VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

10 CFR 2.202
EA-12-051

February 27, 2014

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

Serial No.: 12-166E
NL&OS/MAE: R0A
Docket Nos.: 50-338/339
License Nos.: NPF-4/7

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
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. 12-166B)
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. 12-166D)
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 July 2, 2013 (Serial No. 12-166C)
5. North Anna 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 May 28, 2013, Dr. V. Sreenivas, the NRC Project Manager for North Anna Power Station, transmitted a Request for Additional Information (RAI) in an email to Mr. David Heacock, President and Chief Nuclear Officer of Dominion, regarding the North Anna SFP Level

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Instrumentation system OIP. By letter dated July 2, 2013, Dominion submitted its response to the RAI (Reference 4).

On November 1, 2013, Dominion received an Interim Staff Evaluation (ISE) regarding the North Anna SFP Level Instrumentation system OIP in a letter from Dr. V. Sreenivas 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 May 28, 2013 RAIs. Also, any commitments made in Reference 4 are no longer applicable. Responses to the RAIs contained in the ISE are provided in Attachment 2.

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 27TH day of February, 2014.

My Commission Expires: May 31, 2014.

VICKI L. HULL
Notary Public
Commonwealth of Virginia
140542
My Commission Expires May 31, 2014

(SEAL)

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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

North Anna 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 for North Anna Power Station Unit 2 (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 North Anna 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 North Anna Power Station Overall Integrated Plan. 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	February 2013	Complete	
Commence Engineering and Design	March 2013	Complete	
Complete Engineering and Design	December 2013	Started	May 2014
Complete Procurement of SFP Instruments	May 2014	Started	
Commence Installation of SFP Instruments	March 2014	Not Started	June 2014
Level Measurement System Functional	September 2014	Not Started	

The revised milestone target completion dates for 'Complete Engineering and Design' and 'Commence Installation of SFP Instruments' do not impact the Order implementation date for North Anna 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 NAPS 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 order implementation date and no relief/relaxation is required 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 North Anna Power Station Overall Integrated Plan submittal for Order EA-12-051. 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 May 28, 2013, Dominion received RAIs requesting detailed design information regarding the North Anna 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 differences in the design details of Westinghouse's

new 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 these design details are addressed in RAI Nos. 16a and 14, in Attachment 2, respectively.

8 References

The following references support the update to the North Anna Power Station 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. 12-166B, 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. 12-166D).

4. North Anna 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 July 2, 2013 (Serial No. 12-166C).

Attachment 2

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

North Anna Power Station Units 1 and 2

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 responses to the RAIs contained in the Interim Staff Evaluation (ISE) and Request for Additional Information regarding the North Anna SFP Level Instrumentation system received on November 1, 2013.

NRC RAI No. 1:

Please specify which of the two identified values is the correct elevation for Level 1.

Dominion Response:

The correct elevation associated with level 1 (level adequate to support operation of the normal fuel pool cooling system) is 286.6 ft. (286 ft. 7.2 in.) as provided in calculation MISC-11798, "Dominion Fleet Spent Fuel Pool Levels to Provide Adequate NPSH to the Cooling Pumps with a Saturated Pool."

NRC RAI No. 2:

Please provide a clearly labeled sketch or marked-up plant drawing of the plan view of the SFP area, depicting the SFP inside dimensions, the planned locations/placement of the primary and back-up SFP level sensor, and the proposed routing of the cables that will extend from these sensors toward the location of the read-out display device.

Dominion Response:

A plan view sketch of the SFP area is provided as Figure 1 below. The sketch depicts the SFP inside dimensions, the planned locations/placement of the primary and back-up level sensors, and the proposed routing of cables that extend the sensors toward the location of the electronics.

