Exelon Generation®

Order No. EA-12-051

RS-15-027

February 27, 2015

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: 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)

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. 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-14-197)

9. 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, 7 and 8 provided the first, second, and third 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 fourth 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 9.

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 27th day of February 2015.

Respectfully submitted,

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

Enclosure:

1. Clinton Power Station, Unit 1 Fourth 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
Mr. Stephen R. Monarque, NRR/JLD/JPMB, NRC
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Illinois Emergency Management Agency - Division of Nuclear Safety

Enclosure

Clinton Power Station, Unit 1

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

(32 pages)

Clinton Power Station, Unit 1

Fourth 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 Third 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 Third Six-Month status report (Reference 8), and are current as of February 27, 2015.

- SFPLI Equipment has been delivered
- Installation has started

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 NRC 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	
Submit 6 Month Updates:			
Update 1	August 28, 2013	Complete	
Update 2	February 28, 2014	Complete	
Update 3	August 28, 2014	Complete	

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Update 4	February 27, 2015	Complete with this submittal	
Provide Final Safety Evaluation (SE) Info	September 30, 2014	Complete	
Modifications:			
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	1Q2015
Begin Installation	4Q2014	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 NRC 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 1)
1 (RAI -1, Ref. 3)	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**	Complete (Addressed in Reference 4)

	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.	

2 (RAI -2, Ref. 3)	RAI Question: **Please provide a clearly labeled sketch or marked-up plant drawing of the plan view of the SFP area, depicting the SFP inside dimensions, the planned locations/placement of the primary and 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 Provided in the attached sketch "NRC RAI Question 1". NOTE: The method of grounding the bracket assembly may deviate from this sketch when further installation/design details are developed.
3 (RAI -3, Ref. 3)	RAI Question: **Please provide the following: a) The design criteria that will be used to estimate the total loading on the mounting device(s), including static weight loads and dynamic loads. Describe the methodology**	Completed with this submittal a) All SFPIS equipment will be designed in accordance with the Clinton Power Station (CPS) Safe Shutdown Earthquake (SSE) design requirements. The vendor, Westinghouse, evaluated the structural integrity of the mounting brackets in calculation CN-PEUS-14-13. The GTSTRUDL model was 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 became the design inputs to design the mounting bracket anchorage to the refuel floor to withstand a Safe Shutdown Earthquake (SSE).

	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**	Seismic 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 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". This method is endorsed per Chapter 3 of the Updated FSAR Revision 11 for CPS. • 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. Sloshing 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

	connections will attach the level instrument to permanent SFP structures so as to support the level sensor assembly. Part a) – Complete Part b) – Complete Part c) - Complete	determine the potential effects on the sensor. The following Westinghouse documents provide information with respect to the design criteria used, and a description of the methodology used to estimate the total loading on the device. a. CN-PEUS-14-13 –Seismic Analysis of the SFP Mounting bracket at Clinton Power Station b. LTR-SEE-II-13-47, WNA-TR-03149-GEN – Sloshing Analysis c. EQ-QR-269, WNA-TR-03149-GEN, EQ-TP-353 – Seismic Qualification of other components of SFPI Clinton Power Station specific calculations for mounting details associated with Transmitter and SFPLI Monitors have been completed as part of the Engineering Change (EC 392333) package for the modification. The methods used in the calculations followed 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 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 EC 392333. 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 are designed to withstand an 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.
4 (RAI -4, Ref. 3)	RAI Question: **Please provide the following:** **a) A description of the specific method or combination of methods**	Completed with this submittal a) Beyond Design Basis Environment – Westinghouse qualified the components (probe, connector, cable) of the Spent Fuel Pool Instrumentation System (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 functionality of these system components under these beyond design basis environmental conditions. Westinghouse performed testing to

	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**	ensure aging of the components in the SFP area will not have a significant effect on the ability of the equipment to perform following a plant design basis earthquake. Exelon has reviewed the documents and found them acceptable. Reference Westinghouse documents EQ-TP-351, WNA-TR-03149-GEN, and EQ-TP-354 for description of specific qualification methods. Mild Environment – Westinghouse qualified the system components (display panel, sensor) that reside in the mild environment conditions to determine that the components can satisfactorily perform to those conditions. Westinghouse has determined that aging does not have a significant effect on the ability of the equipment to perform following a plant design basis earthquake. Exelon has reviewed the documents and found them acceptable. Reference Westinghouse documents EQ-QR-269, WNA-TR-03149-GEN for description of specific methods. 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. Shock and Vibration – SFPIS pool side brackets are 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. SFPIS pool side brackets for both the primary and backup Westinghouse SFP measurement channels are being 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 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. Reference Westinghouse reports WNA-DS-02957, WNA-TR-04757-GEN for shock and vibration. b) The seismic adequacy of the SFPIS (all components) is demonstrated by vendor testing and analysis in accordance with below listed standards: • IEEE 344-2004, IEEE Recommended Practice for Seismic

