Exelon Generation®

Order No. EA-12-051

RS-15-204

August 28, 2015

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

Peach Bottom Atomic Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

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-13-034)
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-13-126)
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-14-024)
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-14-202)

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-15-032)
10. NRC letter to Exelon Generation Company, LLC, Peach Bottom Atomic 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. MF0849 and MF0850), dated October 30, 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 Peach Bottom Atomic 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 Peach Bottom Atomic 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,

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

Enclosure:

1. Peach Bottom Atomic 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 I
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NRC Project Manager, NRR – Peach Bottom Atomic Power Station, Units 2 and 3
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Enclosure

Peach Bottom Atomic 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

(29 pages)

Enclosure

Peach Bottom Atomic 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

Peach Bottom Atomic Power Station, Units 2 and 3, developed an Overall Integrated Plan (Reference 1 in Section 8), documenting the requirements to install reliable Spent Fuel Pool Level Instrumentation (SFPLI), 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.

- Completion and issuance of the SFPI modification package for Unit 3.
- Completion and issuance of the SFPI modification package for Unit 2.

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.

The revised milestone target completion dates do not impact the order implementation date.

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 19, 2013	Complete	
Submit 6 Month Updates:			
Update 1	August 28, 2013	Complete	

Update 2	February 28, 2014	Complete	
Update 3	August 28, 2014	Complete	
Provide Final Safety Evaluation (SE) Info	September 30, 2014	Complete	
Update 4	February 27, 2015	Complete	
Update 5	August 28, 2015	Complete with this submittal	
Update 6	February 28, 2016	Not Started	
Modifications:			
Conceptual Design	3Q2012	Complete	
Issue Exelon Fleet contract to procure SFPI Equipment	2Q2013	Complete	
Begin Detailed Engineering Design for Unit 3 and Unit 2	4Q2013	Complete	
Complete and Issue SFPI Modification Package for Unit 3	1Q2015	Complete	
Complete and Issue SFPI Modification Package for Unit 2	1Q2015	Complete	
Begin SFPI Installation for Unit 3	2Q2015	Complete	
Complete SFPI Installation for Unit 3 and Put Into Service	P3R20 (Fall 2015)	Started	
Begin SFPI Installation for Unit 2	2Q2016	Complete	
Complete SFPI Installation for Unit 2 and Put Into Service	P2R21 (Fall 2016)	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

Peach Bottom Atomic 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 (Ref.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. 4)	RAI Question: **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 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 racks. 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.**	Complete. (Addressed in Reference 4)

3 (RAI-2, Ref.4)	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 backup 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. Please see Attachment 1 for a sketch which shows the probe locations and drawing markups from the design package which have clouded areas that show the cable/conduit routing on the refuel floor. As shown on Peach Bottom Atomic Power Station drawing S-226, sheet 1, each pool is 35' – 4" in the north-south direction and 40' – 0" in the east-west direction. The sensors are diagonally opposed (north and south) on opposite sides of the pool, which is a distance that is greater than the shortest dimension of the pool.
4 (RAI-3, Ref.4)	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 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**	Complete. a) All SFPIS equipment is designed in accordance with the Peach Bottom Atomic Power Station Safe Shutdown Earthquake (SSE) design requirements. The vendor, Westinghouse, evaluated the structural integrity of the mounting brackets in a calculation. The GTSTRUDL model, used 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 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 are obtained from Peach Bottom Atomic Power Station's UFSAR, Appendix C, Section 2.6, including dead, live,

	support the level sensor assembly.	and earthquake loads. This section has been transmitted to the vendor, Westinghouse, for input to their design analysis. 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 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 are obtained by

		analysis. The TID-7024, Nuclear Reactors and Earthquakes, 1963, by the US Atomic Energy Commission, approach was used to estimate the wave height and natural frequency. Horizontal and vertical impact force on the bracket components were calculated using the wave height and natural frequency obtained using the TID-7024 approach. Using this methodology, sloshing forces were calculated and added to the total reactionary forces that are applicable for bracket anchorage design. The analysis also confirmed that the level probe can withstand a credible 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. PS-1115, Seismic Analysis of the SFP Primary Mounting Bracket Units 2 & 3 b. PS-1116, Seismic Analysis of the SFP Backup Mounting Bracket Units 2 & 3 c. LTR-SEE-II-13-47, WNA-TR-03149-GEN - Sloshing Analysis d. EQ-QR-269, WNA-TR-03149-GEN, EQ-TP-353 - Seismic Qualification of other components of SFPI Peach Bottom Atomic Power Station Calculation PS-1123 addresses the seismic qualification of the readout

