



Ronald A. Jones
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New Nuclear Deployment

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NND-16-0347
10 CFR 50.90
10 CFR 52.63
10 CFR 52.98(c)

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
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Washington, DC 20555

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3
Combined License Nos. NPF-93 and NPF-94
Docket Nos. 52-027 & 52-028

Subject: VCSNS Units 2 & 3 Request for License Amendment and Exemption:
Nuclear Instrumentation System Excore Detector Surface Material
Inspection Clarification (LAR 16-09)

Reference: 1. ND-16-0920, Southern Nuclear Operating Company Vogtle Electric
Generating Plant Units 3 and 4 Request for License Amendment and
Exemption: Nuclear Instrumentation System Excore Detector Surface
Material Inspection Clarification (LAR-16-010) (Accession Number
ML16207A496)

2. ND-16-2114, Southern Nuclear Operating Company Vogtle Electric
Generating Plant Units 3 and 4 Supplement to Request for License
Amendment and Exemption: Nuclear Instrumentation System Excore
Detector Surface Material Inspection Clarification (LAR-16-010S2)
(Accession Number ML16287A662)

In accordance with the provisions of 10 CFR 52.98(c) and 10 CFR 50.90, South Carolina Electric & Gas Company (SCE&G), on behalf of itself and the South Carolina Public Service Authority (Santee Cooper), requests an amendment to the Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 combined license numbers NPF-93 and NPF-94, respectively. The requested amendment requires changes to plant-specific Tier 1 information, with corresponding changes to the associated COL Appendix C information, and involves associated Tier 2 information in the Updated Final Safety Analysis Report (UFSAR). Pursuant to the provisions of 10 CFR 52.63(b)(1), an exemption from elements of the design as certified in the 10 CFR Part 52, Appendix D, design certification rule is also requested for the plant-specific DCD Tier 1 material departures.

The requested amendment proposes clarifications to a plant-specific Tier 1 (and COL Appendix C) table and a UFSAR table in regard to the inspections of the excore source, intermediate, and power range detectors.

The description, technical evaluation, regulatory evaluation (including the Significant Hazards Consideration determination), and environmental considerations for the proposed changes in this license amendment request are contained in Enclosure 1. Enclosure 2 provides the background and supporting basis for the requested exemption. Enclosure 3 identifies the requested changes and provides markups depicting the requested changes to COL Appendix C (and plant-specific Tier 1) and the UFSAR. The markups included in Enclosure 3 reflect the revised markups of those provided by SNC in their supplemental submittal (Reference 2).

In order to support the VCSNS Units 2 and 3 ITAAC schedule, SCE&G requests NRC staff review and approval of the license amendment no later than August 01, 2017. Approval by this date will allow sufficient time to implement licensing basis changes prior to the closure of affected ITAAC activities. SCE&G expects to implement the proposed amendment within thirty days of approval. Southern Nuclear Operating Company (SNC) submitted a similar request in Reference 1, dated July 25, 2016, and requested an approval date for Vogtle Electric Generating Plant (VEGP) Units 3 and 4 of October 27, 2016.

This letter contains no regulatory commitments.

In accordance with 10 CFR 50.91, SCE&G is notifying the State of South Carolina of this LAR by transmitting a copy of this letter and enclosures to the designated State Official.

Should you have any questions, please contact Ms. April R. Rice by telephone at (803) 941-9858, or by email at arice@scana.com.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 16th day of November, 2016.

Sincerely,



Ronald A. Jones
Vice President
New Nuclear Deployment

MRP/RAJ/mrp

- Enclosure 1: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 – Request for License Amendment: Nuclear Instrumentation System Excore Detector Surface Material Inspection Clarification (LAR 16-09)
- Enclosure 2: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 – Exemption Request: Nuclear Instrumentation System Excore Detector Surface Material Inspection Clarification (LAR 16-09)
- Enclosure 3: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 – Proposed Changes to Licensing Basis Documents (LAR 16-09)

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South Carolina Electric and Gas (SCE&G)

NND-16-0347

Enclosure 1

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

Request for License Amendment:

**Nuclear Instrumentation System Excore Detector
Surface Material Inspection Clarification (LAR 16-09)**

(This enclosure contains ten pages, including this cover sheet.)

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Pursuant to 10 CFR 52.98(c) and in accordance with 10 CFR 50.90, South Carolina Electric and Gas (SCE&G) hereby requests an amendment to Combined License (COL) Nos. NPF-93 and NPF-94 for Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3, respectively.

