Exelon Generation®

Order No. EA-12-051

RS-14-196

August 28, 2014

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

Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

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-13-028)
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-13-114)
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-14-018)
8. NRC letter to Exelon Generation Company, LLC, Byron Station, Units 1 and 2 – Interim Staff Evaluation and Request for Additional Information Regarding the Overall Integrated Plan for Implementation of Order EA-12-051, Reliable Spent Fuel Pool Instrumentation (TAC Nos. MF0872 and MF0873), dated November 4, 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 Byron Station, Units 1 and 2 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 Byron 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 28th day of August 2014.

Respectfully submitted,

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

Enclosure:

1. Byron Station, Units 1 and 2 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 - Byron Station, Units 1 and 2
NRC Project Manager, NRR - Byron Station, Units 1 and 2
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Illinois Emergency Management Agency - Division of Nuclear Safety

Enclosure

Byron Station, Units 1 and 2

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

(26 pages)

Byron Station, Units 1 and 2

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

Byron Station, Units 1 and 2, 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 6), and are current as of August 28, 2014.

- Provided responses to all RAIs via ePortal on 3/31/14
- Completed and Issued SFPI Modification Package

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	
Submit 6 Month Updates:			
Update 1	August 28, 2013	Complete	
Update 2	February 28, 2014	Complete	
Provide Final Safety Evaluation (SE) Information	March 31, 2014	Complete	
Update 3	August 28, 2014	Complete with	

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
		this submittal	
Modifications:			
Conceptual Design	3Q2012	Complete	
Begin Detailed Design Engineering	1Q2013	Complete	
Issue Exelon Fleet contract to procure SFPI Equipment	2Q2013	Complete	
Complete and Issue SFPI Modification Package	2Q2014	Complete	
Begin Installation	2Q2014	Complete	
Complete SFPI Installation and Put Into Service	4Q2014	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

Byron Station, Units 1 and 2, 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 (Reference 1) or the Draft Safety Evaluation (SE) and the status of each item.

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
1 (RAI-1a, Ref.4)	**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.**	Complete. (Addressed in Reference 7)

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
2 (Ref.1)	Open Item: **Continuous level indication will be provided by a guided wave radar system, submersible pressure transducer, or other appropriate level sensing technology that will be determined during the detailed engineering phase of the project.**	Complete. (Addressed in Reference 6)
3 (RAI-1b, Ref. 4)	RAI Question: **A clearly labeled sketch depicting the elevation view of the proposed typical mounting arrangement for the portions of the instrument channel consisting of permanent measurement channel equipment (e.g., fixed level sensors and/or stilling wells, and mounting brackets). Indicate on this sketch the datum values representing Level 1, Level 2, and Level 3 as well as the top of the fuel. Indicate on this sketch the portion of the level sensor measurement range that is sensitive to measurement of the fuel pool level, with respect to the Level 1, Level 2, and Level 3 datum points.**	Complete. (Addressed in Reference 4)
4 (RAI-2, Ref.4)	RAI Question: **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. (Addressed in Reference 7)
5 (RAI-3, Ref.4)	RAI Question: **Provide the following:** **a) The design criteria that will be used to estimate the total loading**	Complete. a) All SFPIS equipment will be designed in accordance with the Byron Station Safe Shutdown

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
	on the mounting device(s), including static weight loads and dynamic loads. Describe the methodology that will be used to estimate the total loading, inclusive of design basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces. **b) A description of the manner in which the level sensor (and stilling well, if appropriate) will be attached to the refueling floor and/or other support structures for each planned point of attachment of the probe assembly. Indicate in a schematic the portions of the level sensor that will serve as points of attachment for mechanical/mounting or electrical connections.** **c) A description of the manner by which the mechanical connections will attach the level instrument to permanent SFP structures so as to support the level sensor assembly.**	Earthquake (SSE) design requirements. The vendor, Westinghouse, has evaluated the structural integrity of the mounting brackets in calculation CN-PEUS-13-24. The GTSTRUDL model, used by Westinghouse to calculate the stresses in the bracket assembly, considers load combinations for the dead load, live load and seismic load on the bracket. The reactionary forces calculated from these loads become the design inputs to design the mounting bracket anchorage to the refuel floor to withstand a Safe Shutdown Earthquake (SSE). <u>Seismic</u> The seismic loads are obtained from Byron Station's response spectra curves (Reference Updated FSAR Chapter 3 Figures for Byron Nuclear Generating Station). The following methodology was used in determining the stresses on the bracket assembly: • Frequency analysis, taking into account the dead weight and the hydrodynamic mass of the structure, is performed to obtain the natural frequencies of the structure in all three directions. • SSE (Safe Shutdown Earthquake) response spectra analysis is performed to obtain member stresses and support reactions.

