UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 24, 2014

Mr. David A. Heacock
President and Chief Nuclear Officer
Virginia Electric and Power Company
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: NORTH ANNA POWER STATION, UNITS 1 AND 2 – REPORT FOR THE ONSITE AUDIT REGARDING IMPLEMENTATION OF MITIGATING STRATEGIES AND RELIABLE SPENT FUEL INSTRUMENTATION RELATED TO ORDERS EA-12-049 AND EA-12-051 (TAC NOS. MF0998, MF0999, MF0986, AND MF0987)

Dear Mr. Heacock:

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design-Basis External Events" and Order EA-12-051, "Order to Modify Licenses With Regard To Reliable Spent Fuel Pool Instrumentation," (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML12054A736 and ML12054A679, respectively). The orders require holders of operating reactor licenses and construction permits issued under Title 10 of the *Code of Federal Regulations* Part 50 to submit for review, Overall Integrated Plans (OIPs) including descriptions of how compliance with the requirements of Attachment 2 of each order will be achieved.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A182), Virginia Electric and Power Company (Dominion, the licensee) submitted its OIP for North Anna Power Station, Units 1 and 2 (North Anna) in response to Order EA-12-049. By letters dated April 30, 2013, August 23, 2013, February 27, 2014, and August 28, 2014 (ADAMS Accession Nos. ML13126A207, ML13242A012, ML14069A012, and ML14251A024, respectively), Dominion submitted a supplement and its first three six-month updates to the OIP. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the staff is conducting audits of their responses to Order EA-12-049 in accordance with NRC Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-111, "Regulatory Audits" (ADAMS Accession No. ML082900195). This audit process led to the issuance of the North Anna interim staff evaluation (ISE) and audit report on January 29, 2014 (ADAMS Accession No. ML13338A448) and continues with in-office and onsite portions of this audit.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A017), Dominion submitted its OIP for North Anna in response to Order EA-12-051. By email dated May 28, 2013 (ADAMS Accession No. ML13177A194), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated July 2, 2013, August 23, 2013, February 27, 2014, and August 26, 2014 (ADAMS Accession Nos. ML13190A310, ML13242A015, ML14069A009, and ML14245A401, respectively), Dominion submitted its RAI responses and first three six-month updates to the OIP. The NRC staff's review to date led to the issuance of the North Anna ISE

and RAI dated November 1, 2013 (ADAMS Accession No. ML13281A648). By letter dated March 26, 2014 (ADAMS Accession No. ML14083A620), the NRC notified all licensees and construction permit holders that the staff is conducting in-office and onsite audits of their responses to Order EA-12-051 in accordance with NRC NRR Office Instruction LIC-111, as discussed above.

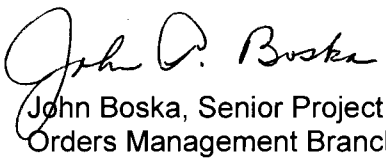
The ongoing audits allow the staff to review open and confirmatory items from the mitigation strategies ISE, RAI responses from the spent fuel pool instrumentation (SFPI) ISE, the licensee's integrated plans, and other audit questions. Additionally, the staff gains a better understanding of submitted and updated information, audit information provided on ePortals, and preliminary Overall Program Documents/Final Integrated Plans while identifying additional information necessary for the licensee to supplement its plan and staff potential concerns.

In support of the ongoing audit of the North Anna OIPs, as supplemented, the NRC staff conducted an onsite audit at the North Anna Power Station from May 19-22, 2014, per the plan dated April 24, 2014 (ADAMS Accession No. ML14112A302). The purpose of the onsite portion of the audit was to provide the NRC staff the opportunity to continue the audit review and gain key insights most easily obtained at the plant as to whether the licensee is on the correct path for compliance with the Mitigation Strategies and SFPI orders. The onsite activities included detailed analysis and calculation discussion, walk-throughs of strategies and equipment laydown, visualization of portable equipment storage and deployment, staging and deployment of offsite equipment, and physical sizing and placement of SFPI equipment.

The enclosed audit report provides a summary of the activities for the onsite audit portion. Additionally, this report contains attachments providing the NRC staff's current review status of all identified audit items from the respective order ISEs, audit questions, licensee identified open items, and questions since the ISE resulting from licensee plan changes, new generic concerns, and/or other items needing resolution for safety evaluation. The NRC staff's intention is that, barring changes to the licensee's plan, technology, and/or generic approach, the audit item review status enclosures comprise the items under NRC staff consideration for the OIPs' safety evaluation.

If you have any questions, please contact me at 301-415-2901 or by e-mail at John.Boska@nrc.gov.

Sincerely,



John Boska, Senior Project Manager
Orders Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket Nos.: 50-338 and 50-339

Enclosure:
Audit report

cc w/encl: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

AUDIT REPORT BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO ORDERS EA-12-049 AND EA-12-051 MODIFYING LICENSES

WITH REGARD TO REQUIREMENTS FOR

MITIGATION STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS

AND RELIABLE SPENT FUEL POOL INSTRUMENTATION

VIRGINIA ELECTRIC AND POWER COMPANY

NORTH ANNA POWER STATION, UNITS 1 AND 2

DOCKET NOS. 50-338 and 50-339

BACKGROUND AND AUDIT BASIS

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design-Basis External Events" and Order EA-12-051, "Order to Modify Licenses With Regard To Reliable Spent Fuel Pool Instrumentation," (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML12054A736 and ML12054A679, respectively). Order EA-12-049 directs licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool (SFP) cooling capabilities in the event of a beyond-design-basis external event (BDBEE). Order EA-12-051 requires, in part, that all operating reactor sites have a reliable means of remotely monitoring wide-range SFP levels to support effective prioritization of event mitigation and recovery actions in the event of a BDBEE. The orders require holders of operating reactor licenses and construction permits issued under Title 10 of the *Code of Federal Regulations* Part 50 to submit for review, Overall Integrated Plans (OIPs) including descriptions of how compliance with the requirements of Attachment 2 of each order will be achieved.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A182), Virginia Electric and Power Company (Dominion, the licensee) submitted its OIP for North Anna Power Station, Units 1 and 2 (North Anna, NAPS) in response to Order EA-12-049. By letters dated April 30, 2013, August 23, 2013, February 27, 2014, and August 28, 2014 (ADAMS Accession Nos. ML13126A207, ML13242A012, ML14069A012, and ML14251A024, respectively), Dominion submitted a supplement and its first three six-month updates to the OIP. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the staff is conducting audits of their responses to Order EA-12-

049 in accordance with NRC Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-111, "Regulatory Audits" (ADAMS Accession No. ML082900195). This audit process led to the issuance of the North Anna interim staff evaluation (ISE) and audit report on January 29, 2014, (ADAMS Accession No. ML13338A448) and continues with in-office and onsite portions of this audit.

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The ongoing audits allow the staff to review open and confirmatory items from the mitigation strategies ISE, RAI responses from the spent fuel pool instrumentation (SFPI) ISE, the licensee's integrated plans, and other audit questions. Additionally, the staff gains a better understanding of submitted and updated information, audit information provided on ePortals, and preliminary Overall Program Documents (OPDs)/Final Integrated Plans (FIPs) while identifying additional information necessary for the licensee to supplement its plan and staff potential concerns.

In support of the ongoing audit of the North Anna OIPs, as supplemented, the NRC staff conducted an onsite audit at the North Anna Power Station from May 19-22, 2014, per the plan dated April 24, 2014 (ADAMS Accession No. ML14112A302). The purpose of the onsite portion of the audit was to provide the NRC staff the opportunity to continue the audit review and gain key insights most easily obtained at the plant as to whether the licensee is on the correct path for compliance with the Mitigation Strategies and SFPI orders.

Following the licensee's declarations of order compliance, the NRC staff will evaluate the OIPs, as supplemented; the resulting site-specific OPD/FIP; and, as appropriate, other licensee submittals based on the requirements in the orders. For Order EA-12-049, the staff will make a safety determination using the Nuclear Energy Institute (NEI) developed guidance document NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" issued in August 2012 (ADAMS Accession No. ML12242A378), as endorsed by NRC Japan Lessons-Learned Project Directorate (JLD) interim staff guidance (ISG) JLD-ISG-2012-01 "Compliance with Order EA-12-049, 'Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events'" (ADAMS Accession No. ML12229A174). For Order EA-12-051, the staff will make a safety determination using the NEI developed guidance document NEI 12-02, "Industry Guidance for Compliance with NRC Order EA-12-051, 'To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation'" (ADAMS Accession No. ML12240A307), as endorsed, with exceptions and clarifications, by NRC ISG JLD-ISG-2012-03 "Compliance with Order EA-12-051, 'Reliable Spent Fuel Pool

Instrumentation"' (ADAMS Accession No. ML12221A339) as providing one acceptable means of meeting the order requirements. Should the licensee propose an alternative strategy for compliance, additional staff review will be required to evaluate the alternative strategy in reference to the applicable order.