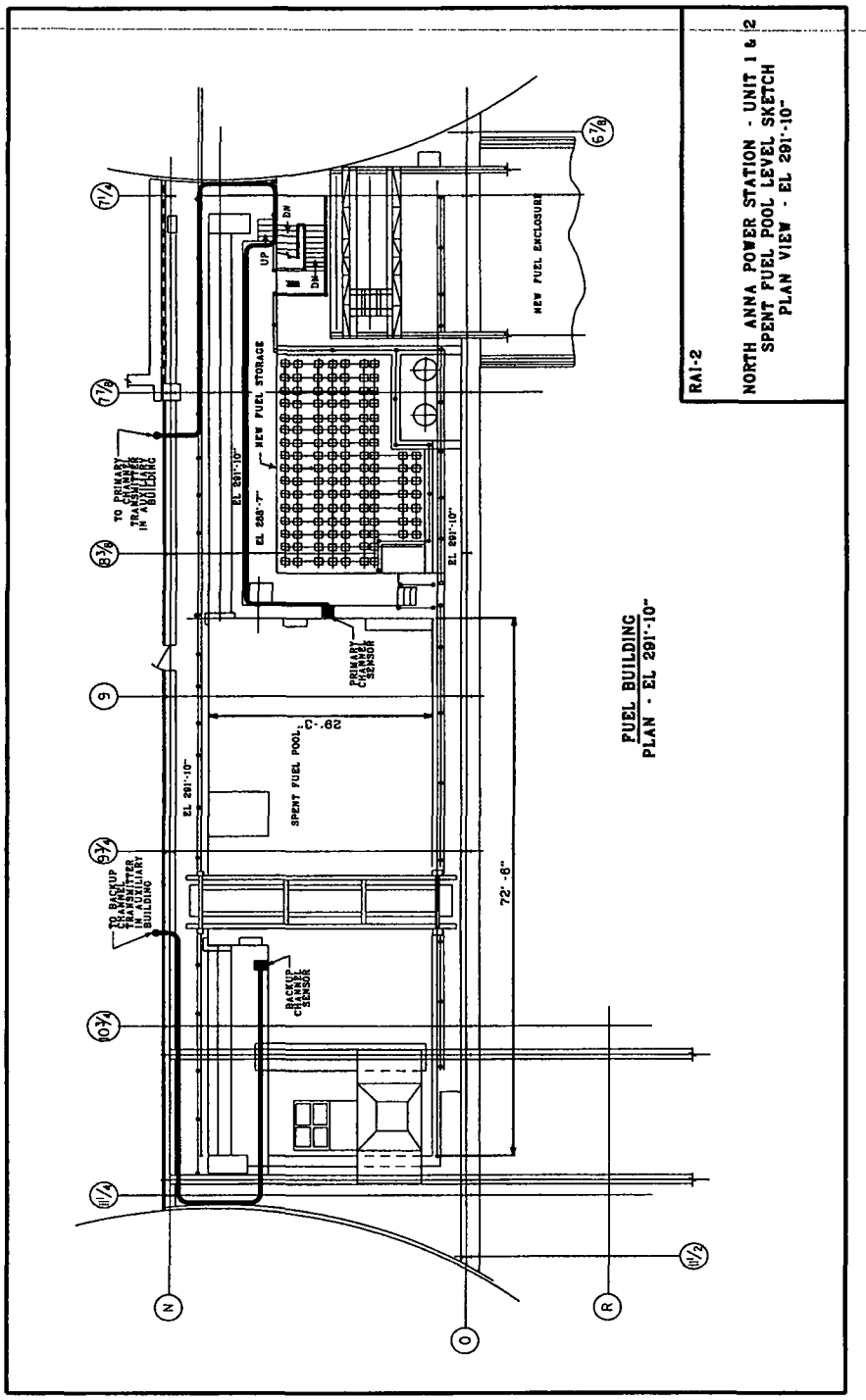


Figure 1 – North Anna SFP Level Instrumentation Plan View

NRC RAI No. 3:

Provide the following:

a) The design criteria that will be used to estimate the total loading on the mounting device(s), including static weight loads and dynamic loads. Describe the methodology 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 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.

