

SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS
RELATED TO AMENDMENT NOS. 94 AND 93
TO THE COMBINED LICENSE NOS. NPF-91 AND NPF-92, RESPECTIVELY
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GEORGIA POWER COMPANY
OGLETHORPE POWER COMPANY
MEAG POWER SPVM, LLC
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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 April 6, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17096A765), as supplemented by letter dated August 18, 2017, (ADAMS Accession No. ML17230A359), Southern Nuclear Operating Company (SNC or the licensee) submitted license amendment request (LAR) 17-011 requesting U.S. Nuclear Regulatory Commission (NRC or the Commission) approval for amendments to the Vogtle Electric Generating Plant (VEGP) Units 3 and 4 combined licenses (COLs) NPF-91 and NPF-92, respectively.

The licensee has also requested an exemption from the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, Appendix D, "Design Certification Rule for the AP1000 Design," Section III.B, "Scope and Contents." This exemption request allows a departure from the corresponding portions of the certified information in Tier 1 of the generic Design Control Document (DCD).¹

¹ While the licensee describes the requested exemption as being from Section III.B of 10 CFR Part 52, Appendix D, the entirety of the exemption pertains to proposed departures from Tier 1 information in the generic DCD. In the remainder of this evaluation, the NRC will refer to the exemption as an exemption from Tier 1 information to match the language of Section VIII.A.4 of 10 CFR Part 52, Appendix D, which specifically governs the granting of exemptions from Tier 1 information.

In order to grant the licensee's request to modify the UFSAR (the plant-specific DCD) Tier 1 information, the NRC must be able to determine that the exemption will comply with the requirements of 10 CFR 52.7 and 50.12. In addition to the factors listed in 10 CFR 50.12, the Commission shall consider whether the special circumstances that Section 50.12 requires to be present outweigh any decrease in safety that may result from the reduction in standardization caused by the exemption. The staff's review of the exemption request, as well as the LAR, is included in this safety evaluation (SE).

The supplement dated August 18, 2017, 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 published in the *Federal Register* on May 9, 2017 (82 FR 21561).

2.0 REGULATORY EVALUATION

The proposed amendment (LAR 17-011) would include changes to the Updated Final Safety Analysis Report (UFSAR) in the form of departures from the incorporated plant-specific DCD (PS-DCD) Tier 2 information and related changes to COL Appendix C. The proposed changes would amend COL Appendix C and corresponding PS-DCD Tier 1 Table 3.3-3, "Class 1E Divisions in Nuclear Island Fire Areas," which identifies Class 1E divisional cables present in various Auxiliary Building Nuclear Island fire areas. Specifically, the proposed changes would include the addition of Note 2 in Table 3.3-3. Note 2 states that, "Class 1E interdivisional cables for data communication are addressed in the applicable Appendix 9A Fire Area Description." The licensee explained that Note 2 would ensure the identification of Class 1E protection and safety monitoring system (PMS) interdivisional fiber-optic cables that are terminated in the four (4) fire areas identified in Table 3.3-3. The specific proposed changes including the affected fire locations are provided below.

The affected fire areas:

- 1202 AF 04, Division A electrical rooms in Auxiliary Building, non-radiologically controlled area
- 1201 AF 02, Division B electrical rooms in Auxiliary Building, non-radiologically controlled area
- 1202 AF 03, Division C electrical rooms in Auxiliary Building, non-radiologically controlled area
- 1201 AF 03, Division D electrical rooms in Auxiliary Building, non-radiologically controlled area

Plant-specific Tier 1 and COL Appendix C changes to Table 3.3-3:

- Revise existing "Note" to be Note 1. Add Note 2 to the table and applicable fire areas to identify cables are interdivisional cables terminated in the designated fire area.

UFSAR Tier 2 changes:

UFSAR Subsection 9A.3.1.2.1.1, Fire Area 1202 AF 04 (Division A electrical and instrumentation and control (I&C) rooms)

- Revise safe shutdown evaluation to identify Class 1E divisions B, C, and D interdivisional cables for data communication between divisions are in this fire area. Revise to identify that in the event of a fire, it is assumed that data transmitted between division A and the other Class 1E divisions is lost, but safe shutdown functions are not disabled.

UFSAR Subsection 9A.3.1.2.2.1, Fire Area 1201 AF 02 (Division B electrical and I&C rooms)

- Revise safe shutdown evaluation to identify Class 1E divisions A, C, and D interdivisional cables for data communication between divisions are in this fire area. Revise to identify that in the event of a fire, it is assumed that data transmitted between division B and the other Class 1E divisions is lost, but safe shutdown functions are not disabled.

UFSAR Subsection 9A.3.1.2.3.1, Fire Area 1202 AF 03 (Division C electrical, I&C, penetration, and RCP trip switchgear rooms)

- Revise safe shutdown evaluation to identify Class 1E divisions A, B, and D interdivisional cables for data communication between divisions are in this fire area. Revise to identify that in the event of a fire, it is assumed that data transmitted between division C and the other Class 1E divisions is lost, but safe shutdown functions are not disabled.

UFSAR Subsection 9A.3.1.2.4.1, Fire Area 1201 AF 03 (Division D electrical and I&C rooms)

- Revise safe shutdown evaluation to identify Class 1E divisions A, B, and C interdivisional cables for data communication between divisions are in this fire area. Revise to identify that in the event of a fire, it is assumed that data transmitted between division D and the other Class 1E divisions is lost, but safe shutdown functions are not disabled.