AUDIT ACTIVITIES

The onsite audit was conducted at the North Anna Power Station facility from Monday, May 19, 2014, through Thursday, May 22, 2014. The NRC audit team staff was as follows:

Title	Team Member	Organization
Team Lead	Steve Campbell	NRR/DIRS
Technical Support – Reactor Systems	John Lehning	NRR/JLD
Technical Support – Reactor Systems	Josh Miller	NRR/JLD
Technical Support – Balance of Plant	Michael Levine	NRR/JLD
Technical Support - Electrical	Matthew McConnell	NRR/JLD
Technical Support - Electrical	Darrell Murdock	NRR/JLD
Technical Support - SFPI	Carla Roque-Cruz	NRR/JLD
Branch Chief	Sheena Whaley	NRR/JLD
Senior Resident Inspector	Gregory Kolcum	R-II
Project Engineer	Ryan Taylor	R-II
Project Manager	James Polickoski	NRR/JLD
Project Manager	Jason Paige	NRR/JLD

The NRC staff executed the onsite portion of the audit per the three part approach discussed in the April 24, 2014, plan, to include conducting a tabletop discussion of the site's integrated mitigating strategies compliance program, a review of specific technical review items, and discussion of specific program topics. Activities that were planned to support the above included detailed analysis and calculation discussions, walk-throughs of strategies and equipment laydown, visualization of portable equipment storage and deployment, staging and deployment of offsite equipment, and physical sizing and placement of SFPI equipment.

AUDIT SUMMARY

1.0 Entrance Meeting (Monday, May 19, 2014)

At the audit entrance meeting, the NRC staff audit team introduced itself followed by introductions from the licensee's staff. The list of participating NRC and licensee staff members is provided in Attachment 1. The NRC audit team provided a brief overview of the audit's objectives and anticipated schedule. The licensee provided the list of review staff pairings and site logistics to support the audit.

2.0 Integrated Mitigating Strategies Compliance Program Overview

Per the audit plan and as an introduction to the site's program, the licensee provided a presentation to the NRC audit team titled, "NRC Audit Presentation: North Anna May 19, 2014." As elements of the brief, the licensee reviewed the design and purpose

of the FLEX Strategies and Modifications, FLEX Storage facility, FLEX Program, Communications, Training, and Spent Fuel Instrumentation. Additionally, the licensee provided and presented the North Anna Power Station extended loss of alternating current power (ELAP) Initiated Event Timeline for 0 – 6 hours, 7 – 12 hours and 12 hours – 5 days flowchart for both the flood and non-flood events.

3.0 Onsite Audit Technical Discussion Topics

Based on the three part audit plan, and with a particular emphasis on the Part B "Specific Technical Review Items," the NRC staff technical reviewers conducted interviews with licensee technical staff, site walk-downs, and detailed document review for the items listed in the plan. Summaries of these activities are discussed below per the particular technical area of review with the documents reviewed listed in Attachment 2. Results of these technical reviews and any additional review items needed from the licensee are documented in the audit item status tables in Attachments 3, 4, and 5, as discussed in the Conclusion section below.

3.1 Reactor Systems Technical Discussions and Walk-Downs

While first conducting the onsite audit at the Dominion corporate office (Innsbrook Technical Center), the NRC reactor systems staff reviewed licensee calculations and engaged Dominion staff and vendor engineers in technical discussions associated with the mitigating strategies for North Anna with respect to maintaining reactor core cooling and adequate shutdown margin. The NRC reactor systems staff then traveled to the North Anna site; conducted walkdowns to audit the feasibility of the mitigating strategies; and discussed issues associated with the implementation of the mitigating strategies with licensee site personnel.

Technical Discussions at the Dominion Innsbrook Technical Center

The NRC staff conducted technical discussions and calculation reviews with licensee staff at the Dominion Innsbrook Technical Center focused on evaluating the open audit items identified in the audit plan. Key issues discussed during the audit are identified below along with a summary of the audit discussion:

a. In review of ISE open item (OI) 3.2.1.2.B, "demonstration of the acceptability of the Flowserve N-9000 seals with the Abeyance feature and validation of an acceptable leakage rate," the rate of seal leakage was recognized as a key parameter in determining the transition from natural circulation to reflux cooling. In particular, the licensee intends to credit margin provided by the reduced leakage from the Flowserve N-9000 reactor coolant pump (RCP) seals with the Abeyance feature to address NRC staff concerns with NOTRUMP coping time calculations included in WCAP-17601-P (which are discussed later in this document). Based upon the unavailability of key personnel and information at the time of this onsite portion of the audit, the NRC staff and licensee agreed to hold future discussions to resolve this issue. Following the onsite audit and as this issue has generic industry implications, further discussions occurred between NRC staff, Dominion licensee staff, and representatives of the

Pressurized-Water Reactor Owners Group (PWROG). Formal resolution of this issue is forthcoming with an expected industry document to be provided to the NRC.

b. In review of ISE OI 3.2.1.8.A, "demonstration of adequate boric acid mixing in the reactor coolant system (RCS)," and prior to the onsite audit, the licensee had stated that it intended to comply with the PWROG white paper on boric acid mixing. During the audit, the licensee clarified that it would further comply with the additional conditions imposed in the NRC staff's endorsement letter of the PWROG white paper. The NRC staff reviewed the licensee's shutdown margin calculations.

c. In review of ISE Confirmatory Item (CI) 3.2.1.1.A and safety evaluation (SE) item #7, "demonstration that RCS makeup is provided in sufficient time to ensure continuity of natural circulation and adequate boric acid mixing in light of significant differences in the analytical predictions from thermal-hydraulic code calculations performed by industry and the NRC staff," the staff had the following observations.

Specifically, industry calculations with the NOTRUMP code that are reported in WCAP-17601-P have predicted significantly less restrictive criteria for continuity of natural circulation and boric acid mixing than the NRC staff's confirmatory calculations with the TRACE code. The NRC staff discussed this issue with licensee and vendor personnel, but a definitive understanding of the basis for the inconsistent predictions was not reached. The licensee further presented ELAP coping time predictions generated from the RELAP5/MOD3.3 code. Although the NRC staff considered these results promising, the licensee clarified that they would not be relied upon as the basis for the licensee to demonstrate compliance with Order EA-12-049. The licensee further provided the NRC staff a qualitative evaluation of the coping time for North Anna Power Station that extrapolated from a NOTRUMP analysis for a Westinghouse three-loop reactor. The NRC staff performed independent confirmatory analysis of the North Anna coping time and is further seeking additional information from the licensee to (1) confirm the values for seal leakage and other parameters that have been assumed in its evaluation and (2) demonstrate that the margins available are sufficient in light of the significant uncertainties associated with the analytical predictions. Discussions on this topic continued with licensee and industry staff following the onsite audit with further documentation expected from licensee and/or industry representatives.

d. In review of ISE CI 3.2.1.1.B, "demonstration that plant parameters assumed in the analytical calculations of ELAP coping time are representative of the actual plant configuration," the NRC staff clarified the information requested to resolve this issue. The licensee did not provide the requested information during the audit as there is a connection to the discussion of the item above.

e. In review of ISE CI 3.2.1.1.C, "demonstration that nitrogen from the accumulators would not be injected into the reactor coolant system during an ELAP event," the

NRC staff performed a confirmatory calculation that agreed with the licensee's determination that nitrogen intrusion would not be expected to occur during an ELAP event.

f. In review of ISE CI 3.2.1.2.C, "demonstration that reactor coolant pump cooldown stresses would not be excessive," the licensee provided information during the audit to support the position that cooldown stresses for Westinghouse and Flowserve reactor coolant pump seals would be within acceptance limits. The licensee further stated that seal cooling would not be restored as part of the ELAP mitigating strategy.

g. In review of ISE CI 3.2.1.8.B, "demonstration of adequate shutdown margin for ELAP scenarios with and without RCP seal leakage," the NRC staff reviewed the licensee's calculation MISC-11788, which focused on the scenario without RCP seal leakage. The licensee concluded, based on its calculations, that RCS boration would not be required for 37 hours following event initiation. The NRC staff agreed with the licensee's conclusion that the limiting quantity of borated makeup would be determined by the no-leakage scenario, but noted that the required timing for RCS makeup could be more limiting for scenarios with RCP seal leakage. The licensee's analysis of an ELAP scenario with RCS leakage is discussed further in item (c) above.

h. In review of ISE CI 3.2.1.8.C, "confirmation that core reload analysis procedures would include a requirement to confirm adequate shutdown margin for future operating cycles," the licensee confirmed during the audit that procedural checks would be performed. The NRC staff noted during the audit that the licensee has significant margin between its boration need time and the initiation time for borated makeup in its mitigating strategy.

i. In review of licensee identified open item (LIC OIP OI) #14, "confirmation that Flowserve N-9000 seals with the Abeyance feature have been installed on two of three reactor coolant pumps at each unit at North Anna," the licensee had originally intended to complete seal replacement activities for two coolant pumps at each unit prior to declaring compliance with Order EA-12-049. However, during the onsite audit, the licensee informed the NRC staff that it currently intends to demonstrate compliance for Unit 1 with seal replacement having been completed for only one reactor coolant pump. Sufficient information was not presented during the audit to demonstrate that North Anna, Unit 1 can achieve compliance with Order EA-12-049 with only a single replacement seal. Following the onsite audit, the licensee notified the NRC staff of its intention to return to its previously identified strategy of installing two of three Flowserve N-9000 RCP seals with the Abeyance feature prior to declaring compliance.

j. In review of SE review item #3, "confirmation that the mitigation strategy procedures provide appropriate guidance regarding reactor coolant system venting," the licensee stated to the NRC staff during the audit that makeup to the RCS could be provided at a pressure exceeding the normal operating pressure. As such, the licensee did not expect that RCS venting would be necessary to

ensure adequate boration and replenishment of RCS inventory. However, the licensee stated that RCS venting could be implemented, if necessary, through the reactor pressure vessel head vents. The licensee stated that venting through the pressurizer power-operated relief valves is not included in the mitigating strategy procedure.

k. In review of SE review item #4, "determination of an appropriate leakage rate for the Westinghouse RCP seals," Westinghouse advised affected customers via Nuclear Safety Advisory Letter (NSAL) 14-1, that the RCP seal leakage rate at normal operating pressure and temperature could be higher than the leakage rate that was assumed in, among other applications, the generic analysis in WCAP-17601-P that was performed to support PWR licensees' ELAP mitigating strategies. During the audit, the licensee stated that a preliminary evaluation indicated that the leakage rate applicable to the Westinghouse RCP seal configuration at North Anna could increase from 21 gallons per minute (gpm) to 24 gpm. However, the licensee's final determination of the applicable leakage rate had not been completed at the time of the audit. Westinghouse recently provided further information to licensees regarding RCP seal leakage that is currently under review.

l. In review of SE review item #5, "confirmation that the reactor vessel level instrumentation system provides a measure of collapsed water level," licensee and vendor personnel: (1) clarified the intent of the discussion from WCAP-17792-P that had motivated the staff's question; and (2) further confirmed that North Anna measures collapsed level.

m. The NRC staff reviewed SE review item #6, "confirmation that the staging and deployment time for FLEX equipment required to support the provision of makeup to the RCS will not be delayed due to early indications of reduced RCS leakage."