		display in the Radwaste Building. The design criteria in this calculation 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, is suspended from the launch plate via a coupler/connector assembly. The launch plate is a subcomponent of the bracket assembly, which is mounted to the refuel floor via anchors. c) The bracket assembly that supports the sensor probe and launch plate is mounted to the refuel floor and spans over the SFP without touching permanent SFP structures. The refuel floor mounting consists of four concrete expansion anchors that bolt the bracket assembly to the refuel floor via the base plate. The concrete expansion anchors and welds are designed to withstand SSE and meet the Peach Bottom Atomic Power Station augmented installation requirements. The qualification details of the bracket are provided in pool-side bracket Seismic Analyses PS-1115 and PS-1116. The qualification of the anchorage to the floor is provided in a Peach Bottom Atomic Power Station specific computation – Reactor Building (RB) Primary and Backup Spent Fuel Pool Instrumentation System (SFPIS) Baseplate and Anchorage

		Evaluation Units 2 and 3 which is Attachment 24 of the ECR 13-00508.
5 (RAI-4, Ref.4)	RAI Question: **Please provide the following:** **a) A description of the specific method or combination of methods that will be applied to demonstrate the reliability of the permanently installed equipment under beyond-design-basis (BDB) 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 (i) the level sensor mounted in the SFP area, and (ii) 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.**	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 were subjected to beyond design basis conditions of heat and humidity, thermal and radiation aging mechanisms. This testing confirmed the 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. Mild Environment – Westinghouse qualified the components (display panel, transmitter) of the SPFIS located in the Radwaste Building Fan Room to the mild environment to determine that the components can satisfactorily perform to those conditions. Westinghouse confirmed that aging does not have a significant effect on the ability of the equipment to perform following a plant design basis earthquake. 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. For temperature and humidity qualification of the displays IEEE 344-2004, IEEE 323-2003, NRC

		Regulatory Guides 1.100, Revision 3; 1.209, March 2007; and EPRI TR-107330 guidance were followed. The readout display is located in the Radwaste Building and is not expected to be subject to the 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 the NRC Order EA-12-051, the 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 are 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, were 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 are mounted to a seismically qualified wall and contain the active electronics, and aid in protecting the internal components from vibration induced damage.

		b) The seismic adequacy of the SFPIS (all components) were 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 • Peach Bottom Calculation PS-1123 - Seismic Qualification of the Spent Fuel Pool Level Instrumentation System Equipment 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 seismically qualified the SFPI instrument and its components. With the instrument seismically qualified and installed as described in RAI-5b response, including the readout display in the Radwaste Building, the instrument is assured to maintain reliable and accurate indication when

		required.
6 (RAI-5, Ref.4)	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 on how each level measurement system, consisting of level sensor electronics, cabling, and readout devices will be designed and installed to address independence through the application and selection of independent power sources, the use of 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 are installed such that: a) The level probes are mounted diagonally opposed on opposite sides (north and south) of the SFP and are 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 signal cables from the level probes maintain physical separation for the routing on the refuel floor. After they penetrate the refuel floor their proximity increases as they are routed to the level transmitters located in the Radwaste Building Fan Room. Maintaining separation in this area is not necessary as it is in the Reactor Building; also the signal cables are in separate conduits for the entire route. The Unit 2 level transmitters and electronics enclosures are located in the south end of the Radwaste Building Fan Room, while the Unit 3 level transmitters and electronics enclosures are located in the north end of the Radwaste Building Fan Room. The Radwaste Building Fan Room is a location readily accessible by operators during a postulated BDBEE. The primary channels of both Unit 2 and Unit 3 receive power from 120VAC power distribution panel 20Y035. The backup channels of both Unit 2 and Unit 3 receive power from 120VAC power distribution panel 30Y035. Both power sources, 20Y035 and 30Y035, are fed from safety-related Division 1 MCCs. Furthermore, both of the MCCs that feed the power sources are backed up by a power supply which is part

		of the station FLEX strategy. Each of the four power feeds is routed in its' own conduit.
7 (RAI-6, Ref.4)	RAI Question: **Please provide the following:** **a) A description of the electrical alternating current power sources and capacities for the primary and backup channels.** **b) If the level measurement channels are to be powered through a battery system (either directly or through an Uninterruptible Power Supply (UPS)), 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 BDB event for the minimum duration needed, consistent with the plant mitigation strategies for BDB external events (Order EA-12-049).**	Replaced by Interim SE RAI #9.
8 (RAI-7, Ref.4)	RAI Question: **Please provide the following:** **a) An estimate of the expected instrument channel accuracy performance under both (i) normal SFP level conditions (approximately Level 1 or higher) and (ii) at the BDB 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.** **b) A description of the methodology that will be used for determining the maximum allowed deviation from the instrument channel design accuracy**	Complete. (Addressed in Reference 8)