UFSAR Table 9A-2

- Revise the table to identify Class 1E cables for PMS in fire areas 1201 AF 02, 1201 AF 03, 1202 AF 03, and 1202 AF 04. Add new Note 2 to last page of table to state the interdivisional cables for data communication are further addressed in UFSAR Appendix 9A. List Note 2 for each division (A, B, C and D) of the Class 1E cables identified for the fire areas.

10 CFR Part 52, Appendix D, Section VIII.A.4 states that exemptions from Tier 1 information are governed by the requirements of 10 CFR 52.63(b)(1) and 52.98(f). It also states that the Commission will deny such a request if the design change will result in a significant decrease in the level of plant safety otherwise provided by the design.

10 CFR 52.63(b)(1) allows the licensee to request NRC approval for an exemption from one or more elements of the certification information. The Commission may only grant such a request if it complies with the requirements of 10 CFR 52.7, which in turn points to the requirements listed in 10 CFR 50.12 for specific exemptions, and if the special circumstances present outweigh the potential decrease in safety due to reduced standardization. Therefore, any exemption from Tier 1 must meet the requirements of 10 CFR 50.12, 52.7 and 52.63(b)(1).

10 CFR 52.98(f) states that any modification to, addition to, or deletion from the terms and conditions of a COL is a proposed amendment to the license. This includes any modification to, addition to, or deletion from the Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) contained in the license. The licensee proposes modifying information contained in Appendix C of COLs NPF-91 and NPF-92. Therefore, the proposed change requires a license amendment.

10 CFR Part 50.55a, *Codes and standards* requires, in subsection (h)(3) *Safety systems*, that construction permits and operating licenses under this part, and design approvals, design certifications, and combined licenses under part 52 of this chapter, must meet the requirements for safety systems in Institute of Electrical and Electronic Engineers (IEEE) standard (Std.) 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," and the correction sheet dated January 30, 1995.

10 CFR Part 50, Appendix A, General Design Criterion (GDC) 2 "*Design bases for protection against natural phenomena*," requires, in part that structures, systems, and components (SSCs) 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. The design bases for these SSCs shall reflect: (1) appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena, and (3) the importance of the safety functions to be performed.

GDC 4, "*Environmental and dynamic effects design bases*," requires, in part, that SSCs 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. These SSCs shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit.

GDC 17, "*Electric power systems*," requires, in part, that an onsite electric power system and an offsite electric power system be provided to permit functioning of SSCs important to safety. The onsite electric power distribution system, shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure.

GDC 18, "*Inspection and testing of electric power systems*," requires, in part, that electric power systems important to safety be designed to permit appropriate periodic inspection and testing of important areas and features, such as wiring, insulation, connections, and switchboards, to assess the continuity of the systems and the condition of their components. The systems shall be designed with a capability to test periodically (1) the operability and functional performance of the components of the systems, such as onsite power sources, relays, switches, and buses, and (2) the operability of the systems as a whole.

GDC 21, "*Protection system reliability and testability*," requires that the protection system shall be designed for high functional reliability and inservice testability commensurate with the safety functions to be performed. Redundancy and independence designed into the protection system shall be sufficient to assure that (1) no single failure results in loss of the protection function and (2) removal from service of any component or channel does not result in loss of the required minimum redundancy unless the acceptable reliability of operation of the protection system can be otherwise demonstrated. The protection system shall be designed to permit periodic testing of its functioning when the reactor is in operation, including a capability to test channels independently to determine failures and losses of redundancy that may have occurred.

GDC 22, "*Protection system independence*," requires that the protection system shall be designed to assure that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident conditions on redundant channels do not result in loss of the protection function, or shall be demonstrated to be acceptable on some other defined basis. Design techniques, such as functional diversity or diversity in component design and principles of operation, shall be used to the extent practical to prevent loss of the protection function.

GDC 23, "*Protection system failure modes*," requires that the protection system shall be designed to fail into a safe state or into a state demonstrated to be acceptable on some other defined basis if conditions such as disconnection of the system, loss of energy (e.g., electric power, instrument air), or postulated adverse environments (e.g., extreme heat or cold, fire, pressure, steam, water, and radiation) are experienced.

GDC 24, "*Separation of protection and control systems*," requires that the protection system shall be separated from control systems to the extent that failure of any single control system component or channel, or failure or removal from service of any single protection system component or channel which is common to the control and protection systems leaves intact a system satisfying all reliability, redundancy, and independence requirements of the protection system. Interconnection of the protection and control systems shall be limited so as to assure that safety is not significantly impaired.

Regulatory Guide (RG) 1.75, "Physical Independence of Electric Systems" endorses and augments the guidance in IEEE Std. 384-1981, "IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits," which discusses physical separation of circuits and electrical equipment contained in or associated with the Class 1E power system.

3.0 TECHNICAL EVALUATION

3.1 EVALUATION OF EXEMPTION

The Tier 1 information for which a plant-specific departure and exemption was requested includes corresponding changes to COL Appendix C information. The result of this exemption would be that the licensee could implement modifications to Tier 1 information described and justified in LAR 17-011 if, and only if, the NRC approves LAR 17-011. This exemption is a permanent exemption limited in scope to the particular Tier 1 information specified.