Although it is reasonable for plant operators to control the injection of RCS makeup in accordance with input from available instrumentation, the NRC staff's expectation is that licensees will stage and deploy the equipment necessary for providing makeup to the RCS in accordance with the timeline prescribed in the integrated plan, even if early indications suggest reduced RCS leakage. During the audit, the licensee agreed that deployment of FLEX equipment necessary to support RCS makeup would not be delayed based upon early indications of reduced RCS leakage and further stated that the intent of the FLEX strategy guidelines is to provide flexibility to operators in case conditions are more severe than expected.

n. The NRC staff reviewed SE review item #8, "confirmation that, accounting for sufficient delay period to provide for adequate boric acid mixing, there is sufficient flow capacity to support borated makeup to both units at North Anna from a single FLEX RCS makeup pump taking suction from a portable batching tank."

The licensee informed the NRC staff that it had the capability of supplying adequate borated makeup flow to both units from a single FLEX makeup pump and portable batching tank. The licensee stated that the flow from the FLEX makeup pump would be alternated between units and that sufficient flow could be provided in this manner to compensate for ongoing RCS leakage. However, it was not clear to the NRC staff that the licensee's determination had considered an allowance for the time required to ensure adequate mixing of the powdered boric acid with the water added to the portable batching tank. Although the licensee was developing a calculation to resolve this issue, the calculation was not available prior to the conclusion of the audit.

Human Factors

The NRC Reactor Systems staff reviewed various human factors questions during the audit in review of SE review item #10 as well as ISE CI 3.1.1.3.A, ISE CI 3.1.5.2.A, LIC OIP OI #7, AQ #2, and AQ #44 regarding North Anna human factors during an ELAP event. The questions addressed areas of the generic plant, program and policy, and operations as reviewed during plant walkdowns. The human factors questions focused more on the ability of plant personnel to perform functions required during the ELAP event rather than the ability of the equipment to perform the functions.

The NRC staff discussed 33 human factors related questions with Dominion personnel at the Innsbrook Technical Center and the North Anna site. The NRC staff's review focused on the strategy and plans to deal with the ELAP, the licensee's procedures in place, and the human factors issues that arose during the implementation of the Integrated Plan. The NRC staff reviewed the North Anna FLEX Support Guidelines (FSGs) and staffing plan to verify the number of staff on-site to perform the required functions in the required amount of time. The review also focused on any new or changed operator actions that were a result of the mitigating strategies. Some of the areas of review during the audit with regards to human factors included:

- New or changed procedures;
- New or changed interfaces or controls;
- New or changed alarms or displays;
- New or changed training;
- Protective equipment for personnel responding to the ELAP;
- Effects on the personnel's ability to respond to the ELAP;
- Effects of the environment in equipment locations, as well as outside on the ability of the plant personnel to respond to the ELAP;
- Beyond-Design Basis (BDB) equipment identification;
- Responsibilities of various personnel during the ELAP;
- The interaction of the two units on site;
- The current procedures and controls used in developing strategies and procedures; and
- Operator actions in various ELAP response activities such as RCS injection or repowering electrical busses

During its review, the NRC staff noted human factors aids for BDB equipment and the licensee's analyses regarding the time needed to cover distances to employ the strategy. This review noted area accessibility and the availability of area cooling. The licensee provided the NRC staff the procedures used to ensure that human factors are accounted for in their implementation of the ELAP event. Roles of personnel in coordination of ELAP activities were discussed as well as methods of communication and verification.

Walkdowns

The NRC JLD Reactor Systems staff performed walkdowns at the North Anna site in review of Human Factors SE review item #10, ISE CI 3.1.1.3.A, Audit Question (AQ) #2, AQ #44, LIC OIP OI #7, ISE CI 3.1.5.2.A, ISE CI 3.2.1.1.A, SE 7, ISE CI 3.2.1.1.B, and ISE CI 3.2.1.8.B. The walkdowns were done to verify locations of equipment, connections, modifications, accessibility, and distances throughout the plant. The walkdowns helped in visualizing the North Anna plan for BDBEE response, and the locations reviewed inlcuded:

- Flowserve N-9000 RCP seal and drawings;
- Staging areas/alley ways where pumps/diesel generators would be located;
- Atmospheric Dump Valve rooms;
- Turbine Driven Auxiliary Feedwater (TDAFW) pump room (new connections);
- Motor Driven Auxiliary Feedwater (AFW) pump room;
- Non-robust Refueling Water Storage Tanks (RWSTs);
- Protected emergency condensate storage tanks (ECSTs) as well as non-protected Condensate Storage Tanks (CSTs);
- Primary grade water tanks;
- Locations for the portable boric acid mixing tank;
- Spent Fuel Pool (SFP) exterior water connection;
- Quench spray room (new connection RWST suction);
- Low Head Safety Injection room (new connection for RCS injection);
- The control room as well as location for SFP level indication panel;
- The SFP area (where hoses will be laid out and the spray system operated as well as operation of roll up doors);
- The electric connections in the control rod drive mechanism rooms; and
- The charging pump cubicles and the cross connects and valves

The NRC staff focused on the cooldown and boration aspects of the Phase 2 RCS injection strategy. The NRC staff noted whether the available water sources for RCS injection or RCS cooldown were robust or not as well as the locations, quality, and robustness of the backup sources and other available sources. The NRC staff noted the locations of pump staging areas and injection points as well as the routes that would be utilized to deploy hoses for FLEX make-up. The NRC staff gained a better understanding of the functional component of the Phase 2 plans for deployment of equipment and its locations as well as the necessary human actions that would go along with deployment of the equipment.

3.2 Electrical Technical Discussions and Walk-Downs

The NRC Electrical Engineering staff met with North Anna staff and reviewed electrical single-line diagrams, summaries of calculations for sizing the FLEX diesel generators and station batteries, and refueling strategies for portable diesel powered equipment. They also reviewed summaries of calculations that addressed the effects of temperature on the electrical equipment credited in the mitigating strategies integrated plan as a result of losing heating, ventilation, and air conditioning (HVAC) during an ELAP as a result of a BDBEE.

NRC staff also performed walkdowns of the areas where portable electrical equipment will be located, the connection points to the electrical distribution system, the cable runs from the portable 120 Volt (V), 480 V, and 4160 V FLEX diesel generators, and the electrical panels associated with the licensee's load shedding scheme.

a. In review of ISE CI 3.1.1.1.A, the NRC staff reviewed the list of portable FLEX equipment and the proposed onsite BDB storage location. The equipment to be stored in the BDB storage building includes the 120V alternating current (VAC) and 480VAC FLEX diesel generators, cables, portable FLEX pumps, hoses, etc. The licensee's staff mentioned that the North Anna BDB storage building was designed to meet the plant's design basis for high wind hazards with the actual building design criteria in accordance with Dominion Specification CV-0004, which states that the minimum design tornado wind load is 360 miles per hour.

   In addition, the licensee stated that the North Anna BDB storage building has been designed to meet the plant's design basis for snow, ice, and cold conditions with the actual design criteria in accordance with Dominion Specification CV-0004, which states: "The design of the HVAC systems shall be based on maintaining the following indoor design conditions: Heating: minimum indoor temperature of 50°F; Cooling: maximum indoor temperature of 100°F."

b. In review of ISE CI 3.2.4.2.A regarding electrical equipment cooling, the NRC staff reviewed the licensee's assessment of temperature effects on the electrical equipment as a result of extreme temperature hazards.

   During the on-site audit, the NRC staff reviewed calculation ME-0972 - Rev. 0, "Evaluation of Room Air Temperatures Following Extended Loss of AC Power (ELAP)," and Addendum A, "Analysis with Doors Open." Calculation ME-0972 analyzes the heat-up of the following areas during Phases 1 and 2 of the ELAP event to ensure the loss of forced ventilation and resulting room temperatures would not affect any credited mitigation equipment required for FLEX strategies:

   - Main Control Room (MCR);
   - Emergency Switchgear Room (ESGR);
   - Main Steam Valve House (MSVH) Steam Generator Power Operated Relief Valve (PORV) area;
   - Mechanical Equipment Room (MER) in the Turbine Building;

- Quench Spray (QS) Pumphouse;
- Auxiliary Building; and
- AFW Pumphouse, TDAFW Pump Room

The licensee's analyses showed no issues in terms of equipment function for the duration of an ELAP with the exception of the TDAFW pump room. The licensee previously analyzed the TDAFW pump room in calculation 01040.4410-USB-268 for temperature transients during a station blackout event. The analysis was based on the conservative assumption that the door to the AFW pumphouse was closed. With this assumption, the TDAFW pump room maximum temperature was below 130 degrees Fahrenheit (°F), but was still increasing at the end of the evaluation period (approximately 8 hours).