	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.	
9 (RAI-8, Ref.4)	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 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.** **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. 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. Peach Bottom Atomic Power Station in-situ test methodology is based on the Westinghouse Two Point Verification Method, LTR-SFPIS-14-55. b) The level displayed by the channels will be verified per the Peach Bottom Atomic Power Station 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. c) Functional checks will be performed per Westinghouse functionality test procedure WNA-TP-04613-GEN at the Westinghouse recommended frequency. Calibration tests will be performed per Westinghouse calibration procedure WNA-TP-04709-GEN at the Westinghouse recommended frequency. In accordance with Peach Bottom Atomic Power Station maintenance and operating programs, Peach Bottom Atomic Power Station will develop by

		September 30, 2015, calibration, functional test, and channel verification procedures per Westinghouse recommendations to ensure reliable, accurate and continuous SFPI functionality. d) By September 30, 2015, Peach Bottom Atomic Power 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.4)	RAI Question: **Please provide the following:** **a) The specific location for the primary and backup instrument channel displays.** **b) If the primary and backup displays are not located in the main control room, please provide a description of the selected location(s) for the primary and backup displays, including prompt accessibility to displays, 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 will enable the information from these instruments to be considered "promptly accessible" to various drain-down scenarios and external events.**	Replaced by Interim SE RAI #12.

11 (RAI-10, Ref.4)	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 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.**	Replaced by Interim SE RAI #13.
12 (RAI-11, Ref.4)	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 verified by inspection and audit to demonstrate conformance with design and system readiness requirements. Please 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.** **b) A description of how the guidance in NEI12-02, Section 4.3 regarding compensatory actions for one or both non-functioning channels will**	Complete. (Addressed in Reference 9)

	be addressed. **c) 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.**	

Draft Safety Evaluation Open Items

OI#	Description	Status
1 (RAI-1, Ref. 5)	RAI Question: **Please specify which of the three elevations provided is the correct elevation for Level 1.**	Complete. (Addressed in Reference 7)
2 (RAI-4, Ref. 5)	RAI Question: **For RAI 3(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 the 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) PS-1115, Seismic Analysis of the SFP Primary Mounting Bracket Units 2 & 3 b) PS-1116, Seismic Analysis of the SFP Backup Mounting Bracket Units 2 & 3 c) LTR-SEE-II-13-47, WNA-TR-03149-GEN - Sloshing Analysis, d) EQ-QR-269, WNA-TR-03149-GEN, EQ-TP-353 - Seismic Qualification of other components of SFPI Peach Bottom Atomic Power Station Calculation PS-1123, Seismic Qualification of the Spent Fuel Pool Level Instrumentation System Equipment, addresses the seismic qualification of the indicators located in the Radwaste Building. The design criteria used in this calculation satisfies the requirements to withstand a SSE and meets the Peach Bottom Atomic Power Station safety related installation requirements

		for mounting the readout displays in the Radwaste Building.
3 (RAI-5, Ref. 5)	RAI Question: **For each of the mounting attachments required to attach SFP level 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.**	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: 1. Component weights and dimensions, anchor 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. 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, 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, checking attachments to structure and resolving overstresses.
4 (RAI-7, Ref. 5)	RAI Question: **For RAI 6 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 the Order requirements.**	Complete. Some RAI's have been renumbered. This question refers to RAI-4, Reference 4. Below is a summary of the test conditions used by Westinghouse to qualify the SFPIS. These test conditions are also documented in Attachment 2 items 3, 4, 5, 6, 7, and 8. Environmental Conditions for SFPIS Components installed in the Spent Fuel Pool Area at Peach Bottom Atomic Power Station are bounded by below test conditions, except for radiation TID 12" above top of fuel rack for beyond design basis conditions (BDB). The BDB radiation TID, 12" above top of fuel rack for Peach Bottom is 3.E07 R γ, per calculation PM-1176 – NEI 12-02 Spent Fuel Pool Doses. The BDB radiation value to which the Westinghouse equipment is qualified to is 1.E07 R γ, per Section 5.1.1 of WNA-TR-03149-GEN. The radiation value of 3.E07 R γ is higher than 1.E07 R γ to which Westinghouse qualified the instrument. However, this value of 3.E07 R γ is applicable only when the water is at Level 3. At Level 2 the TID reduces to 2.E07 R γ and it further reduces to 7.E06 at Level 1 and above. With SFP water level at Level 3 the only components of SFPI that are exposed to high

radiation are the stainless steel probe and the stainless steel anchor. The materials with which the probe and the anchor are manufactured are resistant to radiation effects. The stainless steel anchor and stainless steel probe can withstand 40 year dose. Westinghouse updated the design specification (WNA-DS-02957-GEN) and LTR-SFPIS-13-35, Revision 1 documentation to include the above technical justification.