As stated in Section VIII.A.4 of Appendix D to 10 CFR Part 52, an exemption from Tier 1 information is governed by the requirements of 10 CFR 52.63(b)(1) and 52.98(f). Additionally, Section VIII.A.4 of Appendix D to 10 CFR Part 52 provides that the Commission will deny a request for an exemption from Tier 1 if it finds that the requested change will result in a

significant decrease in the level of safety otherwise provided by the design. Pursuant to 10 CFR 52.63(b)(1), the Commission may grant exemptions from one or more elements of the certification information, so long as the criteria given in 10 CFR 52.7, which, in turn, references 10 CFR 50.12, are met and that the special circumstances, which are defined by 10 CFR 50.12(a)(2), outweigh any potential decrease in safety due to reduced standardization.

Pursuant to 10 CFR 52.7, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR Part 52. As 10 CFR 52.7 further states, the Commission's consideration will be governed by 10 CFR 50.12, "Specific exemptions," which states that an exemption may be granted when: (1) the exemptions are authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security; and (2) special circumstances are present. Specifically, 10 CFR 50.12(a)(2) lists six special circumstances for which an exemption may be considered. It is necessary for one of these special circumstances to be present in order for the NRC to consider granting an exemption request. The licensee stated that the requested exemption meets the special circumstances of 10 CFR 50.12(a)(2)(ii). That subparagraph defines special circumstances as when "[a]pplication of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule." The staff's analysis of each of these findings is presented below.

3.1.1 AUTHORIZED BY LAW

This exemption would allow the licensee to implement a revision to Tier 1 (and corresponding COL Appendix C) Table 3.3-3, Class 1E Divisions in Nuclear Island Fire Areas, to indicate the presence of PMS interdivisional fiber-optic cables terminating within fire areas 1201 AF 02, 1201 AF 03, 1202 AF 03, and 1202 AF 04. This exemption is a permanent exemption limited in scope to particular Tier 1 information. Subsequent changes to Tier 1 (and corresponding COL Appendix C) Table 3.3-3 or any other Tier 1 information would be subject to the exemption process specified in Section VIII.A.4 of Appendix D to 10 CFR Part 52 and the requirements of 10 CFR 52.63(b)(1). As stated above, 10 CFR Part 52, Appendix D, Section VIII.A.4 allows the NRC to grant exemptions from one or more elements of the Tier 1 information. Based on 10 CFR Part 52, Appendix D, Section VIII.A.4, the NRC staff has determined that granting of the licensee's proposed exemption will not result in a violation of the Atomic Energy Act of 1954, as amended, or the Commission's regulations. Therefore, as required by 10 CFR 50.12(a)(1), the exemption is authorized by law.

3.1.2 NO UNDUE RISK TO PUBLIC HEALTH AND SAFETY

The underlying purpose of Appendix D to 10 CFR Part 52 is to ensure that a licensee will construct and operate the plant based on the approved information found in the DCD incorporated by reference into a licensee's licensing basis. The changes proposed continue to reflect the approved licensing basis for VEGP Units 3 and 4, and will maintain a consistent level of detail with that which is currently provided elsewhere in Tier 1 of the DCD. The changes proposed by the licensee do not add or delete systems or equipment as described in Tier 1 of the AP1000 DCD. These changes will not impact the ability of the systems or equipment to perform their design function. Because they will not alter the operation of any plant equipment or systems, these changes do not present an undue risk from existing equipment or systems. These changes do not add any new equipment or system interfaces to the current plant design. The description changes do not introduce any new industrial, chemical, or radiological hazards that would represent a public health or safety risk, nor do they modify or remove any design or

operational controls or safeguards intended to mitigate any existing on-site hazards. Furthermore, the proposed changes would not allow for a new fission product release path, result in a new fission product barrier failure mode, or create a new sequence of events that would result in significant fuel cladding failures. Accordingly, these changes do not present an undue risk from any new equipment or systems. Therefore, as required by 10 CFR 52.7 and 10 CFR 50.12(a)(1), the staff finds that the granting of the requested exemption will not present undue risk to public health and safety.

3.1.3 CONSISTENT WITH COMMON DEFENSE AND SECURITY

The proposed exemption would allow changes to elements of the plant-specific DCD Tier 1, thereby departing from the AP1000 certified (Tier 1) design information. This proposed exemption would be a permanent exemption limited in scope to particular Tier 1 (and corresponding COL Appendix C) Table 3.3-3. Subsequent changes to Tier 1 (and corresponding COL Appendix C) Table 3.3-3 or any other Tier 1 information would be subject to the exemption process in Section VIII.A.4 of Appendix D to 10 CFR Part 52. The change does not alter or impede the design, function, or operation of any plant SSCs associated with the facility's physical or cyber security and, therefore, does not affect any plant equipment that is necessary to maintain a safe and secure plant status. In addition, the changes have no impact on plant security or safeguards. Therefore, as required by 10 CFR 52.7 and 10 CFR 50.12(a)(1), the staff finds that the requested exemption is consistent with the common defense and security.

3.1.4 SPECIAL CIRCUMSTANCES

Special circumstances, in accordance with 10 CFR 50.12(a)(2)(ii), are present whenever application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule. The underlying purpose of the Tier 1 information is to ensure that a licensee will safely construct and operate a plant based on the certified information found in the AP1000 DCD, which was incorporated by reference into the VEGP Units 3 and 4 licensing basis. The proposed change would revise plant-specific Tier 1 (and corresponding COL Appendix C) Table 3.3-3 to include the presence of Class 1E PMS interdivisional fiber-optic cables terminating in PMS cabinets within the applicable fire areas in the table. These changes will enable the licensee to safely construct and operate the AP1000 facility consistent with the design certified by the NRC by changing the information mentioned above found in Tier 1 (and corresponding COL Appendix C) Table 3.3-3 of the plant-specific DCD.

