



Order No. EA-12-051

RS-15-026

February 27, 2015

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

Braidwood Station, Units 1 and 2
Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and STN 50-457

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-13-027)
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-13-112)
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-14-017)
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-14-195)

9. NRC letter to Exelon Generation Company, LLC, Braidwood 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, 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.

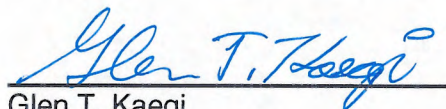
Reference 1 required submission of an initial status report 60 days following issuance of the final interim staff guidance (Reference 2) and an overall integrated plan pursuant to Section IV, Condition C. Reference 2 endorses industry guidance document NEI 12-02, Revision 1 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided the EGC initial status report regarding reliable spent fuel pool instrumentation. Reference 5 provided the Braidwood 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, 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 Braidwood 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. Braidwood Station, Units 1 and 2 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 - Braidwood Station, Units 1 and 2
NRC Project Manager, NRR - Braidwood Station, Units 1 and 2
Ms. Jessica A. Kratchman, NRR/JLD/PMB, NRC
Mr. Stephen R. Monarque, NRR/JLD/JPMB, NRC
Mr. Robert L. Dennig, NRR/DSS/SCVB, NRC
Mr. Joel S. Wiebe, NRR/DORL/LPL3-2, NRC
Mr. John Hughey, NRR/JLD/MSD, NRC
Illinois Emergency Management Agency - Division of Nuclear Safety

Enclosure

Braidwood Station, Units 1 and 2

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

(12 pages)

Braidwood Station, Units 1 and 2

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

Braidwood 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 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.

- Completed Detailed Design
- Started Installation

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 31, 2013	Complete	
Submit 6 Month Updates:			
Update 1	August 28, 2013	Complete	
Update 2	February 28, 2014	Complete	
Update 3	August 28, 2014	Complete	
Update 4	February 27, 2015	Complete with this submittal	

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Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
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 Design Engineering	4Q2013	Complete	
Complete and Issue SFPI Modification Package	3Q2014	Complete	
Begin Installation	1Q2015	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

Braidwood 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.	<u>Complete.</u> (Addressed in Reference 8)

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Overall Integrated Plan Open Items		
OI#	Description	Status
2 (Ref.1)	<p><u>Open Item:</u></p> <p>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.</p>	<p><u>Complete.</u></p> <p>(Addressed in Reference 6)</p>
3 (RAI-1b, Ref. 4)	<p><u>RAI Question:</u></p> <p>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.</p>	<p><u>Complete.</u></p> <p>(Addressed in Reference 4)</p>
4 (RAI-2, Ref.4)	<p><u>RAI Question:</u></p> <p>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.</p>	<p><u>Complete.</u></p> <p>(Addressed in Reference 8)</p>
5 (RAI-3, Ref.4)	<p><u>RAI Question:</u></p> <p>Provide the following: a) The design criteria that will be used to estimate the total loading</p>	<p><u>Complete.</u></p> <p>(Addressed in Reference 8)</p>

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Overall Integrated Plan Open Items		
Ol#	Description	Status
	<p>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.</p> <p>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.</p> <p>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.</p>	
<p>6 (RAI-4, Ref.4)</p>	<p><u>RAI Question:</u> 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</p>	<p><u>Complete.</u> (Addressed in Reference 8)</p>

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Overall Integrated Plan Open Items		
OI#	Description	Status
	<p>under the worst-case credible design basis loading at the location where the equipment will be mounted. Include a discussion of this seismic reliability demonstration as it applies to a) the level sensor mounted in the SFP area, and b) any control boxes, electronics, or read-out and re-transmitting devices that will be employed to convey the level information from the level sensor to the plant operators or emergency responders.</p> <p>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.</p>	
<p>7 (RAI-5, Ref.4)</p>	<p><u>RAI Question:</u> Provide the following: a) A description of how the two channels of the proposed level measurement system meet this requirement so that the potential for a common cause event to adversely affect both channels is minimized to the extent practicable. b) Further information on how each level measurement system, consisting of level sensor electronics, cabling, and readout devices will be designed and installed to address independence through the application and selection of independent power sources, the use of physical and spatial separation, independence of signals sent to the location(s) of the readout devices, and the</p>	<p><u>Complete.</u> (Addressed in Reference 8)</p>

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Overall Integrated Plan Open Items		
Ol#	Description	Status
	independence of the displays.	
8 (RAI-6, Ref.4)	<u>RAI Question:</u> 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.	<u>Complete.</u> (Addressed in Reference 8)
9 (RAI-7, Ref.4)	<u>RAI Question:</u> Provide the following: a) An estimate of the expected instrument channel accuracy performance under both (a) normal 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.	<u>Complete.</u> a) Braidwood Station has analyzed the channel accuracy to the main control room indicators in the calculation BRW-14-0220-I for the normal and BDB operating conditions and determined the displayed level is accurate to within $\pm 5''$. The accuracy is within the channel accuracy requirements of the Order (± 1 foot) for BDB conditions and meets the NEI 12-02 requirements. b) (Addressed in Reference 8)
10 (RAI-8, Ref.4)	<u>RAI Question:</u> Provide the following: a) A description of the capability and provisions the proposed level sensing equipment will have to	<u>Started.</u> a) (Addressed in Reference 8) b) (Addressed in Reference 8)