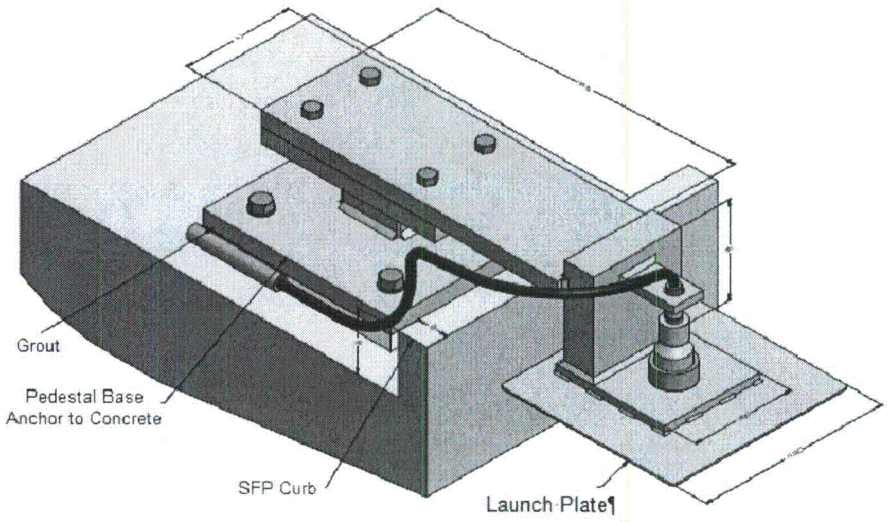
Dominion Response:

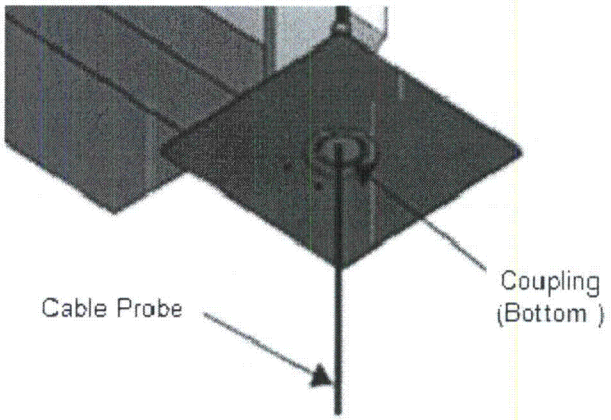
a) The mounting device (mounting bracket) for the Spent Fuel Pool Instrumentation System (SFPIS) is designated as Quality Classification NSQ (non-safety related, with special quality requirements) in accordance with the Dominion Nuclear Quality Assurance Program. The mounting bracket design will meet the North Anna Power Station (NAPS) design and licensing basis requirements for Seismic Category I components, and will include consideration of static weight loads and hydrodynamic loads.

   The analysis method that will be used to qualify the mounting bracket for the loading conditions, will include the design basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing. The North Anna-specific analysis of the mounting bracket is being performed by Westinghouse (SFPIS equipment supplier) and the document providing the methods, design criteria, and results of the analysis will be available for NRC review upon request.

b) The level sensor consists of a stranded stainless steel cable level probe that is threaded on the top end. The probe attaches (threads) into a coupling that is secured to the mounting bracket launch plate and extends down into the pool. The attachment to the signal cable is via a coaxial connection on the top side of the launch plate coupling. The mounting bracket is attached to the SFP structure at the concrete curb utilizing expansion-type concrete anchor bolts.

   The simplified drawing below shows a representation of the attachment of the probe and the sensor cable to the mounting bracket (launch plate) , and mounting bracket attachment to the SFP structure.





c) The level sensor (probe) is designed to be attached near its upper end to the mounting bracket, as described in the response to RAI #3b above. The mounting bracket will be attached to the SFP concrete curb utilizing expansion-type concrete anchor bolts. The mounting bracket to the SFP structure concrete curb anchorage is designed to meet the requirements of the North Anna design and licensing basis for Seismic Category I components including seismic loads, static weight loads and hydrodynamic loads.

NRC RAI No. 4:

For RAI 3(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

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 (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).

The North Anna plant-specific analysis of the sensor probe in pool (sloshing effects) and pool-side bracket is being performed by Westinghouse consistent with the test strategy document, and the report providing the methods, design criteria, and results of the analysis and 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. 5:

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.

