

SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS  
RELATED TO AMENDMENT NO. 17 TO THE COMBINED LICENSE NO. NPF-91  
AND LICENSE NO. NPF-92  
SOUTHERN NUCLEAR OPERATING COMPANY, INC.  
GEORGIA POWER COMPANY  
OGLETHORPE POWER COMPANY  
MUNICIPAL ELECTRIC AUTHORITY OF GEORGIA  
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 July 15, 2013, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13197A117), and supplemented by a letter dated November 15, 2013 (ADAMS Accession No. ML13319B203), Southern Nuclear Operating Company (SNC/Licensee) requested that the U.S. Nuclear Regulatory Commission (NRC/Commission) amend the combined licenses (COLs) for Vogtle Electric Generating Plant Units 3 and 4, COL Numbers NPF-91 and NPF-92, respectively.

The proposed changes would depart from plant-specific Design Control Document (DCD) Tier 2\* and associated Tier 2 material incorporated into the Updated Final Safety Analysis Report (UFSAR) by revising the design changes related to the CA03 structural module, which is the in-containment refueling water storage tank (IRWST) west wall. The proposed departures consist of changes to Tier 2\* Figure 3.8.3-8 Sheet 3, "Structural Modules – Typical Design Details" to:

1. Clarify the material used for horizontal stiffeners.
2. Add a stiffener to the configuration.
3. Revise the number and distribution of shear studs on the module support legs that anchor the module into the concrete.
4. Increase the number of rows of anchoring bars on the sub-module legs, and add a note permitting anchor bars with standard hooks.

The proposed departures also included changes to Tier 2 Information in UFSAR Subsection 6.1.1.3 and UFSAR Table 6.1-1 to:

1. Clarify potential inconsistencies between UFSAR Table 6.1-1 and UFSAR Subsection 6.1.1.3 associated with the plate material to be used for the wetted surface on the IRWST.

2. Change TP304 stainless steel referenced in Table 6.1-1 to low carbon TP304L stainless steel.

In its letter dated November 15, 2013, the licensee provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on September 3, 2013 (78 FR 54288).

## 2.0 REGULATORY EVALUATION

Appendix D, "Design Certification Rule for the AP1000 Design," of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," Section VIII.B.6 requires NRC approval for departures from Tier 2\* information. Because the proposed amendment request involves changes to Tier 2\* information NRC approval is required before making the Tier 2\* changes addressed in this departure.

Section VIII.B.5.a. of Appendix D of 10 CFR Part 52 requires NRC approval for departures from Tier 2 information that involves a change to or departure from Tier 2\* information. Because the proposed amendment request includes changes to Tier 2 information which involve changes to Tier 2\* information NRC approval is required before making the Tier 2 changes addressed in this departure.

The NRC staff considered the following regulatory requirements in reviewing the licensee's proposed UFSAR changes.

10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion (GDC) 1, "Quality Standards and Records," requires that structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of safety functions to be performed.

10 CFR Part 50, Appendix A, GDC 2, "Design Bases for Protection Against Natural Phenomena," requires that structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform their safety functions.

10 CFR Part 50, Appendix A, GDC 4, "Environmental and Dynamic Effects Design Basis," requires that structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents.

10 CFR Part 50, Appendix S, "Earthquake Engineering Criteria for Nuclear Power Plants," requires that nuclear power plants shall be designed so that, if safe-shutdown earthquake (SSE) ground motion occurs, certain SSCs will remain functional and within applicable stress, strain, and deformation limits. The required safety functions of structures, systems, and components must be assured during and after the vibratory ground motion associated with the SSE ground motion through design, testing, or qualification methods.

10 CFR Part 50, Appendix B, Criterion IX, requires that measures be established to assure that special processes like welding are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements. As noted in NUREG-0800, Section 6.1.1, application of special process control requirements provides assurance that implementation of special processes will not introduce conditions adverse to quality in engineered safety feature systems.

### 3.0 TECHNICAL EVALUATION

To perform the technical evaluation, the NRC staff considered UFSAR Sections 3.7, “Seismic Design” and 3.8, “Design of Category I Structures.” The staff also examined the portions of NUREG-1793, Supplement 2, “Final Safety Evaluation Report Related to Certification of the AP1000 Standard Plant Design” (NUREG-1793) (ADAMS Accession No. ML112061231), and the “Final Safety Evaluation Report for the Vogtle Electric Generating Plant Units 3 and 4 Combined License Application,” (ADAMS Accession No. ML110450302) documenting the staff’s technical evaluation of those aspects of the AP1000 DCD and Vogtle COL application, respectively. The staff reviewed the licensee’s proposed action to evaluate the impact of the requested UFSAR on design changes related to the CA03 structural module.

