim staff guidance, the probe, coaxial cable, and the mounting brackets are "inherently

		resistant to shock and vibration loadings." As a result, no additional shock and vibration testing is required for these components. SFPIS pool side brackets for both the primary and backup Westinghouse SFP measurement channels will be permanently installed and fixed to rigid refuel floors, which are Seismic Category 1 structures. The SFPI system components, such as level sensor and its bracket, display enclosure and its bracket, will be subjected to seismic testing, including shock and vibration test requirements. The level sensor electronics are enclosed in a NEMA-4X housing. The display electronics panel utilizes a NEMA-4X rated stainless steel housing as well. These housings will be mounted to a seismically qualified wall and will contain the active electronics, and aid in protecting the internal components from vibration induced damage. Reference Westinghouse Report WNA-DS-02957 for shock and vibration. b) The seismic adequacy of the SFPIS (all components) is demonstrated by vendor testing and analysis in accordance with below listed standards: • IEEE 344-2004, IEEE Recommended Practice for Seismic Qualification of Class 1E Electrical Equipment for Nuclear Power Generating Stations • IEEE-323-1974, Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations • USNRC Regulatory Guide 1.100, Rev. 3 • USNRC Regulatory Guide 1.92, Rev. 1 • Dresden Calculation - Seismic Qualification of the SFPIS Indicator Seismic adequacy of the level sensor probe supporting bracket within the SFP area was demonstrated by analysis as discussed in the response to RAI-3. c) Westinghouse has seismically qualified the SFPI instrument and its components. CN-PEUS-14-20 describes Pool-side Bracket

		Seismic Analysis; EQ-QR-269, WNA-TR-03149-GEN describes remaining seismic qualifications of the instrument components. With the instrument to be seismically qualified and installed as described in RAI 5b response, including the readout display in the Turbine Building, the instrument is assured to maintain reliable and accurate indication when required. Westinghouse Report WNA-CN-00301-GEN and Dresden Engineering Change 398999 provide the channel accuracy from measurement to display.
6 (RAI-5, Ref.3)	RAI Question: Please provide the following: a) A description of how the two channels of the proposed level measurement system meet this requirement so that the potential for a common cause event to adversely affect both channels is minimized to the extent practicable. b)Further information describing the design and installation of each level measurement system, consisting of level sensor electronics, cabling, and readout devices. Please address how independence of these components of the primary and back-up channels is achieved through the application of independent power sources, physical and spatial separation, independence of signals sent to the location(s) of the readout devices, and the independence of the displays.	Complete The two channels of the proposed level measurement system will be installed such that: a) The level probes will be mounted on the east and west side of each SFP and will be separated by a distance greater than the span of the shortest side of the pool. This meets the NEI 12-02, Revision 1 guidance for channel separation. b) The information related to physical separation, is depicted in Attachment 1, which shows the location of the probe and mounting brackets and cable routing to the two individual transmitters. Dresden Station's primary and backup instrument channel displays will be located on the Main Floor of the Turbine Building along the Reactor Building wall and will have physical and spatial separation between the displays. Each system's cables will be spatially separated using Dresden Station's divisional spatial separation criteria. The independent power sources will consist of powering each train from a separate power supply.
7 (RAI-6, Ref. 3)	RAI Question: Please provide the following: a) A description of the electrical ac power sources and capacities for the primary and backup channels. b) If the level measurement	Complete a) The primary and backup SFPLI instrument channels will be normally powered from 120 VAC. Upon loss of normal AC power, individual batteries installed in each channel's electronics / UPS enclosure will automatically maintain continuous channel operation for at least 3 days. The power cables will be routed so that

