



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

SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS

RELATED TO AMENDMENT NO. 156

TO THE COMBINED LICENSE NO. NPF-91

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

GEORGIA POWER COMPANY

OGLETHORPE POWER CORPORATION

MEAG POWER SPVM, LLC

MEAG POWER SPVJ, LLC

MEAG POWER SPVP, LLC

CITY OF DALTON, GEORGIA

VOGTLE ELECTRIC GENERATING PLANT, UNIT 3

DOCKET NO. 52-025

1.0 INTRODUCTION

By application dated October 19, 2018, titled, "Request for License Amendment: Column Line 1 Wall Reinforcement Area Change," (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18292A660) and designated License Amendment Request (LAR) 18-026, the Southern Nuclear Operating Company (SNC) requested that the Nuclear Regulatory Commission (NRC) amend Vogtle Electric Generating Plant (VEGP) Unit 3, Combined License (COL) Number NPF-91. The proposed amendment would depart from the AP1000 Design Control Document (DCD) Tier 2* material that has been incorporated into the Updated Final Safety Analysis Report (UFSAR) by changing the vertical reinforcement information provided in the VEGP Unit 3 column line 1 wall from elevation 135'-3" to 137'-0". The requested amendment also proposes related changes to UFSAR Tier 2* information in UFSAR Table 3H.5-3 and UFSAR Figure 3H.5-3.

2.0 REGULATORY EVALUATION

The NRC staff considered the following regulatory requirements in reviewing the LAR that included the proposed UFSAR changes.

Title 10 of the *Code of Federal Regulations* (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, tsunami, and seiches without loss of capability to perform their safety functions.

10 CFR Part 50, Appendix A, GDC 4, "Environmental and Dynamic Effects Design Bases," requires that structures, systems, and components important to safety 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 52, Appendix D, "Design Certification Rule for the AP1000 Design," of 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," Section VIII.B.6 requires prior NRC approval for the departure from Tier 2* information.

3.0 TECHNICAL EVALUATION

3.1 Evaluation of Proposed Changes

The information presented by SNC in LAR 18-026 was evaluated by the staff for its completeness, quality, and clarity. The proposed change revises the area of steel vertical reinforcement by adding Note 4 in UFSAR Table 3H.5-3 for the auxiliary building wall on column line 1 from elevation 135'-3" to 137'-0". The proposed change impacts UFSAR Tier 2* information in UFSAR Table 3H.5-3 and UFSAR Figure 3H.5-3.

The primary function of the auxiliary building is to provide protection and separation for the Seismic Category I mechanical and electrical equipment located outside the containment building. The safety-related systems and components needed to bring the plant to safe shutdown are located inside the auxiliary building which has thick structural concrete exterior walls that provide protection from missiles generated in other portions of the plant. The external walls and roof are reinforced concrete. The auxiliary building is a reinforced concrete and structural steel structure with three floors above grade and two floors below grade. The floor slabs and the structural walls of the auxiliary building are structurally connected to the cylindrical section of the shield building.

To perform the technical evaluation, the staff considered Vogtle UFSAR Section 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" (ADAMS Accession No. ML112061231), and "Final Safety Evaluation Report for the Vogtle Electric Generating Plant Units 3 & 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.

3.1.1.1 Vertical Reinforcement Development of #8@12"

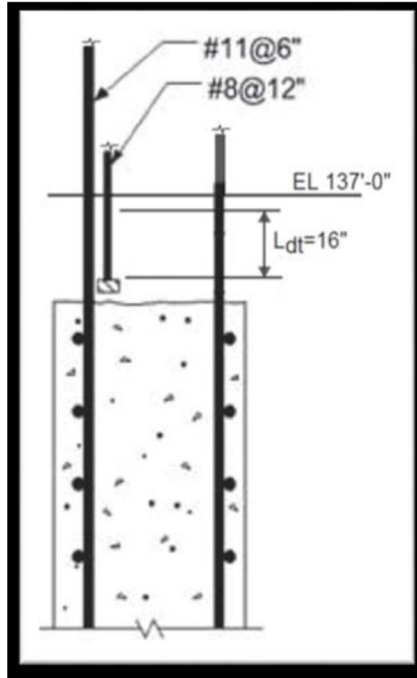
The auxiliary building wall at column line 1 (Wall 1) is the exterior wall at the south end of the nuclear island, adjacent to the radwaste building. The reinforced concrete wall extends from the top of the basemat at elevation 66'-6" to the roof at elevation 180'-0". The wall is designed for the applicable loads including dead load, live load, hydrostatic load, static and dynamic lateral soil pressure loads, seismic loads, and thermal loads. UFSAR Table 3H.5-3 details the required and provided auxiliary building wall reinforcements for Wall 1. UFSAR Figure 3H.5-3 depicts the typical wall reinforcement in the upper section of Wall 1 and details the #8@12" vertical rebar reinforcements.