Dominion Response:

As described in RAI 3a, 3b, and 3c above, the level sensing probe is attached to the mounting bracket, which is anchored to the SFP structure at the concrete curb using concrete expansion anchors. The anchorage to the Seismic Category I SFP structure meets the design requirements described in the response to RAI 3c.

Each of the additional SFPIS components required to be mounted / anchored will be fixed to plant structures consistent with the North Anna design and licensing basis for Seismic Category I components, and include consideration of design basis maximum seismic loads and static weight loads.

NRC RAI No. 6:

Please provide analysis of the maximum expected radiological conditions (dose rate and total integrated dose) to which the equipment (including transmitters, control boxes, and display panels) will be exposed. Also, please provide documentation indicating how it was determined that the electronics for the SFP level instrumentation is capable of withstanding a total integrated dose of $1X10^4$ Rads. Please discuss the time period over which the analyzed total integrated dose was applied.

Dominion Response:

A radiation dose rate analysis was performed to support the radiological assessment requirements defined by NEI 12-02 for the SFP and Auxiliary Building areas, the results are provided in Calculation RA-0048, "Radiological Evaluation following a Beyond Design Basis NAPS SFP Draindown for NEI 12-02." The results of this analysis provided dose rates and integrated doses for 7-days post-BDB event conservatively assuming SFP water level at one foot above the fuel rack. The analysis also provided dose rates and integrated doses for 40-year normal operation. The 7-day integrated doses were based on the core inventories (spent fuel sources) at 100 hours after shutdown as defined in NEI 12-02. The dose rate analysis resulted in a 7-day integrated dose of $3.2X10^6$ Rads at the coupler location in the SFP area. The dose rate analysis resulted in a 7-day integrated dose of 470 Rads and 40-year integrated dose of 880 Rads in the Auxiliary Building where the SFPIS sensor transmitters are located. These values were compared to the design criteria of 10^7 Rads for the SFP area and 10^3 Rads for the Auxiliary Building area and formed the basis for demonstrating reliability of the permanently installed SFPIS.

Radiation test results supplied by Westinghouse in qualification summary test report EQ-QR-269, "Design Verification Testing Summary Report for the Spent Fuel Pool Instrumentation System" have qualified the coupler and coaxial connecting cable to greater than 10^7 Rads. This comparison formed the basis for demonstrating reliability of the permanently installed equipment located in the SFP area.

The SFP level instrumentation electronics utilize Commercial-off-the-Shelf (COTS) components containing Complementary Metal Oxide Semiconductor (CMOS) devices which have been found to be capable of withstanding ionizing dose radiation levels of up to 10^3 Rads as described in EPRI 1021067 "Nuclear Power Plant Equipment Qualification Reference Manual," Rev. 1, and discussed in RG 1.209, "Guidelines for Environmental Qualification of Safety-Related Computer Based Instrumentation and Control Systems in Nuclear Power Plants." Comparing the calculated integrated dose for both the short-term post-BDB event and the long-term normal operating conditions to the industry accepted limit formed the basis to demonstrate reliability of the permanently installed sensor transmitter equipment located within the Auxiliary Building under post-BDB event radiological conditions.

The control box, Uninterruptable Power Supply (UPS), and displays are located in the Main Control Room (MCR) where habitability will be maintained as part of the FLEX strategies and, therefore, will not be subject to excessive radiological conditions.

NRC RAI No. 7:

Please provide information indicating (a) what are the temperature ratings and whether the temperature ratings for the system electronics (including transmitters, control boxes, and display panels) are continuous duty ratings; and, (b) what will be the maximum expected ambient temperature in the rooms in which the system electronics will be located under BDB conditions in which there are no AC power available to run Heating Ventilation and Air Conditioning (HVAC) systems?