Environmental Conditions for SFPIS Components in the Spent Fuel Pool Area

Level sensor probe, coax coupler and connector assembly, launch plate and pool side bracket assembly, coax cable are designed and qualified to operate reliably in the below specified environmental conditions.

Parameter	Normal	BDB
Temperature	65 – 109.7 °F	212 °F
Pressure	-0.25 "wc	Atmospheric
Humidity	10-90% 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 designed and qualified to operate reliably in the below specified environmental conditions.

Parameter	Normal	BDB	BDB (Level Sensor Electronics

				Only)
		Temperature	65 – 107.1 °F	65 – 107.1 °F	65 – 107.1 °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

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 for Byron's configuration and the final test reports were reviewed and found acceptable by Exelon for Peach Bottom.

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 document WNA-DS-02957-GEN. Westinghouse's design specification satisfies the Peach Bottom Atomic Power Station installation requirements to withstand a SSE.

Vibration Justification

As specified in RAI-5, components of the system (i.e., bracket, transmitter, display enclosure) are permanently installed to meet the requirements to withstand a SSE and meet the Peach

		Bottom Atomic Power Station safety related 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 in document LTR-SEE-II-13-47 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.
5 (RAI-9, Ref. 5)	RAI Question: **Please provide the following:** **a) A description of the electrical ac power sources and capacities for the primary and backup 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.**	Complete. (Addressed in Reference 9)
6 (RAI-12, Ref. 5)	RAI Question: **Please provide the following:** **a) The specific location for the primary and**	Complete. (Addressed in Reference 8)

	backup instrument channel display. b) For any SFP level instrumentation displays located outside the main control room, 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-through) that it will take for personnel to access the display. Additionally, please include a 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.	
7 (RAI-13, 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 SFP instrumentation. The licensee is requested to include a brief description of the specific technical objectives to be achieved within each procedure.**	Started. Site procedures will be developed for system inspection, calibration and test, maintenance, 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 visible portions of system components are in place, complete, and in the correct configuration. 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. Procedure development will be completed by September 30, 2015.

