

February 27, 2014

Attention: Document Control Desk  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

Serial No.: 12-167D  
NL&OS/MAE: R0A  
Docket Nos.: 50-280/281  
License Nos.: DPR-32/37

**VIRGINIA ELECTRIC AND POWER COMPANY**  
**SURRY POWER STATION UNITS 1 AND 2**  
**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)**

References:

1. NRC Order Number EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, dated March 12, 2012
2. Virginia Electric and Power Company's 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 (Serial No. 12-167B)
3. Virginia Electric and Power Company's 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 23, 2013 (Serial No. 12-167C)
4. Virginia Electric and Power Company's March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), Request for Additional Information (RAI) Response, dated August 8, 2013 (Serial No. 13-416)
5. Surry Power Station, Units 1 and 2: NRC Interim Staff Evaluation and Request for Additional Information Regarding to Overall Integrated Plan for Implementation of Order EA-12-051, Reliable Spent Fuel Pool Instrumentation, dated November 1, 2013

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued an order (Reference 1) to Virginia Electric and Power Company (Dominion). Reference 1 was immediately effective and directs Dominion to install reliable Spent Fuel Pool (SFP) Level Instrumentation.

Reference 1 required submission of an Overall Integrated Plan (OIP) (Reference 2) pursuant to Section IV, Condition C. Reference 1 also required submission of a status report at six-month intervals following submittal of the OIP.

Attachment 1 of this letter provides the second six-month status report and an update of milestone accomplishments since the submittal of the first six-month status report (Reference 3), including any changes to the compliance method, schedule, or need for relief and the basis.

On July 11, 2013, Ms. Karen Cotton Gross, the NRC Project Manager for Surry Power Station, transmitted a Request for Additional Information (RAI) to Mr. David Heacock, President and

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NRC

Chief Nuclear Officer of Dominion, regarding the Surry SFP Level Instrumentation system OIP. By letter dated August 8, 2013, Dominion submitted its response to the RAI (Reference 4).

On November 1, 2013, Dominion received an Interim Staff Evaluation (ISE) regarding the Surry SFP Level Instrumentation system OIP in a letter from Ms. K. C. Gross to Mr. David Heacock (Reference 5). As discussed in a public meeting on February 6, 2014, with the NRC, the RAIs contained in the ISE supersede the July 11, 2013 RAIs. Also, any commitments made in Reference 4 are no longer applicable. Responses to RAIs contained in the ISE are provided in Attachment 2 for those RAIs where design information is available. Responses to the remaining RAIs contained in the ISE will be provided in the next six-month status update, as the information becomes available, but no later than September 30, 2014.

If you have any questions, please contact Ms. Margaret Earle at (804) 273-2768.

Sincerely,



Mark D. Sartain  
Vice President Nuclear Engineering  
Virginia Electric and Power Company

Attachments (2)

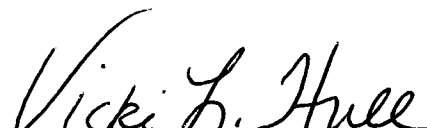
Commitments made by this letter: No new Regulatory Commitments

COMMONWEALTH OF VIRGINIA                    )  
  )  
COUNTY OF HENRICO                            )

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Mark D. Sartain who is Vice President Nuclear Engineering of Virginia Electric and Power Company. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of the Company, and that the statements in the document are true to the best of his knowledge and belief.

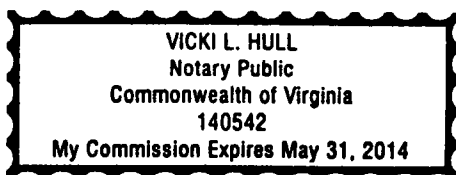
Acknowledged before me this 27<sup>TH</sup> day of February, 2014.

My Commission Expires: May 31, 2014.



Vicki L. Hull  
Notary Public

(SEAL)



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NRC Senior Resident Inspector  
Surry Power Station

**Attachment 1**

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

**Surry Power Station Units 1 and 2**

**Virginia Electric and Power Company (Dominion)**

## Six Month Status Report for the Implementation of Order EA-12-051

### 1 Introduction

Dominion developed an Overall Integrated Plan (OIP) (Reference 1) documenting the requirements to install reliable Spent Fuel Pool (SFP) Level Instrumentation in response to Order EA-12-051 (the Order) (Reference 2). This attachment provides an update of milestone accomplishments since submittal of the last status report (Reference 3), 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 Surry Power Station OIP for Order EA-12-051 and are current as of January 31, 2014.

