



Order No. EA-12-051

RS-14-197

August 28, 2014

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

Clinton Power Station, Unit 1  
Facility Operating License No. NPF-62  
NRC Docket No. 50-461

Subject: 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)

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-13-029)
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-13-116)
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-14-019)
8. NRC letter to Exelon Generation Company, LLC, Clinton Power Station, Unit 1 – Interim Staff Evaluation and Request for Additional Information Regarding the Overall Integrated Plan for Implementation of Order EA-12-051, Reliable Spent Fuel Pool Instrumentation (TAC No. MF0791), dated November 15, 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.

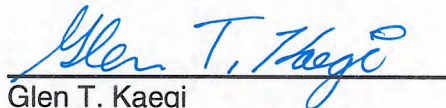
Reference 1 required submission of an initial status report 60 days following issuance of the final interim staff guidance (Reference 2) and an overall integrated plan pursuant to Section IV, Condition C. Reference 2 endorses industry guidance document NEI 12-02, Revision 1 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided the EGC initial status report regarding reliable spent fuel pool instrumentation. Reference 5 provided the Clinton Power Station, Unit 1 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 and 7 provided the first and second six-month status reports, respectively, pursuant to Section IV, Condition C.2, of Reference 1 for Clinton Power Station. The purpose of this letter is to provide the third 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 8.

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 28<sup>th</sup> day of August 2014.

Respectfully submitted,



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

Enclosure:

1. Clinton Power Station, Unit 1 Third 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 – Clinton Power Station, Unit 1  
NRC Project Manager, NRR – Clinton Power Station, Unit 1  
Ms. Jessica A. Kratchman, NRR/JLD/PMB, NRC  
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Illinois Emergency Management Agency - Division of Nuclear Safety

**Enclosure**

**Clinton Power Station, Unit 1**

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

(30 pages)

## Clinton Power Station, Unit 1

### Third 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

Clinton Power Station, Unit 1, (CPS) 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 Second 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 Second Six-Month status report (Reference 7), and are current as of August 28, 2014.

- Provided responses to all RAIs via ePortal on 6/20/14
- Commenced procurement of equipment
- SFPI Modification is 50% prepared

#### 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 Responses to RAIs	July 5, 2013	Complete	
<b>Submit 6 Month Updates:</b>			
Update 1	August 28, 2013	Complete	
Update 2	February 28, 2014	Complete	
Update 3	August 28, 2014	Complete with	

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Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
		this submittal	
Provide Final Safety Evaluation (SE) Info	September 30, 2014	Complete	
<b>Modifications:</b>			
Conceptual Design	3Q2012	Complete	
Issue Exelon Fleet contract to procure SFPI Equipment	2Q2013	Complete	
Begin Detailed Engineering Design	4Q2013	Complete	
Complete and Issue SFPI Modification Package	3Q2014	Started	
Begin Installation	4Q2014	Not Started	
Complete SFPI Installation and Put Into Service	2Q2015	Not 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**

CPS 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

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<p>1 (Ref. 1)</p>	<p><u>Open Item:</u> <b>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.</b></p>	<p><u>Complete.</u> (Addressed in Reference 1)</p>
<p>1 (RAI -1, Ref. 4)</p>	<p><u>RAI Question:</u> <b>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>  <b>b) A clearly labeled sketch depicting the elevation view of the proposed typical mounting arrangement</b></p>	<p><u>Complete</u> (Addressed in Reference 4)</p>

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	<p>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.</p>	
<p>2 (RAI -2,</p>	<p><u>RAI Question:</u> Please provide a clearly</p>	<p><u>Complete</u> Provided in the attached preliminary sketch "NRC RAI Question 1". NOTE: The method of grounding the bracket assembly may deviate</p>



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<p>Ref. 4)</p>	<p><b>labeled sketch or marked-up plant drawing of the plan view of the SFP area, depicting the SFP inside dimensions, the planned locations/place ment 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.</b></p>	<p>from this sketch when further installation/design details are developed.</p>
<p>3 (RAI -3, Ref. 4)</p>	<p><b>RAI Question:</b> <b>Please provide the following:</b> <b>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</b></p>	<p><b><u>Started</u></b></p> <p>a) All Spent Fuel pool Instrumentation (SFPI) equipment will be designed in accordance with the Clinton Power Station (CPS) Safe Shutdown Earthquake (SSE) design requirements.</p> <p>The vendor, Westinghouse, is currently evaluating the structural integrity of the mounting brackets in calculation CN-PEUS-14-13. The GTSTRUDL model will be used by Westinghouse to calculate the stresses in the bracket assembly. This 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).</p> <p>Seismic</p> <p>The seismic loads are obtained from the Clinton Power Station response spectra curves (Reference Updated FSAR Chapter 3 Figures 3.7 for CPS). The following methodology will be used in</p>