7 Potential Draft Safety Evaluation Impacts

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

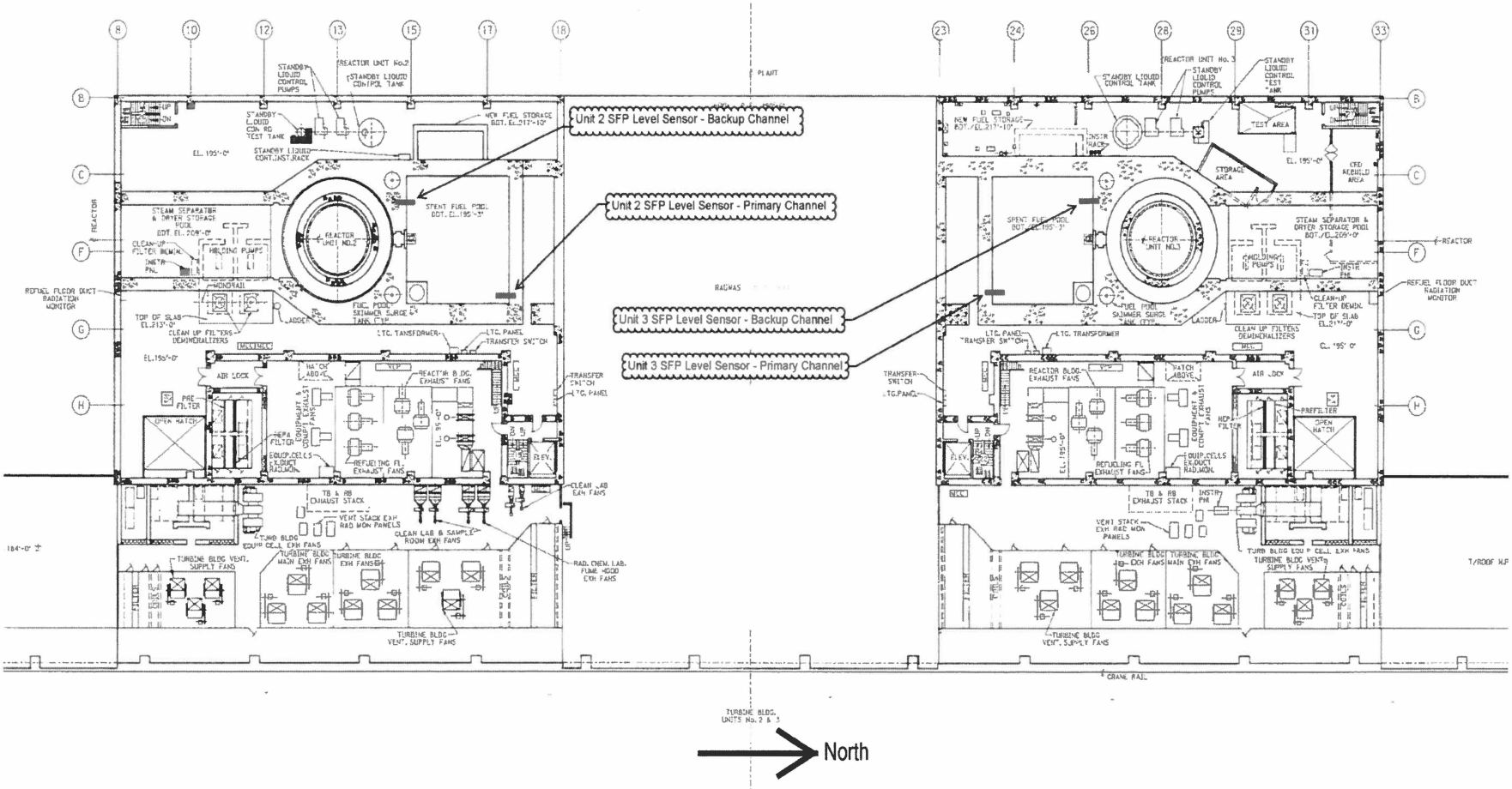
8 References

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 Requirements for Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)," dated February 28, 2013 (RS-13- 034)
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 24, 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 19, 2013 (RS-13-178)
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 30, 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-13-126).
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-14-024).
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-14-202).
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-15-032).