	channels are to be powered through a battery system (either directly or through an Uninterruptible Power Supply), please provide the design criteria that will be applied to size the battery in a manner that ensures, with margin, that the channel will be available to run reliably and continuously following the onset of the beyond-design-basis event for the minimum duration needed, consistent with the plant mitigation strategies for beyond-design-basis external events (Order EA-12-049).	spatial and physical separation is maintained between the primary and backup channels. Additionally, a receptacle and a selector switch are installed in each channel electronics / UPS enclosure to directly connect emergency power to the SFPLI. b) The Westinghouse Report, WNA-CN-00300-GEN, provides the results of the calculation depicting the battery backup duty cycle. This calculation demonstrates that battery capacity is 4.22 days to maintain the level indicating function to the display location, located in the Turbine Building. The calculation also determines that the battery will last for 72 hours. Therefore, the results of the calculation meet the NEI 12-02 requirements.
8 (RAI-7, Ref.3)	RAI Question: Please provide the following: c) An estimate of the expected instrument channel accuracy performance (e.g., in percent of span) under both a) normal SFP level conditions (approximately Level 1 or higher) and b) at the beyond-design-basis conditions (i.e., radiation, temperature, humidity, post-seismic and post-shock conditions) that would be present if the SFP level were at the Level 2 and Level 3 datum points. d) A description of the methodology that will be used for determining the maximum allowed deviation from the instrument channel design accuracy that will be employed under normal operating conditions as an acceptance criterion for a calibration procedure to flag to operators and to technicians that the channel requires adjustment to within the normal condition design accuracy.	Complete c) The Westinghouse documents WNA-CN-00301-GEN and WNA-DS-02957-GEN describe the channel accuracy under both (a) normal SFP level conditions and (b) at the Beyond Design Basis (BDB) conditions that would be present if SFP level were at Level 2 and Level 3 datum points. Each instrument channel will be accurate to within ±3" during normal spent fuel pool level conditions. The instrument channels will retain this accuracy after BDB conditions, in accordance with the above Westinghouse documents. The same channel accuracy requirements are applicable to the readout display in the turbine building. The accuracy is within the channel accuracy requirements of the Order (±1 foot) for BDB conditions and meets the NEI 12-02 requirements. d) The Westinghouse document WNA-TP-04709-GEN describes the methodology for routine testing/calibration verification and calibration methodology. This document also specifies the required accuracy criteria under normal operating conditions. Dresden Station calibration and channel verification procedures will follow the guidance and criteria provided in this document. Instrument channel calibration will be performed if the level indication reflects a value that is outside the acceptance band that will be established in the Dresden Station calibration

		and channel verification procedures. Calibration will be performed once per refueling cycle for Dresden Station. Calibration on a SFP level channel is to be completed within 60 days of a planned refueling outage considering normal testing scheduling allowances (e.g., 25%). This is in compliance with the NEI 12-02 guidance for Spent Fuel Pool Instrumentation.
9 (RAI-8, Ref.3)	RAI Question: Please provide the following: a) A description of the capability and provisions 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. 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. c) A description of how calibration tests and functional checks will be performed, and the frequency at which they will be conducted. Discuss how these surveillances will be incorporated into the plant surveillance program. d) A description of what preventive maintenance tasks are 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.	Started - Planned completion date is November 2015. a) Westinghouse calibration procedure WNA-TP-04709-GEN and functional test procedure WNA-TP-04613-GEN describe the capabilities and provisions of SFPI periodic testing and calibration, including in-situ testing. Westinghouse calibration and functional test procedures are acceptable for Dresden Station. Dresden Station will review the procedures to ensure the instrument can be calibrated, functionally tested, and in-situ tested per the Order requirements. b) The level displayed by the channels will be verified per the Dresden Station administrative and 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 tolerances in WNA-TP-04709-GEN, channel calibration will be performed. c) Functional checks will be performed per Westinghouse functionality test procedure WNA-TP-04613-GEN at the frequency determined by Dresden Station maintenance and operating programs based on the Westinghouse recommended frequency. Calibration tests will be performed per Westinghouse calibration procedure WNA-TP-04709-GEN at the frequency determined by Dresden Station maintenance and operating programs based on the Westinghouse recommended frequency. In accordance with Dresden Station maintenance and operating programs, Dresden Station will develop calibration, functional test, channel verification procedures per Westinghouse recommendations to ensure reliable, accurate and continuous SFPI functionality. d) Dresden Station will develop 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.
10 (RAI-9, Ref. 3)	RAI Question: Please provide the following: a) The specific location for each of the primary and backup instrument channel displays. b) If the primary and backup display location is other than the main control room, provide justification for prompt accessibility to displays including primary and alternate route evaluation, habitability at display location(s), continual resource availability for personnel responsible to promptly read displays, and provisions for communications with decision makers for the various SFP drain down scenarios and external events. c) The reasons justifying why the locations selected enable the information from these instruments to be considered "promptly accessible." Include consideration of various drain-down scenarios.	Replaced by Interim SE RAI #11 (Reference 5).
11 (RAI-10, Ref.3)	RAI Question: Please provide the following: a) A list of the operating (both normal and abnormal response) procedures, calibration/test procedures, maintenance procedures, and inspection procedures that will be developed for use of the SFP instrumentation in a manner that addresses the order requirements. b) A brief description of the specific technical objectives to be achieved within each procedure. If your plan	Replaced by Interim SE RAI #12 (Reference 5).