In order to consider the temperatures achievable during the significantly longer time periods associated with an ELAP event, calculation ME-0972 evaluated the TDAFW pump room with the assumption that the TDAFW pump room door to the AFW pumphouse was open (Addendum A of calculation ME-0972). Under this assumption, the TDAFW pump room "steady state" temperature was shown to remain less than 130 °F.

The North Anna Environmental Zone Description does not state a maximum ambient temperature for the TDAFW pump room, but limits the temperature of the pumped AFW fluid to 120 °F. Calculation ME-0972 states that, since the steady state temperature in the TDAFW pump room remains below 130 °F, the temperature in this room is not expected to adversely affect the performance or reliability of the pump or pump motor.

The licensee indicated that compensatory actions, such as opening the AFW pumphouse door, will be included in the FLEX coping procedures and will ensure acceptable temperatures following an ELAP event and no other operator action to deploy portable ventilation equipment is expected to be necessary during the plant response to an ELAP.

The NRC staff's review focused on whether the electrical equipment relied upon as part of the North Anna mitigation strategy for an ELAP as a result of a BDBEE will not be adversely affected by increases in temperature as a result of loss of HVAC.

c. In reviewing ISE CI 3.2.4.2.B, the NRC staff reviewed the licensee's assessment of temperature effects on the batteries as a result of extreme temperature hazards and the licensee's hydrogen gas mitigation strategy.

To confirm the adequacy of the battery room ventilation, the NRC staff reviewed calculation ME-0972, Revision 0, and FSG-4, "ELAP [direct current] DC Bus Load Shed and Management," and the four battery rooms per unit at North Anna with concrete walls partitioned out of the main control room (MCR) envelope.

Two battery rooms are in the emergency switchgear room (ESGR), and two are in the cable spreading room above the CR.

The ventilation for the battery rooms in the ESGR flows from the ESGR into the battery room, and then outside through the normal exhaust fan. For the battery rooms above the MCR, air is drawn from the MCR and exhausted back to the MCR. The battery rooms are not modeled in the loss of ventilation transient analysis model however, and calculation ME-0972, Revision 0 shows that the expected loss of ventilation transient temperatures in the ESGR and in the MCR are expected to remain below 120 °F while relying on installed plant equipment (Phase 1) of an ELAP event. Therefore, the temperatures in the battery rooms above and below the MCR are expected to be approximately the same as the temperatures of the ESGR and the CR, respectively, during Phase 1. As a result of its review, the NRC staff review concluded that the heat added to the battery rooms during battery discharge in Phase 1 of the ELAP scenario is negligible.

Since hydrogen generation is primarily a concern when batteries are being recharged, FSG-4 and FSG-13 require the battery room exhaust flow path and exhaust fans to be aligned and flow confirmed prior to starting the battery chargers, which will be powered by the 480 VAC FLEX diesel generators. The exhaust fans and exhaust flow paths are the same components used in normal plant operation and design basis events. Calculation ME-0972, Revision 0 shows that the expected loss of ventilation transient temperatures in the sources of suction for the battery room ventilation systems is expected to remain below 120 °F indefinitely.

Following transition from installed plant equipment to on-site FLEX equipment (Phase 2) conditions in the battery rooms, the licensee's current strategy for obtaining additional capability and redundancy from off-site equipment until power, water, and coolant injection systems are restored (Phase 3) is to repower a MCR chiller for each unit and thus re-establish normal HVAC cooling capacity for the MCR envelope.

The NRC staff's review of the licensee's assessment is that the impact of extreme low temperatures is not expected to be significant due to the continuous connection with the MCR and ESGR spaces and the heat storage capacity of the battery room concrete walls/floors/ceilings. However, if decreasing battery room temperatures become a concern, the FSGs provide for the use of portable heating equipment.

The NRC staff's review focused on whether the licensee's mitigating strategies will ensure that neither high nor low temperature extremes will challenge the equipment design limits in the North Anna battery rooms and whether the licensee's procedures will ensure that accumulation of hydrogen in the battery rooms will not reach the point of combustibility.

d. In reviewing ISE CI 3.2.4.8.A, the NRC staff reviewed calculations for the Phase 2 and 3 FLEX diesel generators to confirm that that they are of sufficient capacity to supply the expected loads.

The NRC staff reviewed Calculation EE-0863, "Calculation for North Anna Power Station Beyond Design Basis – FLEX Electrical 480 VAC and 120 VAC System Loading Analysis for NAPS BDB FLEX DC NA-13-01017," and EE-0865, "Calculation for North Anna Power Station Beyond Design Basis – FLEX Electrical 480 VAC and 120 VAC System Loading Analysis for NAPS BDB FLEX DC NA-13-01018."

The licensee plans to utilize both a 120 VAC FLEX diesel generator and a 480 VAC FLEX diesel generator for each North Anna unit as part of its Phase 2 mitigating strategy. The design rating for the 120 VAC diesel generators is 35.5 kilowatts (kW). The design rating for the 480 VAC diesel generators is 350 kW. For North Anna Unit 1, the total loads for the 120 and 480 VAC diesel generators are 12.4 kW and 189 kW, respectively. For North Anna Unit 2, the total loads for the 120 and 480 VAC diesel generators are 13.9 KW, and 264 KW, respectively.

The NRC staff reviewed EE-0871 "Calculations for North Anna Power Station Beyond Design Basis – FLEX Electrical 4160 VAC System Loading Analysis." The licensee plans to utilize 4160 VAC FLEX diesel generators that will be supplied by a National SAFER Response Center (NSRC) as part of its Phase 3 mitigating strategy. The licensee expects the design ratings for these diesel generators will be approximately 2 megawatts (MW). In calculation EE-0871, the licensee estimated that the total loading during Phase 3 would be 1.7 MW.

During the onsite audit, the NRC staff identified the following items needing additional information from the licensee pertaining to the FLEX diesel generators but the licensee was unable to provide a response prior to the conclusion of the onsite audit:

1) Review of the calculations provided in EE-0863 and EE-0865 by the NRC staff identified that the loading calculations for the 120 VAC and 480 VAC FLEX diesel generators did not address the potential impact of extreme high ambient temperature on the diesel generator ratings while at the staging location.

2) The licensee did not provide information to show that the exhaust from the FLEX diesel generators would not compromise the habitability of vital areas in the adjacent buildings due to the location of intake louvers near the FLEX diesel generator staging area.

3) The licensee did not provide a discussion on their plan for maintaining and monitoring the 120 VAC and 480 VAC FLEX diesel generators cables.

4) The licensee did not describe how the 120 VAC cables will be stored to ensure that they are not adversely impacted by a seismic event.

Additional SE review items #12 and #13 were opened to address the above NRC staff questions.

e. In reviewing ISE CI 3.2.4.9.A, the NRC staff reviewed licensee documentation, "NAPS BDB Equipment Fuel Tank Evaluation," providing detailed information regarding equipment tank capacities, equipment fuel usage rates, calculated run times of equipment with a full tank of diesel fuel, onsite diesel fuel oil storage tank capacities, and diesel fuel oil delivery capability.

The NRC staff's review focused on the adequacy of the licensee's fuel resupply strategy for when the diesel driven equipment needs to be refilled to ensure continuous operation of the equipment.

f. In reviewing AQ #42, the NRC staff reviewed conceptual electrical single line diagrams to evaluate how electrical isolation will be maintained when the FLEX diesel generators are connected to the North Anna's electrical distribution system.

The conceptual electrical single line diagrams showed the connection points for the 120 VAC, 480 VAC, and 4160 VAC FLEX diesel generators to North Anna's electrical distribution system. The NRC staff review determined that the switchgear, load centers, and motor control centers where the FLEX diesel generators will be connected can be closed or opened manually by using FLEX procedures to prevent electrical equipment damage from simultaneously supplying power from multiple electrical power sources.

The NRC staff reviewed Figure 7, "One Line Diagram BDB Electrical Distribution System North Anna Power Station Units 1 and 2;" drawing 11715-FE-1BA, "Appendix R Evaluation Protective Device Coordination Electrical One Line Diagram North Anna Power Station 1;" and drawing 12050-FE-1BA, "Appendix R Evaluation Protective Device Coordination Electrical One Line Diagram North Anna Power Station Unit 2." These drawings showed the licensee's plan for electrical isolation and protection (Class 1E breakers) between the FLEX diesel generators and Class 1E systems to maintain the integrity of Class 1E electrical distribution system consistent with NEI 12-06 for appropriate electrical isolation and interactions.

The NRC staff's review focused on whether FLEX electrical equipment will be protected from simultaneous power supply from multiple electrical power sources and that appropriate electrical isolation will be included in the licensee's FLEX procedures/guidance.

g. In reviewing AQ #44, the NRC staff reviewed the licensee's direct current (dc) load shedding strategy. North Anna's Phase 1 mitigation strategy involves utilizing the installed Class 1E 125 VDC batteries before transitioning to Phase 2.

The licensee's procedure directs operators to significantly strip loads from the dc bus as soon as an ELAP condition is declared to extend the batteries life.

During the onsite audit, the NRC staff reviewed FSG-4, ETE-CPR-2012-0017 - Rev. 0, "Beyond Design Basis – 125 VDC Analysis for Load Shedding and Extending Coping Time," EE-0009, Revision 1, "125 Vdc System Analysis," and the licensee responses provided on the ePortal.