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<p><b>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></p> <p><b>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.</b></p> <p><b>c) A description of the manner by which the mechanical connections will attach the level</b></p>	<p>determining the stresses on the bracket assembly:</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• SSE (Safe Shutdown Earthquake) response spectra analysis is performed to obtain member stresses and support reactions.</li> <li>• 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". This method is endorsed per Chapter 3 of the Updated FSAR Revision 11 for CPS.</li> <li>• The seismic loads for each of the three directions are combined by the Square Root of the Sum of Squares (SRSS) Method.</li> <li>• Sloshing analysis is performed to obtain liquid pressure and its impact on bracket design.</li> <li>• 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.</li> </ul> <p>Sloshing</p> <p>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 will be calculated using the wave height and natural frequency obtained using TID-7024 approach. Using this methodology, sloshing forces are calculated and added to the total reactionary forces that would be applicable for bracket anchorage design. The analysis also determines that the level probe can withstand a credible design basis seismic event. During the design basis event, the SFP water level is expected to rise and parts of the level sensor probe are assumed to become submerged in water. The load impact due to the rising water and submergence of the bracket components have also been considered for the overall sloshing impact. Reliable operation of the level measurement sensor with a submerged interconnecting cable has been demonstrated by analysis of previous Westinghouse testing of the cable, and the vendor's cable qualification. Boron build up on the probe has been analyzed to determine the potential effects on the sensor.</p> <p>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.</p>
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	<p><b>instrument to permanent SFP structures so as to support the level sensor assembly.</b></p>	<p>a. CN-PEUS-14-13 –Seismic Analysis of the SFP Mounting bracket at Clinton Power Station</p> <p>b. LTR-SEE-II-13-47, WNA-TR-03149-GEN – Sloshing Analysis</p> <p>c. EQ-QR-269, WNA-TR-03149-GEN, EQ-TP-353 – Seismic Qualification of other components of SFPI</p> <p>Clinton Power Station specific calculations mounting details associated with Transmitter and SFPLI Monitors are being developed as part of the Engineering Change package for the modification. The methods used in the calculation will follow IEEE Standard 344-2004 and IEEE Standard 323-2003 for seismic qualification of the instrument.</p> <p><b>Calculations – Complete Oct. 15, 2014</b></p> <p>b) The level sensor, which is one long probe, will be suspended from the launch plate via coupler/connector assembly. The launch plate is a subcomponent of the bracket assembly, which is mounted to the refuel floor via anchors. Attachment 1 shows a schematic of the level sensor with mechanical attachment points. Note that the connection to station ground may deviate from this sketch as the design details are further established in the Engineering Change (EC) 392333.</p> <p><b>Complete</b></p> <p>c) The bracket assembly that supports the sensor probe and launch plate will be mechanically connected to the Fuel Building structure (see Attachment 1). The mechanical connection consists of four concrete expansion anchors that will bolt the bracket assembly to the Fuel Building structure via the base plate. The concrete expansion anchors will be designed to withstand SSE and will meet the CPS seismic related installation requirements. The qualification details of the bracket will be provided in Westinghouse’s Pool-side bracket Seismic Analysis and the qualification of the anchorage to the floor is provided in the supporting CPS specific calculation performed as part of the Engineering Change modification.</p> <p><b>Engineering Change – Complete – Nov. 21, 2014</b></p>
<p>4 (RAI -4, Ref. 4)</p>	<p><u>RAI Question:</u> <b>Please provide the following: a) A description of the specific method or combination of methods that will be</b></p>	<p><b><u>Started</u></b></p> <p>a) Beyond Design Basis Environment – Westinghouse qualified the components (probe, connector, cable) of the SFPI 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 functionality of these system components under these 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</p>

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<p><b>applied to demonstrate the reliability of the permanently installed equipment under beyond-design-basis (BDB) ambient temperature, humidity, shock, vibration, and radiation conditions.</b></p> <p><b>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</b></p>	<p>perform following a plant design basis earthquake. Exelon has reviewed the documents and found them acceptable. Reference Westinghouse documents EQ-TP-351, WNA-TR-03149-GEN, and EQ-TP-354 for description of specific qualification methods.</p> <p>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. The habitability of the monitor display locations will be maintained as part of the FLEX strategies, and therefore, the readout display in the Auxiliary and Control Buildings will not be subject to harsh environmental or radiological conditions.</p> <p>Shock and Vibration – SFPI pool side brackets will be analyzed for Safe Shutdown Earthquake design requirements per NRC order EA-12-051 and NEI 12-02 guidance. As provided by 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 CPS site specific shock and vibration testing is required for these components. SFPI 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 mounting bracket were subjected to seismic testing, including shock and vibration test requirements. The results for shock and vibration tests were consistent with the anticipated shock and vibration expected to be seen by mounted equipment. The level monitoring electronics is enclosed in a NEMA-4X housing which is a seismic rated stainless steel housing as well. These housings will be seismically mounted to a seismically qualified wall and structure and will contain the active electronics, and aid in protecting the internal components from vibration induced damage.</p> <p>Reference Westinghouse reports WNA-DS-02957, WNA-TR-03149-GEN for shock and vibration.</p> <p><b>Complete</b></p> <p>b) The seismic adequacy of the SFPI (all components) is demonstrated by vendor testing and analysis in accordance with below listed standards:</p> <ul style="list-style-type: none"> <li>• IEEE 344-2004, IEEE Recommended Practice for Seismic</li> </ul>
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	<p><b>re-transmitting devices that will be employed to convey the level information from the level sensor to the plant operators or emergency responders.</b>  <b>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.</b></p>	<p>Qualification of Class 1E Electrical Equipment for Nuclear Power Generating Stations</p> <ul style="list-style-type: none"> <li>• IEEE-323-1974, Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations</li> <li>• USNRC Regulatory Guide 1.100, Rev. 3</li> <li>• USNRC Regulatory Guide 1.92, Rev. 1</li> <li>• A calculation which will be prepared in support of the Engineering Change for mounting the SFPLI monitoring equipment (Pool Side Bracket, Transmitter and Display Enclosure).</li> </ul> <p>Seismic adequacy of the level sensor probe supporting bracket within the SFP area was demonstrated by analysis as discussed in response to RAI-3.</p> <p><b>Complete</b></p> <p>c) Westinghouse has seismically qualified the SFPI instrument and its components. A CPS specific calculation and EQ analysis will be developed which supports the Pool-side Bracket Seismic Analysis and EQ requirements. With the instrument being seismically qualified and installed as described in RAI 2 response, including the monitor display in the Auxiliary and Control Building, the instrument is assured to maintain reliable and accurate indication when required. Westinghouse report WNA-CN-00301-GEN and Clinton Power Station Engineering Change 392333, in development, will provide the details of the equipment accuracy from measurement to display.</p> <p><b>Engineering Change – Complete – Nov. 21, 2014</b></p>
<p>5 (RAI -5, Ref. 4)</p>	<p><u>RAI Question:</u>  <b>Please provide the following:</b>  <b>a) A description of how the two channels of the proposed level measurement system meet this requirement so that the</b></p>	<p><b><u>Started</u></b></p> <p>a) The two channels proposed locations of the spent fuel probe and mounting meet the requirements of NEI 12-02 section 3.2 – Arrangement. More specifically, to ensure adequate channel separation, the level sensor for the primary channel will be mounted approximately 6'-6" east of the southwest corner of the pool while the level sensor backup channel will be mounted approximately 13'-9" south of the northeast corner of the pool. This means the two level sensors are separated by a distance of approximately 34' which is a longer distance than the shorter dimension of the spent fuel pool as specified by NEI 12-02 guidance.</p>

