



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

SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS

RELATED TO AMENDMENT NOS. 110 AND 109

TO THE COMBINED LICENSE NOS. NPF-91 AND NPF-92

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

GEORGIA POWER COMPANY

OGLETHORPE POWER COMPANY

MEAG POWER SPVM, LLC

MEAG POWER SPVJ, LLC

MEAG POWER SPVP, LLC

CITY OF DALTON, GEORGIA

VOGTLE ELECTRIC GENERATING PLANT UNITS 3 AND 4

DOCKET NOS. 52-025 AND 52-026

1.0 INTRODUCTION

By letter dated September 13, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17256A626), Southern Nuclear Operating Company (SNC) submitted a license amendment request (LAR) 17-032 and requested that the U.S. Nuclear Regulatory Commission (NRC) amend the combined licenses (COL) for Vogtle Electric Generating Plant (VEGP) Units 3 and 4, COL Numbers NPF-91 and NPF-92, respectively. LAR 17-032 proposed changes to the Updated Final Safety Analysis Report (UFSAR) in the form of departures from the incorporated plant-specific Design Control Document Tier 2 information and proposed changes to the VEGP Units 3 and 4, COL, Appendix A, Technical Specifications (TS). The proposed changes revised the plant-specific Tier 2 information addressing the mass of trisodium phosphate (TSP) required inside containment.

## 2.0 REGULATORY EVALUATION

The changes proposed by SNC in this LAR revise the UFSAR and TS to modify the mass of TSP required inside containment. The TSP solution adjusts the pH of the water in the containment following an accident in which the containment floods.

The NRC staff considered the following regulatory requirements in reviewing the proposed changes.

Title 10 of the *Code of Federal Regulations* (10 CFR) 52.98(f) requires NRC approval for any modification to, addition to, or deletion from the terms and conditions of a COL. This activity involves a departure from COL, Appendix A, Technical Specification 3.6.8.

10 CFR Part 52, Appendix D, Section VIII.B.5.a allows an applicant or licensee who references this appendix to depart from Tier 2 information, without prior NRC approval, unless the proposed departure involves a change to, or departure from, Tier 1 information, Tier 2\* information, or the TS, or requires a license amendment under paragraphs B.5.b or B.5.c of the section.

Appendix D, Section VIII.C.6 states that after issuance of a license, "Changes to the plant-specific TS will be treated as license amendments under 10 CFR 50.90." 10 CFR 50.90 addresses the application for amendment of license, construction permit, or early site permit. The proposed LAR requires changes in the TS, and therefore an LAR is required to be submitted for NRC approval.

10 CFR 50.36, TS impose limits, operating conditions, and other requirements upon reactor facility operation for the public health and safety. The TS are derived from the analyses and evaluations in the safety analysis report. In general, TS must contain: (1) safety limits and limiting safety system settings; (2) limiting conditions for operation; (3) surveillance requirements; (4) design features; and (5) administrative controls.

10 CFR Part 50, Appendix A, General Design Criteria (GDC) 14, "Reactor coolant pressure boundary," requires that the reactor coolant pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.

GDC 41, "Containment atmosphere cleanup," requires that systems to control fission products, hydrogen, oxygen, and other substances which may be released into the reactor containment shall be provided as necessary to reduce, consistent with the functioning of other associated systems, the concentration and quality of fission products released to the environment following postulated accidents, and to control the concentration of hydrogen or oxygen and other substances in the containment atmosphere following postulated accidents to assure that containment integrity is maintained.

## 3.0 TECHNICAL EVALUATION

### 3.1 PROPOSED CHANGES

The proposed changes to the COL, Appendix A, TS and UFSAR are as follows.

- Revise Limiting Condition for Operation (LCO) 3.6.8 as follows:

“The pH adjustment baskets shall contain  $\geq$  25,920 lbs of trisodium phosphate (TSP).”

- Revise Surveillance Requirement 3.6.8.1 as follows:

“Verify the pH adjustment baskets contain  $\geq$  25,920 lbs of TSP.”

- Revise the first sentence of the second paragraph of UFSAR Subsection 6.3.2.2.4 as follows:

“The total weight of TSP contained in the baskets is at least 25,920 pounds.”

### 3.2 TECHNICAL EVALUATION OF PROPOSED CHANGES

The staff reviewed the proposed changes to the UFSAR Subsection 6.3.2.2.4, “pH Adjustment Baskets,” presented in LAR 17-032 with respect to the passive core cooling system (PXS) that provides emergency core cooling following postulated design basis events. The PXS controls containment sump water pH by providing chemical addition during post-accident conditions. As described in USFAR Section 6.3, the PXS also establishes floodup chemistry conditions that support radionuclide retention with high radioactivity in containment. Additionally, the chemical addition helps to reduce the potential for stress corrosion cracking of stainless steel components in a post-floodup condition, where chlorides can potentially affect these components during a long-term floodup event. In the event of a design basis accident, iodine may be released from the fuel to containment. To limit potential iodine release outside of containment, the pH of the water in the containment sump is adjusted by the addition of TSP. Post-accident control of the pH in the containment sump water is achieved through the use of pH adjustment baskets containing granulated TSP. TSP is capable of maintaining containment sump water pH within a range of 7.0 to 9.5.