1. SUMMARY DESCRIPTION

The proposed changes would revise the Combined Licenses (COLs) in regard to the materials of construction of the nuclear instrumentation excore detectors which are exposed to post design basis accident (DBA) conditions in containment to align Tier 1 excore detector information with underlying Tier 2 information.

The requested amendment requires a change to Updated Final Safety Analysis Report (UFSAR) information that involves a change to the COL Appendix C and corresponding plant-specific Tier 1 information. This enclosure requests approval of the license amendment necessary to implement this change and its involved UFSAR change.

2. DETAILED DESCRIPTION

As described in UFSAR Subsection 6.1.1.4, "Material Compatibility with Reactor Coolant System Coolant and Engineered Safety Features Fluids," in the post-accident environment, both aluminum and zinc surfaces in the containment are subject to chemical attack resulting in the production of hydrogen and/or chemical precipitants that can affect long-term core cooling. The amount of aluminum allowed in the containment below the maximum flood level of a design basis loss of coolant accident (LOCA) will be limited during operating conditions.

A large potential source of aluminum in the AP1000 containment is the nuclear instrumentation excore (source range, intermediate range, and power range) detectors. The flooded surfaces of the detectors would be wetted by water containing boric acid and trisodium phosphate from the containment sump. To avoid sump water contact with the aluminum canning of the excore detectors, the source, intermediate, and power range detectors' aluminum is completely enclosed in stainless steel or titanium housings during manufacture of the detectors. Because the aluminum material of the detectors is encased in stainless steel or titanium, the amount of aluminum in the excore detectors is not applied to the aluminum restriction as they are not subject to the DBA environment as a result of the stainless steel/titanium encasement.

COL Appendix C and plant-specific Tier 1, Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) Table 2.2.3-4, Item 8.c) xiv) states, "Inspections will be conducted of the exposed surfaces of the source range, intermediate range, and power range detectors." The acceptance criterion for this inspection is that these surfaces are "made of stainless steel or titanium." The Inspections, Tests, Analyses; and the Acceptance Criteria do not make it sufficiently clear that the inspection is to ensure the design and fabrication of the excore detectors excludes aluminum surfaces from exposure. The aluminum surfaces of the detectors are encased in either stainless steel or titanium, and therefore cannot be visibly inspected after manufacture.

As stated in UFSAR Subsection 6.1.1.4, the concern with the excore detectors is the aluminum canning of the detectors. The proposed change is to modify the design feature listed in UFSAR Table 14.3-2 "Design Basis Accident Analyses" for UFSAR Subsection 6.1.1.4, to be consistent with the design feature discussed in UFSAR Subsection 6.1.1.4, and to clarify that the inspections, tests, and analyses activity for the materials of construction criterion is of the aluminum portions of the source range, intermediate range, and power range detectors which are encased in either stainless steel or titanium. The concerns are generation of hydrogen from

materials wetted by water containing boric acid and trisodium phosphate from the containment sump, and the creation of chemical precipitates from the reaction of aluminum with containment sump water.

The excore detectors are installed in detector wells located around the reactor vessel in the containment CA04 module. The wells have a welded cap at the top, with the openings at the bottom of the wells through which the instrument cables pass. The excore detectors are installed into these wells from the bottom and positioned radially in the detector wells using ceramic insulators. The detector assemblies are secured axially by a stainless steel pin inserted through the bottom of the well and the detector pedestal. The detector pedestal is designed for a close fit with the inner dimensions of the bottom of the well. The pedestal has two small openings to allow the detector integral cables to exit the well and be routed to exit conduits. The exit conduits are dedicated conduits which carry the detector integral cables out of the reactor cavity to a junction box located outside of the CA04 module.

Licensing Basis Change Descriptions:

Proposed Licensing Basis Changes

Text, Table, or Figure	Description of the Proposed Change
UFSAR Table 14.3-2	Specify the Design Feature for Reference Section 6.1.1.4 is that the aluminum surfaces of the excore detectors are encased in stainless steel or titanium.
COL Appendix C and corresponding Plant-Specific Tier 1 Table 2.2.3-4, Item 8.c) xiv) Inspections, Tests, Analyses and Acceptance Criterion	Specify that the inspection of the excore nuclear instrumentation system source, intermediate, and power range detectors will be conducted, and specify in the ITAAC Acceptance Criterion that a report exists that concludes that the aluminum surface of the detector is encased in stainless steel or titanium, to be consistent with the underlying Tier 2 design information.