According to procedure ECA-0.0, upon declaration of an ELAP event an operator will be dispatched from the MCR to perform dc load shedding. Procedure ECA-0.0 also directs the operators to stop the dc Turbine Oil Pump, and after ensuring hydrogen gas has been vented from the Main Generator, to stop the dc Seal Oil Pump and to accomplish this within 60 minutes following the loss of all ac power.

Using procedure FSG-4, the operator will strip the remaining dc loads from the dc buses and the alternating current (ac) loads from the vital buses within the following 30 minutes. Therefore, all load stripping will be completed within 90 minutes following initiation of loss of all ac power. During the onsite walk-down, the NRC staff questioned whether the load shed of the dc loads and the vital ac loads could be completed in 30 minutes. In its response, the licensee stated that a time validation study will be completed in the near future to validate whether the dc loads and vital ac loads can be shed within 30 minutes. Following the onsite audit, the NRC staff observed time validation, but formal results from the licensee were not yet available.

h. In reviewing SE review item #1, the NRC staff reviewed the licensee's change in strategy to pre-stage the 120 VAC and 480 VAC FLEX diesel generators.

During the onsite audit, the licensee's staff noted that the plan is to store both the 120 VAC and 480 VAC FLEX diesel generators in the BDB storage building as opposed to pre-staging them as indicated in their February 2014 update to its OIP. Therefore, once an ELAP event is declared, the licensee will deploy and stage the 120 VAC FLEX diesel generators. The licensee's staff would then connect the 120 and 480 VAC FLEX diesel generators to the two BDB power distribution panels (1 per unit) to repower portions of the electrical distribution system. According to ETE-CPR-2012-0012, Revision 3, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," the licensee expects to have the 120 VAC FLEX generators deployed, staged, and connected to the electrical distribution system approximately 6 hours after the onset of an ELAP event. Once the 120 VAC FLEX generators are connected to the electrical distribution system and supplying loads, the licensee would begin deploying and staging the 480 VAC FLEX generators.

The NRC staff review's has focused on the Phase 2 electrical strategy's consistency with the guidance in NEI 12-06, but the NRC staff is requesting further audit information regarding time validation study confirming that the equipment can be deployed, staged, connected to the electrical distribution

system, and supply power to the loads within the times assumed in the licensee's OIP.

3.3 Balance-of-Plant Technical Discussions and Walk-Downs

The NRC Balance of Plant staff met with Dominion staff and reviewed FSGs, station procedures, FLEX equipment deployment strategies, site flooding analyses, summaries of calculations for hydraulic analyses of FLEX pumps and associated hoses and piping, ventilation strategies and summaries of ventilation calculations, and refueling strategies for portable and pre-staged diesel powered equipment. In addition, the NRC staff performed walk-downs of FLEX deployment paths, deployment locations of portable and pre-staged FLEX equipment, connection points of hoses, hose laydown areas, areas affected by local intense precipitation (LIP) events, and the spent fuel pool (SFP) area.

a. In review of ISE CI 3.1.1.1.A, AQ #1, and LIC OIP OI #6, related to the confirmation of the final design of the FLEX storage structure, the NRC staff met with licensee staff and discussed how the licensee will confirm that the FLEX storage structure will conform to the guidance in NEI 12-06. The licensee stated that they will provide documentation of the final review and inspection of the building by a qualified local government (Louisa County, Virginia) inspector.

b. The NRC staff reviewed ISE CI 3.1.1.3.A and AQ #2, related to a reference source for the operators for obtaining necessary instrument readings to support implementation of the coping strategy for both control room and non-control room readouts; how and where to measure key readings at containment penetrations; critical actions to perform until alternate indications can be connected; and instructions on how to control critical equipment without control power.

As part of its review, the NRC staff reviewed FSG-7, "Loss of Vital Instruments or Control Power" which is focused on: 1) the methods the licensee will use to control AFW to the SGs if MCR instrumentation is lost; 2) whether the licensee relied on a generic *time since shutdown vs. required flow* chart; 3) if such a chart could be modified to reflect actual operating conditions; and 4) if the equipment needed to take alternate readings, listed in Attachment 3 of FSG-7, was aggregated in one location and if said equipment would be protected for BDB events.

The NRC staff was concerned that the licensee may rely on a generic *time since shutdown vs. required flow* chart with the basis that the plant has been operating at 100 percent power for greater than 100 days before shutdown (basis for FLEX strategies and provides worst-case maximum decay heat). FSG-7 provides instructions for operators to locally control AFW flow to the SGs. The instructions direct the operator to throttle flow as necessary to the required flow, but do not provide information explaining how to determine the required flow. The NRC staff asked the licensee how an operator would: 1) obtain the required AFW flow information; 2) verify that the new valve position is indeed supplying the required flow; 3) control AFW flow if the ability to control AFW flow from the control room was lost directly following the reactor trip and before the plant reached steady-

state; and 4) determine the required AFW flow in the interim between losing control room indication and obtaining local alternate indication readings, and if the licensee would rely on a generic *time since shutdown vs. required flow* chart.

Following discussions with the NRC staff, the licensee stated that they would revise FSG-7 to provide guidance to operators on how to determine required AFW flow, and to clarify that all equipment needed to take alternate readings is aggregated in a protected location (with additional equipment in various places throughout the plant). In addition, the licensee stated that they would update their Integrated Plan to provide a justification for not relying on the *time since shutdown vs. required flow* chart in the absence of SG level indication.

c. In review of ISE CI 3.1.5.2.A related to manual actions in high temperature areas, the NRC staff met with licensee engineers; reviewed station procedure SA-AA-109, "Heat Stress Management;" and walked down areas where manual action would be required in high heat areas. The NRC staff's review focused on the TDAFW pump room, MSVH, and SFP area. During the walkdown of these areas, the NRC staff discussed with the licensee staff the feasibility of any manual actions, time constraints, and any compensatory measures in place to mitigate the effects of high heat on plant personnel.

d. In reviewing ISE CI 3.2.1.9.A related to N+1 capability of the RCS injection pumps, the NRC staff reviewed summaries of calculation ME-0965 and met with licensee engineers to discuss the injection strategy using BDB RCS pumps. The licensee stated previously that two BDB RCS pumps were sufficient to provide N+1 capability because one pump can supply RCS inventory make-up to both units by alternating injection between the units.

The NRC staff's review focused on the feasibility of switching between the units. Specifically, the time required to switch between units; if the licensee considered shrinkage from cool down in their flow requirement assumptions; and if the licensee accounted for unidentified leakage in their required flow assumptions. The licensee stated that the above would be required for switching BDB RCS pumps between units (after the initial pump relocation and set-up) and would require minor valve manipulations. In addition, the licensee stated that shrinkage and unidentified leakage were considered when evaluating the required minimum flow requirements.

e. In reviewing ISE CI 3.2.1.9.B, AQ #24, and LIC OIP #5 related to the BDB FLEX pumps capacity to support required FLEX strategies, the NRC staff reviewed summaries of calculation ME-0966; met with licensee engineers to discuss FLEX strategies; and walked down areas where strategies will be implemented. The NRC staff's review focused on the feasibility of selected hose deployment routes; capability of BDB FLEX pumps to supply required flow rates and pressures; and how the licensee would control flow if the pump is providing water to two separate functions (e.g., AFW suction and SFP make-up).

f. In reviewing ISE CI 3.2.4.2.A, AQ # 51, and LIC OIP # 13 related to the licensee's ventilation strategy, the NRC staff reviewed calculation ME-0972 (including Addendum A); met with licensee engineers to discuss ventilation strategies in the TDAFW pump room, MSVH, and SFP area; and walked down the above areas. The NRC staff's review focused on the feasibility and adequacy of the licensee's ventilation strategy, and any time constraints associated with the strategy.

During the review, the NRC staff noted that the licensee does not plan to lay hoses on the SFP deck (part of the minimum baseline capability) before the onset of bulk boiling in the SFP. Without a completed detailed ventilation analysis for the SFP area by the licensee, the NRC questioned the adequacy of the licensee's ventilation strategy regarding allowing personnel to enter the SFP area and lay hoses after the onset of bulk boiling. The licensee stated that they will either: 1) perform a detailed ventilation analysis, or 2) revise strategy to lay hoses before the onset of bulk boiling in the SFP. Additional SE review item #14 was opened to address the above NRC staff questions.

g. In reviewing ISE CI 3.2.4.4.A and LIC OIP OI #17 related to the licensee's lighting strategy, the NRC staff met with licensee staff and discussed the lighting strategy and walked down areas where manual action would be required. The licensee stated that they will rely on Appendix R lighting for approximately the first 8 hours following an ELAP and using hand held lighting where necessary. After 8 hours, the licensee plans to use portable lighting stations.

The NRC staff's review focused on the feasibility of using hand held lighting and portable light stations in low light areas where manual action is required. The staff walked down the auxiliary building, SFP, TDAFW room, MSVH, service water pump house, and the hydrogen recombiner rooms.

h. In review of ISE CI 3.2.4.9.A and LIC OIP OI #16 related to fuels supplies and refueling strategy for FLEX equipment, the NRC staff reviewed the licensee's FLEX equipment refueling strategy and met with licensee staff to discuss the strategy and walk down fuel storage locations. The NRC staff's review focused on the adequacy of the onsite fuel supply to fuel FLEX equipment during Phase 2, the protection of onsite fuel supplies, and the ability to supply indefinite fuel during Phase 3.