Dominion Response:

a) The temperature rating for the electronic equipment located in the Auxiliary Building and the MCR (transmitter, control box, UPS, display) is 120 degrees F based on a continuous duty rating and 140 degrees F under abnormal conditions. The basis for the temperature ratings is provided in Section 4.6 of Westinghouse design specification WNA-DS-02957-GEN, Rev. 2. The temperature rating test results for abnormal conditions are provided in Section 4.5 of Westinghouse report EQ-QR-269, "Design Verification Testing Summary Report for the Spent Fuel Pool Instrumentation System."

b) The electronic transmitter equipment will be mounted within the Auxiliary Building one elevation below the SFP Operating Deck. This area of the Auxiliary Building is described in NAPS "Environmental Zone Description" and is not expected to exceed 95 degrees F during normal operations. The maximum temperature under postulated BDB conditions in which there is no ac power available to run heating ventilation and air conditioning (HVAC) systems is not expected to exceed 120 degrees F. The room temperatures were analyzed utilizing GOTHIC computational code and the results are included in Addendum 00A to NAPS calculation NA-CALC-MEC-ME-0972, "Evaluation of Room Air Temperatures Following Extended Loss of AC Power (ELAP)."

   The displays, control box and UPS are located in the Main Control Room (MCR) where habitability will be maintained as part of the FLEX strategies. NAPS calculation NA-CALC-MEC-ME-0972 evaluates the MCR temperatures and concludes the MCR will not be subject to temperature conditions beyond the ratings stated in RAI 7a.

NRC RAI No. 8:

Please provide information indicating the maximum expected relative humidity in the rooms in which the system electronics will be located under BDB conditions, in which there are no AC power available to run HVAC systems, and whether the sensor electronics are capable of continuously performing its required functions under this expected humidity condition.

Dominion Response:

The electronic transmitter equipment will be mounted within the Auxiliary Building one elevation below the SFP Operating Deck. The maximum humidity for NAPS postulated BDB conditions in which there is no ac power available to run heating ventilation and air conditioning (HVAC) system is expected to be less than 95% relative humidity which was analyzed utilizing GOTHIC computational code and the results are included in Addendum 00A to NAPS calculation NA-CALC-MEC-ME-0972, "Evaluation of Room Air Temperatures Following Extended Loss of AC Power (ELAP)". Equipment testing under normal and abnormal conditions with humidity levels up to 95% were performed by Westinghouse and the results documented in Section 4.5 of EQ-QR-269, "Design Verification Testing Summary Report for the Spent Fuel Pool Instrumentation System." The results from testing performed by Westinghouse compared to the maximum post-BDB event humidity level of 95% was found to be acceptable. This comparison formed the basis to demonstrate reliability of the permanently installed electronic equipment located within the Auxiliary Building under the post-BDB event conditions for relative humidity.

The displays, control box and UPS are located in the Main Control Room (MCR) where habitability will be maintained as part of the FLEX strategies. It is reasonable to assume that the MCR relative humidity would not be any greater than the humidity experienced in the Auxiliary Building areas. Therefore, the MCR will not be subject to conditions greater than 95% relative humidity.

NRC RAI No. 9:

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 braided 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. 4. 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. 10:

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. 9 above.

NRC RAI No. 11:

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. 4. 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. 12:

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. North Anna 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 Section 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 action will be taken until after a seismic event.

NRC RAI No. 13:

For RAI #12 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 is 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 following:

a) A description of the electrical AC power sources and capabilities for the primary and backup channels.

b) Please provide the NRC staff with the final configuration of the power supply source for each channel so that the staff may conclude that the two channels are independent from a power supply assignment perspective.

Dominion Response:

a) Each instrument channel is normally powered by a 120 VAC distribution panels to support continuous monitoring of the SFP level. The 120 VAC distribution panels for the primary and backup channels are powered by different 480 VAC buses. Therefore, the loss of either of the 480 VAC buses will not result in the failure of both instrument channels. On loss of normal 120 VAC power, each channel is equipped with a separate UPS that will automatically transfer to a dedicated 72-hour back-up battery. If normal power is restored, then the instrument channels will automatically transfer back to the normal 120 VAC power source. The backup batteries are maintained in a charged state by the associated UPS.

   The instrument channels can also be powered through a manually selected alternate AC power source, if available. The Westinghouse SFP Level Instrumentation system design does not include an optional external DC power input.

b) See response to RAI #14a above.