	incorporates the use of portable spent fuel level monitoring components, please include a description of the objectives to be achieved with regard to the storage location and provisions for installation of the portable components when needed.	
12 (RAI-11, Ref.3)	RAI Question: Please provide the following: a) Further information describing the maintenance and testing program the licensee will establish and implement to ensure that regular testing and calibration is performed and b)verified by inspection and audit to demonstrate conformance with design and system readiness requirements. Include a description of your plans for ensuring that necessary channel checks, functional tests, periodic calibration, and maintenance will be conducted for the level measurement system and its supporting equipment. c) A description of how the guidance in NEI12-02, Section 4.3 regarding compensatory actions for one or both non-functioning channels will be addressed. d) A description of what compensatory actions are planned in the event that one of the instrument channels cannot be restored to functional status within 90 days.	Complete Dresden Station revised the compensatory action plan requirements applicable to conditions where the instrument channel(s) are not restored to functional status within the specified time, as specified in the Note. The condition will be entered into the corrective action program in lieu of a report to PORC. Response for a,b: Performance tests (functional checks) and Operator performance checks are described in detail in the vendor operator's manual, and the applicable information will be contained in plant operating procedures. Operator performance tests will be performed periodically as recommended by the equipment vendor. Channel functional tests per operations procedures with limits established in consideration of vendor equipment specifications will be performed at appropriate frequencies established equivalent to or more frequently than existing SFPI. Manual calibration and operator performance checks will be performed on a periodic scheduled basis with additional maintenance on an as-needed basis when flagged by the system's automated diagnostic testing features. Channel calibration tests per maintenance procedures with limits established in consideration of vendor equipment specifications will be performed at frequencies established in consideration of vendor recommendations. SFPI channel/equipment maintenance/preventative maintenance and testing program requirements to ensure design and system readiness will be

established in accordance with Exelon's processes and procedures and in consideration of vendor recommendations to ensure that appropriate regular testing, channel checks, functional tests, periodic calibration, and maintenance is performed (and available for inspection and audit). Subject maintenance and testing program requirements will be developed during the SFPI modification design process.

Response for c, d:

Both primary and backup SFPI channels will incorporate permanent installation (with no reliance on portable, post-event installation) of relatively simple and robust augmented quality equipment. Permanent installation coupled with stocking of adequate spare parts reasonably diminishes the likelihood that a single channel (and greatly diminishes the likelihood that both channels) is (are) out-of-service for an extended period of time. Planned compensatory actions for unlikely extended out-of-service events are summarized as follows:

# Channel(s) Out-of-Service	Required Restoration Action	Compensatory Action if Required Restoration Action not completed within Specified Time
1	Restore channel to functional status within 90 days (or if channel restoration not expected within 90 days, then proceed to Compensatory Action)	Immediately initiate action in accordance with Note below
2	Initiate action within 24 hours to restore one	Immediately initiate action in accordance with

			channel to functional status and restore one channel to functional status within 72 hours	Note below
		Note: Initiate an Issue Report to enter the condition into the Corrective Action Program. Identify the equipment out of service time is greater than the specified allowed out of service time, develop and implement an alternate method of monitoring, determine the cause of the non-functionality, and the plans and schedule for restoring the instrumentation channel(s) to functional status.		

Draft Safety Evaluation Open Items		
OI#	**Description**	**Status**
1 (RAI-3, Ref. 5)	RAI Question: For RAI 2(a) above, please provide the analyses used to verify the design criteria and methodology for seismic testing of the SFP instrumentation and the electronics units, including design-basis maximum seismic loads and hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces.	Complete The following Westinghouse documents provide the analyses used to verify the design criteria and describe the methodology for seismic testing of the SFP instrumentation and electronics units, inclusive of design basis maximum seismic loads and hydrodynamic loads that could result from pool sloshing and other effects that could accompany such seismic forces: a. CN-PEUS-14-20 – Pool-side Bracket Seismic Analysis b. LTR-SEE-II-13-47, WNA-TR-03149-GEN - Sloshing Analysis c. EQ-QR-269, WNA-TR-03149-GEN, EQ-TP-353 - Seismic Qualification of other components of SFPI Dresden Station specific Calculation DRE14-0048, Seismic Qualification of the SFPLI System Components, addresses the seismic qualification of the display panel indicators. The design criteria that is used in this calculation satisfies the requirements to withstand a SSE and meets the Dresden Station safety related installation requirements for mounting the readout displays in the turbine building.
2 (RAI-4, Ref. 5)	RAI Question: For each of the mounting attachments required to attach SFP level	Complete The structural integrity and mounting of SFP level equipment is based on formal calculations, plant drawings, and approved work plans per Exelon procedures and processes. Design inputs include, but are not limited to, the following:

	equipment to plant structures, please describe the design inputs and the methodology that was used to qualify the structural integrity of the affected structures/equipment .	1. Component weights and dimensions, core hole locations and support details. 2. The capability of concrete expansion anchors. 3. The loads (dynamic and static) for the probe mounting bracket. 4. Concrete properties. 5. Seismic acceleration requirements for electrical equipment. 6. Allowable stresses for structural bolts. Methodology to qualify the safety related structural integrity includes, but is not limited to, the following: 1. Structural Weldments – Qualifying the weld design entails the selection of a weld's physical attributes, such as type, configuration and size, which will make it suitable for transferring the prescribed loads within appropriate limits. This process involves determining the maximum unit forces on the weld and comparing them with the weld capacity. The methodology determines weld design forces by assuming nominal linear stress/strain distribution. For each design, the engineer must confirm that the distribution of stiffness within the joint is consistent with this assumption. In some cases more refined techniques may be required to predict appropriate distribution of weld forces. 2. Concrete Expansions - The design methodology of concrete expansion anchor assemblies involves: 1) application of component attachment loads to the plate, 2) analysis of the assembly to determine the resultant tension and shear forces on individual anchors, 3) evaluation of the anchor forces relative to anchor allowables, and 4) computation and evaluation of bending stresses in the CEA plate. Reactions for the attached component (applied to the plate at the centroid of the attachment weld) shall be resolved into moments, shears and axial loads (about the major axes of the expansion anchor plate). 3. Local Stress Effects – The member local stresses for open sections are computed according to specific procedures for flange attachments, web attachments, attachments to flanges of beams supporting concrete, and attachments to webs of beams supporting concrete. 4. Existing Embedment Plate Evaluation - Embedment plates for mechanical/electrical component support attachments (i.e., pipe supports, conduit supports, HVAC supports, etc.) are evaluated as follows: • Determine embedment plate detail based on the component support design drawing and appropriate structural drawings. • Determine an allowable load for the embedment plate detail per plant design tables.

		• Ensure that the attachment location satisfies the location. tolerances used in determining the embedment plate allowables. • Calculate reactions at face of embedment plate. • Determine if the embedment plate can be qualified per criteria. 5. Conduit and Conduit Supports - Structural adequacy of rigid conduit is evaluated by determining the critical span condition and loads, checking conduit stresses, and verifying structural adequacy of conduit clamps. Structural adequacy of Conduit, Junction Boxes and Junction Box supports is evaluated by determining loads, calculating member forces and joint reactions, checking member stresses, checking connections, checking expansion anchor assemblies, and checking attachments to structure and resolving overstresses. 6. Cable Tray Loading Violations (CTLVs) - The structural evaluation of cable tray supports for potential increase in design basis loading are performed by identifying the hangers affected by the routing point. For each affected hanger, the controlling routing point will be determined, and the actual load associated with the routing point will be computed. Then the actual load will be compared to the load used in the hanger design. An evaluation of cable tray hanger for any increased load is performed. 7. Category I Partition Walls - When qualifying a wall for a new/revised attachment, the following method is utilized: • If the loads on the existing critical design strip are larger in magnitude than the loads on the design strip containing the new attachment, then the wall can be qualified by this comparison. • If the wall cannot be qualified by comparison of loading, moment and shear due to the attachment shall be calculated and their effects added to the critical design strip. New stresses or moment and shear will be compared to the allowable stresses/capacities. • If this results in an unacceptable overstress condition, detailed evaluation of the design strip containing the attachment is required. All existing attachments and core holes in the strip will be accounted for in this evaluation.
3 (RAI-6, Ref. 5)	<u>RAI Question</u>: For RAI #5 above, please provide the results for the selected methods, tests and analyses used to demonstrate the qualification and reliability of the installed equipment in accordance with	Complete Below is a summary of the test conditions used by Westinghouse to qualify the SFPIS. These test conditions are documented in Westinghouse documents EQ-QR-269, WNA-TR-03149-GEN, WNA-DS-02957 and LTR-SFPIS-13-35. The materials with which the probe and the anchor are manufactured are to be resistant to radiation effects. The stainless steel anchor and stainless steel probe are to be designed to withstand 40 year dose. Environmental Conditions for SFPIS Components in the Spent Fuel Pool Area: Level sensor probe, coax coupler and connector assembly, launch plate

	the Order requirements.	and pool side bracket assembly, coax cable are designed and qualified to operate reliably in the below specified environmental conditions.