The design of the auxiliary building Wall 1 from elevation 117'-6" to elevation 135'-3" requires outer layer reinforcing bar (also called rebar) curtains (north and south face) consisting of #11@6" vertical bars with #11@6" horizontal bars. A second layer of #8@12" vertical bars is required to begin development length below elevation 135'-3" and extending splice length above elevation 135'-3" on the south face only. There were no second layer #8@12" vertical bars installed in the south face for the entire length of Wall 1 around elevation 135'-3" prior to concrete placement of Wall 1 from elevation 117'-6" to elevation 135'-3". This results in a reinforcement area and configuration that deviates from the Tier 2* information contained in UFSAR Table 3H.5-3 and Figure 3H.5-3. The impacted area is a subsection of wall Section 1 and 6 as shown on UFSAR Figure 3H.5-2.

The proposed changes involve the #8@12" vertical rebar being installed around elevation 135'-3" with a mechanically headed reinforcement (T-head), providing full development of the bars at and above elevation 137'-0", in accordance with American Concrete Institute (ACI) 318-11, "Building Code Requirements for Structural Concrete." Due to this change, the provided minimum amount of reinforcement area is less than the existing UFSAR Table 3H.5-3 provided minimum value of 3.91 square inches per foot (in²/ft) between elevation 135'-3" and elevation 137'-0". The actual provided value is 3.12 in²/ft. SNC's evaluation determined a maximum required area of steel, along the entire evaluated length of wall between elevation 135'-3" and elevation 137'-0", of 2.801 in²/ft, for load combinations which do not consider simultaneous thermal and safe shutdown earthquake loads, consistent with UFSAR Table 3H.5-3 reported values. The resulting interaction ratio (IR) of the conservative refinement for the impacted region is 0.898 (2.801 in²/ft / 3.12 in²/ft). A required area value of 2.81 in²/ft is included in the proposed markups, which conservatively bounds the actual required area of 2.801 in²/ft. Since the IR is less than 1.0, this change is acceptable and continues to satisfy the acceptance criteria of the ACI 349-01, "Code Requirements for Nuclear Safety Related Concrete Structures," and applicable design criteria.

The staff reviewed UFSAR Subsection 3H.5.1.1 and applicable ACI 318-11, "Building Code Requirements for Structural Concrete (ACI 318-11)," and ACI 349-01 code provisions pertaining to concrete, critical sections and loads. The development length of a #8 headed reinforcement in tension is 16", consistent with ACI 349-01 and ACI 318-11, Section 12.6, "Development of Headed and Mechanically Anchored Deformed Bars in Tension." Given the existing construction joint at elevation 135'-3", the available height of wall to develop the bars prior to elevation 137'-0" is 21".

An example sketch of how the mechanically headed #8@12" vertical reinforcement would be placed at elevation 135'-3" is shown below:



Therefore, the installation of these bars using a headed reinforcement ensures that the bars will be fully developed at elevation 137'-0" and above, consistent with provisions of ACI 318-11. The staff finds that the change to the reinforcement area between elevation 135'-3" and elevation 137'-0" is in accordance with and continues to satisfy the acceptance criteria of ACI 349-01 and ACI 318-11 and has no adverse impact on the seismic response of Wall 1. The change does not significantly impact the approved design and Wall 1 will continue to withstand the design basis loads without loss of structural integrity or the safety-related functions.

3.1.1.2 Tornado Missile Impact on Wall 1

The staff reviewed SNCs statement regarding the effect of the proposed change on the design function to withstand tornado missiles, stating, "Since an impact due to a tornado missile can only occur on the exterior face of the wall, the reduction in reinforcement occurs on the compression face of the wall under tornado loading and the reduction in compression side reinforcing area (south face of Wall 1) has no adverse impact on design function of Wall 1 to withstand tornado missile impacts for postulated missiles." SNC further stated: "There are no credible postulated internally generated missiles in this area; therefore, there is no adverse impact on the design function of Wall 1 to withstand tornado missile impacts."

Based on the review of the proposed change, the staff concluded that the SNC met design bases commitment per UFSAR Chapter 3 and ACI 349-01 code requirements.

3.1.1.3 Construction Joint for Wall 1 at Elevation 135'-3"

The staff reviewed SNCs statement regarding the construction joint for Wall 1 at Elevation 135'-3" as follows: "The change does not impact the amount of provided rebar considered transverse to the horizontal construction joint in Wall 1 at elevation 135'-3", as only the #11@6" reinforcement located on the northern and southern face of the wall were considered.

Therefore, changing the #8@12" reinforcement has no impact to the existing qualification of the construction joint located within Wall 1 at elevation 135'-3".

Based on this evaluation and the staff review of the design bases, the staff concluded that the SNC met design bases commitment per UFSAR Chapter 3 and ACI 349-01 and ACI 318-11 code requirements.