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	<p><b>potential for a common cause event to adversely affect both channels is minimized to the extent practicable.</b>  <b>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.</b></p>	<p><b>Complete</b></p> <p>b) The information related to physical separation, is depicted in the attached sketch NRC RAI Question 1, which shows the location of the probe and mounting brackets, cable routing for the two individual transmitters, and the cable routing and location of the monitors in the Auxiliary Building and the Control Building. The independent power sources will be described in the Clinton Power Station Engineering Change number 392333 and will consist of powering each train from a separate Motor Control Center.</p> <p><b>Engineering Change – Complete – Nov. 21, 2014</b></p>
<p>6 (RAI -6, Ref. 4)</p>	<p><u>RAI Question:</u>  <b>Please provide the following:</b>  <b>a) A description of the electrical AC</b></p>	<p>Replaced by Interim SE RAI #8.</p>

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<p><b>power sources and capacities for the primary and backup channels.</b></p> <p><b>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).</b></p>	
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7  (RAI -7, Ref. 4)	<p><b>RAI Question:</b></p> <p><b>Please provide the following:</b></p> <p><b>a) An estimate of the expected instrument channel accuracy performance under both (a) normal SFP level conditions (approximately Level 1 or higher) and (b) 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></p> <p><b>b) 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</b></p>	<p><b>Started</b></p> <p>a) The Westinghouse documents WNA-CN-00301 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 <math>\pm 3</math>" during normal spent fuel pool level conditions. The instrument channels will retain this accuracy after BDB conditions, in accordance with the above Westinghouse documents. This value is within the channel accuracy requirements of the Order (<math>\pm 1</math> foot).</p> <p><b>Complete</b></p> <p>b) The Westinghouse document WNA-TP-04709- describes the methodology for routine testing/calibration verification and calibration methodology. This document also specifies the required accuracy criteria under normal operating conditions. Clinton Power Station calibration and channel verification procedures will follow the guidance and criteria provided in this document.</p> <p>Instrument channel calibration will be performed if the level indication reflects a value that is outside the acceptance band established in the Clinton Power Station calibration and channel verification procedures.</p> <p>Instrument channel loop accuracy and set point deviation/error will be addressed in the Engineering Change (EC) 392333 and details will be provided in the 4th six (6) month update in 2014.</p> <p>Calibration will be performed at a frequency consistent with Technical Specification equipment that relates to refueling outages once per 24 months for Clinton Power Station. Consistent with Westinghouse document WNA-TP-04709-GEN, calibration on a SFP level channel will be completed within 60 days of the 24 month period considering normal testing scheduling allowances (e.g. 25%). This is in compliance with the NEI 12-02 guidance for Spent Fuel Pool Instrumentation.</p> <p><b>Engineering Change - Complete – Nov. 21, 2014</b></p>
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	<p><b>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.</b></p>	
<p>8 (RAI -8, Ref. 4)</p>	<p><u>RAI Question:</u> <b>Please provide the following:</b> <b>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> <b>b) A description of how such testing and calibration will enable the conduct of regular</b></p>	<p><b><u>Started</u></b></p> <p>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. Clinton Power Station will use these documents as the basis for doing the SFPI periodic testing and calibration.</p> <p><b>Procedure Issue – Feb. 20, 2015</b></p> <p>b) The level displayed by the channels will be verified per the Clinton Power 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 tolerance in WNA-TP-04709-GEN, channel calibration will be performed.</p> <p><b>Procedure Issue – Feb. 20, 2015</b></p> <p>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 Clinton Power Station (CPS) maintenance and operating programs, CPS will develop calibration, functional test, channel verification procedures per Westinghouse recommendations to ensure reliable, accurate and continuous SFPI functionality by February, 2015. This action will be tracked as part of the Engineering Change 392333 Design Attribute</p>

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<p>channel checks of each independent channel against the other, and against any other permanently-installed SFP level instrumentation.</p> <p>c) A description of how functional checks will be performed, and the frequency at which they will be conducted. Describe how calibration tests will be performed, and the frequency at which they will be conducted. Provide a discussion as to how these surveillances will be incorporated into the plant surveillance program.</p> <p>d) A description of what preventive maintenance tasks are required to be performed</p>	<p>Review process as defined in CC-AA-102, "Design Input and Configuration Change Impact Screening" procedure.</p> <p><b>Procedure Issue – Feb. 20, 2015</b></p> <p>d) CPS 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 by February, 2015. This action will be tracked as part of the Engineering Change 392333 Design Attribute Review process as defined in CC-AA-102, "Design Input and Configuration Change Impact Screening" procedure.</p> <p><b>Preventive Maintenance Task defined – Feb. 20, 2015</b></p>
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	<p>during normal operation, and the planned maximum surveillance interval that is necessary to ensure that the channels are fully conditioned to accurately and reliably perform their functions when needed.</p>	
<p>9 (RAI -9, Ref. 4)</p>	<p><u>RAI Question:</u>  <b>Please provide the following:</b>  <b>a) The specific location for the primary and backup instrument channel displays.</b>  <b>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</b></p>	<p>Replaced by Interim SE RAI #11</p>