Parameter	Normal	BDB
Temperature	50-140°F	212°F
Pressure	Atmospheric	Atmospheric
Humidity	0-95% RH	100% (saturated steam)
Radiation TID γ (above pool)	1E03 Rads	1E07 Rads
Radiation TID γ (12" above top of fuel rack)	1E09 Rads (TID Max Life Dose) (probe and weight only)	1E07 Rads (7 Day Dose)

Environmental Conditions Outside of the Spent Fuel Pool Area:

The level sensor transmitter and bracket, electronics display enclosure and bracket are to be designed and qualified to operate reliably in the below specified environmental conditions.

Parameter	Normal	BDB	BDB (Level Sensor Electronics Only)
Temperature	50-120°F	140°F	140°F
Pressure	Atmospheric	Atmospheric	Atmospheric
Humidity	0-95% RH	0-95% (non-condensing)	0-95% (non-condensing)
Duration	3 days	3 days	3 days
Radiation TID γ	≤ 1E03 R γ	≤ 1E03 R	≤ 1E03 R

Dresden specific Calculation DRE14-0048, Seismic Qualification of the

		SFPLI System Components, supports the seismic installation and environmental analysis of the display enclosures and transmitters. Thermal and Radiation Aging – organic components in SFP area: Westinghouse documents EQ-QR-269, EQ-TP-354, WNA-TR-03149-GEN provide thermal and radiation aging program details for the SFPI components. Westinghouse completed their thermal and radiation aging testing programs to qualify the SFPI components to 1.25 years. Exelon has reviewed the documents and found them acceptable. Additionally, Westinghouse has completed their aging tests to age the system components to 10 years. The tests were completed satisfactorily and the final test reports were reviewed and found acceptable by Exelon. Seismic Category I Testing: Seismic qualification testing performed by Westinghouse along with the technical evaluations performed by Westinghouse confirms that the SFPIS meets the seismic requirements of the vendor's design specification. Westinghouse's design specification satisfies the Dresden Station installation requirements to withstand a SSE. Vibration Justification: Components of the system (i.e., bracket, transmitter , display enclosure) will be permanently installed to meet the requirements to withstand a SSE and will meet the Dresden Station seismic installation requirements. Westinghouse has analyzed the pool side bracket to withstand design basis SSE. Other components of the SFPIS were subjected to shock and vibration during the seismic testing and met the requirements necessary for mounted equipment. Sloshing Justification: The sloshing calculation performed by Westinghouse was reviewed for a design basis seismic event and found acceptable. Sloshing forces were taken into consideration for the anchorage design of the pool side bracket to ensure the bracket is rigidly mounted to include sloshing affects.
4 (RAI-8, Ref. 5)	<u>RAI Question</u>: Please provide the following: a) A description of the electrical ac power sources and capabilities for the primary and backup	Complete a) The primary and backup SFPLI instrument channels will be normally powered from 120VAC. Upon loss of normal AC power, individual batteries installed in each channel's electronics / UPS enclosure will automatically maintain continuous channel operation for at least 3 days. The power cables will be routed so that spatial and physical separation is maintained between the primary and backup channels. Additionally, a receptacle and a selector switch