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
		• 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 Appendix A of the Updated FSAR Revision 14 for Byron Nuclear Generating Station. • The seismic loads for each of the three directions are combined by the Square Root of the Sum of Squares (SRSS) Method. • Sloshing analysis is performed to obtain liquid pressure and its impact on bracket design. • The seismic results are combined with the dead load results and the hydrodynamic pressure results in absolute sum. These combined results are compared with the allowable stress values. <u>Sloshing</u> Sloshing forces were obtained by analysis. The TID-7024, Nuclear Reactors and Earthquakes, 1963, by the US Atomic Energy Commission, approach has been used to estimate the wave height and natural frequency. Horizontal and vertical impact force on the bracket components was calculated using the wave height and natural frequency obtained using TID-7024 approach. Using this methodology, sloshing forces

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
		have been calculated and added to the total reactionary forces that would be applicable for bracket anchorage design. The analysis also determined 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 borated water. The load impact due to the rising water and submergence of the bracket components has 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 in WNA-TR-03149-GEN. 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-13-24 – Pool-side Bracket Seismic Analysis b. LTR-SEE-II-13-47, WNA-TR-03149-GEN – Sloshing Analysis

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
		c. EQ-QR-269, WNA-TR-03149-GEN, EQ-TP-353 – Seismic Qualification of other components of SFPI Byron Station specific calculations BYR10-109 - Seismic Qualification of Instrument Mounting Details Associated with Plant Process Computer Replacement, and BYR14-056 - Seismic Qualification of Weschler Indicator VX-252, are being developed to address the seismic qualification of the readout display (Weschler Instruments) in the main control room (MCR). The design criteria used in this calculation meets the requirements to withstand a SSE and will meet the Byron Station safety related installation requirements. The methods used in the calculation follow IEEE Standard 344-2004 and IEEE Standard 323-2003 for seismic qualification of the instrument. b) The level sensor, which is one long probe, will be suspended from the launch plate via 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. c) The bracket assembly that supports the sensor probe and launch plate will be mechanically connected to the SFP structure. The mechanical connection

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
		consists of four concrete expansion anchors that will bolt the bracket assembly to the SFP structure via the base plate. The concrete expansion anchors will be designed to withstand SSE and will meet the Byron Station safety related installation requirements. The qualification details of the bracket are provided in Westinghouse's Pool-side bracket Seismic Analysis CN-PEUS-13-24 and the qualification of the anchorage to the floor is provided in Byron Station specific calculation BYR13-192 – Evaluation of SFPI Sensor Mounting Detail Anchorage and Mounting for 0PL04J and 0PL06J.
6 (RAI-4, Ref.4)	RAI Question: **Provide the following:** **a) A description of the specific method or combination of methods that will be applied to demonstrate the reliability of the permanently installed equipment under beyond-design basis ambient temperature, humidity, shock, vibration, and radiation conditions.** **b) A description of the testing and/or analyses that will be conducted to provide assurance that the equipment will perform reliably under the worst-case credible design basis loading at the location where the equipment will be mounted. Include a discussion of this seismic reliability demonstration as it applies to a) the level sensor mounted in the SFP area, and b) any control**	Complete. a) Beyond Design Basis Environment – Westinghouse qualified the components (probe, connector, cable) of the SFPIS located in the SFP area to the beyond design basis environment. Components of the system were subjected to beyond design basis conditions of heat and humidity, thermal and radiation aging mechanisms. This testing confirmed 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 perform following a plant design basis earthquake. Exelon has reviewed the documents and found acceptable. Reference