Special circumstances are present in the particular circumstances discussed in LAR 17-011 because the application of the specified Tier 1 information is not necessary to achieve the underlying purpose of the rule. The proposed changes provide clarification in plant-specific Tier 1 (and corresponding COL Appendix C) Table 3.3-3 to ensure the identification and presence of Class 1E PMS interdivisional fiber-optic cables terminating within certain fire areas identified in plant-specific Tier 1 (and corresponding COL Appendix C) Table 3.3-3. There are no design changes proposed to PMS function or voting logic, or to divisional cable separation criteria or fire boundaries which separate these interdivisional cables. This exemption request and associated revisions to Tier 1 (and corresponding COL Appendix C) Table 3.3-3 enables the underlying purpose of the rule to be met. Therefore, the staff finds that the special circumstances required by 10 CFR 50.12(a)(2)(ii) for the granting of an exemption from the Tier 1 information exist.

3.1.5 SPECIAL CIRCUMSTANCES OUTWEIGH REDUCED STANDARDIZATION

Under 52.63(b)(1), “[i]n addition to the factors listed in § 52.7, the Commission shall consider whether the special circumstances that § 52.7 requires to be present outweigh any decrease in safety that may result from the reduction in standardization caused by the exemption.” This exemption would allow the implementation of changes to Tier 1 (and corresponding COL Appendix C) Table 3.3-3 in the plant-specific DCD that are being proposed in the LAR. The justification provided in LAR 17-011, the exemption request, and the associated licensing basis mark-ups demonstrate that there is a limited change from the standard information provided in the generic AP1000 DCD, and that information is unnecessary to achieve the underlying purpose of the rule. The design functions of the system associated with this request will continue to be maintained because the associated revisions to Table 3.3-3 support the intent of the table to ensure the identification and presence of Class 1E PMS interdivisional fiber-optic cables terminating within certain fire areas and thereby facilitate successful ITAAC closure. These benefits, including benefits to the public health and safety to ensure that the ITAAC are fully completed, outweigh any potential decrease in safety that may result from the reduction in standardization caused by the exemption. Consequently, the safety impact that may result from any reduction in standardization is minimized. Because there are no design changes proposed to PMS function or voting logic, or to divisional cable separation criteria or fire boundaries which separate these interdivisional cables, the proposed design changes do not result in a reduction in the level of safety. Based on the foregoing reasons, as required by 10 CFR Part 52.63(b)(1), the staff finds that the special circumstances outweigh the effects the departure has on the standardization of the AP1000 design.

3.1.6 NO SIGNIFICANT REDUCTION IN SAFETY

This exemption would allow the implementation of changes to Tier 1 (and corresponding COL Appendix C) Table 3.3-3 in the plant-specific DCD and corresponding changes to Appendix C that are being proposed in the LAR. The exemption request proposes to depart from the certified design by modifying Tier 1 (and corresponding COL Appendix C) Table 3.3-3 to support the intent of the table to identify the presence of Class 1E cables within the given fire areas and thereby facilitate successful ITAAC closure. The changes for consistency will not impact the functional capabilities of this system. The proposed changes do not create the possibility of a new or different accident from any accident previously evaluated or reduce any margin of safety as the interdivisional fiber-optic cables added to the table were considered during the AP1000 design certification process. Therefore, based on the foregoing reasons and as required by 10 CFR Part 52, Appendix D, Section VIII.A.4, the staff finds that granting the exemption would not result in a significant decrease in the level of safety otherwise provided by the design.

3.2 TECHNICAL EVALUATION OF PROPOSED CHANGES

3.2.1 TECHNICAL EVALUATION FROM ELECTRICAL ENGINEERING PERSPECTIVE

In LAR 17-011 the licensee proposed adding a second note, Note 2, to Tier 1 (and corresponding COL Appendix C) Table 3.3-3, “Class 1E Divisions in Nuclear Island Fire Areas.” The proposed changes are associated with the completion of Tier 1 (and corresponding COL Appendix C) Table 3.3-6, ITAAC 7.c and ITAAC 7.e (ITAAC Nos. 3.3.00.07c.i.a (ITAAC Index No. 795), 3.3.00.07c.i.b (796), 3.3.00.07c.ii.a (797), 3.3.00.07c.ii.b (798) and 3.3.00.07e (812)). To account for the Tier 1 (and corresponding COL Appendix C) Table 3.3-3 changes, the licensee proposed UFSAR Tier 2 changes to the following sections as discussed in the LAR: UFSAR Subsection 9A.3.1.2.1.1, Fire Area 1202 AF 04 (Division A electrical and I&C rooms),

UFSAR Subsection 9A.3.1.2.2.1, Fire Area 1201 AF 02 (Division B electrical and I&C rooms), UFSAR Subsection 9A.3.1.2.3.1, Fire Area 1202 AF 03 (Division C electrical, I&C, penetration, and RCP trip switchgear rooms), and UFSAR Subsection 9A.3.1.2.4.1, Fire Area 1201 AF 03 (Division D electrical and I&C rooms). The UFSAR changes identify the Class 1E interdivisional cables in the associated fire areas. The LAR states that in the event of a fire, loss of a single division does not result in a loss of safe shutdown functionality as redundant divisions are routed in separate fire areas and designed to operate despite the loss of an entire division. Furthermore, UFSAR Section 9.5.1.1, "Design Basis," states that the AP1000 plant is designed to separate redundant safe shutdown components and associated electrical divisions to preserve the capability to safely shut down the plant following a fire.

