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

April 13, 2022

Mr. Daniel G. Stoddard
Senior Vice President and
Chief Nuclear Officer
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: SURRY POWER STATION, UNITS 1 AND 2 – REGULATORY AUDIT SUMMARY RELATED TO THE LICENSE AMENDMENT REQUEST TO CHANGE LOSS-OF-COOLANT ACCIDENT CHEMICAL BUFFER (EPID L-2021-LLA-0179)

Dear Mr. Stoddard:

By letter dated September 30, 2021, Agencywide Documents Access and Management System (ADAMS) Accession No. ML21277A065, as supplemented by letter dated November 29, 2021, ADAMS Accession No. ML21334A169, Virginia Electric and Power Company, the licensee (Dominion Energy Virginia) submitted a license amendment request (LAR) for Surry Power Station, Units 1 and 2 (Surry). The proposed amendment would revise the Surry's Technical Specifications to eliminate the Refueling Water Chemical Addition Tank and allow the use of sodium tetraborate decahydrate to replace sodium hydroxide as a chemical additive (buffer) for containment sump pH control following a loss-of-coolant accident at Surry.

To enhance the review of the licensee's request, the U.S. Nuclear Regulatory Commission (NRC) staff conducted a virtual audit of supporting documents from February 1 to March 18, 2022. The NRC staff audited the requested documents to: (1) examine and evaluate non-docketed information, (2) increase the NRC staff's understanding of the LAR and (3) identify any information that may require docketing to support the NRC staff's regulatory finding. A summary of the regulatory audit is enclosed, as well as the topics discussed during teleconferences held in support of the audit.

If you have any questions, please contact me at (301) 415-5136, or via email at John.Klos@nrc.gov.

Sincerely,

/RA/

John Klos, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-280 and 50-281
Enclosures:
1. Regulatory Audit Summary
2. Audit topics during teleconferences.

cc: Listserv

REGULATORY AUDIT SUMMARY RELATED TO LICENSE AMENDMENT REQUEST

TO CHANGE LOSS-OF-COOLANT ACCIDENT CHEMICAL BUFFER

VIRGINIA ELECTRIC AND POWER COMPANY

SURRY POWER STATION, UNIT NOS. 1 AND 2

DOCKET NOS. 50-280 AND 50-281

1.0 BACKGROUND

A regulatory audit is a planned license or regulation-related activity that includes the examination and evaluation of non-docketed information. This audit was conducted with the intent to: (1) examine and evaluate non-docketed information, (2) increase the U.S. Nuclear Regulatory Commission (NRC) staff's understanding of the license amendment request (LAR) and (3) identify any information that may require docketing to support the NRC staff's regulatory finding.

By letter dated September 30, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21277A065), as supplemented by letter dated November 29, 2021 (ADAMS Accession No. ML21334A169), Virginia Electric and Power Company, the licensee (Dominion Energy Virginia) submitted a LAR for Surry Power Station, Units 1 and 2 (Surry). The proposed amendment would revise the Surry 1 and 2 Technical Specifications (TSs) to eliminate the Refueling Water Chemical Addition Tank (CAT) and allow the use of sodium tetraborate decahydrate (NaTB) to replace sodium hydroxide (NaOH) as a chemical additive (buffer) for containment sump pH control following a loss-of-coolant accident (LOCA) at Surry.

The NRC staff performed a preliminary review of the LAR and determined that a regulatory audit would assist in reviewing the licensee's calculations supporting the LAR and timely completion of the review. The regulatory audit was performed consistent with NRC Office of Nuclear Reactor Regulation Office Instruction LIC-111, Revision 1, "Regulatory Audits," dated October 31, 2019 (ADAMS Accession No. ML19226A274).