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
	boxes, electronics, or read-out and re-transmitting devices that will be employed to convey the level information from the level sensor to the plant operators or emergency responders. **c) A description of the specific method or combination of methods that will be used to confirm the reliability of the permanently installed equipment such that following a seismic event the instrument will maintain its required accuracy.**	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 acceptable. Reference Westinghouse documents EQ-QR-269, WNA-TR-03149-GEN for description of specific methods. MCR Display – Byron Station specific calculation (BYR14-056 - Seismic Qualification of Weschler Indicator VX-252) includes a Report of Qualification Testing performed by the vendor (Weschler Instruments). The methods used by the vendor to qualify the readout display follow IEEE Standard 344-2004 and IEEE Standard 323-2003 for seismic qualification of the instrument. For temperature and humidity qualification of the displays IEEE 344-2004, IEEE 323-2003, NRC Regulatory Guides 1.100, Revision 3; 1.209, March 2007; and EPRI TR-107330 guidance was followed. The habitability of the MCR will be maintained as part of the FLEX strategies, and therefore, the

Overall Integrated Plan Open Items		
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		readout display in the MCR will not be subject to harsh environmental or radiological conditions. Shock and Vibration – SFPIS pool side brackets were analyzed for Safe Shutdown Earthquake design requirements per NRC order EA-12-051 and NEI 12-02 guidance. As 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 shock and vibration testing is required for these components. SFPIS pool side brackets for both the primary and backup Westinghouse SFP measurement channels will be permanently installed and fixed to rigid refuel floors, which are Seismic Category 1 structures. The SFPI system components, such as level sensor and its bracket, display enclosure and its bracket, 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 sensor electronics are enclosed in a NEMA-4X housing. The display electronics panel utilizes a NEMA-4X rated stainless steel housing as well. These housings will be mounted to a seismically qualified

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
		wall 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 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 • Calculation BYR10-109, Seismic Qualification of Instrument Mounting Details Associated with Plant Process Computer Replacement • BYR14-056 - Seismic Qualification of Weschler Indicator VX-252 Seismic adequacy of the level sensor probe supporting bracket

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
		within the SFP area was demonstrated by analysis as discussed in response to RAI-3, Ref. 4 of the Overall Integrated Plan Open Items table. c) Westinghouse has seismically qualified the SFPI instrument and its components. CN-PEUS-13-24 describes Pool-side Bracket Seismic Analysis, EQ-QR-269, WNA-TR-03149-GEN, EQ-TP-353 describe remaining seismic qualifications of the instrument components. With the instrument being seismically qualified and installed as described in part (b) of this RAI response (RAI-4, Ref. 4 of Overall Integrated Plan Open Items table), including the readout display in the main control room, the instrument is assured to maintain reliable and accurate indication when required. Westinghouse report WNA-CN-00301-GEN and Byron Engineering Change 392445 provide the channel accuracy from measurement to display.
7 (RAI-5, Ref.4)	RAI Question: **Provide the following:** **a) A description of how the two channels of the proposed level measurement system meet this requirement so that the potential for a common cause event to adversely affect both channels is minimized to the extent practicable.** **b) Further information on how each level measurement system, consisting of level sensor electronics, cabling, and readout devices will be designed and installed to address independence through the application and**	Complete. (Addressed in Reference 7)

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
	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.	
8 (RAI-6, Ref.4)	RAI Question: **Provide the following:** **a) A description of the electrical ac power sources and capabilities 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 assured.**	Complete. Response for part (a): (Addressed in Reference 7) Response for (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 Electrical Penetration Area at Byron Station. The calculation also determines that the battery will last for 72 hours assuming the remote display in the MCR consumes a maximum of 0.064 Amps. Byron Station is crediting the MCR display as the primary display. The remote display vendor (Weschler's) data sheet indicates the readout display is self-contained. It will be calibrated to consume no more than 0.022 Amps, which bounds the 0.064 Amps assumed in the Westinghouse calculation above. Therefore, the Byron Station readout display of level indication in the MCR will be available for greater than 72 hours of operation. The results of the calculation meet the NEI 12-02 requirements.
9 (RAI-7, Ref.4)	RAI Question: **Provide the following:** **a) An estimate of the expected instrument channel accuracy performance under both (a) normal**	Started. a) The Westinghouse documents WNA-CN-00301 (Attachment 2, item 17) and WNA-DS-02957-GEN (Attachment 2, item 1)