	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. Part a) – Complete Part b) – Complete Part c) – Complete	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 • A calculation which will be prepared in support of the EC for mounting the SFPLI monitoring equipment (Pool Side Bracket, Transmitter and Display Enclosure). Seismic adequacy of the level sensor probe supporting bracket within the SFP area was demonstrated by analysis as discussed in response to RAI-3. c) Westinghouse has seismically qualified the SFPI instrument and its components. A CPS specific calculation and EQ analysis has been performed 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 EC 392333, provides the details of the equipment accuracy from measurement to display.
5 (RAI -5, Ref. 3)	RAI Question: **Please provide the following: a) A description of how the two**	Completed with this submittal a) The two channel 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, one level sensor probe is being mounted approximately

	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.** Part a) – Complete Part b) – Complete	on the northwest corner of the pool while the other level sensor probe is being mounted near the center of the east wall of the pool. This means the two level sensor probes 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. 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 are described in the Clinton Power Station EC 392333 and consist of powering each train from a separate Motor Control Center.

6 (RAI -6, Ref. 3)	RAI Question: **Please provide the following:** **a) A description of the electrical AC power sources and capacities for the primary and backup channels.** **b) If the level measurement 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**	Complete with this submittal a) A detailed description of the electrical AC power sources is included in the EC 392333 Design Summary. b) The Westinghouse Report, WNA-CN-00300-GEN, provides the results of the calculation depicting the battery back-up duty cycle. This calculation demonstrates that battery capacity is 4.22 days to maintain the level indication function to the display. Therefore, the Clinton Power Station readout display of level indication will be available for greater than 72 hours of operation. The results of the calculation meet the NEI 12-02 reqirements.

	mitigation strategies for BDB external events (Order EA-12-049). Complete	
7 (RAI -7, Ref. 3)	RAI Question: **Please provide the following:** **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) A description of the methodology that will be used for determining the maximum allowed**	Started a) The Westinghouse documents WNA-CN-00301-GEN and WNA-DS-02957-GEN describe the channel accuracy under both (a) normal SFP level conditions and (b) at the Beyond Design Basis (BDB) conditions that would be present if SFP level were at Level 2 and Level 3 datum points. Each instrument channel will be accurate to within ±3"during normal spent fuel pool level conditions. The instrument channels will retain this accuracy after BDB conditions, in accordance with the above Westinghouse documents. This value is within the channel accuracy requirements of the Order (±1 foot). 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. 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 forecast for issuance in the first quarter of 2015. Instrument channel loop accuracy and set point deviation/error is addressed in the EC 392333 as defined in Westinghouse document WNA-CN-00301-GEN. Functional check will be performed once per refueling cycle for Clinton Power Station. Per Westinghouse document WNA-TP-04709-GEN calibration on a SFP level channel is to be completed within 60 days of a planned refueling outage considering normal testing scheduling allowances (e.g., 25%). This is in compliance with the NEI 12-02 guidance for Spent Fuel Pool Instrumentation.

	deviation from the instrument channel design accuracy that will be employed under normal operating conditions as an acceptance criterion for a calibration procedure to flag to operators and to technicians that the channel requires adjustment to within the normal condition design accuracy. Part a) – Complete Part b) Fcst Completion 3/31/15	
8 (RAI -8, Ref. 3)	RAI Question: **Please provide the following:** **a) A description of the capability and provisions the proposed level sensing equipment will have to enable periodic testing and calibration, including how this capability**	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. Clinton Power Station will use these documents as the basis for performing the SFPI periodic testing and calibration. 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. c) Functional checks will be performed per Westinghouse functionality test procedure WNA-TP-04613-GEN at the Westinghouse

	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**	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, and channel verification procedures per Westinghouse recommendations to ensure reliable, accurate and continuous SFPI functionality by March 31, 2015. This action will be tracked as part of the EC 392333 Design Attribute Review process as defined in CC-AA-102, "Design Input and Configuration Change Impact Screening" procedure. d) By March 31, 2015, 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. This action will be tracked as part of the EC 392333 Design Attribute Review process as defined in CC-AA-102, "Design Input and Configuration Change Impact Screening" procedure.

	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.** Part a) – Fcst Complete 3/31/15 Part b) Fcst Complete 3/31/15 Part c) – Fcst Complete 3/31/15 Part d) – Fcst Complete 3/31/15	
9 (RAI -9, Ref. 3)	<u>RAI Question</u>: **Please provide the following:** **a) The specific location for**	Replaced by Interim SE RAI #11

	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 communicatio ns 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.	
10 (RAI -10, Ref. 3)	RAI Question: **Please provide a description of the standards, guidelines and/or criteria that will be utilized to 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.**	Replaced by Interim SE RAI #12
11 (RAI -11,	RAI Question: **Please provide the**	Started Response for a:

<table>
<tr>
<td>Ref. 3)</td>
<td>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</td>
<td>Performance tests (functional checks) and Operator performance checks will be described in detail in the vendor operator's manual, and the applicable information is planned to be contained in plant operating procedures.