3. TECHNICAL EVALUATION

The proposed change to specify the inspection of the excore detectors verifies the aluminum surfaces are completely contained in non-reactive materials (stainless steel or titanium), avoiding the introduction of aluminum into the post-loss of coolant accident (LOCA) containment environment. The presence of aluminum in the post-LOCA environment creates the potential for hydrogen generation and creation of chemical precipitates. Hydrogen in the containment atmosphere can create an ignition or detonation potential which could challenge containment integrity. The creation of chemical precipitates could reduce flow through the containment recirculation screens or reduce heat transfer in the reactor core by blocking cooling channels. The inspections and acceptance criteria of Tier 1 Table 2.2.3-4, Item 8.c) xiv) verify the excore detectors are designed and manufactured in such a manner that the aluminum content of the

detectors is properly contained and will not present a hydrogen generation or chemical precipitate problem in the containment post-LOCA environment. As described in UFSAR Subsection 7.1.2.7.2, the outputs of the power range excore detector channels are used for protecting the reactor core against the consequences of rod ejection accidents and adverse power distributions resulting from dropped control rods. The power range excore detectors are also used for the control rod speed control function and alerting the reactor operator of an excessive power imbalance between quadrants of the reactor core. The change to the inspections and acceptance criteria for the excore detectors has no impact on the ability of the intermediate range excore detector to monitor post-accident conditions of the reactor, or the ability of the source, intermediate, and power range detectors to measure leakage neutrons and provide signals to the nuclear instrumentation system. Encasing the aluminum of the excore detectors in stainless steel or titanium prevents hydrogen generation and the formation of chemical precipitates which could lead to challenges to containment integrity or block passive core cooling system (PXS) containment recirculation screens. The proposed changes do not affect any function or feature used for the prevention and mitigation of accidents or their safety analyses. No safety-related structure, system, component (SSC) or function is involved. The proposed changes do not involve nor interface with any SSC accident initiator or initiating sequence of events related to the accidents evaluated in the plant-specific DCD or UFSAR and therefore do not have an adverse effect on any SSC design function.

The proposed changes do not affect the radiological source terms (i.e., amounts and types of radioactive materials released, their release rates and release durations) used in the accident analyses. The equipment involved in these proposed changes does not affect safety-related equipment or a fission product barrier. No system or design function or equipment qualification is adversely affected by the proposed changes. The changes do not result in a new failure mode, malfunction or sequence of events that could adversely affect a radioactive material barrier or safety-related equipment. The proposed changes do 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.

The SSCs affected by this license amendment request are not used to contain, control, channel, monitor, process or release radioactive and non-radioactive materials. The types and quantities of expected effluents are not changed, and no effluent release path is adversely affected by the proposed changes. Therefore, radioactive or non-radioactive material effluents are not affected by the proposed changes.

Plant radiation zones (as described in UFSAR Section 12.3), controls under 10 CFR 20, and expected amounts and types of radioactive materials are not affected by the proposed changes. Therefore, individual and cumulative radiation exposures do not change.

Summary

The proposed change specifies that inspections of the nuclear instrument excore detectors are performed to verify the aluminum surfaces of the excore source, intermediate, and power range detectors are contained in stainless steel or titanium and are not exposed to the post-LOCA containment environment. The above proposed changes would not adversely affect any safety-related equipment or function, design function, radioactive material barrier or safety analysis.

4. REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

10 CFR 52.98(f) requires NRC approval for any modification to, addition to, or deletion from the terms and conditions of a combined license (COL). The proposed change involves a change to COL Appendix C (and plant-specific DCD Tier 1) Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) information. Therefore, NRC approval is required prior to making the plant-specific proposed change in this license amendment request.

10 CFR 52, Appendix D, Section VII.B.5.a allows an applicant or licensee who references this appendix to depart from Tier 2 information, without prior NRC approval, unless the proposed departure involves a change to or departure from Tier 1 information, Tier 2* information, or the Technical Specifications, or requires a license amendment under paragraphs B.5.b or B.5.c of the section. The proposed change involves a change to COL Appendix C (and plant-specific DCD Tier 1) ITAAC information. Therefore, NRC approval is required prior to making the change to Tier 2 information.