To perform the technical evaluation, the staff considered the proposed changes to VEGP Units 3 and 4, UFSAR Subsection 6.3.2.2.4, and TS 3.6.8 by reviewing the Westinghouse calculation APP-PXS-M3C-021 “AP1000 Post loss-of-coolant accident (LOCA) pH Adjustment,” Revision 2. Additionally, the staff independently performed the calculations and compared the staff’s results to the results submitted in the revised TS and USFAR.

The amendment changes the required TSP dodecahydrate ( $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ ) amount of 26,460 pounds (lbs.) to 25,920 lbs. for the total weight of contained in the pH adjustment baskets. This change reflects the finalization of the design during which the maximum volume of post-accident containment water was changed from 908,000 gallons to 867,308 gallons. Additionally, the LAR states that, “during design finalization, the containment water boron concentration (which is a function of containment water volume and other inputs) was changed from 2990 parts per million (ppm) to 3014 ppm.”

The staff evaluated the proposed changes by reviewing APP-PXS-M3C-021, Revision 2. Document No. APP-PXS-M3C-021 contained the calculations, methodology, and inputs for calculating the containment post-accident pH of 7 in a borated solution. APP-PXS-M3C-021 also included a detailed analysis with different variables of boron concentration from different systems and also included margins to account for other sources of acids and bases that build up over time. As describe in the NUREG/CR-5950, the most important acids in containment are

nitric acid (HNO<sub>3</sub>), produced by irradiation of water and air, and hydrochloric acid (HCl), produced by irradiation or heating of electrical cable insulation. Additionally, cesium hydroxide is a base that can also be found in the containment. The staff determined the assumptions and methodology were reasonable because the staff spot-checked the calculations and found them correct. The staff also reviewed the margin in the evaluations to account for additional acids and bases and found the margin reasonable because the information was based on the approved AP1000 design. Overall, the staff determined that the information provided by the licensee provided reasonable assurance that the pH will be maintained between 7 and 9.5 during the post-LOCA period. Therefore, the staff finds it acceptable to change TS LCO 3.6.8 to reduce the amount of TSP to 25,920 lbs. from 26,460 lbs.

The pH adjustment prevents corrosion of metal objects in the reactor coolant pressure boundary and therefore supports the purpose of GDC 14. NUREG-0800, "Branch Technical Position MTEB 6-1," (3) sets a minimum pH of 7.0 for post-accident emergency coolant water to reduce the probability of SCC of austenitic stainless steel components, non-sensitized or sensitized, non-stressed or stressed. The staff finds that the proposed changes submitted by the licensee are acceptable because the pH will be maintained between 7 and 9.5 to reduce the probability of stress corrosion cracking of austenitic stainless steel components in post-accident conditions, therefore compliance with GDC 14 is unaffected by the proposed change.

The function of the containment cleanup system is to control fission product releases to the environment following a postulated accident. The staff finds that the proposed changes submitted by the licensee are acceptable based on the staff's evaluation of the licensee's analysis indicating that the pH will be maintained above 7 in order to support the retention of iodine in the containment. This meets the intent of GDC 41. Having a pH of 7 or higher will mitigate other acids that may be introduced into the containment water post-accident.

Based on the staff's evaluation, the staff concludes that the proposed UFSAR changes do not impact the licensee's compliance with the requirements in 10 CFR Part 50, Appendix A, GDC 14 and 41. Therefore, the staff finds the proposed changes to be acceptable.

#### 4.0 STATE CONSULTATION

In accordance with the Commission's regulations in 10 CFR 50.91(b), the Georgia State official was consulted on January 29, 2018, of the proposed issuance of the amendment. The State official had no comments.

#### 5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20, "*Standards for Protection Against Radiation.*" The NRC staff finds that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite. Also, there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (82 FR 55401 published on November 21, 2017). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

## 6.0 CONCLUSION

The staff has concluded, based on the considerations discussed in Section 3.0 of this safety evaluation and confirming that these proposed changes do not change an analysis methodology, assumptions, or the design itself, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by the proposed activities, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public. Therefore, the staff finds the changes proposed in LAR 17-032 to be acceptable.

## 7.0 REFERENCES

1. Vogtle Electric Generating Plant Units 3 and 4, Request for License Amendment (LAR-17-032) RE: Containment Flooding pH Adjustment Changes, (ADAMS Accession No. ML17256A626).
2. Final Safety Evaluation Report for Vogtle Electric Generating Plant Units 3 and 4 Combined License Application, August 5, 2011 (ADAMS Accession No. ML110450302).
3. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)," March 2007 (ADAMS Accession No. ML070660036).
4. NUREG-1793, Supplement 2, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Plant Design," August 5, 2011 (ADAMS Accession No. ML112061231).
5. Vogtle Electric Generating Plant Units 3 and 4, Updated Final Safety Analysis Report, Chapter 3, Section 3.8, "Design of Category I Structures," April 6, 2016 (ADAMS Accession No. ML16174A168).
6. Westinghouse Electric Company, Westinghouse Proprietary Class 2, "AP1000 Post LOCA pH Adjustment," dated October 5, 2016 (Document No. APP-PXS-M3C-021, Revision 2).
7. NUREG/CR-5950, "Iodine Evolution and pH Control," December 1992 (ML063460464)