ATTACHMENT 1

SFP Level Sensor Locations and Conduit Routing



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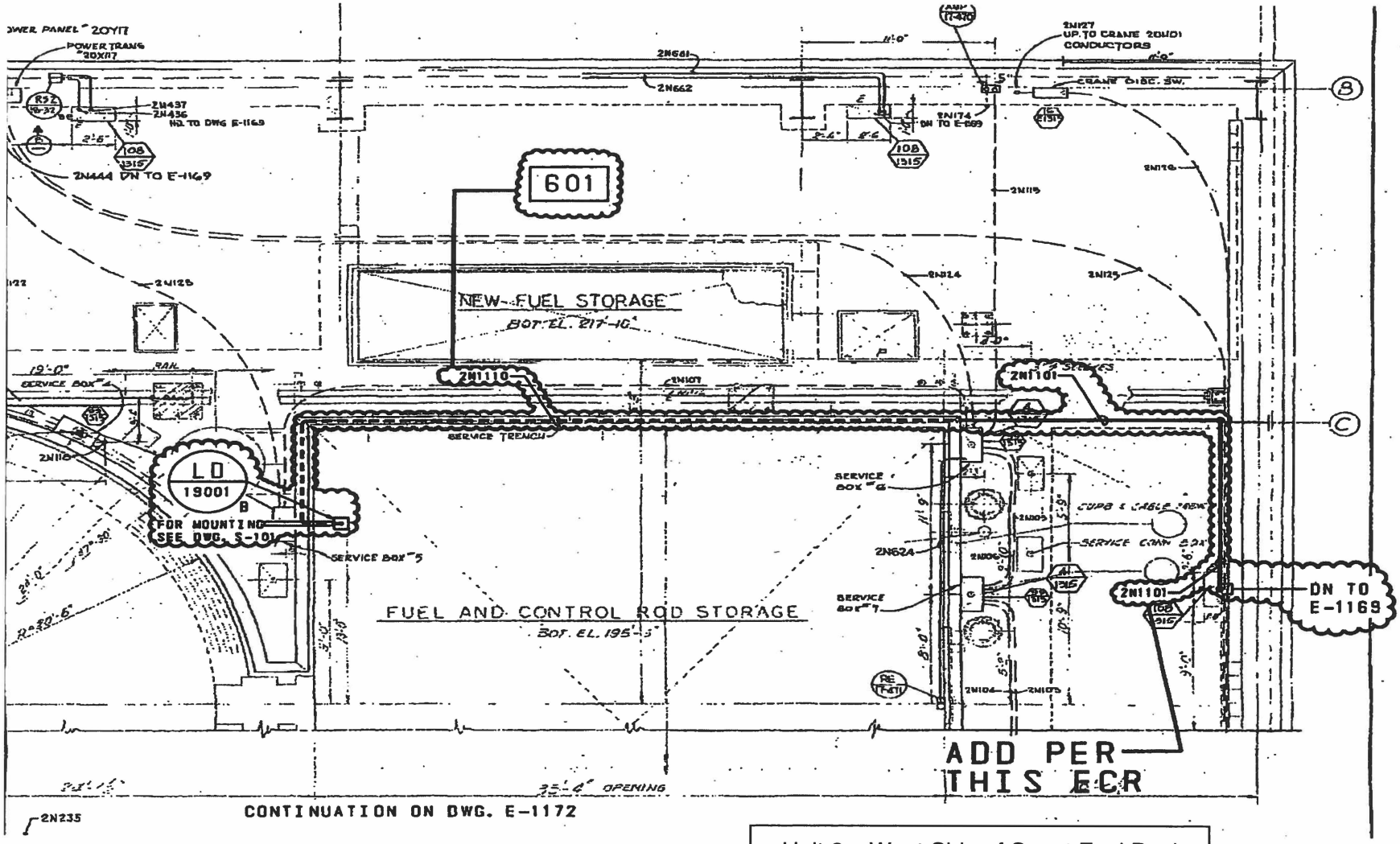
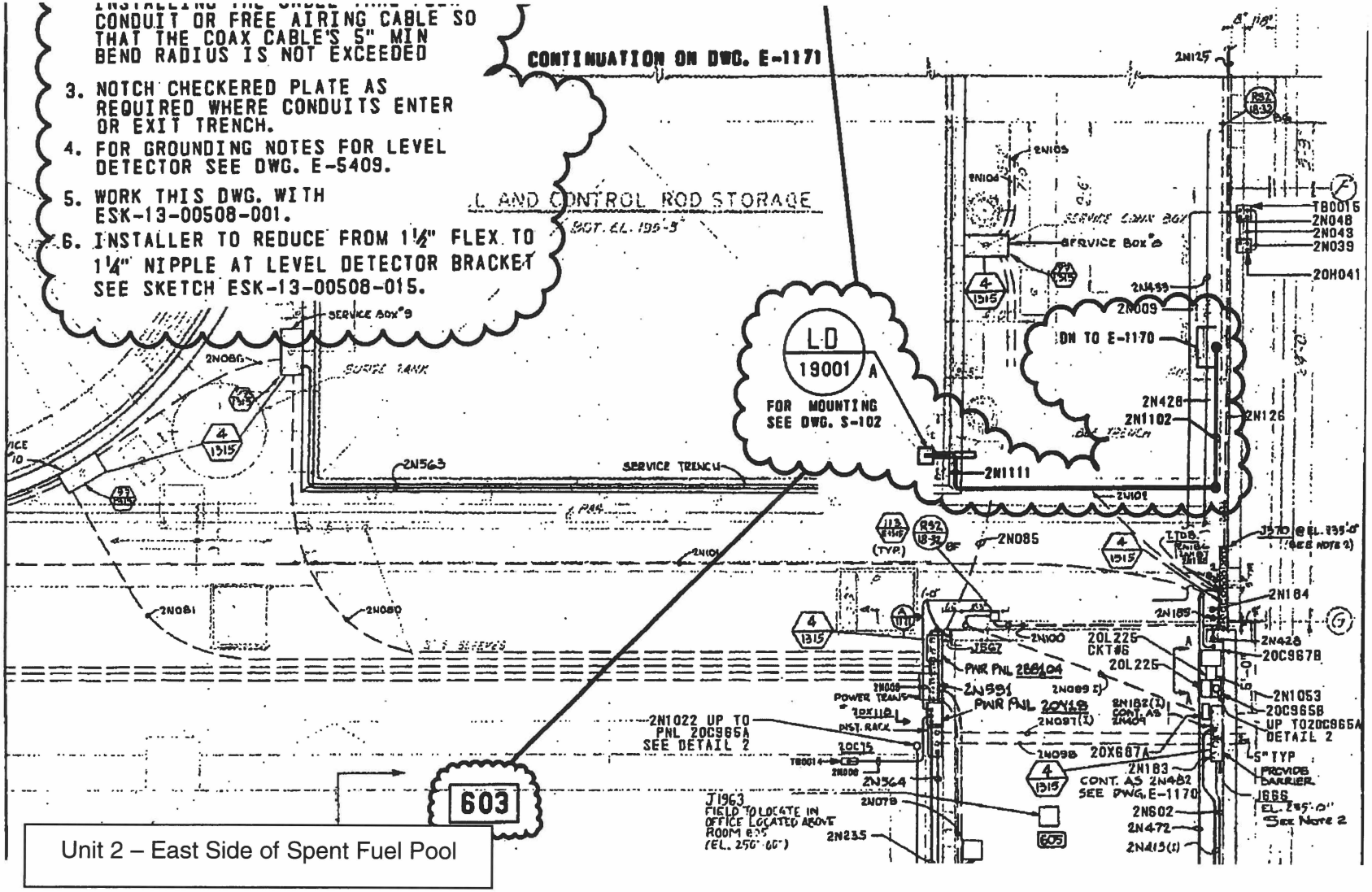