GDC 2 requires that SSCs important to safety be designed to withstand the effects of natural phenomena without loss of capability to perform their safety functions. VEGP Units 3 and 4 UFSAR Section 3.1.1, "Overall Requirements," states that the safety-related SSCs are designed to withstand the effects of natural phenomena without loss of the capability to perform their safety-related functions. In the LAR, the licensee states that (1) plant accidents and severe natural phenomena are not assumed to occur concurrently with a postulated fire, and (2) the redundant divisions of the PMS are designed and located to mitigate the effects of natural phenomena, normal operating maintenance and testing, and design basis accidents (DBA) causing a loss of safety functions. The staff finds that the loss of a division to fire does not disable the other three divisions, because the components available in these three divisions are sufficient to achieve and maintain safe shutdown. In addition, the staff finds that the proposed changes do not change the current PMS design features. Since a loss of one division does not affect safe shutdown and the PMS design continues to comply with GDC 2, the staff finds the changes acceptable.

GDC 4 requires that SSCs important to safety be designed to withstand the envelope of environmental conditions possible where the equipment is located under all conditions. VEGP Units 3 and 4 UFSAR Section 3.1.1 states that the safety-related SSCs are 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. In the LAR, the licensee explained that safe shutdown functions or the ability to maintain the plant in a safe shutdown condition can be accomplished in the event of a fire. The staff finds that the loss of a division to fire does not disable the other three divisions, because the components available in these three divisions are sufficient to achieve and maintain safe shutdown. Furthermore, the staff finds that the proposed changes do not change the current PMS design features which comply with GDC 4. The staff finds that the proposed changes are acceptable because 1) there are no changes to the PMS design, the PMS continues to comply with the requirements to GDC 4 and 2) the ability to achieve and maintain safe shutdown is unaffected.

GDC 17 requires in part that the onsite electric distribution system have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure. VEGP Units 3 and 4 UFSAR Section 8.1.4.2, "Onsite Power System," states that the Class 1E direct-current (dc) and uninterruptible power supply power system meets the single failure criterion. The LAR states that the interdivisional cables provide signals associated with some safe shutdown functions in accordance with UFSAR Subsection 7.4.1.1, which describes safe shutdown functions using safety-related systems.

In Tier 1 (and corresponding COL Appendix C) Table 3.3-6, ITAAC 7.e (ITAAC No. 3.3.00.07e (812)), the licensee is required to perform inspections of the as-built Class 1E communications

cable between two divisions to confirm that the PMS voting logic is not defeated by the loss of any single cable raceway or fire area. The proposed Note 2 is used to identify the existence of additional cables in the four referenced fire areas used to communicate between divisions called interdivisional cables (e.g., Division A – interdivisional cables for Divisions B, C, and D). Therefore, ITAAC No. 3.3.00.07e (812) is performed to verify that PMS voting logic is maintained in the event of the loss of a fire area, as stated in the UFSAR. In addition, the LAR states that redundant cable divisions which support PMS functions are routed separately in other fire areas and will not be affected in the event of a fire in one of the identified fire areas. The staff verified UFSAR Table 9A-2, “Safe Shutdown Components,” and found that each of the fire areas were separate and included the associated Class 1E divisional and interdivisional cables. The physical divisional Class 1E cable separation is provided by 3-hour fire barriers, as stated in UFSAR Tier 2 Subsection 9A.3.1.2.1.1, 9A.3.1.2.2.1, 9A.3.1.2.3.1, and 9A.3.1.2.4.1. Therefore, the divisional cable separation including the 3-hour fire barriers provides the separation necessary for the redundant cable divisions to be available in the event of a fire.

VEGP Units 3 and 4 UFSAR Section 9.5.1.3, “Safety Evaluation (Fire Protection Analysis),” states that the safe shutdown fire evaluation in Appendix 9A shows that there is sufficient safety-related equipment available after a fire which destroys a single fire area outside containment or any fire zone inside containment, to bring the plant to this safe shutdown condition. In the LAR, the licensee explained that in the event of a fire in one division, it is assumed that data transmitted between the affected division and the other Class 1E divisions is lost, but safe shutdown functions are not disabled. Therefore, the staff finds that loss of one division including interdivisional cabling due to fire or DBA does not prevent the Class 1E PMS system from performing its safety function. The staff finds that the proposed changes do not change the current PMS design, which complies with GDC 17. The staff finds that since the PMS system continues to comply with GDC 17 and the loss of one division does not affect safe shutdown, the proposed changes are acceptable.