Operational performance tests are planned to be performed periodically as recommended by the equipment vendor.

Channel functional tests per plant 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.

Manual calibration and 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.

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 vendor recommendations.

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.

Response for b, c:

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 CC-CL-118-1001 Diverse and Flexible Coping Strategies (FLEX) and Spent Fuel Pool Instrumentation Program Implementation and are summarized as follows:
<table>
<tr><th># Channel(s) Out-of-</th><th>Required Restoration</th><th>Compensatory Action if Required Restoration Action not completed within Specified Time</th></tr>
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	actions for one or both non-functioning channels will 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. Part a) Forcast Complete 3/31/15 Part b) & c) Complete	<table><tr><td>Service</td><td>Action</td><td></td></tr><tr><td>1</td><td>Restore Channel to functional status within 90 days (or if channel restoration not expected within 90 days, then proceed to Compensatory Action</td><td>Immediately initiate action in accordance with note below</td></tr><tr><td>2</td><td>Initiate action within 24 hours to restore one channel to functional status and restore one channel to functional status within 72 hours.</td><td>Immediately initiate action in accordance with note below</td></tr></table> Note: Initiate an Issue Report to enter the condition into the Corrective Action Program. Identify the equipment out of service time is greater than the specified allowed out of service time, develop and implement an alternate method of monitoring, determine the cause of the non-functionality, and the plans and schedule for restoring the instrumentation channel(s) to functional status.

Draft Safety Evaluation Open Items		
OI#	**Description**	**Status**
1 (RAI-3,	RAI Question: **For RAI 2(a) above, please**	Completed with this submittal The following Westinghouse documents provide the analyses used to verify the design criteria and describe the methodology for seismic testing of the SFP

Ref. 5)	**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	instrumentation and electronics units, inclusive of design basis maximum seismic loads and hydrodynamic loads that could result from pool sloshing and other effects that could accompany such seismic forces: a. CN-PEUS-14-13 – Seismic Analysis of the SFP Mounting Bracket at Clinton Power Station b. LTR-SEE-II-13-47, WNA-TR-03149-GEN – Sloshing Analysis c. EQ-QR-269, WNA-TR-03149-GEN, EQ-TP-353 – Seismic Qualification of other components of SFPI 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. CPS specific calculations which support the EC 392333 are identified as part of the Affected Documents for the modification and addresses the seismic qualification of the monitors and transmitters. The design criteria used in these calculations satisfies the requirements to withstand a SSE and meet the CPS seismic related installation requirements for mounting the readout displays and transmitters in the Auxiliary Building and Control Building.
2 (RAI-4, 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**	Complete with this submittal Clinton Power Station calculations IP-S-0302, Evaluation of SFPI Sensor Mounting Bracket Anchor Plate Detail, and IP-S-0303, Evaluate Mounting Details for Level Transmitters and Electrical Enclosures, and EC 392333 were performed. The design criteria used in these calculations and EC 392333 meets the requirements to withstand a SSE and will meet the Clinton Power Station safety related installation requirements. The methods used in the calculations follow IEEE Standard 344-2004 and IEEE Standard 323-2003 for seismic qualification of the instruments. The analysis has been finalized.

<table>
<tr><td></td><td>integrity of the affected structures/ equipment.

Complete</td><td></td></tr>
<tr><td>3

(RAI-6, Ref. 5)</td><td>RAI Question:

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.

Complete</td><td>Complete with this submittal

Below is a summary of the test conditions used by Westinghouse to qualify the SFPIS. 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 SFPIS 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 SFPIS Components in the Spent Fuel Pool Area

Level sensor probe, coax coupler and connector assembly, launch plate and pool side bracket assembly, and coax cable are designed and qualified to operate reliably in the below specified environmental conditions.
<table>
<tr><td>Parameter</td><td>Normal</td><td>BDB</td></tr>
<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>
<tr><td>Humidity</td><td>0-95% RH</td><td>100% (saturated steam)</td></tr>
<tr><td>Radiation TID γ (above pool)</td><td>1E03 Rads</td><td>1E07 Rads</td></tr>
<tr><td>Radiation TID γ (12” above top of fuel rack)</td><td>1E09 Rads (probe and weight only)</td><td>1E07 Rads</td></tr>
</table>
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.
<table>
<tr><td>Parameter</td><td>Normal</td><td>BDB</td><td>BDB

(Level Sensor Electronics Only)</td></tr>
</table></td></tr>
</table>

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

Clinton specific calculations which support the seismic installation and environmental analysis of the display enclosures and transmitters are included on the Affected Document List (ADL) for the 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 them acceptable.