The licensee's refueling strategy did not provide fuel consumption rates for Phase 3 equipment arriving from the NSRC nor did it contain a means to provide indefinite fuel supply for Phase 3. The licensee stated that they have enough fuel onsite to power equipment for at least 72 hours and that they will use existing supplies to provide an additional long-term fuel supply if needed. Following the onsite audit, the licensee updated the refueling strategy to include fuel consumption rates for Phase 3 NSRC equipment and provide documentation verifying that existing fuel suppliers have the capacity to supply the Phase 3 fuel needs long-term.

i. In reviewing AQ #20 related to the Unit 3 flooding evaluation and the effects of the new LIP event, the NRC staff met with licensee staff to discuss and walk down the areas affected by the LIP event. The NRC staff's review focused on the effect of local ponding as a result of the LIP event on storage, deployment, and operation of portable FLEX equipment. The licensee's flooding evaluation showed that local ponding will occur following the updated LIP event, but that duration is short enough that local ponding will have a negligible effect on implementation of FLEX strategies.

j. In reviewing of SE review item #1 related to the licensee's plan in their February 27, 2014, update to pre-stage the portable 120/240 VAC diesel generator, NRC staff met with licensee staff to discuss the protection of the pre-staged diesel generator. The licensee stated that they no longer plan to pre-stage the diesel generator and will update their OIP to reflect such.

k. During the licensee's presentation of their FLEX implementation strategies during this onsite audit, the licensee stated that for Modes 5 and 6, the RWSTs would be the only water source used to provide borated water to the reactor. The RWSTs at North Anna are not protected from design-basis tornados and tornado generated missiles. The NRC staff inquired as to the adequacy of crediting an unprotected water source in relation to the guidance in NEI 12-06 and the NEI position paper for mitigating strategies resolution of shutdown modes. The NRC staff noted that this maybe an issue requiring generic industry resolution. Additional SE review item #11 was opened to address the above NRC staff questions.

3.4 Spent Fuel Pool Instrumentation Technical Discussions and Walk-Downs

The NRC staff met with Dominion staff and reviewed diagrams depicting the Spent Fuel Pool Instrumentation (SFPI) locations and routing of cables from the SFP area to the display location in the MCR. The NRC staff also reviewed documentation related to the mounting of the SFPI to the SFP deck. In addition, the staff discussed the issue of electromagnetic compatibility (EMC) with the licensee.

a. In response to Spent Fuel Pool Instrumentation (SFPI) Request for Additional Information (RAI) #2, the licensee submitted a diagram of the SFP area with the locations for the SFPI and the routing of the cables within the SFP. The NRC staff inquired as to the routing of cables and missile protection outside the SFP area and into the MCR. During the onsite audit, the licensee indicated that the routing of the SFPI cables outside the SFP area will be in accordance with North Anna cable separation practices for safety-related components. The licensee also indicated that the cables for the primary and back-up SFP instruments are more than 2 feet apart at all times.

During the onsite audit visit, the NRC staff walked down the SFP area and the route for the primary and back-up cables. The walkdown started at the MCR where licensee staff indicated the locations for the SFPI display cabinet, the

electrical power source, and the connections for the displays. From the MCR, the staff visited the cable spreading room and then the SFP area which is the proposed location for the SFPI sensor probe and the exit point from the SFP area to the Auxiliary Building. The NRC staff walked the complete cable routing from the SFP to the MCR for the primary and back-up SFPI.

The NRC staff's review of this item focused on the degree of separation between the primary and back-up cable routing and missile protection once outside the SFP area.

b. In reviewing SFPLI RAI #3, the NRC staff reviewed the licensee's description of the location and the manner by which the SFPI mounting bracket would attach the SFPI level sensor to the refueling floor. During the onsite audit, the NRC staff reviewed licensee documentation and drawings describing the mounting bracket and anchor bolt dimensions, materials, and the seismic and hydrodynamic loads applicable to the mounting bracket site configuration.

For this item, the NRC staff reviewed calculation, CEM-0139, "Mounting details for Spent Fuel Pool Monitoring," Revision 0; CN-PEUS-14-3, "Seismic Analysis of the Spent Fuel Pool Mounting Bracket for Surry Power Station, Millstone Power station Unit 3 & North Anna Power Station," Revision 1; drawing 10121D79, "North Anna Spent Fuel Pool Instrumentation System Level Sensor Assembly, Revision 1, sheets 1, 3 and 4; drawing 10121D79, "North Ana Spent Fuel Pool Instrumentation System Level Sensor Assembly," Revision 0, sheet 2; and drawing 10067E16, "North Anna, Surry and Millstone Unit 3 Nuclear Generating Stations Spent Fuel Pool Mounting Bracket Plan, Sections, and Details," Revision 2. The NRC staff also walked down the proposed location for the mounting brackets on the east and west ends on the refueling deck. The licensee showed the NRC staff the location (indicated by a mark-up on the refueling floor) where the base of the mounting bracket and anchor bolts on the east end would be located. The licensee also stated that the mounting bracket design will meet North Anna design and licensing basis requirements for Seismic Category I components and will include consideration of static weight loads and hydrodynamic loads.

The NRC staff's review of this item focused on the location for the primary and back-up mounting bracket for the SFPI sensor probe and the impact the installation could have on the SFP refueling floor and/or other connection points.

c. During the onsite audit, the NRC staff reviewed the vendor tests performed in the area of EMC related to electromagnetic interference (EMI) that could affect the performance of the SFPI during a BDB event. The NRC staff discussed this issue with the licensee, and the licensee indicated their awareness of this issue. The licensee explained that they performed some additional testing at the vendor facility during the factory acceptance test using radios in the vicinity of the SFPI. The licensee indicated that further information addressing this issue would be provided to the staff.

The NRC staff's review of this item focused on any EMI that could adversely affect the function of the SFPI during the BDB event. Additional SE review item #9 was opened to address the above NRC staff questions.

3.5 Other Technical Discussion Areas and Walk-Downs

a. Dominion Nuclear Training Program - The NRC staff met with the licensee staff and discussed Dominion's Systematic Approach to Training (SAT) program as it applies to mitigating strategies and SFPLI. The NRC staff reviewed administrative procedures and observed a portion of an FSG training class to North Anna non-licensed operators.

1) In response to LIC OIP OI #10 regarding the Dominion Nuclear Training Program, the licensee indicated that training documents and processes would be revised, developed, and maintained to assure personnel proficiency in the mitigation of BDB events. These programs and controls would be developed and implemented in accordance with the SAT.

2) In review of this item, the NRC staff reviewed administrative procedure TR-AA-100, "Analysis," Revision 10, and discussed the analysis phase of the SAT with the licensee. This analysis phase is the first step in determining whether training is needed and to identify the tasks, skills, knowledge and aptitudes that must be trained. The licensee described how new equipment, procedure changes, or policy changes would result in conducting a needs analysis in the SAT. This analysis would trigger the development of new training for site personnel. The licensee indicated that all non-licensed operators, reactor operators, senior reactor operators, and shift technical advisors will be trained in BDB mitigating strategies.

3) The NRC staff inquired about operator training related to testing and calibration of new technology and/or components at the site such as the SFPLI. The licensee indicated that North Anna personnel visited the SFPI vendor facility to witness and train on the processes for operation, testing, and calibration of the SFP instruments and development of testing and calibration procedures.

4) The NRC staff's review of this item focused on the licensee's process (SAT) to revise, develop, and maintain the necessary training to assure personnel proficiency in the mitigation of BDB events.

b. In review of ISE CI 3.2.4.4.B and LIC OIP OI #18, the NRC staff discussed the site's communications enhancements with licensee staff. The discussions reviewed the licensee's current plans regarding communications equipment to be purchased for the initial and long-term site communications strategy during the ELAP event. The discussions included a review of the commercial equipment details, storage locations, deployment procedures, and connections to pre-staged, installed equipment in the MCR. NRC staff discussions with licensee

staff also included the use of hand-held radios and their storage locations, charging stations, power sources for the charging stations, applicable procedures under development in relation to site emergency communications, and other communications capabilities documented in procedures available to operators.

The NRC staff's review of the communications enhancements focused on the viability, deployment complexity and timing, battery durability, and charging capability for the site BDB communications strategy.

c. In review of the security and building access procedures following an ELAP and BDBEE, the NRC staff interviewed plant personnel and conducted plant walk-downs focusing on the personnel and vehicle access system responses for the owner-controlled area, protected areas, and vital areas following an ELAP during a BDBEE.

The NRC staff's review focused on the ability for onsite and supplemental personnel to navigate and access the plant following an ELAP and for any needed vehicles or large, portable FLEX equipment to enter the protected area fence line following the event. Additional SE review item #15 was opened to address the above NRC staff questions. Information supplied by the licensee following the audit was sufficient to close this item.

d. In review of ISE CI 3.1.1.4.A, the NRC staff reviewed the draft SAFER Response Plan for North Anna and conducted walkdowns of the "B" staging area and the linkage to the Phase 2 equipment deployment haul routes. During the onsite audit, the NRC staff requested the liquefaction and safety of flight analyses for the "B" staging area designated to receive equipment and supplies from the NSRC. Following the onsite audit, the licensee completed a qualitative liquefaction analysis and completed a safety of flight analysis with the designated helicopter SAFER contractor.

Additionally, the NRC staff discussed Phase 3 haul route coordination with offsite emergency management resources in light of the five hazards. This discussion focused on how the impact to regional infrastructure would impact decision making with state, local, and SAFER officials in the transit of NSRC Phase 3 equipment to the site.

The NRC staff's review of the equipment staging and deployment capability from the "B" staging area focused on the viability of the chosen area, as it receives the Phase 3 equipment and connects to the Phase 2 portion of the strategy and the emergency management coordination for Phase 3 equipment arriving over land or via air.