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
	SFP level conditions (approximately Level1 or higher) and (b) at the beyond design-basis conditions (i.e., radiation, temperature, humidity, post-seismic and post-shock conditions) that would be present if the SFP level were at the Level2 and Level3 datum points. **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 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.**	describe the channel accuracy under both (a) normal SFP level conditions and (b) at the Beyond Design Basis (BDB) conditions that would be present if SFP level were at Level 2 and Level 3 datum points. Each instrument channel will be accurate to within ±3"during normal spent fuel pool level conditions. The instrument channels will retain this accuracy after BDB conditions, in accordance with the above Westinghouse documents. The same channel accuracy requirements are applicable to the readout display in the main control room as the display enclosures are installed locally in the Electrical Penetration Area. Byron Station has analyzed the channel accuracy to the main control room indicators in the Engineering Change package 392445, Revision 0 for the normal operating conditions and determined that the displayed level is accurate to within ±5.06". Byron is in the process of analyzing the channel accuracy to the main control room indicators for the BDB conditions. Byron will complete the analysis by September 30, 2014. At this time Byron station believes the accuracy will be within the channel accuracy requirements of the Order (±1 foot) for BDB conditions. b) The Westinghouse document WNA-TP-04709-GEN describes the methodology for routine testing/calibration verification and calibration methodology. This document also specifies the required accuracy criteria under

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
		normal operating conditions. Byron 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 Byron Station calibration and channel verification procedures. Instrument channel loop accuracy and set point deviation/error are determined using the Byron Station Engineering Standard NES-EIC-20.04 for safety related instruments. The methodology used to determine the set point deviation in this standard is consistent with ANSI/ISA-67.04.01-2000. Per this methodology, since drift value was not specified by the vendor, a default random drift value of ±1% of span (or ±1% of full scale, for conservatism) for mechanical components were assigned. A setting tolerance of twice the reference accuracy, which is a typical value, was applied to the indicator to yield an overall setting tolerance of ± 2% of full scale. This value will be used for the calibration procedure being developed for this instrument loop. The resultant non-negligible terms (Reference Accuracy, Drift, Readability, Measurement and Test Equipment Effect, and Setting Tolerance) are all random terms,

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
		and will be combined using the Square Root Sum of Squares (SRSS) methodology given in Engineering Standard NES-EIC-20.04. Thus, the maximum deviation introduced by the indicator, in percent of full span, is computed. Calibration will be performed once per refueling cycle for Byron 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.
10 (RAI-8, Ref.4)	RAI Question: **Provide the following:** **a) A description of the capability and provisions the proposed level sensing equipment will have to enable periodic testing and calibration, including how this capability enables the equipment to be tested in-situ.** **b) A description of how such testing and calibration will enable the conduct of regular channel checks of each independent channel against the other, and against any other permanently-installed SFP level instrumentation.** **c) A description of how functional checks will be performed, and the frequency at which they will be conducted. Describe how calibration tests will be performed, and the frequency at which they will be conducted.**	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. Westinghouse calibration and functional test procedures are acceptable for Byron. However, Byron must use a different in-situ test methodology to accommodate Byron's low profile bracket installation. Westinghouse provided letter LTR-SFPIS-14-55, Revision 0 (SFPIS 2 Point Verification Methodology) describing the new in-situ test methodology to accommodate Byron's low profile bracket. Exelon has reviewed the letter and found acceptable. b) The level displayed by the