Additionally, Westinghouse has completed their aging tests to age the system components to 10 years. The tests were completed satisfactorily and the final test reports were reviewed and found acceptable for Clinton Station.

Seismic Category I Testing

Seismic qualification testing performed by Westinghouse along with the technical evaluations performed by Westinghouse confirm that the SFPIS 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.

Vibration Justification

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 SFPIS were subjected to shock and vibration during the seismic testing and met the requirements necessary for mounted equipment.

Sloshing Justification

		The sloshing calculation developed by Westinghouse has been reviewed for a design basis seismic event for acceptability as part of EC 392333 preparation. Sloshing forces were taken into consideration for the anchorage design of the pool side bracket to ensure the bracket is rigidly mounted to include sloshing affects.
4 (RAI-8, Ref. 5)	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.** Part a) Complete Part b) - Complete	Complete with this submittal a) The Clinton Power Station (CPS) electrical ac power sources for the primary and backup Spent Fuel Pool Level Indication channels are designed to be two separate Balance of Plant Motor Control Centers fed from different Unit Subs. The details of this power is defined in the CPS EC 392333. 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.

5 (RAI-11, Ref. 5)	RAI Question: **Please provide the following:** **a) The specific location for the primary and backup instrument channel display.** **b) If a display will be located somewhere other than the control room or alternate shutdown panel, please describe the evaluation used to validate that the display location can be accessed without unreasonable delay following a BDB event. Include the time available for personnel to access the display as credited in the evaluation, as well as the actual time (e.g., based on walk-throughs) that it will take for**	Complete a) The specific location of the primary and backup instrument channel display (monitor) is depicted on the attached sketch, NRC RAI Question 1. 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.

	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. Part a) – Complete Part b) - Complete	
6 (RAI-12, Ref. 5)	RAI Question: **Please provide a list of the procedures addressing operation (both normal**	Started The procedures will be assigned and developed as part of the EC Design Attribute Review process in accordance with CC-AA-102 "Design Input and Configuration Change Impact Screening". The procedure numbers, titles and technical objectives will be developed prior to the EC being Released for Operations by March 31, 2015.

	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. Fcst Complete 3/31/15	

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- 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).

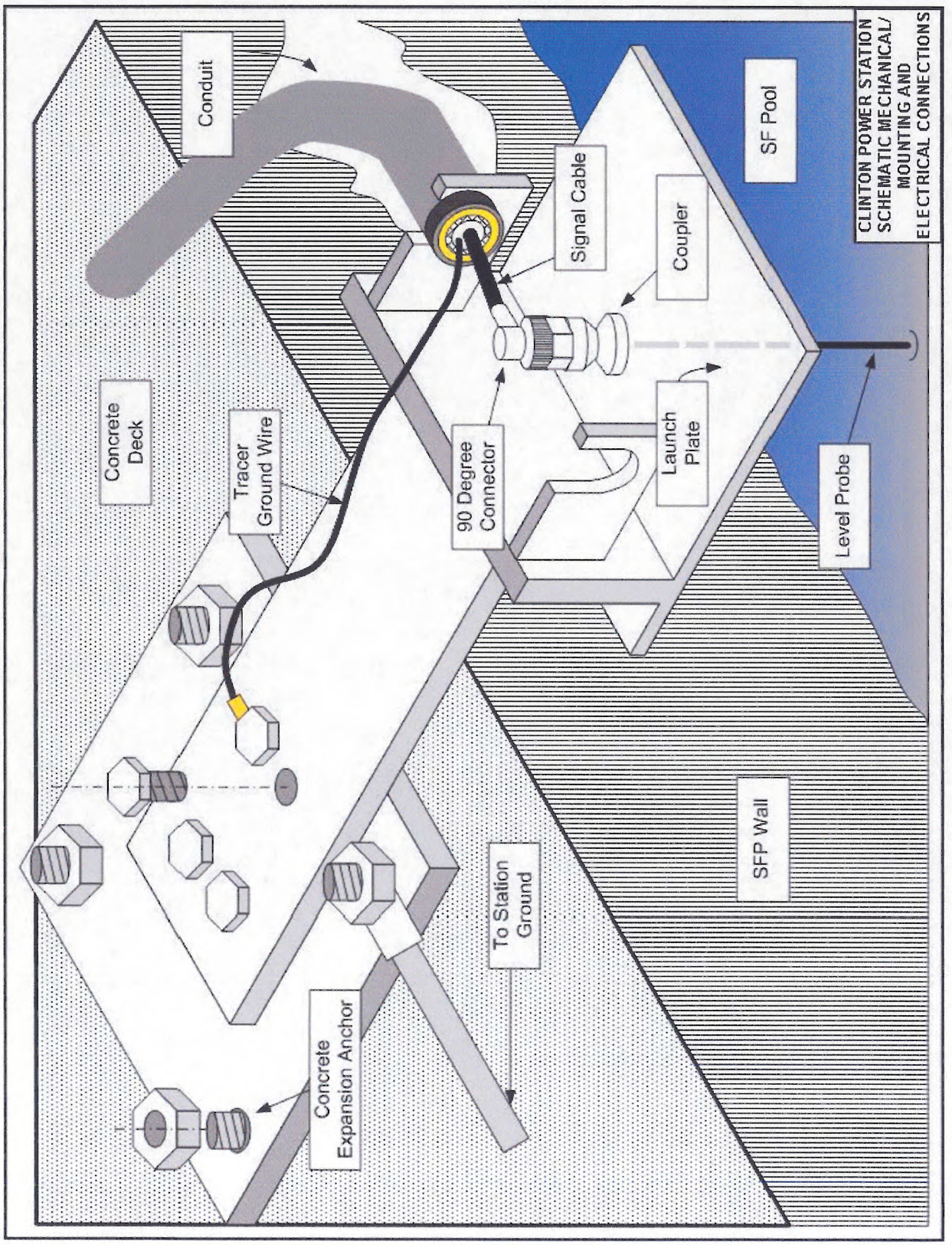
5. USNRC letter to Exelon Generation Company, LLC, "Interim Staff Evaluation and Request for Additional Information Regarding the Overall Integrated Plan for Implementation of Order EA-12-051, Reliable Spent Fuel Pool Instrumentation", dated November 15, 2013.
6. First Six-Month Status Report for the 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).
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-14-197).