Unit 2 – West Side of Spent Fuel Pool

ATTACHMENT 1

SFP Level Sensor Locations and Conduit Routing



ATTACHMENT 1

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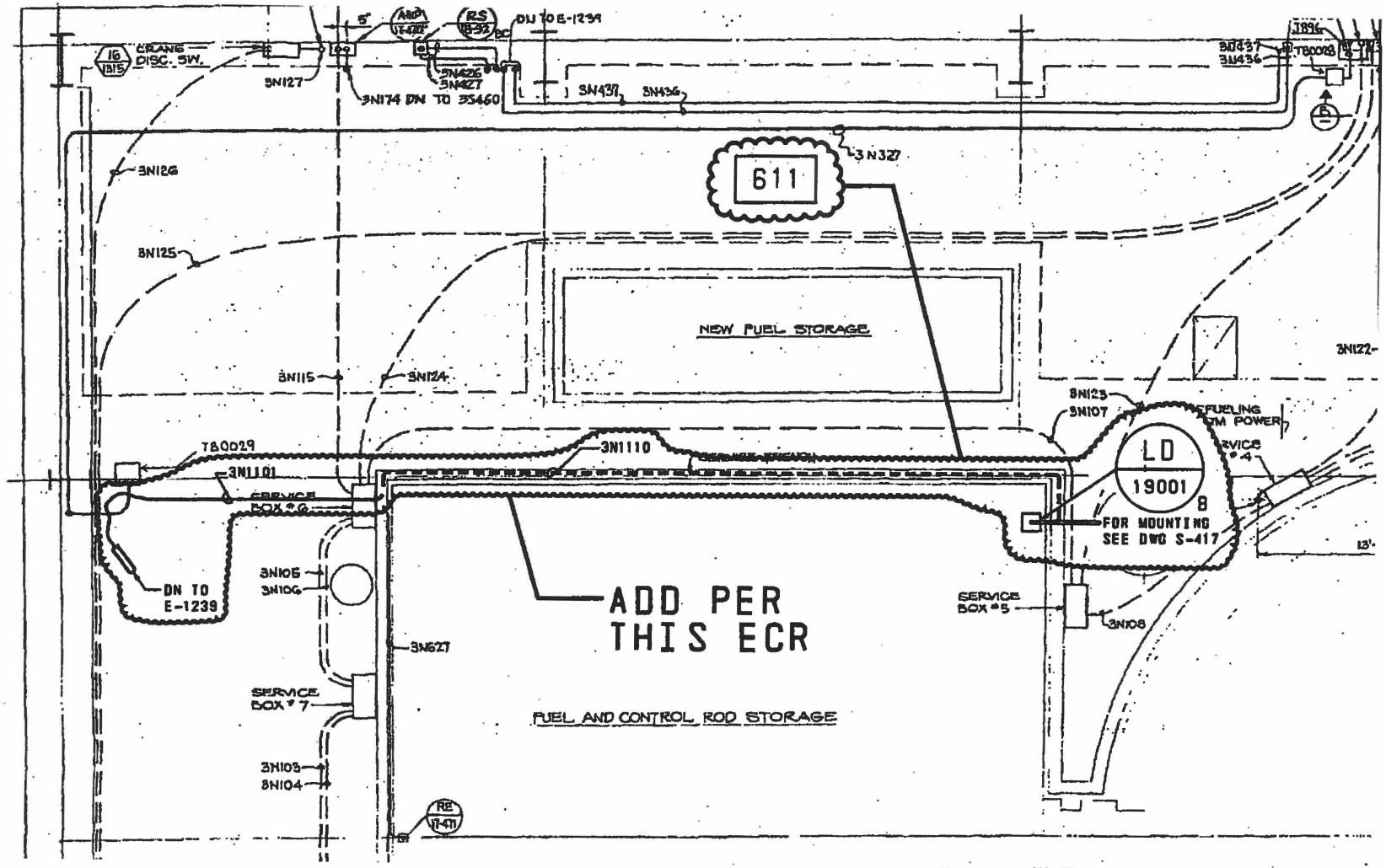