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	<p><b>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.</b></p> <p><b>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.</b></p>	
<p>10 (RAI -10, Ref. 4)</p>	<p><b><u>RAI Question:</u></b></p> <p><b>Please provide a description of the standards, guidelines and/or criteria that will be utilized to</b></p>	<p>Replaced by Interim SE RAI #12.</p>

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	<p><b>develop procedures for inspection, maintenance, repair, operation, abnormal response, and administrative controls associated with the SFP level instrumentation, as well as storage and installation of portable instruments.</b></p>	
<p>11 (RAI -11, Ref. 4)</p>	<p><u>RAI Question:</u>  <b>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.</b></p>	<p><b><u>Started</u></b></p> <p>Response for a:</p> <p>Performance tests (functional checks) and Operator performance checks will be described in detail in the vendor operator's manual WNA-TP-04613-GEN, and the applicable information is planned to be contained in plant operating procedures.</p> <p>Operator performance tests are planned to be performed periodically as recommended by the equipment vendor.</p> <p>Channel functional tests per operations procedures with limits established in consideration of vendor equipment specifications are planned to be performed at appropriate frequencies established equivalent to or more frequently than existing SFPI.</p> <p>Manual calibration and operator performance checks are planned to be performed in a periodic scheduled fashion with additional maintenance on an as-needed basis when flagged by the system's automated diagnostic testing features.</p> <p>Channel calibration tests per maintenance procedures with limits established in consideration of vendor equipment specifications are planned to be performed at frequencies established in consideration of</p>

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<p><b>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></p> <p><b>b) 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.</b></p> <p><b>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.</b></p>	<p>vendor recommendations.</p> <p>SFPI channel/equipment maintenance/preventative maintenance and testing program requirements to ensure design and system readiness are planned to 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 are planned to be developed during the SFPI modification design process.</p> <p><b>Complete Feb. 20, 2015</b></p> <p>Response for b, c:</p> <p>Both primary and backup SFPI channels 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 will be controlled by procedure(s) that address the Diverse and Flexible Coping Strategies (Flex) and Spent Fuel Pool Instrumentation Program Implementation and are summarized as follows:</p>									
	<table border="1"> <thead> <tr> <th data-bbox="520 1138 685 1308"># Channel(s) Out-of-Service</th> <th data-bbox="685 1138 883 1308">Required Restoration Action</th> <th data-bbox="883 1138 1445 1308">Compensatory Action if Required Restoration Action not completed within Specified Time</th> </tr> </thead> <tbody> <tr> <td data-bbox="520 1308 685 1532">1</td> <td data-bbox="685 1308 883 1532">Restore Channel to functional status within 90 days.</td> <td data-bbox="883 1308 1445 1532">Immediately initiate action in accordance with note below</td> </tr> <tr> <td data-bbox="520 1532 685 1883">2</td> <td data-bbox="685 1532 883 1883">Initiate action within 24 hours to restore one channel to functional status within 72 hours.</td> <td data-bbox="883 1532 1445 1883">Immediately initiate action in accordance with note below</td> </tr> </tbody> </table>	# 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.	Immediately initiate action in accordance with note below	2	Initiate action within 24 hours to restore one channel to functional status within 72 hours.	Immediately initiate action in accordance with note below
	# 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.	Immediately initiate action in accordance with note below								
2	Initiate action within 24 hours to restore one channel to functional status within 72 hours.	Immediately initiate action in accordance with note below								

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		<p>Note: Present a report to the on-site Plant Operations Review Committee (PORC) within the following 14 days. The report shall outline the planned alternate method of monitoring, the cause of the non-functionality, and the plans and schedule for restoring the instrumentation channel(s) to functional status.</p> <p><b>Complete – Define Actions in Procedure(s) – Feb. 20, 2015</b></p>
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Draft Safety Evaluation Open Items		
OI#	Description	Status
<p>1</p> <p>(RA I-3, Ref. 5)</p>	<p><u>RAI Question:</u></p> <p><b>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 the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces.</b></p>	<p><b><u>Started</u></b></p> <p>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:</p> <ul style="list-style-type: none"> <li>a. CN-PEUS-14-13 – Seismic Analysis of the SFP Mounting Bracket at Clinton Power Station</li> <li>b. LTR-SEE-II-13-47, WNA-TR-03149-GEN – Sloshing Analysis</li> <li>c. EQ-QR-269, WNA-TR-03149-GEN, EQ-TP-353 – Seismic Qualification of other components of SFPI</li> </ul> <p>No equipment failures were noted as a result of seismic test runs. Seismic test data has been documented in the seismic test reports, referenced above.</p> <p>CPS specific calculations which support the Engineering Change modification will address the seismic qualification of the monitors and transmitters. The design criteria used in these calculations satisfies the requirements to withstand a SSE and will meet the CPS seismic related installation requirements for mounting the readout displays and transmitters in the Auxiliary Building and Control Building.</p> <p><b>Site Specific Calculations - Complete - Sept. 30, 2014</b></p>