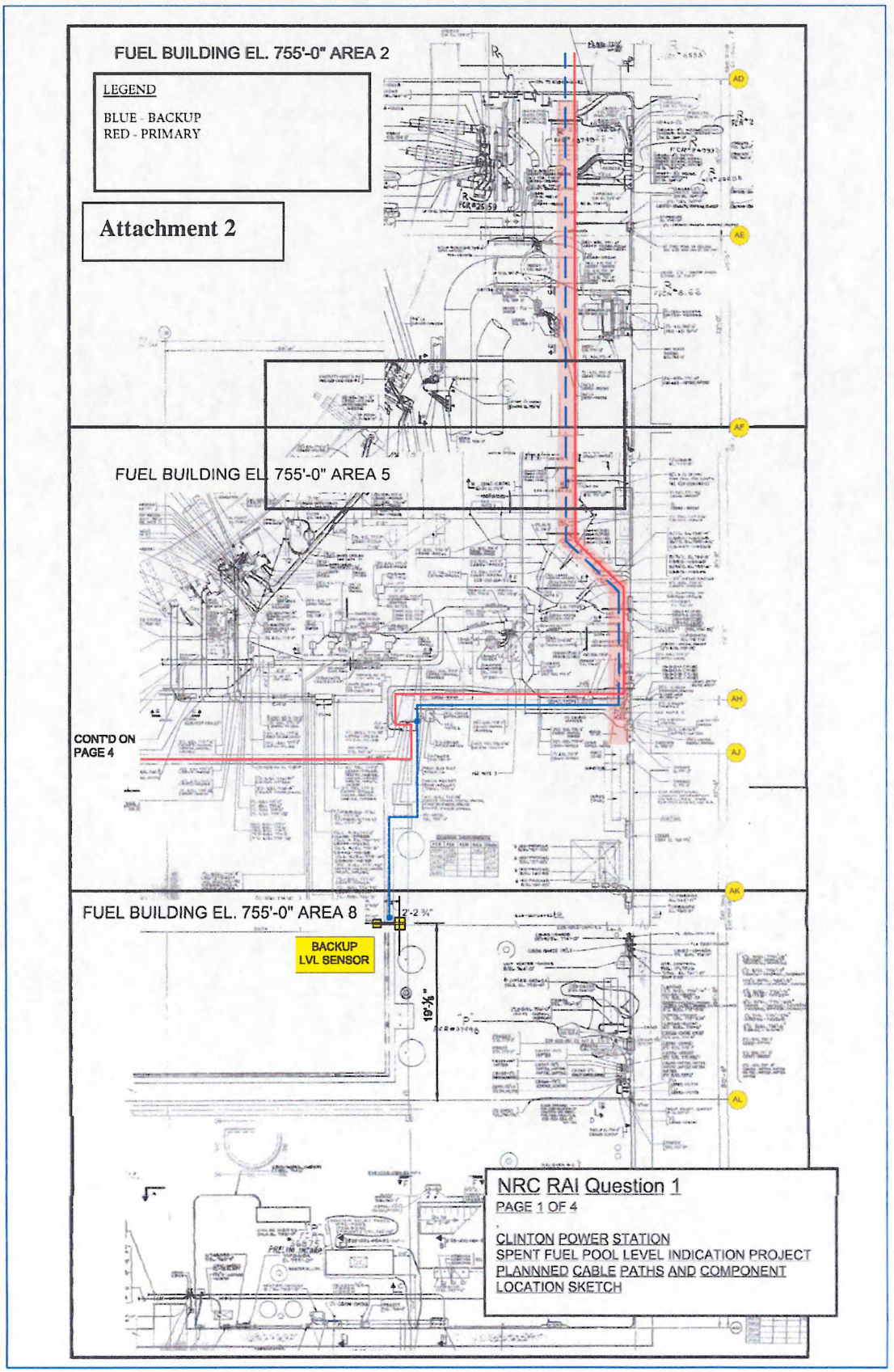
9 Attachments

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

Attachment 2 – Planned Cable Paths and Component Location Sketch

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




FUEL BUILDING EL. 755'-0" AREA 2
LEGEND
BLUE - BACKUP
RED - PRIMARY
Attachment 2
FUEL BUILDING EL. 755'-0" AREA 5
CONT'D ON PAGE 4