	channels. b) Please provide the results of the calculation depicting the battery backup duty cycle requirements demonstrating that its capacity is sufficient to maintain the level indication function until offsite resource availability is reasonably assured.	are installed in each channel electronics / UPS enclosure to directly connect emergency power to the SFPLI. b) The Westinghouse Report, WNA-CN-00300-GEN, provides the results of the calculation depicting the battery backup duty cycle. This calculation demonstrates that battery capacity is 4.22 days to maintain the level indicating function to the display location, located in the Turbine Building. The calculation also determines that the battery will last for 72 hours. The Dresden Station readout display of level indication in the Turbine Building will be available for 72 hours of operation. Therefore, the results of the calculation meet the NEI 12-02 requirements.
5 (RAI-11, Ref. 5)	RAI Question: Please provide the following: a) The specific location for each of the primary and backup instrument channel displays. b) If a display will be located somewhere other than the control room or alternate shutdown panel, please describe the evaluation used to validate that the display location can be accessed without unreasonable delay following a BDB event. Include the time available for personnel to access the display as credited in the evaluation, as well as the actual time (e.g., based on walk-throughs) that it will take for personnel to access the display. Additionally, please include a	Complete a) The Dresden Station primary and backup instrument channel displays will be located on the Main Floor of the Turbine Building along the Reactor Building wall. b) The Dresden Station primary and backup instrument channel displays are located outside of the control room. As described above, they are located in the Turbine Building. This location was selected due to the display location proximity to the main control room. Dresden Station UFSAR Section 3.8.4 states that the Turbine Building portion of the structural complex is a Class II structure as explained in Section 3.8.5. Section 3.8.5 states that Class II structures supporting Class I structures, systems and components were designed to Class II requirements and have been investigated to assure that the integrity of the Class I items is not compromised. The instrument channel display location has been investigated to assure that the integrity of the display items is not compromised. Both primary and backup instrument channel display locations are selected to reduce the likelihood of missile damage to the displays. Dresden Station UFSAR Figure 3.11-4 shows the Main Floor of the Turbine Building as zone 38 and would include the display location and the access to the displays from the Control Room. UFSAR Table 3.11-2 shows zone 38 with a normal maximum temperature of 120°F which would allow emergency responders to perform level display monitoring. Travel time from the Control Room to the primary and secondary display is approximately 5 minutes based on walkdowns. There are alternate paths if the primary path is blocked or is not habitable. The maximum time to reach the display locations via the alternate paths is 8 minutes. Radiological habitability at the display location and the path to the display location was evaluated against estimated dose rates from SFP draindown conditions to Level 3, and exposure to personnel monitoring SFP levels are expected to remain less than emergency exposure limits allowable for emergency responders to perform this action. Also, for severe accidents scenarios involving core damage and increased radiological exposure levels, access to these SFP level displays for

	description of the radiological and environmental conditions on the paths personnel might take. Describe whether the display location remains habitable for radiological, heat and humidity, and other environmental conditions following a BDB event. Describe whether personnel are continuously stationed at the display or monitor the display periodically.	short term can be achieved (see UFSAR Appendix 12A). Exposure duration to personnel monitoring SFP levels would be limited to remain less than emergency exposure limits allowable for emergency responders to perform this action. The SFP electronics and displays are not expected to accumulate radiation dose higher than the qualified TID 1.0E03 rads. This is because the location is outside secondary containment and not near any piping systems that could contain fission products (see UFSAR Appendix 12A). Heat and humidity from SFP boildown conditions was evaluated for this location. The location is at an elevation below the SFP operating floor and physically separated by secondary containment such that heat and humidity from a boiling SFP is not expected to compromise habitability at this location and the path to the display locations.
6 (RAI-12, Ref. 5)	RAI Question: Please provide a list of the procedures addressing operation (both normal and abnormal response), calibration, test, maintenance, and inspection procedures that will be developed for use of the spent SFP instrumentation. Please provide a brief description of the specific technical objectives to be achieved within each procedure.	Complete Appropriate quality measures will be selected for the SFPIS required by Order EA-12-051, consistent with Appendix A of NEI 12-02. Site procedures are being developed for system inspection, calibration and test, maintenance, repair, operation and normal and abnormal responses, in accordance with Exelon's procedure control process. Technical objectives to be achieved in each of the respective procedures are described below: Procedure Objectives to be achieved: 1. System Inspection: To verify that system components are in place, complete, and in the correct configuration, and that the sensor probe is free of significant deposits. 2. Calibration and Test: To verify that the system is within the specified accuracy, is functioning as designed, and is appropriately indicating SFP water level. 3. Maintenance: To establish and define scheduled and preventive maintenance requirements and activities necessary to minimize the possibility of system interruption. 4. Operation: to provide sufficient instructions for operation and use of the system by plant operation staff. 5. Responses: To define the actions to be taken upon observation of system level indications, including actions to be taken at the levels defined in NEI 12-02.

Note: RAIs not included in the Interim Staff Evaluation Open Items Table are duplicate to the RAIs in Reference 3 and are listed in the Overall Integrated Plan Open Item Table.