NRC RAI No. 15:

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 North Anna.

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 additional remote display connected to the SFPIS, 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. 16:

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," provides the required display accuracy of the level indication as within ± 3 inches of the entire range, which is from normal water level to the top of the fuel racks under 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. 16 a), 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.

NRC RAI No. 17:

Please provide a list of the procedures addressing operation (both normal and abnormal response), calibration, test, maintenance, and inspection procedures that will be developed for use of the SFP instrumentation. The licensee is requested to include a brief description of the specific technical objectives to be achieved within each procedure.

Dominion Response:

Appropriate quality assurance measures that are consistent with Appendix A-1 of NEI 12-02 will be established for the SFP level instrumentation as required by order EA-12-051. Site specific procedures will be developed for system inspection, calibration and test, maintenance, repair, operation, and normal and abnormal responses in accordance with NAPS procedural controls and will be based on recommended operation and maintenance procedures provided by Westinghouse. Technical objectives will be achieved through NAPS specific procedures based on the following general types:

	Type of Procedure	Objective to be Achieved
1)	System Inspection	To verify the system components are in place, complete, and in the correct configuration, and that the sensor probe is free from significant boric acid deposition
2)	Calibration and Test	To verify that the system is within specified accuracy, is functioning as designed, and is properly indicating SFP level
3)	Maintenance	To establish and define scheduled and preventative maintenance requirements and activities necessary to minimize the possibility of interruption
4)	Repair	To specify troubleshooting steps and component repair and replacement activities in the even of a system malfunction
5)	Operation	To provide sufficient instructions for operation and

	Type of Procedure	Objective to be Achieved
		use of the system by plant staff personnel
6)	FLEX Support Guideline (FSG)	To define the actions to be taken upon observation of system level indications, including actions to be taken at the levels defined in NEI 12-02

NRC RAI No. 18:

Please provide the following:

a) *Further information describing the maintenance and testing program the licensee will establish and implement to ensure that regular testing and calibration is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. Please include a description of the 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) *Information describing compensatory actions when both channels are out-of-order, and the implementation procedures.*

c) *Additional information describing expedited and compensatory actions in the maintenance procedure to address when one of the instrument channels cannot be restored to functional status within 90 days*

Dominion Response:

a) Channel Check is not a specified requirement in NEI 12-02. Channel Check is specified in IEEE 338-1987 for Safety Systems. SFP level instrument channels are not safety related and are not subject to testing requirements of safety related instrumentation. If the plant staff determined a need to confirm that the two channels are performing as expected, the two channels may be read in the Main Control Room. While the SFP is operating within design basis and at normal level, the indicators may be compared to fixed marks within the SFP by visual observation to confirm indicated level. The periodic calibration verification will be performed within 60 days of a refueling outage considering normal testing scheduling allowances (e.g., 25%). Calibration verification will not be required to be performed more than once per 12 months. These calibration requirements are consistent with the guidance provided in NEI 12-02 section 4.3. Periodic calibration verification procedures will be in place based on information provided by Westinghouse in WNA-TP-04709-GEN, "Spent Fuel Pool Instrumentation System Calibration Procedure." Preventive maintenance procedures to include tests, inspection and periodic

replacement of the backup batteries will be developed based on recommendation from Westinghouse.

b) Provisions associated with out of service (OOS) or non-functional equipment including allowed outage times and compensatory actions will be consistent with the guidance provided in Section 4.3 of NEI 12-02. If one OOS channel cannot be restored to service within 90 days, appropriate compensatory actions, including the use of alternate suitable equipment, will be taken. If both channels become OOS, actions would be initiated within 24 hours to restore one of the channels to operable status and to implements appropriate compensatory actions, including the use of alternate suitable equipment and/or supplemental personnel, within 72 hours. Additionally, if both channels are OOS, a Condition Report will be initiated and addressed through the Dominion's Corrective Action Program.

   North Anna will maintain sufficient spare parts for the SFPIS, taking into account the lead time and availability of spare parts, in order to expedite maintenance activities, when necessary, to provide assurance that a channel can be restored to service within 90 days.

c) See response to RAI 18b.