FUEL BUILDING EL. 755'-0" AREA 8
BACKUP LVL SENSOR
NRC RAI Question 1
PAGE 1 OF 4
CLINTON POWER STATION
SPENT FUEL POOL LEVEL INDICATION PROJECT
PLANNNED CABLE PATHS AND COMPONENT LOCATION SKETCH

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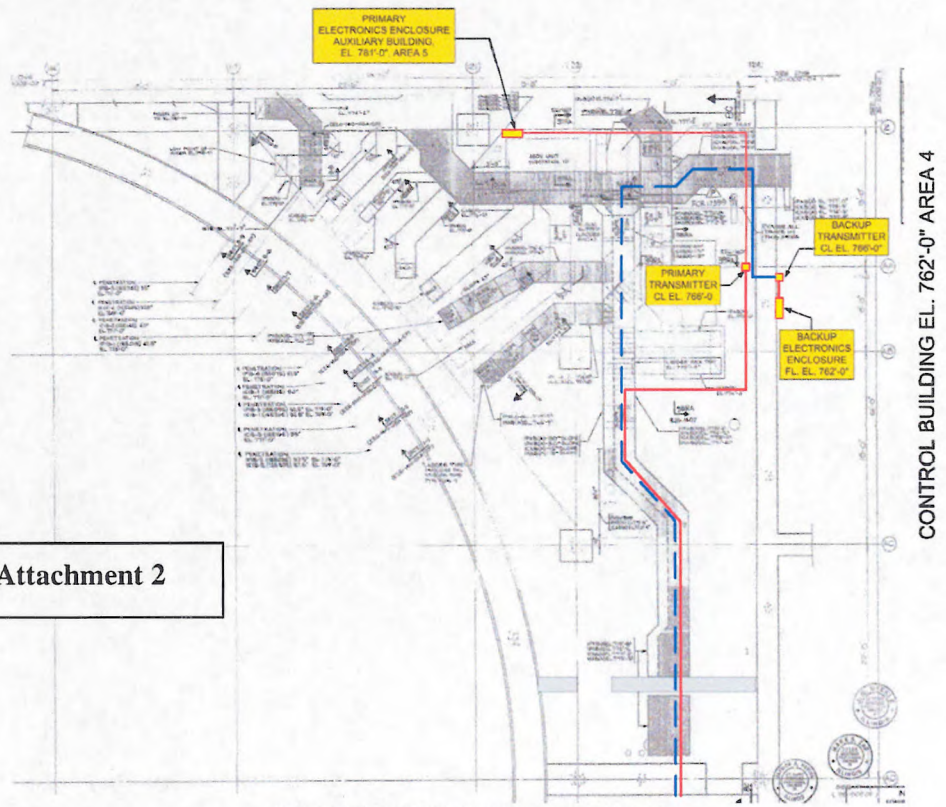
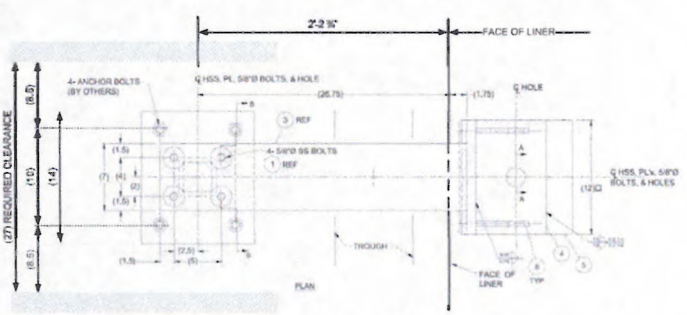
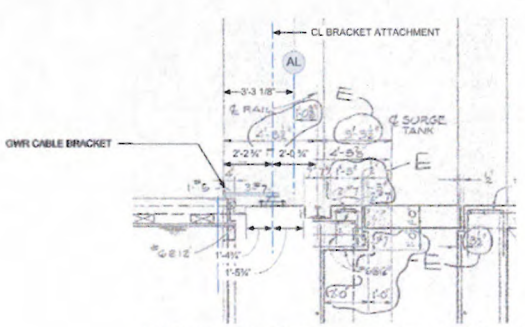
Attachment 2