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<p>2  (RA I-4, Ref. 5)</p>	<p><u>RAI Question:</u>  <b>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.</b></p>	<p><b><u>Started</u></b>  This is in progress and will be updated/provided when the design analysis for the Engineering Change (EC) 392333 has been completed.  <b>Engineering Change - Complete – Nov. 21, 2014</b></p>									
<p>3  (RA I-6, Ref. 5)</p>	<p><u>RAI Question:</u>  <b>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 the Order requirements.</b></p>	<p><b><u>Started</u></b>  Below is a summary of the test conditions used by Westinghouse to qualify the SFPI. These test conditions are also documented in Westinghouse documents EQ-QR-269, WNA-TR-03149-GEN, EQ-TP-354 LTR-SFPIS-13-35, and WNA-DS-02957-GEN. Environmental Conditions for SFPI Components installed in the Spent Fuel Pool Area at Clinton Power Station will be verified as bounded as part of EC 392333 Design Summary. 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 SFPI 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.</p> <table border="1" data-bbox="503 1730 1508 1904"> <thead> <tr> <th>Parameter</th> <th>Normal</th> <th>BDB</th> </tr> </thead> <tbody> <tr> <td>Temperature</td> <td>50-140°F</td> <td>212°F</td> </tr> <tr> <td>Pressure</td> <td>Atmospheric</td> <td>Atmospheric</td> </tr> </tbody> </table>	Parameter	Normal	BDB	Temperature	50-140°F	212°F	Pressure	Atmospheric	Atmospheric
Parameter	Normal	BDB									
Temperature	50-140°F	212°F									
Pressure	Atmospheric	Atmospheric									



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Humidity	0-95% RH	100% (saturated steam)
Radiation TID $\gamma$ (above pool)	1E03 Rads	1E07 Rads
Radiation TID $\gamma$ (12" above top of fuel rack)	1E09 Rads(probe and weight only)	1E07 Rads

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	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 $\gamma$	$\leq 1E03 R \gamma$	$\leq 1E03 R$	$\leq 1E03 R$

Clinton specific calculations which support the seismic installation and environmental analysis of the display enclosures and transmitters will be included on the affected Document List (ADL) for the Engineering Change (EC) 392333.

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 acceptable.

Additionally, Westinghouse is continuing their aging tests to age the system components to 10 years. These tests are projected to be completed towards end of Summer 2014. Final test reports are scheduled to be provided to Exelon by September 4, 2014. Exelon will complete the test report reviews by

		<p>September 30, 2014.</p> <p>Seismic Category I Testing</p> <p>Seismic qualification testing performed by Westinghouse along with the technical evaluations performed by Westinghouse confirm that the SFPI meets the seismic requirements of NEI 12-02. Westinghouse's design and supporting analysis satisfies the Clinton Power Station installation requirements to withstand a SSE.</p> <p>Vibration Justification</p> <p>As specified in RAI-2, components of the system i.e., bracket, transmitter enclosure, display enclosure, and readout display in the Auxiliary and Control Building, will be permanently installed to meet the requirements to withstand a SSE and will meet the Clinton Power Station seismic related installation requirements. Westinghouse has analyzed the pool side bracket to withstand design basis SSE. Other components of the SFPI were subjected to shock and vibration during the seismic testing and met the requirements necessary for mounted equipment.</p> <p>Sloshing Justification</p> <p>The sloshing calculation developed by Westinghouse will be reviewed for a design basis seismic event for acceptability as part of Engineering Change 392333 preparation. Sloshing forces will be taken into consideration for the anchorage design of the pool side bracket to ensure the bracket is rigidly mounted to include sloshing affects.</p> <p><b>Engineering Change - Complete – Nov. 21, 2014</b></p>
<p>4  (RA I-8, Ref. 5)</p>	<p><u>RAI Question:</u></p> <p><b>Please provide the following:</b></p> <p><b>a) A description of the electrical ac power sources and capacities for the primary and backup channels.</b></p> <p><b>b) Please provide the results of the calculation depicting the battery backup duty cycle requirements</b></p>	<p><b>Started</b></p> <p>a) The Clinton Power Station (CPS) electrical ac power sources for the primary and backup Spent Fuel Pool Level Indication channels will be two separate Balance of Plant Motor Control Centers fed from different Unit Subs. The details of this power will be defined in the CPS Engineering Change 392333.</p> <p><b>Engineering Change - Complete – Nov. 21, 2014</b></p> <p>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 Control and Auxiliary Building. The results of the calculation meet the NEI 12-02 requirements. Reference Section 5.4.1. of Ref 2.</p> <p><b>Complete</b></p>

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	<p>demonstrating that its capacity is sufficient to maintain the level indication function until offsite resource availability is reasonably assured.</p>	
<p>5  (RA I-11, Ref. 5)</p>	<p><u>RAI Question:</u>   <b>Please provide the following:</b>  <b>a) The specific location for the primary and backup instrument channel display.</b>  <b>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</b></p>	<p><b><u>Complete</u></b></p> <p>a) The specific location of the primary and backup instrument channel display (monitor) is depicted on the attached sketch, NRC RAI Question 1.</p> <p><b><u>Complete</u></b></p> <p>b) Clinton Power Station will have a display near the Remote (alternate) Shutdown Panel as shown on the attached sketch NRC RAI Question 1. This location was selected since it has been proven that it can be accessed without unreasonable delay during an event including a BDB event and is analyzed for Remote Shutdown Panel design basis accident radiation and habitability conditions. Time to access this display is the same as that addressed in the UFSAR for access to the Remote Shutdown Panel. This area BDB condition is addressed in RAI #6, "Environmental Conditions Outside of the Spent Fuel Pool Area". The Display Enclosure (monitor) will be periodically checked as part of Operator rounds.</p> <p><b><u>Complete</u></b></p>