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
	d) A discussion as to how these surveillances will be incorporated into the plant surveillance program. **e) A description of the preventive maintenance tasks required to be performed during normal operation, and the planned maximum surveillance interval that is necessary to assure that the channels are fully conditioned to accurately and reliably perform their functions when needed.**	channels will be verified per the Byron 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 recommended frequency. Calibration tests will be performed per Westinghouse calibration procedure WNA-TP-04709-GEN at the Westinghouse recommended frequency. d) Byron Station has developed calibration, functional test, and channel verification procedures per Westinghouse recommendations to ensure reliable, accurate and continuous SFPI functionality. Procedures (calibrations, functional checks, preventive maintenance, etc.) will be incorporated into plant programs per Exelon configuration control procedure CC-AA-103 (Configuration Change Control for Permanent Physical Plant Changes). This procedure controls implementation of engineering based configuration changes at Byron Station. As part of this process, Byron Station Departments review the Configuration Change content to determine the impact on their department activities, procedures and documentation. These reviews are documented in the associated modification package.

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
		Actions needed to implement the required changes to activities, to procedures and to documentation are tracked to completion in the Exelon Action Tracking system. Due dates are assigned in the Action Tracking system. e) Byron Station will develop preventive maintenance tasks for the SFPI per Westinghouse recommendation identified in the technical manual WNA-GO-00127-GEN to assure that the channels are fully conditioned to accurately and reliably perform their functions when needed by September 12, 2014.
11 (RAI-9, Ref.4)	RAI Question: **Please provide the following:** **a) The specific location for each of the primary and backup instrument channel displays.** **b) If the primary and backup display location is other than the main control room, provide justification for prompt accessibility to displays including primary and alternate route evaluation, habitability at display location(s), continual resource availability for personnel responsible to promptly read displays, and provisions for communications with decision makers for the various SFP drain down scenarios and external events.** **c) The reasons justifying why the locations selected enable the information from these instruments to be considered "promptly accessible" to various drain-down scenarios and external events.**	Complete. (Addressed in Reference 6)

Overall Integrated Plan Open Items		
OI#	**Description**	**Status**
12 (RAI-10, Ref.4)	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.**	Complete. (Addressed in Reference 7)
13 (RAI-11, Ref.4)	RAI Question: **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. 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 NEI 12-02 section 4.3 regarding compensatory 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.**	Complete. (Addressed in Reference 7)

Draft Safety Evaluation Open Items		
OI#	**Description**	**Status**
1 (RAI 1, Ref. 5)	RAI Question: **Please provide the results of the calculation used to determine the water elevation necessary for the pump's required NPSH to confirm that Level 1 has been adequately identified.**	Complete. (Addressed in Reference 7)
2 (RAI-4, Ref. 5)	RAI Question: **For RAI 3(a) above, provide the analyses used to verify the design criteria and methodology for seismic testing of the SFP instrumentation and the electronics units, including design basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces.**	Complete. The following Westinghouse documents provide the analyses used to verify the design criteria and describe the methodology for seismic testing of the SFP instrumentation and electronics units, inclusive of design basis maximum seismic loads and hydrodynamic loads that could result from pool sloshing and other effects that could accompany such seismic forces: a) CN-PEUS-13-24 – Pool-side Bracket Seismic Analysis b) LTR-SEE-II-13-47, WNA-TR-03149-GEN – Sloshing Analysis c) EQ-QR-269, WNA-TR-03149-GEN, EQ-TP-353 – Seismic Qualification of other components of SFPI 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. Byron Station specific calculations BYR10-109 - Seismic Qualification of Instrument Mounting Details Associated with Plant Process Computer Replacement, and BYR14-056 - Seismic Qualification of Weschler Indicator VX-252, will address the seismic qualification of the main control room indicators. The design criteria used in this calculation satisfies the requirements to withstand a SSE and will meet the Byron Station safety related installation requirements for mounting the readout displays in the main control room.
3 (RAI-5, Ref. 5)	RAI Question: **For each of the mounting attachments**	Complete. (Addressed in Reference 7)