AUXILIARY BUILDING EL. 762'-0" AREA 5



GWR CABLE BRACKET

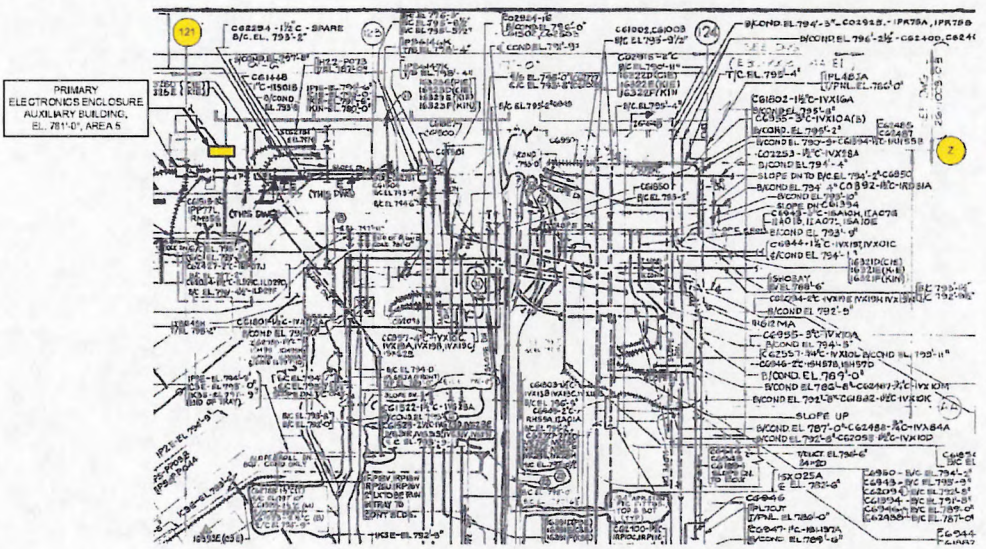


GWR CABLE BRACKET ARRANGEMENT
AT SOUTH SIDE OF FUEL POOL
(REF. S-28-1403 / SECT. 28-3)