4.0 Exit Meeting (Thursday, May 22, 2014)

The NRC staff audit team conducted an exit meeting with licensee staff following the closure of onsite audit activities. The NRC staff highlighted items reviewed and noted that detailed results of the onsite audit trip will be documented in this report. Eleven

items were discussed in detail at the exit meeting, and all of these items have been discussed above.

CONCLUSION

The NRC staff completed all three parts of the North Anna onsite audit plan as issued on April 24, 2014. Each detailed audit item listed in Part 2 of the plan was reviewed by NRC staff members while on site. In addition to the list of NRC and licensee onsite staff participants in Attachment 1, Attachment 2 provides a list of documents reviewed during the onsite audit portion.

In support of the continuing audit process as Dominion proceeds towards orders compliance for the North Anna site, the three additional attachments noted below provide the status of all audit review items (including what occurred onsite) that the NRC staff is evaluating in anticipation of issuance of a combined safety evaluation for both the Mitigation Strategies and Spent Fuel Pool Level Instrumentation orders. The five sources for the audit items referenced below are as follows:

a. Interim Staff Evaluation (ISE) Open Items (OIs) and Confirmatory Items (CIs)

b. Audit Questions (AQs)

c. Licensee-identified OIP Open Items (OIs)

d. SFPI Requests for Additional Information (RAIs)

e. Additional SE needed information

The tables in the attachments provide audit item status as follows:

a. Attachment 3: North Anna Mitigation Strategies (MS)/Spent Fuel Pool Instrumentation (SFPI) SE Audit Items not requiring further NRC staff review and transition to SE anticipated

b. Attachment 4: North Anna MS/SFPI SE Audit Items currently under NRC staff review but not requiring further licensee input

c. Attachment 5: North Anna MS/SFPI SE Audit Items currently under NRC staff review and requiring licensee input as delineated

While this report notes the completion of the onsite portion of the audit per the plan dated April 24, 2014, the ongoing audit process continues as per the letters to all licensees and construction permit holders for both orders dated August 28, 2013 and March 26, 2014. Additionally, while Attachments 3-5 provide a progress snapshot of the NRC staff's review of the licensee's OIPs, as supplemented, and as augmented in the audit process, the status and progress of the NRC staff's review may change based on licensee plan changes, resolution of generic issues, and other NRC staff concerns not previously documented. Changes in the NRC staff review will be communicated in the ongoing audit process.

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Attachments:
1. NRC and Licensee Staff Onsite Audit Participants
2. Onsite Audit Documents Reviewed
3. MS/SFPI Audit Items not requiring further NRC staff review
4. MS/SFPI Audit Items currently under NRC staff review (no licensee input needed)
5. MS/SFPI Audit Items currently under NRC staff review (licensee input needed)

Onsite Audit Participants / Meeting Attendees

NRC Staff:

Stephen Campbell	NRR/DIRS/IRIB
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Thomas Sharkey	Director, Nuclear Engineering
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Jim Zaborowski	Supervisor, Nuclear Engineering – Beyond Design Basis
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Ayad Al-Hamdani	Electrical – Beyond Design Basis
Bruce Phaup	Procedure Development – Beyond Design Basis
Bill Carter	Nuclear Engineering - Electrical
Ben Rodill	Beyond Design Basis – Program Development
David Lippard	Licensing Engineer – Beyond Design Basis

Documents Reviewed

- NRC Audit Presentation, May 19, 2014
- FLEX Support Guideline (FSG) - 1, "RCS Inventory Control"
- SA-AA-109, "Heat Stress Management"
- FLEX OIP database
- ME-0965
- MR-0966
- ME-0972 (and Addendum A – Analysis with Doors Open), Revision 0 – "Evaluation of Room Air Temperatures Following ELAP (TDAFW Pump Room)"
- ECA-0.0, "Loss of All AC Power"
- FSG-1, "RCS Inventory Control"
- FSG-3. "Alternate Low Pressure Feedwater"
- FSG-4, "ELAP DC Bus Load Shed/Management"
- FSG-5, "Initial Assessment and FLEX Equipment Staging"
- FSG-6, "Alternate ECST Makeup"
- FSG-7, "Loss of Vital Instrumentation or Control Power"
- FSG-8, "Alternate RCS Boration"
- FSG-9, "Low Decay Heat Temperature Control"
- FSG-13, "Transition from FLEX Equipment (Page 3 – Consideration to restore ventilation for battery charging (hydrogen Removal))"
- Drawing No. Figure 7 – One Line Diagram BDB Electrical Distribution System North Anna Power Station Units 1 & 2
- Drawing No. 11715-FE-1BA – Appendix R Evaluation Protective Device Coordination Electrical One Line Diagram North Anna Power Station Unit 1
- Drawing No. 12050-FE-1BA – Appendix R Protective Device Coordination Electrical One Line Diagram North Anna Power Station Unit 2
- EE-0863, Revisions 1 and 2 - North Anna Power Station Beyond Design Basis – FLEX Electrical 480VAC and 120VAC System Loading Analysis (Unit 1)
- EE-0865, Revisions 0 and 1 - North Anna Power Station Beyond Design Basis – FLEX Electrical 480VAC and 120VAC System Loading Analysis (Unit 2)
- EE-0871, Revision 0 - Calculation for North Anna Power Station Beyond Design Basis – FLEX Electrical 4160VAC System Loading Analysis
- NAPS BDB Equipment Fuel Tank Evaluation
- ETE-CPR-2012-0017, Revision 0 - Beyond Design Basis – 125VDC Analysis for Load Shedding and Extending Coping Time
- ETE-CPR-2012-0012, Revision 3 – Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document
- EE-0009, Revision 1 – 125Vdc System Analysis
- WNA-PT-00188-GEN, Rev. 1, "Spent Fuel Pool Instrumentation System (SFPIS) Standard Product Test Strategy"
- EQ-QR-269, Rev 0, "Design Verification Testing Summary Report for the Spent Fuel Pool Instrumentation System"
- CEM-0139, "Mounting details for Spent Fuel Pool Monitoring," Rev. 0

- CN-PEUS-14-3, "Seismic Analysis of the Spent Fuel Pool Mounting Bracket for Surry Power Station, Millstone Power station Unit 3 & North Anna Power Station," Rev. 1
- Drawing 10121D79, "North Anna Spent Fuel Pool Instrumentation System Level Sensor Assembly, Rev. 1, sheets 1, 3 and 4
- Drawing 10121D79, "North Ana Spent Fuel Pool Instrumentation System Level Sensor Assembly," Rev 0, sheet 2
- WNA-DS-02957, "Design Specification for the Spent Fuel Instrumentation System," Rev. 2.
- WNA-CN-00300-GEN, "Spent Fuel Pool Instrumentation System Power Consumption Calculation," Rev. 0.
- WNA-CN-00301-GEN, "Spent Fuel Pool Instrumentation System Accuracy Analysis," Rev. 0
- WNA-TP-04709-GEN, "Calibration Procedure," Rev. 3
- Drawing 10067E16, "North Anna, Surry and Millstone Unit 3 Nuclear Generating Stations Spent Fuel Pool Mounting Bracket Plan, Sections, and Details," Rev. 2, sheet 1
- Administrative procedure TR-AA-100, "Analysis," Rev. 10
- Amendment 15 to the North Anna Units 1 and 2 PSAR, entitled, *Report on Design and Stability of the North Anna Dam for Virginia Electric and Power Company*

North Anna
Mitigation Strategies/Spent Fuel Pool Instrumentation Safety Evaluation Audit Items:

Audit Items Not Requiring Further NRC Staff Review and Transition to Safety Evaluation Anticipated

Audit Item Reference	Item Description
ISE OI 3.2.1.8.A	Boric acid mixing under single-phase natural circulation conditions
ISE CI 3.1.1.1.A	Storage & Protection of FLEX equipment
ISE CI 3.1.1.3.A	Procedural Interface Considerations (Seismic)
ISE CI 3.1.1.4.A	Off-Site Resources
ISE CI 3.1.5.2.A	Considerations for any manual actions required by plant personnel in high temperature conditions.
ISE CI 3.2.1.1.C	Prevention of accumulator nitrogen injection.
ISE CI 3.2.1.2.C	RCS cooldown in relation to RCP seals
ISE CI 3.2.1.8.B	Adequate shutdown margin for North Anna in ELAP scenarios.
ISE CI 3.2.1.8.C	Shutdown margin calculations
ISE CI 3.2.1.9.A	Sufficient BDB RCS Injections Pumps
ISE CI 3.2.1.9.B	AFW supply, SFP makeup, and RCS inventory hydraulic analysis.
ISE CI 3.2.3.A	Containment analysis
ISE CI 3.2.4.2.B	Battery room ventilation.
ISE CI 3.2.4.4.A	Lighting study
ISE CI 3.2.4.9.A	Fuel Supplies
Audit Question 1	Storage of Portable equipment
Audit Question 2	Seismically qualified electrical equipment
Audit Question 3	External flood-induced challenges
Audit Question 4	Large internal flooding sources
Audit Question 7	Cooling functions for equipment to assure that coping strategy functionality could be maintained.
Audit Question 8	Loss of heat tracing effects for equipment
Audit Question 13	Base seismic hazard that is lower than the currently known maximum probable PGA.
Audit Question 14	Effects snow, ice, and cold temperature at NAPS
Audit Question 15	Key Parameters
Audit Question 19	Load shed of the dc bus
Audit Question 20	Current flood analysis for Unit 3
Audit Question 23	Identifying and evaluating the important parameters and assumptions demonstrating that they are representative of your site and appropriate for simulating the ELAP transient.
Audit Question 24	Single FLEX pump will be used to provide cooling flow to multiple destinations
Audit Question 25	Means of communication between the control room and local equipment operators