Under the License Amendment Request (LAR), the licensee proposed to depart from the plant-specific DCD Tier 2\* information on Figure 3.8.3-8 Sheet 3 by requesting (1) removing the material designation from the figure for the horizontal stiffeners on the wall of the IRWST, (2) adding a stiffener to the configuration, (3) increasing the number and changing the distribution of shear studs on module support legs that anchor the module into the concrete, and (4) increasing the number of rows of anchoring bars on the sub-module legs; and adding a note permitting anchor bars with standard hooks. Additionally, the licensee proposed to depart from the Tier 2 information in UFSAR Subsection 6.1.1.3 and UFSAR Table 6.1-1 to (1) Clarify potential inconsistencies between UFSAR Table 6.1-1 and UFSAR Subsection 6.1.1.3 associated with the plate material to be used for the wetted surface on the IRWST and (2) change TP304 stainless steel referenced in Table 6.1-1 to low carbon TP304L stainless steel.

The staff’s technical evaluation of these design changes is summarized below.

#### 3.1.1 Horizontal Stiffener Material

In Enclosure 4 of the November 15, 2013 LAR supplement, the licensee described the removal of the material designation (i.e., stainless steel) from the UFSAR Figure 3.8.3-8 Sheet 3 which depicts the design of the horizontal stiffeners on the wall of the IRWST. The licensee stated that this change will make the figure consistent with the UFSAR Subsection 3.8.3.5.8.2, which describes the IRWST tank stiffeners to be carbon steel.

The use of carbon steel stiffeners requires dissimilar metal welding between the carbon steel stiffeners and the walls of the IRWST which are fabricated using ASTM A240 S32101 duplex stainless steel (LDX 2101®). Welding carbon steel to duplex stainless steel, such as LDX 2101®, can result in the formation of martensite in the weld. Martensite is a brittle structure, that when present in sufficient quantity, can potentially make welds susceptible to cracking during the fabrication process. Due to the potential increased difficulty associated with dissimilar metal welding and the potential for the formation of martensite in the weld due to excessive dilution of the carbon steel base material into the weld, the staff requested, in a Request for Additional Information dated October 7, 2013 (ADAMS Accession No. ML13280A876), that the licensee describe the weld filler materials that it will use to perform

welding between the stiffeners and the IRWST walls. By letter dated November 6, 2013 (ADAMS Accession No. ML13310A887), the licensee responded that the typical weld filler materials used for welding LDX 2101® to carbon steel are Types 2209 and 309L. The licensee also stated that although martensite can be present in welds, the formation of martensite can be controlled through the procurement of weld filler material, qualification of the welding procedure specification (WPS) and following the WPS throughout the fabrication process.

The staff finds that Types 2209 and 309L weld filler materials are acceptable for dissimilar welding between LDX 2101® to carbon steel because these weld filler materials are compatible with the materials being welded and are the industry recommended weld filler materials when welding LDX 2101® to carbon steel. The staff also finds that excessive dilution of carbon steel into the weld, which could result in the formation of martensite, can be adequately controlled by proper qualification of the WPS and adherence to the WPS throughout the production process. Based on the foregoing, the staff concludes that the licensee will continue to meet Criterion IX of Appendix B to 10 CFR Part 50, and finds the licensee's response to RAI 06.01.01-3 acceptable.

The NRC staff also performed a review of the weld filler material change from a structural engineering perspective and finds that both materials have essentially the same elastic material modulus and; therefore, behave similarly under design basis loads, for which the material is assumed to behave elastically. On this basis, the staff concludes that the design will continue to meet the requirements of GDC 2 and 4 of Appendix A to 10 CFR Part 50, as well as Appendix S to 10 CFR Part 50. Therefore, the staff finds the design change to be acceptable.

### 3.1.2 Adding a stiffener to the configuration

In Enclosures 1 and 2 of the July 15, 2013 LAR submittal, the licensee requested a change to UFSAR Figure 3.8.3-8 Sheet 3 in the form of an increase in the number of horizontal stiffeners and an increase in the size and thickness of some of the stiffeners. In addition, the licensee also added a note to the figure (Note 1) to identify that the horizontal stiffener angle size shown is the design minimum.