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Overall Integrated Plan Open Items		
OI#	Description	Status
	<p>enable periodic testing and calibration, including how this capability enables the equipment to be tested in-situ.</p> <p>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.</p> <p>c) A description of how functional checks will be performed, and the frequency at which they will be conducted. Describe how calibration tests will be performed, and the frequency at which they will be conducted.</p> <p>d) A discussion as to how these surveillances will be incorporated into the plant surveillance program.</p> <p>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.</p>	<p>c) (Addressed in Reference 8).</p> <p>d) In accordance with Braidwood Station maintenance and operating programs, Braidwood Station will develop calibration, functional test, channel verification procedures per Westinghouse recommendations to ensure reliable, accurate and continuous SFPI functionality by April 17, 2015.</p> <p>e) Braidwood 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 April 17, 2015.</p>
<p>11 (RAI-9, Ref.4)</p>	<p><u>RAI Question:</u></p> <p>Please provide the following:</p> <p>a) The specific location for each of the primary and backup instrument channel displays.</p> <p>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</p>	<p><u>Complete.</u></p> <p>(Addressed in Reference 6)</p>

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Overall Integrated Plan Open Items		
OI#	Description	Status
	<p>read displays, and provisions for communications with decision makers for the various SFP drain down scenarios and external events.</p> <p>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.</p>	
<p>12 (RAI-10, Ref.4)</p>	<p><u>RAI Question:</u></p> <p>Please provide the following:</p> <p>a) A list of the operating (both normal and abnormal response) procedures, calibration/test procedures, maintenance procedures, and inspection procedures that will be developed for use of the SFP instrumentation in a manner that addresses the order requirements.</p> <p>b) A brief description of the specific technical objectives to be achieved within each procedure. If your plan incorporates the use of portable spent fuel level monitoring components, please include a description of the objectives to be achieved with regard to the storage location and provisions for installation of the portable components when needed</p>	<p>Replaced by Interim SE RAI #13.</p>

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Overall Integrated Plan Open Items		
OI#	Description	Status
<p>13 (RAI-11, Ref.4)</p>	<p><u>RAI Question:</u> 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.</p>	<p><u>Complete.</u> a) (Addressed in Reference 8). Response for b and c are provided in Reference 8. However Braidwood Station revised the compensatory action note in Reference 8 as provided below: Note: Initiate an Issue Report to enter the condition into the Corrective Action Program. Identify the equipment out of service time is greater than the specified allowed out of service time, develop and implement an alternate method of monitoring, determine the cause of the non-functionality, and the plans and schedule for restoring the instrumentation channel(s) to functional status.</p>

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Draft Safety Evaluation Open Items		
Ol#	Description	Status
1 (RAI-1, Ref. 5)	<u>RAI Question:</u> Provide the results of the calculation used to determine the water elevation necessary for the SFP cooling pump required NPSH to confirm that Level 1 has been adequately identified.	<u>Complete.</u> (Addressed in Reference 8)
2 (RAI-3, Ref. 5)	<u>RAI Question:</u> Provide additional information describing how the final arrangement of the SFP instrumentation and routing of the cabling between the level instruments, the electronics and the displays, meets the Order requirement to arrange the SFP level instrument channels in a manner that provides reasonable protection of the level indication function against missiles that may result from damage to the structure over the SFP.	<u>Complete.</u> (Addressed in Reference 8)
3 (RAI-5, Ref. 5)	<u>RAI Question:</u> For RAI 4(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.	<u>Complete.</u> (Addressed in Reference 8)
4 (RAI-6, Ref. 5)	<u>RAI Question:</u> For each of the mounting attachments required to attach SFP level equipment to plant structures, please describe the design inputs, and the methodology that was used to qualify the structural integrity of the affected structures/equipment.	<u>Complete.</u> (Addressed in Reference 8)
5 (RAI-8,	<u>RAI Question:</u>	<u>Complete.</u> Westinghouse document EQ-QR-269

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Ref. 5)	For RAI #7 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.	was revised to include aging tests that age the system components to 10 years. Braidwood Station has reviewed EQ-QR-269 Revision 2 and found it to be acceptable.
6 (RAI-13, Ref. 5)	<u>RAI Question:</u> 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.	<u>Complete.</u> (Addressed in Reference 8)

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- 027)
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 31, 2013 (RS-13-194).
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.

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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-13-112).
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-14-017).
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-14-195).