Audit Item Reference	Item Description
Audit Question 26	Providing RCS makeup is based on the first or the last RCS loop entering reflux cooling.
Audit Question 27	Uniform boron mixing model
Audit Question 28	RCP seal leakage analysis/rates.
Audit Question 29	Extreme cold event to result in boric acid precipitation or the freezing of water in equipment
Audit Question 30	Analytical methodology for assessing the potential for nitrogen injection from accumulators during an ELAP event.
Audit Question 42	Electrical isolation.
Audit Question 44	Loads that will be shed from the dc bus
Audit Question 45	Basis for the minimum dc bus voltage.
Audit Question 46	Sizing calculation for the FLEX generators.
Audit Question 47	Adequacy of the ventilation provided in the battery room.
Audit Question 48	Battery room ventilation to prevent hydrogen accumulation.
Audit Question 49	Single Line Diagrams showing the proposed connections of Phase 2 and 3 electrical equipment.
Audit Question 50	Equipment maintenance and testing
Audit Question 51	Adequacy of the ventilation provided in the TDAFW pump room.
Audit Question 52	Nuclear Energy Institute position paper addressing mitigating strategies in shutdown and refueling modes.
Licensee Identified Open Item 1	Response times listed in timeline and perform staffing assessment.
Licensee Identified Open Item 3	Class 1E battery life.
Licensee Identified Open Item 4	Phase 3 coping strategy to maintain Containment integrity.
Licensee Identified Open Item 5	Confirm fluid hydraulic-related strategy objectives can be met.
Licensee Identified Open Item 6	Final design for BDB equipment storage.
Licensee Identified Open Item 9	Overall program document.
Licensee Identified Open Item 13	Ventilation strategy.
Licensee Identified Open Item 14	Installation of N-9000 RCP seals in 2 of 3 RCPs in each unit.
Licensee Identified Open Item 15	Electrical components performance requirements.
Licensee Identified Open Item 16	BDB equipment fuel consumption and required re-fill strategies.
Licensee Identified Open Item 17	Lighting study.
Licensee Identified Open Item 18	Communication capabilities.

Audit Item Reference	Item Description
Licensee Identified Open Item 19	Preferred travel pathways.
SFPLI RAI 1	SFP monitoring water levels
SFPLI RAI 2	SFPI arrangement
SFPLI RAI 3	SFPI seismic design and installation
SFPLI RAI 4	SFPI seismic design and installation
SFPLI RAI 5	SFPI seismic design and installation
SFPLI RAI 6	SFPI environmental qualification - radiological conditions
SFPLI RAI 7	SFPI environmental qualification- Temperature
SFPLI RAI 8	SFPI environmental qualification - Humidity
SFPLI RAI 9	SFPI environmental qualification - Effect of Shock
SFPLI RAI 10	SFPI environmental qualification - Effects of Vibration
SFPLI RAI 11	SFPI environmental qualification - Shock and Vibration
SFPLI RAI 12	SFPI environmental qualification - Seismic reliability
SFPLI RAI 13	SFPI reliability qualification
SFPLI RAI 14	SFPI power supply and battery capacity
SFPLI RAI 15	SFPI power supply and battery capacity
SFPLI RAI 16	SFPI Accuracy
SFPLI RAI 17	List of procedures related to SFPI operation, maintenance, calibration, testing and repair
SFPLI RAI 18	SFPI testing and calibration
Safety Evaluation review item 2	Dam forming the lake seismic qualification
Safety Evaluation review item 3	RCS Venting
Safety Evaluation review item 5	RVLIS Measurement Principle
Safety Evaluation review item 6	Timeline to reflux cooling
Safety Evaluation review item 7	NOTRUMP code adequacy to demonstrate that criteria associated with the analysis of an ELAP event
Safety Evaluation review item 10	Human factors questions
Safety Evaluation review item 14	SFP hose deployment strategy

North Anna
Mitigation Strategies/Spent Fuel Pool Instrumentation Safety Evaluation Audit Items:

Audit Items Currently Under NRC Staff Review, Not Requiring Further Licensee Input

Audit Item Reference	Item Description
Licensee Identified Open Item 11	Evaluation of TDAFW pump long term operation
Licensee Identified Open Item 12	Completion of plant modifications

North Anna
Mitigation Strategies/Spent Fuel Pool Instrumentation Safety Evaluation Audit Items:

Audit Items Currently Under NRC Staff Review, Requiring Licensee Input As Delineated

Audit Item Reference	Item Description	Licensee Input Needed
ISE OI 3.2.1.2.B	Demonstration of the acceptability of the use of the FlowServe N-9000 seals with the Abeyance feature and validation of an acceptable leakage rate for these seals.	In light of the generic aspect of this issue, either demonstrate that the generic Flowserve issues are inconsequential for North Anna or provide adequate justification that the leakage rate is applicable to the ELAP analysis.
ISE CI 3.2.1.1.A	Confirm that the use of NOTRUMP code for the ELAP analysis of North Anna is limited to the flow conditions before reflux condensation initiates, including specification of an acceptable definition for reflux condensation cooling.	1. In light of the generic aspects of this code analysis discussion, provide further justification for the assumptions made in the evaluation, particularly the assumed seal leakage rates. 2. Provide additional information to demonstrate that the margin provided by the installation of the low-leakage RCP seals is sufficient in light of the substantial uncertainties associated with the coping times predicted by the thermal-hydraulics code.
ISE CI 3.2.1.1.B	Confirmation that the generic analysis in Section 5.2.1 of WCAP-17601-P is applicable or bounding with respect to North Anna for an appropriate figure of merit for defining entry into the reflux condensation cooling mode.	1. Define the specific evaluation for which North Anna will be based. 2. Provided a spreadsheet of the requested parameters showing plant-to-analysis comparison.
ISE CI 3.2.1.6.A	Sequence of Events – Confirm that the final timeline has been time validated after detailed designs are completed and procedures are developed.	Provide the formal results from the time validation testing.

Audit Item Reference	Item Description	Licensee Input Needed
ISE CI 3.2.2.A	SFP venting – confirm that opening of the roll-up doors would provide an adequate ventilation path for the SFP area.	Provide SFP area habitability analysis and/or hose deployment strategy.
ISE CI 3.2.4.2.A	Ventilation – Equipment Cooling – Confirm development of the ventilation strategy.	Provide the analysis assumptions for the actions specified in the FSGs.
ISE CI 3.2.4.4.B	Communications – Confirm the licensee's proposed enhancements and interim measures to the site's communications systems and that they have been completed.	Provide final communications strategy.
ISE CI 3.2.4.8.A	Electrical Power Sources – Confirm load calculations for the phase 2 and 3 FLEX generators will support supplied loads.	Provide final Phase 2 and Phase 3 load calculations and breaker settings.
Audit Question 44	Provide the direct current (dc) load profile with the required loads for the mitigating strategies to maintain core cooling, containment, and spent fuel pool cooling.	Provide formal results of time validation of dc load shedding.
Licensee Identified Open Item 10	The Dominion Nuclear Training Program will be revised to assure personnel proficiency in the mitigation of BDB events is developed and maintained. These programs and controls will be developed and implemented in accordance with the Systematic Approach to Training (SAT).	Provide revised Training Program document.
Safety Evaluation review item 1	Aug 2014 Update Section 4a. Portable 120/240 VAC DG will not be pre-staged.	Provide time validation study results confirming equipment can be deployed, connected to the electrical distribution system, and supply power to the loads within the times assumed in the licensee's overall integrated plan

Audit Item Reference	Item Description	Licensee Input Needed
Safety Evaluation review item 4	2. (Westinghouse Standard RCP Seals: NSAL-14-1) On February 10, 2014, Westinghouse issued Nuclear Safety Advisory Letter (NSAL)-14-1, which informed licensees of plants with standard Westinghouse RCP seals that 21 gpm may not be a conservative leakage rate for ELAP analysis. This value had been previously used in the ELAP analysis referenced by many Westinghouse PWRs, including the generic reference analysis in WCAP-17601-P. Therefore, please clarify whether the assumption of 21 gpm of seal leakage per RCP (at 550 degrees F, 2250 psia) remains valid in light of the issues identified in NSAL-14-1. In so doing, please identify the specifics of the seal leak off line design and #1 seal faceplate material relative to the categories in NSAL-14-1 and identify the corresponding presumed leakage rate from NSAL-14-1 that is deemed applicable.	Provide final value for the expected leakage for the RCP seals.
Safety Evaluation review item 8	Please provide adequate basis that, when considering mixing time, there is sufficient flow capacity to support borated makeup to both units from a single RCS makeup pump taking suction from a portable batching tank.	Provide calculation to demonstrate adequate flow capacity.
Safety Evaluation review item 9	EMC compliance for SFP level instruments.	1. Provide confirmation that there are no major electrical noise sources near the probes in the SFP. 2. Provide actions taken by the licensee to address the possibility of electromagnetic interference.
Safety Evaluation review item 11	Unprotected water sources in Modes 5 & 6	Provide updated strategy for water sources in Modes 5 and 6.

Audit Item Reference	Item Description	Licensee Input Needed
Safety Evaluation review item 12	FLEX 120/480 vac cable storage, testing, and maintenance.	The staff expects that some periodic maintenance will be performed to uncover any degradation over time. Also address how the cables will be stored to prevent any damage as a result of an earthquake (i.e., anchored/secured to the floor or wall within a seismically protected structure).

If you have any questions, please contact me at 301-415-2901 or by e-mail at John.Boska@nrc.gov.

Sincerely,

/RA/

John Boska, Senior Project Manager
Orders Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket Nos.: 50-338 and 50-339

Enclosure:
Audit report

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