The NRC staff review of the UFSAR Figure 3.8.3-8 changes finds that the addition of the stiffener to the top bay of the IRWST wall will continue to provide adequate resistance to plate buckling or other deformations in the IRWST wall. Staff also notes that the spacing of the additional horizontal stiffeners remains consistent with the existing design. The licensee continues to reference American Institute of Steel Construction (AISC), "Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities," AISC-N690-1994 (AISC N690) for the design of the stiffeners. In addition, staff finds the design change involving the addition of a stiffener to be a localized enhancement to the design and would not have a negative impact on the overall response of the nuclear island. Further, the licensee remains committed to design the IRWST wall in accordance with AISC N690, which remains an acceptable industry standard. On this basis, the staff concludes that the design will continue to meet the requirements of GDC 2 and 4 of Appendix A to 10 CFR Part 50, as well as Appendix S to 10 CFR Part 50. Therefore, the staff finds the proposed changes to Figure 3.8.3-8 to be acceptable.

In addition, the staff finds the proposed change to add a note identifying the horizontal stiffener angle size as a design minimum to be acceptable, because the licensee must still design the stiffener in accordance with AISC N690 provisions in order to satisfy the requirements of GDC 1 of Appendix A to 10 CFR Part 50.

### 3.1.3 Increasing the number and changing the distribution of shear studs

In Enclosure 1 and 2 of the July 15, 2013 LAR supplement, the licensee provided a change to UFSAR Figure 3.8.3-8 Sheet 3 indicating (a) an increase in the number of shear studs from 36 to 42, (b) a change in the arrangement shown on the leg of the module, and (c) a revision to the note to clearly identify the number of studs, the size and spacing.

The NRC staff review of UFSAR Figure 3.8.3-8 proposed changes, which indicates an increase in the number of shear studs from 36 to 42, and a change to the arrangement on the leg of the module to be acceptable on the basis that the licensee will continue to carry out the design details and will perform the design changes in accordance with AISC N690 and American Concrete Institute (ACI), "Building Code Requirements for Nuclear Safety Related Structures," ACI-349-01 (ACI 349) code provisions. The staff finds the requirements of GDC 1 of Appendix A to 10 CFR Part 50 are still met, because the revision improves the description of the design. Therefore, the staff finds the revision to Figure 3.8.3-8 to be acceptable.

### 3.1.4 Increasing the number of rows of anchoring bars on the sub-module legs

In Enclosure 4 of the November 15, 2013 LAR supplement, the licensee provided a change to UFSAR Figure 3.8.3-8 Sheet 3 proposing to add a third layer of bars to the sub-module legs which will be used to anchor module CA03 into the concrete. The proposed change to the figure also adds Note 2 that permits the use of standard hooked bars as anchor bars for sub-modules adjacent to other IRWST walls and permits to have three bars in a row.

The NRC staff review of the proposed UFSAR Figure 3.8.3-8 change, which indicates the addition of a third layer of bars, found the change to be acceptable on the basis that the licensee will continue to carry out the design details and will perform the design changes in accordance with ACI 349 code provisions. The staff finds the requirements of GDC 1 of Appendix A to 10 CFR Part 50 are still met, since ACI 349 Chapter 12 allows standard hook as an appropriate means for bar development. Therefore, the staff finds addition of the note to be acceptable.

### 3.1.5 Modifications made to UFSAR Table 6.1-1 and UFSAR Subection 6.1.1.3

In Enclosure 5 of the November 15, 2013 LAR supplement, the licensee provided a change to Section 6.1.1.3 by specifying the use of the American Society for Testing and Materials (ASTM) specifications in lieu of ASTM and American Society of Mechanical Engineers (ASME) specifications for wetted plate wall materials of the IRWST. This change was made to provide consistency with Table 6.1-1 which only references ASTM specifications for the IRWST. The staff considers this change to be editorial and provide clarification, and therefore acceptable.

The licensee modified Table 6.1-1 to change material specification ASTM A240 TP304 to TP304L or dual certified TP304/TP304L. The staff finds the licensee continues to meet GDC 1 and Appendix B requirements with respect to material selection, because TP304L and dual certified TP304/304L are low carbon stainless steel materials that are more resistant to sensitization and thus less susceptible to stress corrosion cracking than standard grade TP304. Therefore, the staff finds this change to be acceptable.