7 Potential Draft Safety Evaluation Impacts

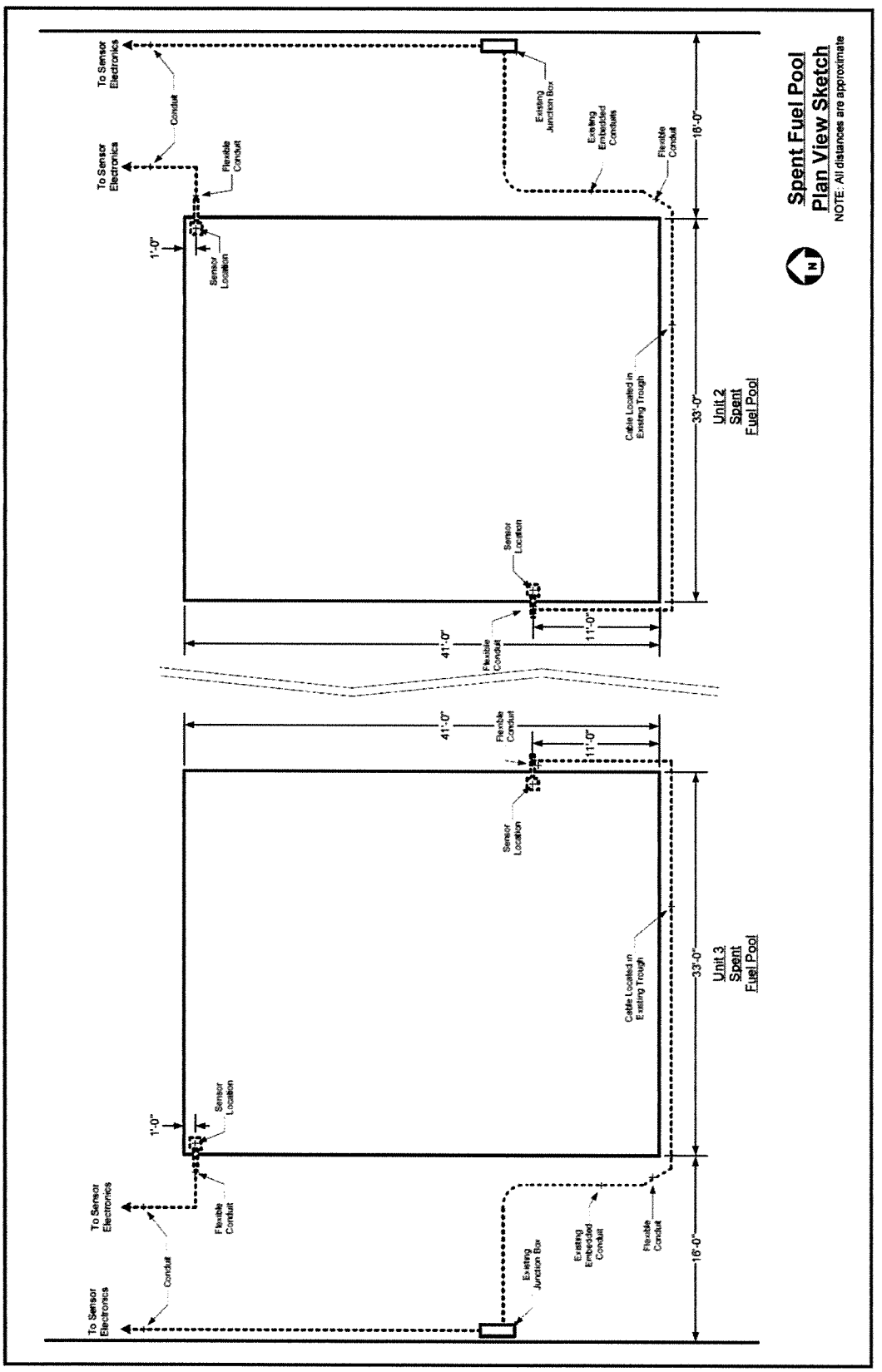
There are no potential impacts to the Draft Safety Evaluation identified at this time.