	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.	
4 (RAI-7, Ref. 5)	RAI Question: **For RAI #6 above, provide the results from the selected methods, tests and analyses used to demonstrate the qualification and reliability of the installed equipment in accordance with the Order requirements.**	Started. Below is a summary of the test conditions used by Westinghouse to qualify the SFPIS. These test conditions are documented in Westinghouse documents EQ-QR-269, WNA-TR-03149-GEN, EQ-TP-354, WNA-DS-02957 AND LTR-SFPIS-13-35. Environmental Conditions for SFPIS Components installed in the Spent Fuel Pool Area at Byron Station are bounded by below test conditions, except for radiation TID 12" above top of fuel rack for beyond design basis conditions (BDB). The BDB radiation TID, 12" above top of fuel rack for Byron is 4.E07 R γ, per calculation BYR13-051 – NEI 12-02 Spent Fuel Pool Doses. The BDB radiation value to which the Westinghouse equipment is qualified to is 1.E07 R γ, per Section 5.1.1 of WNA-TR-03149-GEN. The radiation value of 4.E07 R γ is higher than 1.E07 R γ to which Westinghouse qualified the instrument to. However, this value of 4.E07 R γ is applicable only when the water is at Level 3. At Level 2 the TID reduces to 2.E07 R γ and it further reduces to 8.E06 at Level 1 and above. With SFP water level at Level 3 the only components of SFPI that are exposed to high radiation are the stainless steel probe and the stainless steel anchor. The materials with which the probe and the anchor are manufactured are resistant to radiation effects. The stainless steel anchor and stainless steel probe can withstand 40 year dose. Westinghouse updated the design specification (WNA-DS-02957-GEN) and LTR-SFPIS-13-35, Revision 1 documentation to include the above technical justification. Environmental Conditions for SFPIS Components in the Spent Fuel Pool Area Level sensor probe, coax coupler and connector assembly, launch plate and pool side bracket assembly, coax cable are designed and qualified to operate reliably in the below specified environmental conditions.

Parameter	Normal	BDB
Temperature	50-140°F	212°F
Pressure	Atmospheric	Atmospheric
Humidity	0-95% RH	100% (saturated steam)
Radiation TID γ (above pool)	1E03 Rads	1E07 Rads
Radiation TID γ (12" above top of fuel rack)	1E09 Rads (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 γ	≤ 1E03 R γ	≤ 1E03 R	≤ 1E03 R

Byron Station specific calculation (BYR14-056 - Seismic Qualification of Weschler Indicator VX-252) describes the results of the qualification testing of the MCR readout display to the design basis temperature, humidity, and vibration to demonstrate its reliability. The display was also tested to demonstrate that it performed accurately under extreme heat and humidity conditions.

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 September 30, 2014.

Seismic Category I Testing

Seismic qualification testing performed by Westinghouse along with the technical evaluations performed by Westinghouse confirms that the SFPIS meets the seismic requirements of the vendor's design specification. Westinghouse's design specification satisfies the Byron Station installation requirements to withstand a SSE.

Vibration Justification

As specified in the response for RAI-4, Ref. 4 in the Overall Integrated Plan Open Items table, components of the system (i.e., bracket, transmitter enclosure, display enclosure, and readout display in the MCR) will be permanently installed to meet the requirements to withstand a SSE and will meet the Byron Station safety related installation requirements. Westinghouse has analyzed the pool side bracket to withstand design basis SSE. Other components of the SFPIS were

		subjected to shock and vibration during the seismic testing and met the requirements necessary for mounted equipment. Sloshing Justification The sloshing calculation performed by Westinghouse was reviewed for a design basis seismic event and found acceptable. Sloshing forces were taken into consideration for the anchorage design of the pool side bracket to ensure the bracket is rigidly mounted to include sloshing affects.
5 (RAI-13, Ref. 5)	RAI Question: **Provide a list of the procedures addressing operation (both normal and abnormal response), calibration, test, maintenance, and inspection procedures that will be developed for use of the spent SFP instrumentation. Provide a brief description of the specific technical objectives to be achieved within each procedure.**	Complete. (Addressed in Reference 7)

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- 028)

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-13-156).
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 4, 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-13-114).
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-14-018).

ATTACHMENT – 1

Schematic of the Level Sensor with Mechanical Attachment Points