- Submit OIP
- Commence Engineering and Design

### 3 Milestone Schedule Status

The following table provides an update to the milestone schedule supporting the OIP. This table provides the activity status of each item and the expected completion date noting any change. The target completion dates are subject to change as design and implementation details are developed.

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Submit OIP	Feb 2013	Complete	
Commence Engineering and Design	March 2013	Complete	
Complete Engineering and Design	December 2013	Started	May 2014
Complete Procurement of SFP Instruments	December 2013	Started	June 2014
Commence Installation of SFP Instruments	June 2014	Not Started	
Level Measurement System Functional	September 2014	Not Started	

The revised milestone target completion dates for 'Complete Engineering and Design' and 'Complete Procurement of SFP Instruments' do not impact the Order implementation date for Surry Power Station.

#### **4 Changes to Compliance Method**

There are no changes to Dominion's compliance method with NEI 12-02; however, the vendor for the SFP Level Instrumentation system has changed to Westinghouse. The Guided Wave Radar Technology will continue to be utilized and use of this proven technology will comply with Order EA-12-051, as described in the Surry SFP Level Instrumentation OIP. However, although the same technology is being used, some of the design details are being changed from the previously selected level instrumentation system (e.g., mounting brackets).

#### **5 Need for Relief/Relaxation and Basis for the Relief/Relaxation**

Dominion expects to comply with the Surry Power Station Order implementation date, and no required relief/relaxation has been identified at this time.

#### **6 Open Items from Overall Integrated Plan and Interim Staff Evaluation**

No update is required since there were no open items identified in the Surry Power Station Overall Integrated Plan submittal for Order EA-02-051. Request for Additional Information (RAI) identified in the Interim Staff Evaluation (Reference 4) are addressed in Attachment 2 of this letter.

#### **7 Potential Interim Staff Evaluation Impacts**

On July 11, 2013 Dominion received RAIs requesting detailed design information regarding the Surry SFP Level Instrumentation system. At that time, the design of the previously selected SFP Level Instrumentation system was not complete and only some of the design specifics were provided in a RAI response (Reference 5). The remaining design details were deferred to a later Six-Month Status Update, some of which were provided in the August 2013 Six-Month Status Update. Subsequently, some of this information was referenced in the Interim Staff Evaluation (ISE) issued on November 1, 2013.

Dominion has performed a comparison of the new Westinghouse SFP Level Instrumentation design against the design details that were included in the ISE and were previously provided in the RAI response and the August 2013 Six-Month Status Update. Dominion concludes that difference in the design details of Westinghouse's

instrumentation that could have potential impact on the NRC ISE are limited to the following:

- 1) Instrument display accuracy
- 2) Back-up DC power source

Clarification of design detail for Item 1 is addressed in RAI No. 15 in Attachment 2.

Clarification of design detail for Item 2 will be addressed in the next Six-Month Status Update, as the information becomes available, but no later than September 30, 2014.

## **8 References**

The following references support the update to the SFP Level Instrumentation Overall Integrated Plan described in this attachment.

1. "Virginia Electric and Power Company's 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)," Serial No. 12-167B, dated February 28, 2013.
2. NRC Order Number EA-12-051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," dated March 12, 2012.
3. "Virginia Electric and Power Company's 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 23, 2013 (Serial No. 12-167C).
4. Surry Power Station, Units 1 and 2: "NRC Interim Staff Evaluation and Request for Additional Information Regarding to Overall Integrated Plan for Implementation of Order EA-12-051, Reliable Spent Fuel Pool Instrumentation," dated November 1, 2013
5. "Virginia Electric and Power Company's March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), Request for Additional Information (RAI) Response," dated August 8, 2013 (Serial No. 13-416).

**Attachment 2**

**Order EA-12-051 Interim Staff Evaluation (ISE)  
Request for Additional Information (RAI) Responses**

**Surry Power Station Units 1 and 2  
Virginia Electric and Power Company (Dominion)**



**Virginia Electric and Power Company (Dominion)  
Six Month Status Report for the Implementation of Order EA-12-051  
Interim Staff Evaluation RAI Responses**

This attachment provides the available responses to RAIs contained in the Interim Staff Evaluation (ISE) and Request for Additional Information regarding the Surry SFP Level Instrumentation system received on November 1, 2013. Responses to the remaining RAIs will be provided in the next Six-Month Status Update, as the information becomes available, but no later than September 30, 2014.