2.0 AUDIT ACTIVITIES

The NRC staff conducted a regulatory audit that consisted of a document review via the licensee's portal and a series of virtual teleconferences. An audit plan was provided to the licensee by letter dated January 14, 2022 (ADAMS Accession No. ML22004A287), which contained the subject areas, an outlined schedule, and logistics for the audit. The audit was originally planned to end on March 15, 2022, but was extended to March 18, 2022, to allow the NRC staff to complete document reviews and covered discussion topics with the licensee. The list of documents sent to the licensee's portal by the license that were examined by the audit team is provided in Section 4.0 below.

The discussion topics that were part of the three video teleconferences are included in Enclosure 2. Audit activities for each subject area are summarized below.

pH Buffer Calculations

The NRC staff reviewed the audit documents to assess the details associated with the buffer pH calculations, including description of the key assumptions, its methodology, and inputs.

Basket Members and Connections

The NRC staff reviewed the audit documents to assess detailed information of how the chemical baskets and their structural connections were analyzed, and the methodology utilized while applying the American Institute of Steel Construction 9th Edition, "Manual of Steel Construction."

3.0 AUDIT TEAM

The NRC audit team members:

- Gregory Makar, Materials Engineer, Team Leader
- John Ma, Senior Civil Engineer (Structural)
- John Klos, Surry Licensing Project Manager

4.0 DOCUMENTS PROVIDED IN THE LICENSEE'S PORTAL

Number	Document No.	Title	Rev. No.	Date
1	ETE-NAF-2020-0029	Transmittal of Parameters for Refueling Water Storage Tank [RWST] Chemical Addition Tank (CAT) Removal/ Buffer Replacement Sizing Calculations for North Anna and Surry Power Stations to Sargent & Lundy LLC	01	6/1/2021
2	NA	NRC SPS sump level vs. time and earliest RMT (Excel spreadsheet)	02	3/10/2022
3	CM-AA-CLC-301, Calculation no. CEM-0224	Reactor Containment NaTB Basket Design	00	5/19/2021
4	CM-AA-CLC-301, Calculation no. ME-12169	Post-LOCA Containment Sump pH Control Using Sodium Tetraborate Decahydrate	00	8/10/2021
5	CM-AA-CLC-301, Calculation no. 12846.01-PE-030	Containment Water Volume vs. Elevation	01	7/1/2021

5.0 TELECONFERENCE DISCUSSION POINTS OF THE AUDIT

Discussed during February 23, 2022 Audit Teleconference:

1. Please clarify the location of the perforated plate in the basket design.

   The licensee clarified that the plates are welded in place and located on the sides and bottom of the basket. The mesh is located on the inside of the perforated plate and clamped to the tube steel.

2. Please explain how the water of hydration from the sodium tetraborate is factored into the water mass for the pH calculation.

   The licensee stated that the water of hydration (i.e., “decahydrate”) from the sodium tetraborate decahydrate buffer is included in the total water mass for the pH calculation. The calculation assumes this water is added to the containment pool as the buffer is dissolved.

3. The amount of strong acid generated is considerably higher than for the other plants shown in Table 5.8-1 of Calculation ME-12169. Please discuss possible reasons (e.g., the accuracy of the amount of exposed cable insulation in containment).

   The licensee explained that the strong acid is described in the calculation and considers both components – hydrochloric acid from irradiation of chlorine-containing cable insulation and nitric acid from irradiation of water. The calculation follows the method in NUREG/CR-5950 ORNL/TM-12242, “Iodine Evolution and pH control,” December 1992 (ADAMS Accession No. ML063460464) for the amount of acid produced. The NRC staff acknowledged calculating the same amounts as the licensee using NUREG/CR-5950. The licensee’s estimate of the insulation quantity was based on a total mass only and was assumed to be the chorine-containing Hypalon material. The licensee considers this conservative because the insulation may include other materials, and not all of the insulation is necessarily subject to irradiation. The amount of acid or cable calculated for other plants was not discussed.