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<p>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 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</p>	
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	<b>periodically.</b>	
6  (RA I- 12, Ref. 5)	<b>RAI Question:</b>  <b>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.</b>	<b>Started</b>  The procedures will be assigned and developed as part of the Engineering Change (EC) Design Attribute Review process in accordance with CC-AA-102 "Design Input and Configuration Change Impact Screening". The procedures numbers, titles and technical objectives will be developed prior to the EC being Released for Operations.  <b>Procedures – Complete – Feb. 20, 2015</b>

**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

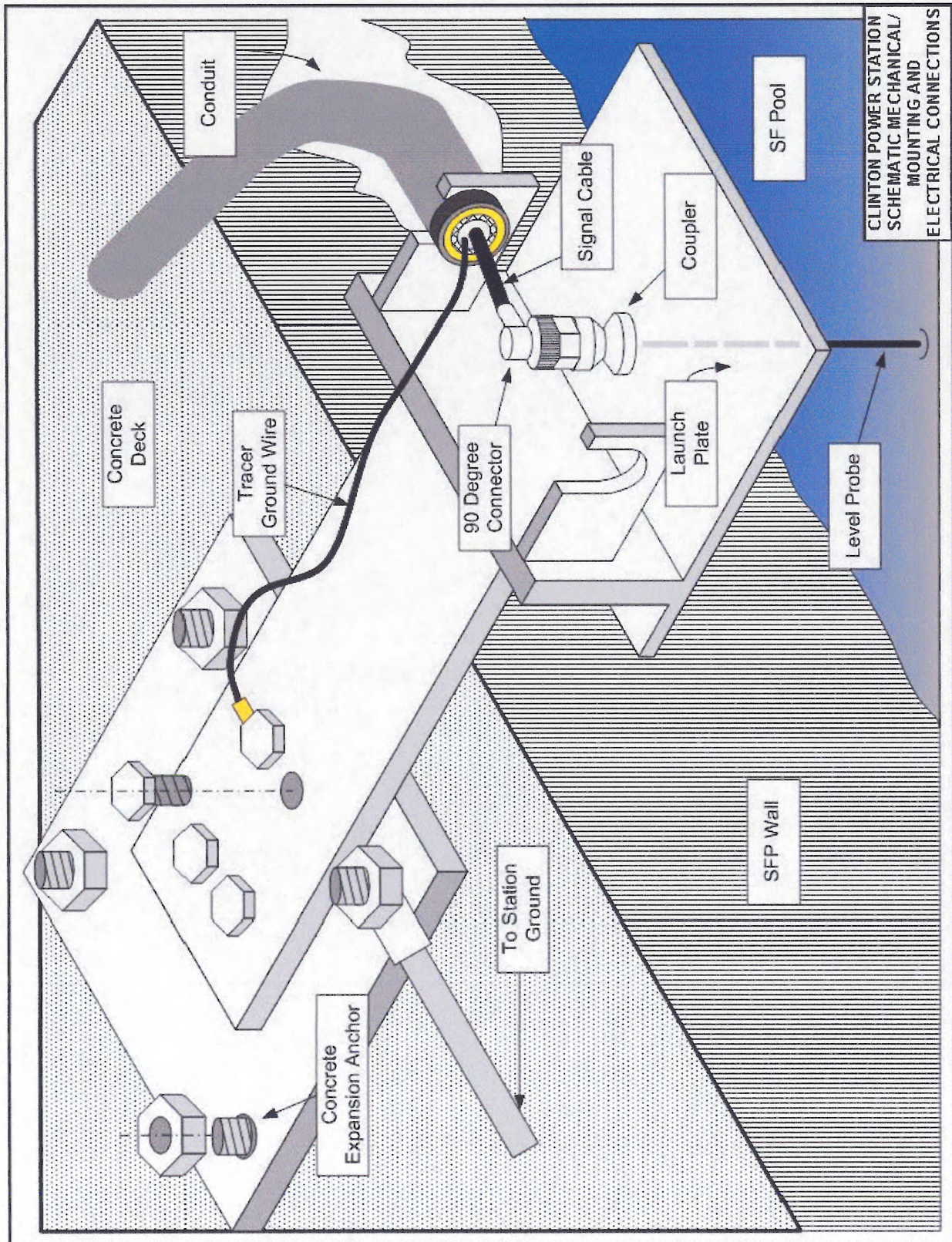
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for Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)", dated February 28, 2013 (RS-13- 029).