**NRC RAI No. 3:**

*For RAI 2(a) above, please provide the analyses used to verify the design criteria and methodology for seismic testing of the SFP instrumentation and the electronics units, including, design basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces.*

**Dominion Response**

Westinghouse document WNA-PT-00188-GEN, Rev. 1, "Spent Fuel Pool Instrumentation System (SFPIS) Standard Product Test Strategy," provides the overall test strategy for the SFPIS system, and addresses the design criteria and methodology for seismic testing of the SFP instrumentation and the electronics units in Section 7. The test strategy includes seismic response spectra that envelope the design basis maximum seismic loads and includes applicable hydrodynamic loading that could result from conditions such as seismic-induced sloshing effects. In accordance with WNA-PT-00188-GEN, the seismic adequacy of the SFPIS equipment is demonstrated in accordance with the applicable guidance in Sections 7, 8, 9 and 10 of IEEE Standard 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," by testing (assemblies with active electronic components, sensor housing bracket, electronics panel mounting, coupler, and interconnecting cable) and analysis (sensor probe in pool and pool-side bracket).

Westinghouse is performing the plant-specific analysis of the sensor probe in pool (including sloshing effects) and the pool-side bracket consistent with the test strategy document. The report providing the methods, design criteria, and results of the analysis will be available for NRC review upon request.

The seismic testing that was performed for the SFPIS is described in Section 4.4 of Westinghouse document EQ-QR-269, Rev. 0, "Design Verification Testing Summary Report for the Spent Fuel Pool Instrumentation System," and the testing results are described in Section 5.4.3. No equipment failures were noted as a result of the seismic testing.

**NRC RAI No. 8:**

*Please provide information describing the evaluation of the comparative sensor design, the shock test method, test results, and forces applied to the sensor applicable to its successful tests demonstrating that the referenced previous testing provides an appropriate means to demonstrate reliability of the sensor under the effects of severe shock.*

**Dominion Response:**

The Westinghouse SFPIS sensor consists of a stainless steel cable probe attached to a permanently installed mounting bracket anchored to the SFP deck. In the installed locations, the SFPIS sensors (probes) will not be subject to shock and vibration loading conditions other than those induced by seismic motions. The SFPIS is subject to testing for anticipated maximum seismic conditions as described in the response to RAI No. 3. Section 8.2.4 (Shock and Vibration Qualification) [DS-02957-1621] of Westinghouse document WNA-DS-02957-GEN, Rev. 2, "Spent Fuel Pool Instrumentation System Design Specification," provides justification that no additional vibration and shock testing is required.

**NRC RAI No. 9:**

*Please provide information describing the evaluation of the comparative sensor design, the vibration test method, test results, and the forces and their frequency ranges and directions applied to the sensor applicable to its successful tests, demonstrating that the referenced previous testing provides an appropriate means to demonstrate reliability of the sensor under the effects of high vibration.*

**Dominion Response:**

See Response to RAI No. 8 above.

**NRC RAI No. 10:**

*Please provide information describing the evaluation of the comparative system electronics (including transmitters, control boxes, and display panels) ratings against postulated plant conditions. Also provide results of the manufacturer's shock and vibration test methods, test results, and the forces and their frequency ranges and directions applied to the system electronics and display panel associated with its successful tests.*

**Dominion Response:**

The SFPIS system electronics associated with both SFP level instrument channels will be permanently installed and anchored to structural walls of seismic category 1

structures and will not be subject to shock or vibration inputs other than those induced by seismic motions. The SFPIS is subject to testing for anticipated maximum seismic conditions as described in the response to RAI No. 3. Section 8.2.4 (Shock and Vibration Qualification), [DS-02957-1621] of Westinghouse document WNA-DS-02957-GEN, Rev. 2, identifies that shock and vibration qualification of the system electronics (including transmitters, control boxes, and display panels) is accomplished by seismic testing and provides justification that no additional vibration and shock testing is required.

**NRC RAI No. 11:**

*Please provide the following:*

*a) 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 boxes, electronics, or read-out and retransmitting devices that will be employed to convey the level information from the level sensor to the plant operators or emergency responders.*

*b) A description of the specific method or combination of methods that will be used to confirm the reliability of the permanently installed equipment during and following seismic conditions to maintain its required accuracy.*

**Dominion Response:**

a) Testing and analysis is conducted by Westinghouse 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. Surry Procurement Specification IC-1210, Rev. 1, provides the design requirements applicable to the installed location for the equipment. Section 7 of Westinghouse document WNA-PT-00188-GEN, Rev. 1, "Spent Fuel Pool Instrumentation System (SFPIS) Standard Product Test Strategy," provides the overall test strategy for the SFPIS system, and addresses the design criteria and methodology for seismic testing of the SFP instrumentation and the electronics units. The test strategy includes seismic response spectra that envelope the design basis maximum seismic loads and includes applicable hydrodynamic loading that could result from conditions such as seismic-induced sloshing effects. In accordance with WNA-PT-00188-GEN, the seismic adequacy of the SFPIS equipment is demonstrated in accordance with the applicable guidance in Sections 7, 8, 9 and 10 of IEEE Standard 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," by testing.