4. Calculation ME-12169 shows the pH results for certain points in time based on meeting the criteria for the 30-day post-LOCA period. Please clarify to what extent have you examined the entire 30-day pH transient to evaluate the methodology and confirmed the acceptance criteria are met?

   For Surry’s calculation, the licensee explained that they considered it unnecessary to create tables or graphs of pH vs. time to evaluate whether the acceptance criteria are met throughout the transient. This is because the sodium tetraborate buffer dissolves quickly compared to the generation of the acids requiring buffering. Therefore, evaluating the time at which the pH of 7 needs to be achieved (68.3 minutes) and the end of 30-day period is sufficient in determining the amount of buffer required to maintain a minimum pH of 7. For calculating the maximum pH to determine if the pH remains below the plan upper limit of pH 9, additional times early in the transient were evaluated because that is when the buffer is added quickly and, for conservatism, the calculation ignores the addition of acids.

The proposed Technical Specifications do not appear to include surveillance requirements to verify that the quantity of sodium tetraborate meets the requirement and the baskets are secured and in the correct locations. Please discuss the controls in place for the buffer in containment. Please also explain how is the amount of buffer going to be accounted for via surveillance requirements.

The original LAR submittal shows the chemical buffer quantity requirement in section TS 3.4. The licensee noted that the portion of TS 3.4 included in the LAR shows that the reactor coolant system shall not be made to exceed a temperature of 350 degrees Fahrenheit or pressure of 450 pounds per square inch gage unless the pH buffer surveillance requirements are met.

The licensee stated that the implementation of the sodium tetraborate buffer will require an operating procedure for performing the verification in TS 3.4. This will be done utilizing a visual level indicator designed in the basket in conjunction with a visual observation of the "condition" of the buffer.

Discussed during the March 10, 2022 Audit Teleconference:

1. The third paragraph in Section 2.15 of ME-12169 describes how Reference 1 data on the total volume of water was not used in the calculation. Please clarify the meaning of this paragraph with respect to the water inventory listed in Section 2.2 and the timing of water additions to containment.

   The licensee explained that the calculation for this LAR dealing with water inventory and the timing of water additions is based on a spreadsheet of data (document no. 2 in Section 4.0 above) which provides a summary of input values. That spreadsheet contains a column showing the total amount of water added to the sump as a function of time without the corresponding boron concentration. Therefore, the final summary calculation on this portion of the LAR did not use that information and instead used the individual components of the water additions which included their boron concentrations, as summarized in the calculation and the LAR supplement. Concerning this discussion point, the licensee also pointed out that the RWST is the only transient source of water injection for this calculation because the other sources are in the sump before the first critical time point occurs in the calculation.

2. Section 4.2 of ME-12169 states, "Normal, non-borated sump water is included in both the maximum and minimum borated water computations." Please explain if this refers to the sump inventory during normal operations (approximately 300 gallons) and if it includes other source.

   The licensee confirmed that the 300 gallons refers to the sump inventory during normal operations and no other sources are included.

3. Please step through the process described in Attachment F of ME-12169 for determining the required sodium tetraborate mass, especially how the assignment of one of two discrete times (page 2 of 7) leads to an evaluation over the full temperature range.

   The licensee responded that the calculation does not document the conditions for every accident which is why it is formatted to consider the full temperature range at particular

points, or times, of interest. The licensee explained that the amount of NaTB required at each temperature is based on applying the data inputs corresponding to that temperature. The licensee stated that Attachment B of ME-12169 is also part of this explanation because it shows the MATHCAD operation for determining NaTB need and max pH. The calculation does not identify why the amount of NaTB peaks at 25C, but this peak in the buffer requirement is related to the temperature dependence of multiple input parameters.

4. Please clarify how the water volume vs. water elevation relationship developed in 12846.01-PE-030 was used to produce the tables and figures of water level vs. time in Attachment H of ME-12169.