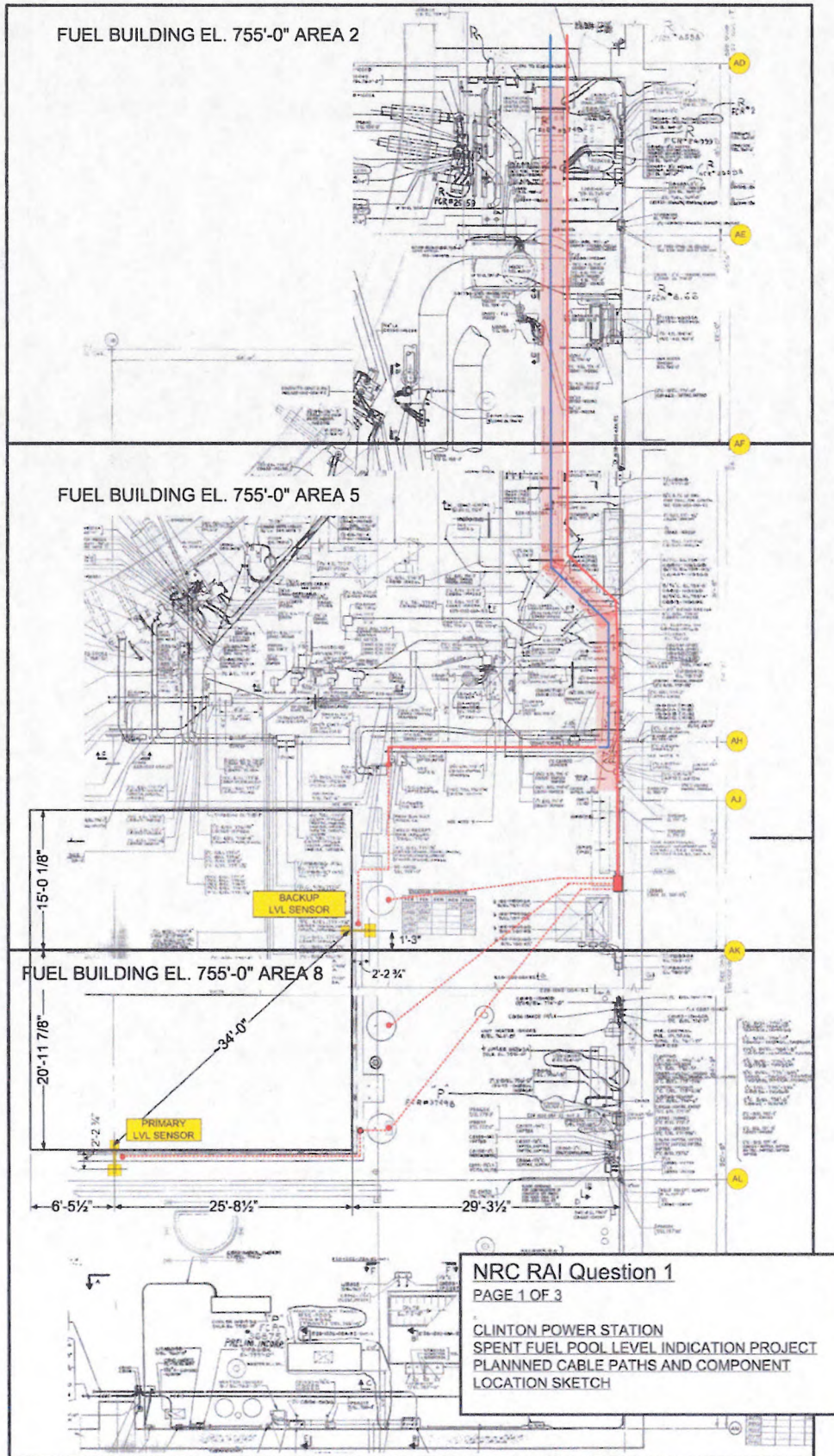
2. NRC Order Number EA-12-051, "Issuance of Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation", dated March 12, 2012.
3. USNRC letter to Exelon Generation Company, LLC, Request for Additional Information Regarding Overall Integrated Plan for Reliable Spent Fuel Pool Instrumentation, dated June 7, 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 3, 2013 (RS-13-157).
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 November 15, 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-13-116).
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-14-019).

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Attachment 1 – CPS Schematic of the level Sensor with Mechanical Attachment Points

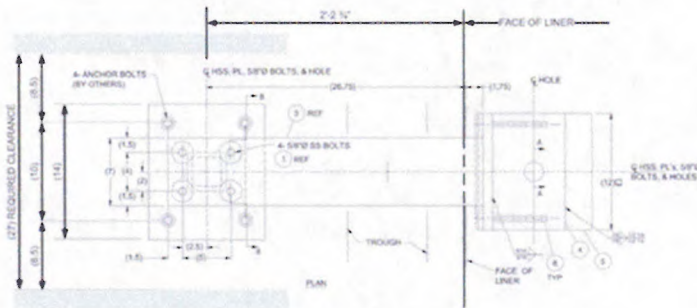
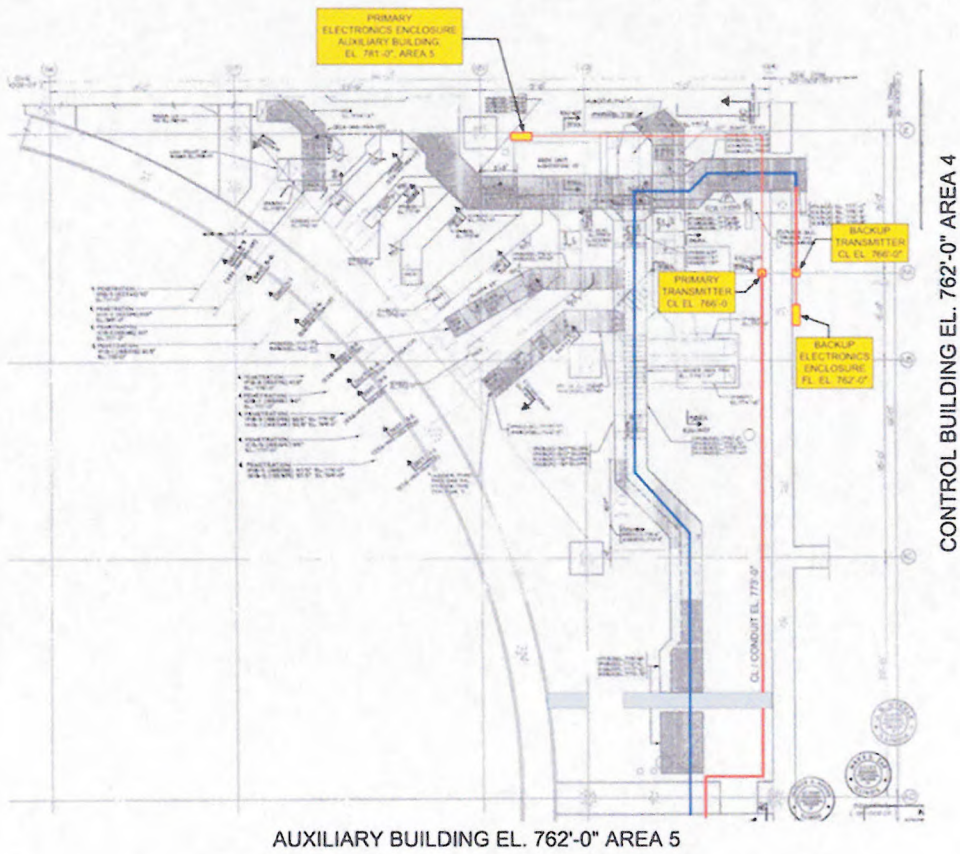