The seismic testing performed is described in Section 4.4 of Westinghouse document EQ-QR-269, Rev. 0, "Design Verification Testing Summary Report for the Spent Fuel Pool Instrumentation System."

- b) The method (testing) and associated performance and acceptance criteria used to confirm the reliability of the SFPIS during and following seismic conditions are described in Sections 2.2 and subsection 3.2.1 of Westinghouse document EQ-QR-269, respectively. The testing addresses the reliability of the permanently installed equipment to maintain required accuracy following seismic conditions. Confirmation of SFPIS function and accuracy following seismic testing is adequate to assure reliability since no operator readings or consequential actions will be taken until after a seismic event.

**NRC RAI No. 12:**

*For RAI #11 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.*

**Dominion Response:**

Results of seismic testing are documented in subsection 5.4.3 of Westinghouse Design Verification Testing Summary Report EQ-QR-269. The equipment met the required performance and acceptance criteria described in subsection 3.2.1 of EQ-QR-269.

The SFPIS maintained accuracy and structural integrity, and acceptable functionality was confirmed at the completion of seismic testing.

**NRC RAI No. 14:**

*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.*

**Dominion Response:**

Westinghouse document WNA-CN-00300-GEN, Rev. 0, "Spent Fuel Pool Instrumentation System Power Consumption Calculation," documents the SFPIS power consumption analysis. Table 5-7 (Level Wired Cabinet, 3-Day Battery Charge Power Consumption) reflects the configuration to be used at Surry.

The calculation concludes that, with an initial full charge, the battery will maintain the level indication function without ac power for 101.21 hours (4.22 days). With an

externally powered remote display connected to the SFPIS (that consumes no more than 0.064 Amps), the battery can maintain the level indication function for 3 days.

The results of the calculation show the battery will provide adequate time for off-site resources to be deployed by the mitigating strategies resulting from Order EA-12-049.

**NRC RAI No. 15:**

*Provide the following:*

*a) 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.*

*b) Please provide analysis verifying that the proposed instrument performance is consistent with these estimated accuracy normal and BDB values. Please demonstrate that the channels will retain these accuracy performance values following a loss of power and subsequent restoration of power.*

**Dominion Response:**

a) Westinghouse document WNA-DS-02957-GEN, Rev. 2, "Spent Fuel Pool Instrumentation System Design Specification," specifies the required display accuracy of the level indication as within  $\pm 3$  inches of the entire range, which is from normal water level to the top of the fuel racks for all environmental conditions. (Note: This display accuracy is for the Westinghouse SFPIS and is a change from the value previously reported.) Westinghouse document WNA-CN-00301-GEN, Rev. 0, "Spent Fuel Pool Instrumentation System Channel Accuracy Analysis," provides the SFPIS channel accuracy analysis.

Westinghouse document WNA-TP-04709-GEN, Rev. 3, "Calibration Procedure," provides the instructions for calibration of the SFPIS. The calibration check is intended to be performed within 60 days of a planned refueling outage, but not more frequently than once per 12 months. The calibration procedure specifies the allowed deviation from the instrument channel required accuracy that initiates a required adjustment to within the normal condition design accuracy.

b) Westinghouse document WNA-CN-00301-GEN, Rev. 0, "Spent Fuel Pool Instrumentation System Channel Accuracy Analysis," provides the SFPIS channel accuracy analysis verifying that the instrument performance is consistent with the accuracy requirements during normal and abnormal conditions.

As described in the response to RAI No. 15 a) above, Westinghouse document WNA-TP-04709-GEN, Rev. 3, "Calibration Procedure," provides the instructions for routine calibration of the SFPIS to ensure that instrument performance is consistent with accuracy requirements during operation.

The results of qualification testing are documented in Westinghouse Design Verification Testing Summary Report EQ-QR-269. These results demonstrate that the channels retained the design accuracy at the completion of each test including loss of power and subsequent restoration of power.