   The licensee explained that the level vs. time relationship in the PE-030 calculation was not used directly in the pH calculation. The licensee stated that the water level vs. volume inputs for determining the water level versus time figures in the pH calculation (e.g., Attachment H) were from a separate spreadsheet. The licensee added the spreadsheet to the licensee's portal after the call (document no. 2 in Section 4.0 above).

Discussed during the March 17, 2022 Audit Teleconference:

1. Please clarify how the relationship between sump volume and level above -27'-7" shown in the sump level vs. time Excel spreadsheet is related to the sump volume vs. elevation Tables 10.1 and 10.2 (and corresponding Figures 10.1 and 10.2) in Calculation 12846.01-PE-030, Rev. 1, and to Appendix H of Calculation ME-12169. For example, from Tables 10.1 and 10.2, it appears that a level of -25'-7" would be 2 feet above the basement elevation of -27'-7" and correspond to approximately 185,000 gallons of containment water volume. However, in the Excel spreadsheet figures, 2 feet of elevation above -27'-7" corresponds to about 120,000 or 140,000 gallons in the containment sump depending on whether holdup volume is included.

   The licensee explained that the water level tables in PE-030 Rev. 1 are not used as input for the pH calculation, although they are partly based on Rev. 0 of PE-30. The Excel spreadsheets are from the GOTHIC LOCA model with a forcing function for the four cases evaluated. The licensee then demonstrated how the graphs within the calculation are related to the spreadsheets. The holdup cases presented in the calculation include water that requires chemical buffering but doesn't add to sump level -- such as when the recirculation piping is empty at the start of the LOCA. For non-holdup cases presented in the calculation all the water contributes to the level and must be buffered. The Excel spreadsheets were used as inputs to the injected water volume and water level profiles vs. time shown in Calculation ME-12169.

2. According to Section 2.14 and Attachment G of Calculation ME-12169, the evaluated buffer height was 15-17 inches. Section 2.14, Attachment G, and the Attachment N drawings indicate the basket height is 18 inches starting at the bottom of the mesh. Please provide the basis for using 17 inches rather than 18 inches as the maximum buffer height.

   The licensee explained that the level in the baskets will be used to meet the TS surveillance requirements and that the filling and measurement requirements of the baskets will be documented in a plant procedure. The baskets' nominal fill level will be

16 inches and they will have visual indicators that identify their fill level. The basket levels and the visual indicators can be found on the basket drawings in Attachment N.

6.0 AUDIT CONCLUSION

The audit was closed on March 18, 2022. The NRC staff review of the proposed license amendment continues. A request for additional information may be issued as needed.

SUBJECT: SURRY POWER STATION, UNITS 1 AND 2 – REGULATORY AUDIT SUMMARY RELATED TO THE LICENSE AMENDMENT REQUEST TO CHANGE LOSS-OF-COOLANT ACCIDENT CHEMICAL BUFFER (EPID L-2021-LLA-0179)

DATED: APRIL 13, 2022

DISTRIBUTION:
PUBLIC
LPL2-1 R/F
RidsAcrs_MailCTR Resource
RidsNrrDorlLpl2-1 Resource
RidsNrrLAKGoldstein Resource
RidsNrrPMSurry Resource
RidsRgn2MailCenter Resource
RidsNrrDexEseb
RidsNrrDnrlNcsg
CNolan, OEDO
GMakar, NRR
JMa, NRR

ADAMS Accession No. ML22089A009

OFFICE	DORL/LPL2-1/PM	DORL/LPL2-1/LA	NRR/DEX/ESEB/BC
NAME	JKlos	KGoldstein	JColaccino
DATE	3/18/2022	03/30/2022	3/31/2022
OFFICE	NRR/DNRL/NCSG/BC	DORL/LPL2-1/BC (A)	DORL/LPL2-1/PM
NAME	SBloom	SWilliams	JKlos
DATE	4/1/2022	4/13/2022	4/13/2022

OFFICIAL RECORD COPY