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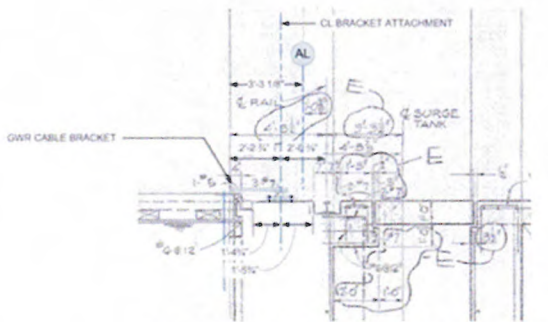




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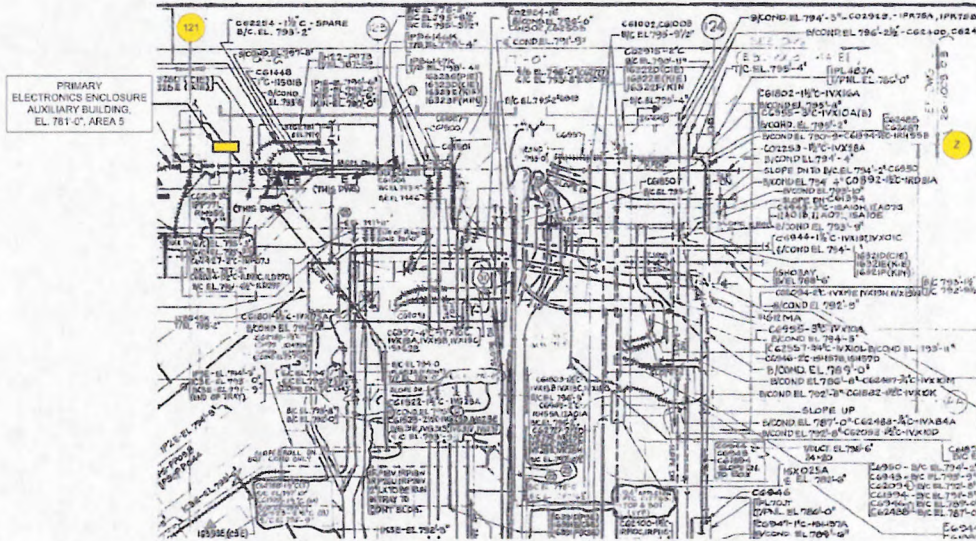
GWR CABLE BRACKET



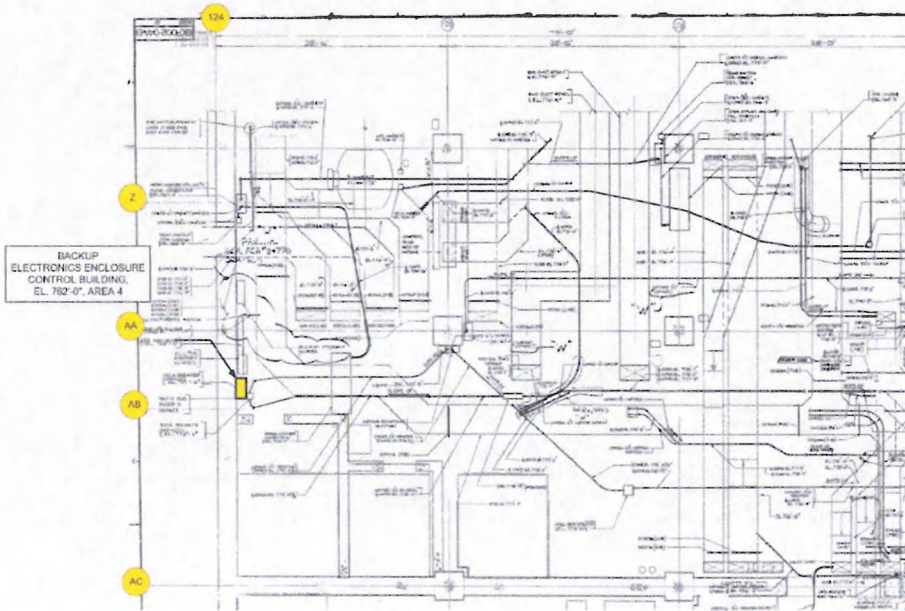
GWR CABLE BRACKET ARRANGEMENT  
 AT SOUTH SIDE OF FUEL POOL  
 (REF. S-28-1403 / SECT. 28-3)

**NRC RAI Question 1**  
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 PLANNED CABLE PATHS AND COMPONENT  
 LOCATION SKETCH

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AUXILIARY BUILDING EL. 781'-0" AREA 5



CONTROL BUILDING EL. 762'-0" AREA 4

NRC RAI Question 1  
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