3.1.1.4 Aircraft Impact Assessment (AIA)

The staff reviewed SNCs statements regarding the impact of the proposed changes on the AIA: "The change to Wall 1 results in a smaller vertical reinforcement ratio in the region between EL. 135'-3" and elevation 137'-0". SNC conducted an assessment of this change to Wall 1 with respect to AIA and concluded that because a specific vertical reinforcement ratio is not credited in the AIA, and because the wall thickness and other design standards and features of Wall 1 are not changing, there is no effect on the AIA due to the change to Wall 1. SNC further stated that there is no change to the design of key design features described in UFSAR Appendix 19F.

Based on the staff evaluation of the proposed change and the review of the design requirements for AIA, the staff concluded that the SNC met design bases commitment per UFSAR Chapter 3, UFSAR Appendix 19F, and ACI 349-01 code requirements.

3.1.1.5 Impact on Adjacent Walls and Slabs

SNC states that the proposed change has no effect on the analysis or capacity of the concrete walls intersecting Wall 1. The slabs are not impacted by the change in Wall 1 vertical reinforcement. In this regard, SNC stated: "Horizontal bars of the intersecting walls, which terminate in Wall 1, remain in conformance with ACI 349-01 requirements."

Based on the staff evaluation of the proposed change and the review of the design bases, the staff concluded that the SNC met design bases commitment per UFSAR Chapter 3 and ACI 349-01 code requirements.

3.1.1.6 Impact on Adjacent Building

The staff reviewed the following SNC statements regarding the proposed change's ability to resist and impact from an adjacent building: "Wall 1 is located adjacent to the non-seismic radwaste building. During a seismic event, it is possible that the radwaste building could collapse and strike Wall 1. If the radwaste building were to impact the nuclear island or collapse in the [safe shutdown earthquake] SSE, it would not impair the integrity of the reinforced concrete nuclear island." In this regard SNC stated: "Wall 1 has been evaluated to show that it can resist the impact from the radwaste building." SNC further stated: "Adjustment of the location of development of the vertical #8 bars does not affect the ability of Wall 1 to resist the impact from a collapse of the radwaste building."

Based on this evaluation of the proposed change and the review of the design bases the staff concluded that the SNC met design bases commitment per UFSAR Chapter 3 and ACI 349-01 code requirements.

3.1.1.7 Concrete Cover

Concrete cover is measured from the concrete surface to the outermost part of the head on headed bars, as outlined in ACI 318-11. The proposed change meets clear cover requirements per ACI 349-01 and ACI 318-11. ACI 318-11 Section 12.6.1.e requires minimum clear cover (db) for the bar to be greater than $2 \times db$. This equates to a minimum clear cover of 2" for #8 bars with headed anchors. ACI 349-01 Section 7.7.1.b requires 2" of clear cover for the south face of Wall 1 for #8 bars in concrete exposed to weather. The staff calculated based on the Figure 3H.5-3, the clear cover for the #8 bars is over 5", as they are in the second layer from the wall edge, and is therefore acceptable.

Based on this evaluation, the staff finds that the SNC met design bases commitment per UFSAR Chapter 3 and ACI 349-01 and ACI 318-11 code requirements.

3.2 Summary of the Technical Evaluation

Based on its technical review, the NRC staff concludes that there is reasonable assurance that the requirements of GDC 1, GDC 2, and GDC 4 of 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix A ("General Design Criteria for Nuclear Power Plants"), and Appendix D ("Design Certification Rule for the AP1000 Design") to 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," will continue to be met. Therefore, the staff finds the proposed changes to be acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Georgia State official was notified of the proposed issuance of the amendment on February 12, 2019. The State official had no comment.

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. The NRC staff has determined 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, and that 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 83 FR 58607 on November 20, 2018. 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 this evaluation that there is reasonable assurance that: (1) the health and safety of the public will not be endangered by operation in the proposed manner, (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 this license amendment acceptable.

7.0 REFERENCES

1. Request for License Amendment: Column Line 1 Wall Reinforcement Area Change (LAR-18-026), letter from Southern Nuclear Operating Company, dated October 19, 2018 (ADAMS Accession No. ML18292A660).
2. U.S. Nuclear Regulatory Commission, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Plant Design," NUREG-1793, Supplement 2, dated August 5, 2011 (ADAMS Accession No. ML112061231).
3. U.S. Nuclear Regulatory Commission, "Final Safety Evaluation Report Related to Combined Licenses for Vogtle Electric Generating Plant, Units 3 and 4," Volume 1, NUREG-2124, September 30, 2012 (ADAMS Accession No. ML12271A045)
4. American Concrete Institute (ACI), ACI-318-11, "Building Code Requirements for Structural Concrete."
5. American Concrete Institute (ACI), ACI-349-01, "Building Code Requirements for Nuclear Safety-Related Concrete Structures."