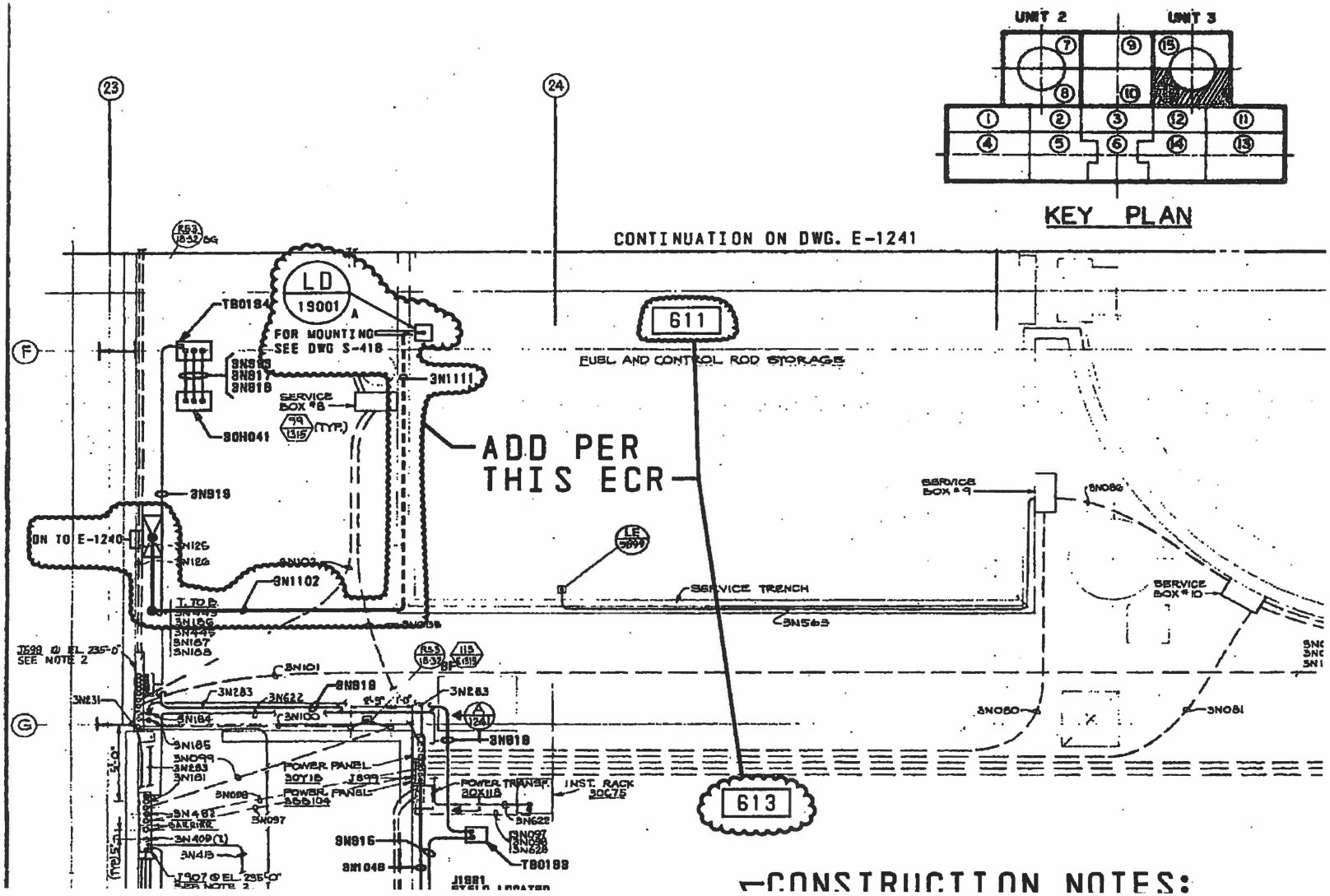


Unit 3 – West Side of Spent Fuel Pool

SFP Level Sensor Locations and Conduit Routing



Unit 3 – East Side of Spent Fuel Pool