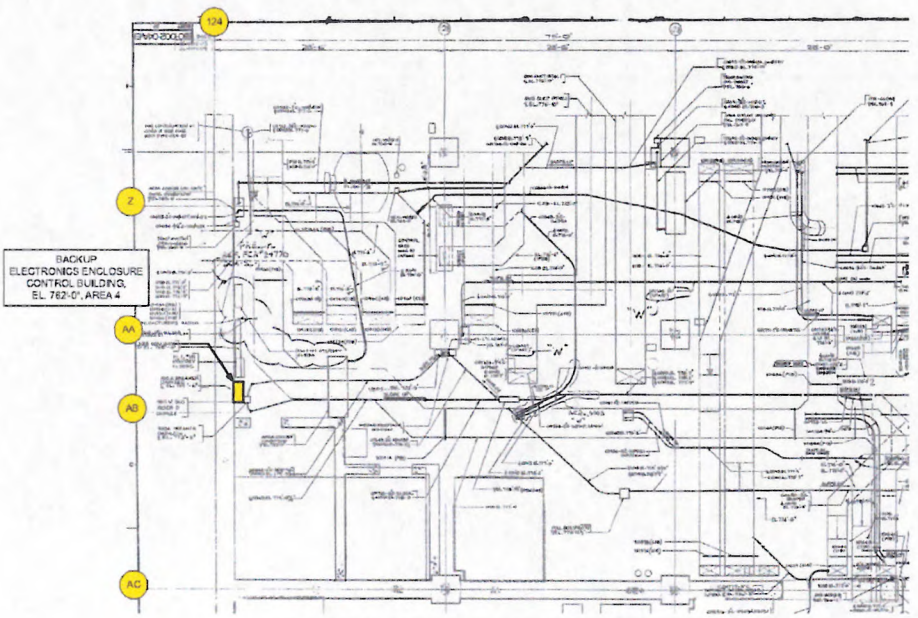
NRC RAI Question 1
PAGE 2 OF 4

CLINTON POWER STATION
SPENT FUEL POOL LEVEL INDICATION PROJECT
PLANNNED CABLE PATHS AND COMPONENT
LOCATION SKETCH

Attachment 2



AUXILIARY BUILDING EL. 781'-0" AREA 5



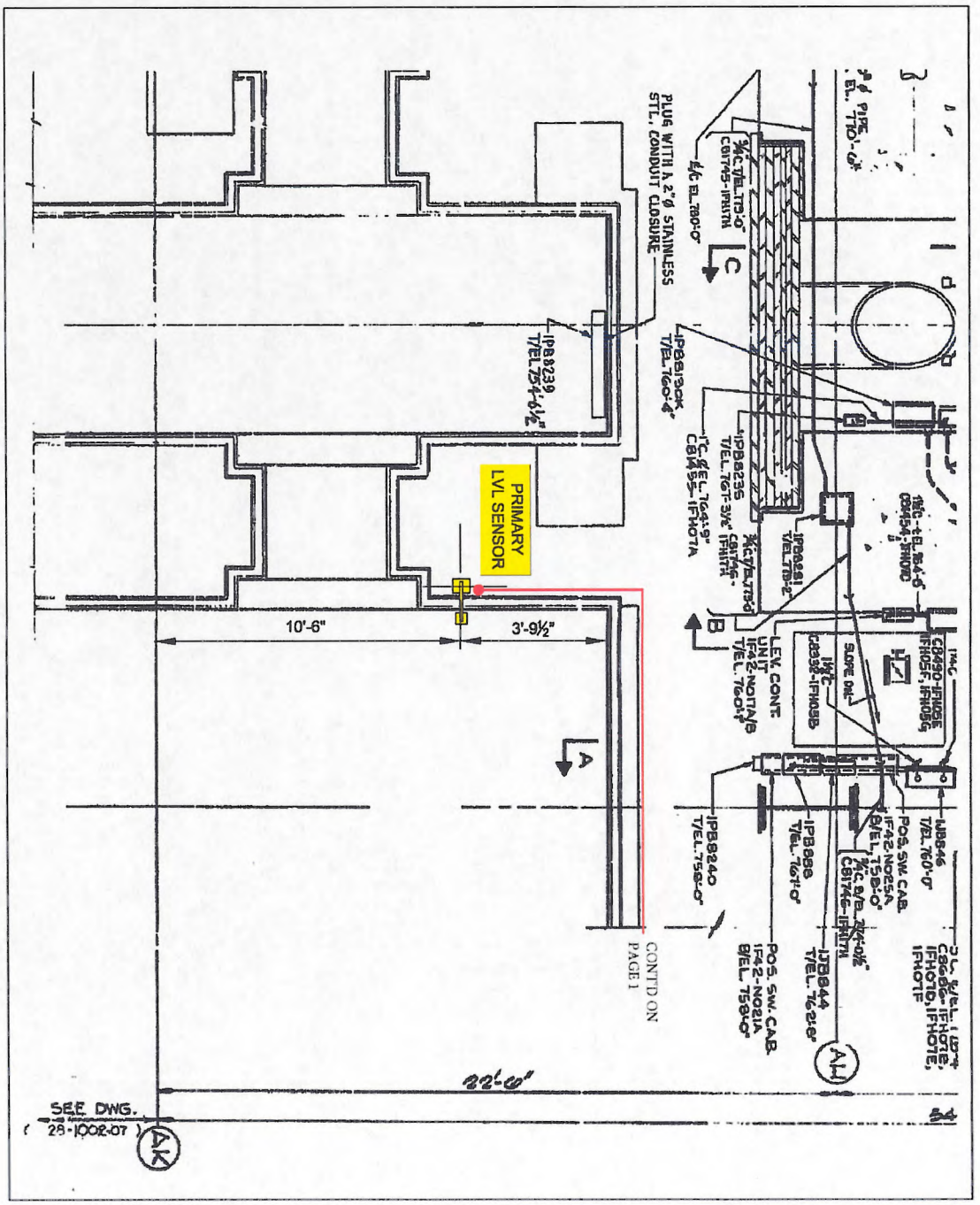
CONTROL BUILDING EL. 762'-0" AREA 4

NRC RAI Question 1
PAGE 3 OF 4

CLINTON POWER STATION
SPENT FUEL POOL LEVEL INDICATION PROJECT
PLANNNED CABLE PATHS AND COMPONENT
LOCATION SKETCH

Attachment 2

FUEL BUILDING EL. 755'-0" AREA 4



NRC RAI Question 1
PAGE 4 OF 4

CLINTON POWER STATION
SPENT FUEL POOL LEVEL INDICATION PROJECT
PLANNNED CABLE PATHS AND COMPONENT LOCATION SKETCH