RG 1.75, Revision 3 endorses and augments the guidance in IEEE Std. 384-1981, which discusses electrical isolation and physical separation to maintain independence of safety-related (Class 1E) circuits and equipment so that safety functions required during and following any design-basis event can be accomplished. VEGP Units 3 and 4 UFSAR Table 8.1-1, “Criteria and Guidelines for Electric Power Systems,” states that RG 1.75 is applicable to UFSAR Section 8.3.2, “DC Power Systems.” In Tier 1 (and corresponding COL Appendix C) Table 3.3-6, ITAAC 7.c.i (ITAAC Nos. 3.3.00.07c.i.a (795) and 3.3.00.07c.i.b (796)) the licensee is required to perform inspections of the Class 1E electrical, communications cables and raceways for each division to confirm that separation is maintained between the Class 1E divisions based on the fire areas identified in Tier 1 (and corresponding COL Appendix C) Table 3.3-3. In Tier 1 (and corresponding COL Appendix C) Table 3.3-6 ITAAC 7.c.ii (ITAAC Nos. 3.3.00.07c.ii.a (797) and 3.3.00.07c.ii.b (798)), the licensee is required to perform inspections of the as-built fire barriers identified in Tier 1 (and corresponding COL Appendix C) Table 3.3-3 to ensure that the as-built fire barriers between fire areas exist. As discussed above in the SE, the proposed changes with the addition of Note 2 is meant to facilitate ITAAC (ITAAC Nos. 3.3.00.07c.i.a (795), 3.3.00.07c.i.b (796), 3.3.00.07c.ii.a (797), and 3.3.00.07c.ii.b (798)) closure.

VEGP Units 3 and 4 UFSAR Section 9.5.1.1, “Safety Design Basis,” states that the AP1000 is designed to (1) separate redundant safe shutdown components and associated electrical divisions to preserve the capability to safely shut down the plant following a fire, and (2) separate redundant trains of safety-related equipment used to mitigate the consequences of a DBA (but not required for safe shutdown following a fire) so that a fire within one train will not damage the redundant train. VEGP Units 3 and 4 UFSAR Section 9.5.1.2.1.1, “Plant Fire

Prevention and Control Features,” states that three-hour fire barriers provide complete separation of redundant safe shutdown components, including equipment, electrical cables, instrumentation and controls. In the LAR, the licensee explained that three-hour fire barriers are provided between the PMS divisional rooms to prevent a fire in one division from causing effects to another division. Therefore, the staff finds that the current design is consistent with RG 1.75 and assures that safety functions required during and following any design-basis event are available, because there is separation of the Class 1E divisions and physical separation of fire areas.

GDC 18, requires provisions of a Class 1E design to include the capability for inspection and testing. The licensee states that the redundant divisions of the PMS are designed and located to mitigate the effects of natural phenomena, normal operating maintenance and testing, and DBA causing a loss of safety functions. In addition, UFSAR Section 8.1.4.2.1 explains that Class 1E systems and equipment are designed to permit periodic inspection and testing and UFSAR Section 7.3.2.2.6 explains that during operation of the reactor, the PMS is tested as described in UFSAR Section 7.1.2.11. The staff finds that the proposed changes do not change the inspection or testing of the PMS design. Therefore, the staff finds that the PMS continues to comply with GDC 18 since there are no changes to the system nor any changes to the inspection and testing of the system, and is therefore acceptable.

3.2.2 TECHNICAL EVALUATION FROM FIRE PROTECTION PERSPECTIVE

LAR 17-011 proposes changes to VEGP Units 3 and 4 Tier 1 (and corresponding COL Appendix C) Table 3.3-3 and UFSAR Tier 2 Appendix 9A and Table 9A-2 to identify redundant Class 1E PMS interdivisional data communication cables terminating in Auxiliary Building fire areas.

The PMS consists of four divisions, designated as A, B, C, and D. The PMS design requires data communications between the four divisions using fiber-optic cables within and across PMS divisions. The licensee stated that the PMS system is designed to operate despite the loss of an entire division by having the divisions physically, functionally, and electrically separated from each other and from non-safety systems. Three-hour rated fire barriers are provided between the PMS divisional rooms to prevent a fire in one room from causing an adverse impact to other divisions. Since interdivisional communication is required between the PMS divisions, LAR 17-011 clarifies and identifies the interdivisional cables that terminate in various fire areas (where PMS division cabinets are located) in order to facilitate future ITAAC closure. The licensee also stated that the proposed changes in LAR 17-011 are for clarification only and there are no design changes to PMS function or voting logic, or to divisional cable separation criteria or fire boundaries which separate these interdivisional cables.

For a postulated fire in any fire area, it is assumed, per RG 1.189, “Fire Protection for Nuclear Power Plants,” that all equipment and cables in the affected area are damaged and could prevent operation or cause mal-operation of equipment necessary to achieve and maintain safe shutdown. As such, the NRC staff reviewed LAR 17-011 to ensure if lack of separation among the redundant PMS interdivisional cables could affect post-fire safe shutdown capability.

The staff issued clarification questions (ADAMS Accession No. ML17172A114) to South Carolina Electric & Gas Company (SCE&G) for Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 LAR 17-05, which is consistent in technical content to VEGP Units 3 and 4 LAR 17-011. The clarification questions asked SCE&G to clarify whether the interdivisional cables are routed together through any fire area without terminating in that area, since a postulated fire

in this scenario may disable all four PMS divisions. In the supplement dated August 18, 2017 (ADAMS Accession No. ML17230A359), SNC addressed the clarification questions and stated that COL Appendix C Table 3.3-6 ITAAC No. 3.3.00.07e (812) requires that Class 1E communication cables which interconnect two divisions be routed and separated such that the PMS voting logic is not defeated by the loss of any single raceway or fire area. Completion of ITAAC No. 3.3.00.07e (812) ensures that the interdivisional cables are not routed together through any fire areas without termination, and divisional separation is provided by three-hour rated fire barriers.