8 References

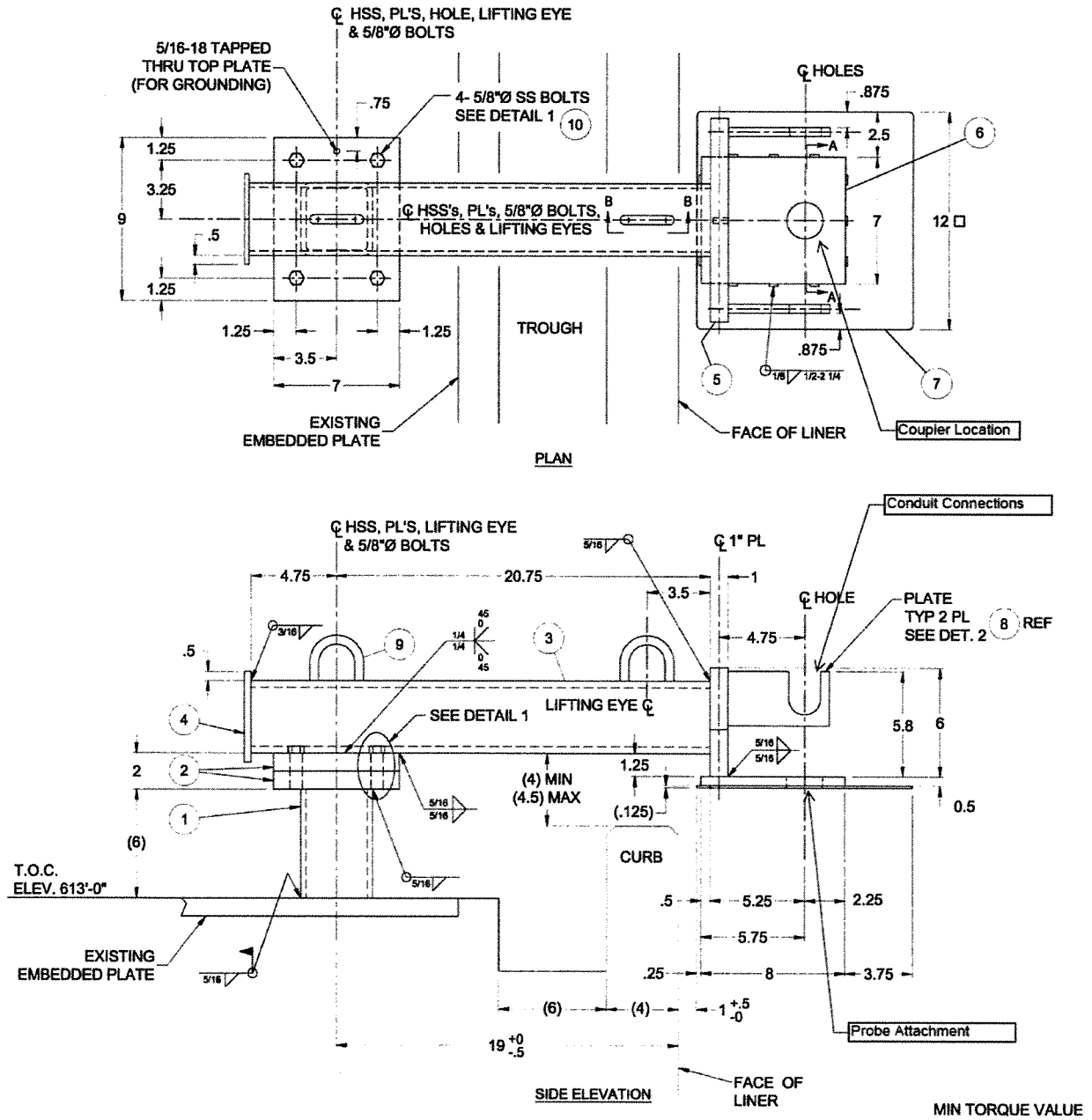
The following references support the updates to the Overall Integrated Plan described in this enclosure.

1. Exelon Generation Company, LLC, letter to USNRC, "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-13-030)
2. NRC Order Number EA-12-051, "Issuance of Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," dated March 12, 2012.
3. USNRC letter to Exelon Generation Company, LLC, "Request for Additional Information Regarding Overall Integrated Plan for Reliable Spent Fuel Pool Instrumentation", dated June 26, 2013.
4. Exelon Generation Company, LLC, letter to USNRC, "Response to Request for Additional Information – Overall Integrated Plan in Response to Commission Order Modifying License Requirements for Reliable Spent Fuel Pool Instrumentation (Order No. EA-12-051)", dated July 18, 2013 (RS-13-176).
5. USNRC letter to Exelon Generation Company, LLC, "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", dated October 29, 2013.
6. First Six-Month Status Report for the Implementation of Order EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, dated August 28, 2013 (RS-13-118).
7. Second Six-Month Status Report for the Implementation of Order EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, dated February 28, 2014 (RS-14-020).
8. Third Six-Month Status Report for the Implementation of Order EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, dated August 28, 2014 (RS-14-198).
9. Fourth Six-Month Status Report for the Implementation of Order EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, dated February 27, 2015 (RS-15-028).

Attachment 1: Plan View of Spent Fuel Pool Area



Attachment 2: Mechanical Mounting and Electrical Connections Sketch (Welded Base)



Attachment 3: Mechanical Mounting and Electrical Connections Sketch (Anchored)