## 3.2 Conclusions

Based on the staff's technical evaluation, the staff finds that:

- LDX® 2101 duplex stainless steel and carbon steel can be readily joined together in accordance with applicable codes and standards.
- Both materials have essentially the same elastic material modulus and therefore behave similarly under design basis loads, which assume elastic material behavior. Both materials are readily joined together using dissimilar metal welds in accordance with AISC N690.
- The addition of the horizontal stiffener continues to provide an adequate approach to provide resistance to buckling or other deformations of the tank wall.
- While the licensee proposed a change to add a note identifying the horizontal stiffener angle size as a design minimum, the stiffener design will be performed in accordance with AISC N690 code provisions.
- The increase in the number of shear studs from 36 to 42, and changing the arrangement on the leg of the module continues to provide an adequate approach to anchor the module wall to the concrete and will be performed in accordance with AISC N690 and ACI 349 code provisions.
- The addition of anchor bars on module legs continues to provide an adequate approach to anchor the module wall to the concrete and will be performed in accordance with the provisions of the ACI 349 code.
- The change from TP304 to TP304L or dual certified TP 304/304L is an improvement in material selection due to the increased resistance of low carbon stainless steel to sensitization which can contribute to stress corrosion cracking.

For the reasons specified above, the NRC staff finds the proposed changes acceptable. Based on these findings, the NRC staff concludes that there is reasonable assurance that the requirements of GDC 1, GDC 2, and GDC 4 of Appendix A to 10 CFR Part 50, Appendix S to 10 CFR Part 50, and criterion IX of Appendix B to 10 CFR Part 50 will continue to be met. Therefore, the staff finds the proposed change to be acceptable.

#### 4.0 STATE CONSULTATION

In accordance with the Commission's regulations in 10 CFR 50.91(b)(2), the Georgia State official was notified 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 has determined that the amendment involves no significant change in the types or significant increase in the amounts of any effluents that may be released off site, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the proposed amendment involves no significant hazards consideration, and there has been no public comment on such finding (Federal Register (FR) notice 78 FR 54288, published on September 3, 2013). 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

Based on the considerations discussed above, the staff has concluded that there is reasonable assurance that (1) the proposed operation will not endanger public health and safety, (2) 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 public health and safety. Therefore, the staff finds the changes proposed in this license amendment, consisting of changes to UFSAR Figure 3.8.3-8 Sheet 3 "Structural Modules – Typical Design Details" and UFSAR Subsection 6.1.1.3 and UFSAR Table 6.1-1, acceptable.

## 7.0 REFERENCES

1. Request for License Amendment– Module CA03 Details (LAR-13-018), letter from Southern Nuclear Operating Company (SNC) dated July 15, 2013 (ADAMS Accession No. ML13197A117).
2. Request for Additional Information (RAI) Letter No. 1 RE: LAR 13-018, letter from staff dated October 7, 2013 (ADAMS Accession No. ML13280A876).
3. Supplement to Request for License Amendment, Response to RAI Letter No. 1 RE: LAR 13-018, letter from SNC dated November 6, 2013 (ADAMS Accession No. ML13310A887).
4. Supplement to Request for License Amendment – Module CA03 Details (LAR-13-018S2), letter from SNC dated November 15, 2013 (ADAMS Accession No. ML13319B203).
5. Vogtle Electric Generating Plant, Units 3 and 4 Updated Final Safety Analysis Report (UFSAR), Revision 2, dated July 3, 2013. (ADAMS Accession No. ML13205A266).
6. AP1000 DCD Revision 19, June 13, 2011 (ADAMS Accession No. ML11171A087).
7. Vogtle Electric Generating Plant Final Safety Evaluation Report (FSER) dated August 5, 2011 (ADAMS Accession No. ML111950510-letter, ADAMS No. ML110450302—FSER package).
8. Final Safety Evaluation Report Related to Certification of the AP1000 Standard Plant Design, NUREG-1793, August 5, 2011 (ADAMS Accession No. ML112061231).
9. American Concrete Institute, "Building Code Requirements for Nuclear Safety Related Structures," ACI-349-01.
10. American Institute of Steel Construction, "Specification for the Design, Fabrication and Erection of Steel Safety Related Structures for Nuclear Facilities," AISC-N690-1994.