Based on such information from the licensee, the staff concluded that a postulated fire in a fire area where PMS interdivisional data communication cables are terminated will, at most, disable one PMS division.

Since the PMS is designed to operate with the loss of a single division and continue operating using reduced coincidence logic, the staff concluded that the proposed changes in LAR 17-011 do not affect the minimum required redundancy of the PMS in the event of a fire and, therefore, has no adverse impact on post-fire safe shutdown capability.

3.2.3 TECHNICAL EVALUATION FROM INSTRUMENTATION AND CONTROL PERSPECTIVE

The AP1000 safety-related PMS provides detection of off-nominal conditions and, when system conditions require, actuates the appropriate safety-related components and functions necessary to achieve and maintain the plant in a safe shutdown condition. While the PMS is typically passive when the plant is in normal operation, when required, the PMS controls safety-related field components in the plant. These same safety-related field components are typically controlled by signals generated in the non-safety related plant control system via use of a priority module within the PMS.

LAR 17-011 proposes that changes to the COL Appendix C (and plant-specific Tier 1) identified in Table 3.3-3 more clearly identify that the interdivisional cables for the PMS are terminated in the identified Auxiliary Building fire areas in addition to the cable divisions currently listed for these areas. Interdivisional cables are defined as cables that interconnect PMS divisions, including Division A, B, C, and D cables. This clarity will be achieved via the addition of proposed Note 2 within Tier 1 (and corresponding COL Appendix C) Table 3.3-3, "Class 1E Divisions in Nuclear Island Fire Areas." Note 2 states, "Cables from this division in this fire area are limited to interdivisional cables terminating in this area."

Additionally, information will be added to UFSAR Appendix 9A, Fire Protection Analysis in Subsections 9A.3.1.2.1.1 through 9A.3.1.2.1.4 that detail that if the cables used for data communication are damaged in the event of a fire it is assumed that data transmitted between the given division and the other Class 1E divisions is lost. However this loss of data does not disable the safe shutdown functions of the other three Class 1E divisions. This addition is also referenced in UFSAR Table 9A-2, "Safe Shutdown Components," via the addition of Note 2, "Class 1E Interdivisional Cables for data communication are addressed in the applicable Appendix 9A Fire Area Description"

Design Description 5.b) in Section 2.5.2, "Protection and Safety Monitoring System", of Tier 1 of the PS-DCD, states, "Separation is provided between PMS Class 1E divisions, and between Class 1E and non-Class 1E cable." Design Commitment 5.b) of Table 2.5.2-8, "Inspections, Tests, Analyses and Acceptance Criteria," of Tier 1 of the PS-DCD states, "Separation is

provided between PMS Class 1E divisions, and between Class 1E and non-Class 1E cable” and in the Inspections, Tests and Analyses section of the table it informs the reader to “See Tier 1 Material, Table 3.3-6, items 7.d and 7.e.” These ITAAC are used to verify that proper separation of the PMS communication divisions is achieved during and after construction. Specifically, in the ITAAC in Subsection 7.e (ITAAC No. 3.3.00.07e (812)) of Section 3.3 Buildings of Appendix C of the COL it states, “Class 1E communication cables which interconnect two divisions are routed and separated such that the Protection and Safety Monitoring System voting logic is not defeated by the loss of any single raceway or fire area.” Based upon the staff’s prior approval of the layout and routing of the PMS’s interdivisional signal and communication cables and based upon the licensee’s response to the staffs’ question related to the LAR that states, in part, “No equipment, devices or components are being installed, removed or altered,” and as ITAAC 3.3.00.07e (812) is still valid, the clarifying information presented in the LAR is acceptable.

IEEE Std. 603-1991 is incorporated by reference into the VEGP Units 3 and 4 UFSAR and PS-DCD and provides generic acceptance criteria for those entities who undertake the construction, implementation and operation of a safety system for a nuclear power plant. Section 5.6 of IEEE Std. 603-1991, “Independence,” states, in part, “5.6.1 Between Redundant Portions of a Safety System. Redundant portions of a safety system provided for a safety function shall be independent of and physically separated from each other to the degree necessary to retain the capability to accomplish the safety function during and following any design basis event requiring that safety function.”

Given that in order for the divisions of the PMS to operate properly, communication must exist between the different divisions at the output of the bistable process logic microprocessors and the associated inputs to the local coincidence logic processors which supports the “to the degree necessary” phraseology within Section 5.6.1 of IEEE Std. 603-1991 and the original safety evaluation found that degree of separation between the interdivisional cables acceptable, and given the licensee’s statement that, “no equipment, devices or components are being installed, removed or altered,” the requested change is acceptable.

GDC 21, “*Protection system reliability and testability*,” requires, in part, that, “Redundancy and independence designed into the protection system shall be sufficient to assure that (1) no single failure results in loss of the protection function.” As demonstrated in the paragraph above, adequate independence still exists between the PMS interdivisional cables, the acceptance criteria for GDC 21 as it relates to independence continues to be met, thus the requested change is acceptable.

GDC 22, “*Protection system independence*,” requires, in part, “that the protection system shall be designed to assure that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident conditions on redundant channels do not result in loss of the protection function...” Again, based upon the licensee’s response that, “...no equipment, devices or components are being installed, removed or altered,” the system’s independence is not being impacted by this license amendment and, therefore, the proposed changes are acceptable.

GDC 23, “*Protection system failure modes*,” requires that the protection system shall be designed to fail into a safe state or into a state demonstrated to be acceptable on some other defined basis if conditions such as disconnection of the system, loss of energy (e.g., electric power, instrument air), or postulated adverse environments (e.g., extreme heat or cold, fire, pressure, steam, water, and radiation) are experienced. Based upon the description of the

proposed license amendment and the licensee's response that described that, in the event of a failure of an interdivisional cable, no changes would be made to the trip logic for the reactor trip or engineered safety features functions as described in the AP1000 Protection and Safety Monitoring System Architecture Technical Report, WCAP-16675-P, Revision 5 or the accompanying SE, the failure modes are therefore unaffected and, as such, the proposed changes are acceptable.

GDC 24, "*Separation of protection and control systems*," requires that the protection system shall be separated from control systems to the extent that failure of any single control system component or channel, or failure or removal from service of any single protection system component or channel which is common to the control and protection systems leaves intact a system satisfying all reliability, redundancy, and independence requirements of the protection system. Interconnection of the protection and control systems shall be limited so as to assure that safety is not significantly impaired. Given that the licensee's request in no way impacts the separation between the protection and control systems, the requested change is acceptable.

In summary, the staff finds the proposed changes described in LAR 17-011, to add clarifying information about PMS interdivisional cables to relevant sections of the UFSAR and COL, meet the requirements of IEEE Std. 603-1991, 10 CFR 50 Appendix A, GDCs 21, 22, 23, and 24. Additionally, since the relevant ITAAC are not impacted by this LAR, such that the licensee continues to be required to perform inspections of the as-built Class 1E signal and communications cables between the different divisions of the PMS to verify the PMS voting logic is not defeated by the loss of any single cable raceway or fire area, the staff finds the proposed changes in LAR 17-011 are acceptable.

3.3 SUMMARY OF TECHNICAL EVALUATION

In LAR 17-011, the licensee proposed to make changes that would affect the COL Appendix C, the corresponding plant-specific Tier 1 information, as well as the UFSAR. The NRC documented its review of the above changes in Section 3.2 of this SE and finds the changes to the Class 1E PMS divisions and associated fire areas and the affected sections in COL Appendix C, its corresponding plant-specific DCD Tier 1 and the UFSAR acceptable in accordance with 10 CFR 50.55a(h)(3), 10 CFR 50, Appendix A, GDCs 2, 4, 17, 18, 21, 22, 23, and 24 and the guidance provided in RG 1.75.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations 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*." 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 (*Federal Register*, 82 FR 21561, dated May 9, 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 issuing the amendment.

Because the exemption is necessary to allow the changes proposed in this LAR, and because the exemption does not authorize any activities other than those proposed in this LAR, the environmental consideration for the exemption is identical to that of the license amendment. Accordingly, the exemption meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), the NRC staff finds that no environmental impact statement nor environmental assessment needs to be prepared in connection with the issuance of the exemption.

6.0 CONCLUSION

The NRC staff has determined that pursuant to Section VIII.A.4 of Appendix D to 10 CFR Part 52, the exemption proposed in this LAR (1) is authorized by law; (2) presents no undue risk to the public health and safety; (3) is consistent with the common defense and security; (4) presents special circumstances; (5) the special circumstances outweigh the potential decrease in safety due to reduced standardization; and (6) does not reduce the level of safety at the licensee's facility. Therefore, the NRC staff grants the licensee an exemption from the Tier 1 information requested by the licensee.

The staff has concluded, based on the considerations discussed above, that there is reasonable assurance that (1) the health and safety of the public will not be endangered by construction and operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical the common defense and security or the health and safety of the public. Therefore, staff concludes that the changes proposed in this LAR, to modify COL Appendix C (and plant-specific Tier 1) Table 3.3-3 and UFSAR Chapter 9, Tier 2 Appendix 9A and Table 9A-2 to identify Class 1E PMS interdivisional data communication cables terminating in Auxiliary Building fire areas, are acceptable.

7.0 REFERENCES

1. VEGP Units 3 and 4 LAR 17-011, Request for License Amendment and Exemption: Clarification of Protection and Safety Monitoring System (PMS) Interdivisional Cables in Auxiliary Building Fire Areas dated April 6, 2017 (ADAMS Accession No. ML17096A765).
2. VEGP Units 3 and 4 LAR 17-011S1, Supplement to Request for License Amendment and Exemption: Clarification of Protection and Safety Monitoring System (PMS) Interdivisional Cables in Auxiliary Building Fire Areas dated August 18, 2017 (ADAMS Accession No. ML17230A359).
3. Clarification Questions Related to Virgil C. Summer Nuclear Station Units 2 and 3 LAR 17-05, Clarification of PMS Interdivisional Cables in Auxiliary Building Fire Areas (ADAMS Accession No. ML17172A114).
4. VEGP Units 3 and 4 Updated Final Safety Analysis Report (UFSAR), Revision 6, dated March 12, 2017 (ADAMS Accession No. ML17172A218).
5. IEEE Std. 384-1981 "IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits".

6. IEEE Std. 603–1991 “IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations,” and the correction sheet dated January 30, 1995.
7. RG 1.75, “Criteria for Independence of Electrical Safety Systems” (ADAMS Accession No. ML043630448).
8. AP1000 Protection and Safety Monitoring System Architecture Technical Report, WCAP-16675-P, Revision 5.
9. RG 1.189, “Fire Protection for Nuclear Power Plants” (ADAMS Accession No. ML092580550).