10 CFR Part 50, Appendix A, General Design Criterion (GDC) 4, "Environmental and dynamic effects design bases" requires that systems structures and components can accommodate the effects of, and be compatible with the environmental conditions associated with postulated accidents, including loss-of-coolant accidents (LOCA). The proposed change to COL Appendix C and plant-specific Tier 1 Table 2.2.3-4, Item 8.c) xiv) information, maintains the physical design capability of the intermediate and power range detectors to function in a post-LOCA containment environment, and meet this criterion. Therefore, the proposed change complies with the requirements of GDC 4.

10 CFR Part 50, Appendix, A GDC 10, "Reactor design" requires that the reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences. The proposed change to COL Appendix C and plant-specific Tier 1 Table 2.2.3-4, Item 8.c) xiv) information, maintains the design capability and margin of the source, intermediate and power range detectors to assure the fuel design limits are not exceeded during normal operations and anticipated operational occurrences. Therefore, the proposed change complies with the requirements of GDC 10.

10 CFR Part 50, Appendix A, GDC 13, "Instrumentation and control" requires that instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. The proposed change to COL Appendix C and plant-specific Tier 1 Table 2.2.3-4, Item 8.c) xiv) information maintains the ability of the source, intermediate, and power range detectors to monitor reactor power and reactor power excursions. Therefore, the proposed change complies with the requirements of GDC 13.

10 CFR Part 50, Appendix A, GDC 20, "Protection system functions" requires that the protection system shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to

sense accident conditions and to initiate the operation of systems and components important to safety. The proposed change to COL Appendix C and plant-specific Tier 1 Table 2.2.3-4, Item 8.c) xiv) information, maintains the ability of the source, intermediate, and power range detectors to provide protection system inputs of reactor power anomalies. Therefore, the proposed change complies with the requirements of GDC 20.

10 CFR Part 50, Appendix A, GDC 35 requires that a system to provide abundant emergency core cooling be provided. The system safety function shall be to transfer heat from the reactor core following any loss of reactor coolant at a rate such that (1) fuel and clad damage that could interfere with continued effective core cooling is prevented and (2) clad metal-water reaction is limited to negligible amounts. The proposed change to COL Appendix C and plant-specific Tier 1 Table 2.2.3-4, Item 8.c) xiv) ensures aluminum components of excore nuclear instrumentation are isolated from the post-LOCA containment environment and will not create chemical reactions which challenge recirculation cooling of the reactor core or challenge containment integrity. Therefore, the proposed change complies with the requirements of GDC 35.

10 CFR Part 50, Appendix A, GDC 38 requires that a system to remove heat from the reactor containment shall be provided. The system safety function shall be to reduce rapidly, consistent with the functioning of other associated systems, the containment pressure and temperature following any loss-of-coolant accident and maintain them at acceptably low levels. The proposed change to COL Appendix C and plant-specific Tier 1 Table 2.2.3-4, Item 8.c) xiv) ensures aluminum components of excore nuclear instrumentation are isolated from the post-LOCA containment environment and will not create chemical reactions which challenge containment integrity. Therefore, the proposed change complies with the requirements of GDC 38.

4.2 Precedent

No precedent is identified.

4.3 Significant Hazards Consideration Determination

The proposed changes would revise the COLs in regard to the inspection of the aluminum materials of construction of the excore source, intermediate, and power range detectors.

The requested amendment proposes a change to Updated Final Safety Analysis Report (UFSAR) Tier 2 information, which involves a change to the COL Appendix C and corresponding plant-specific Tier 1 information.

An evaluation to determine whether or not a significant hazards consideration is involved with the proposed amendment was completed by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

4.3.1 Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

The proposed change to specify the inspection of the excore source, intermediate, and power range detectors is done to verify that aluminum surfaces are contained in stainless steel or titanium, and avoids the introduction of aluminum into the post-loss of coolant accident (LOCA) containment environment due to detector materials. The proposed change does not alter any safety

related functions. The materials of construction are compatible with the post-LOCA conditions inside containment and will not significantly contribute to hydrogen generation or chemical precipitates. The change does not affect the operation of any systems or equipment that initiate an analyzed accident or alter any structures, systems, and components (SSC) accident initiator or initiating sequence of events.

The change does not impact the support, design, or operation of mechanical and fluid systems. There is no change to plant systems or the response of systems to postulated accident conditions. There is no change to the predicted radioactive releases due to normal operation or postulated accident conditions. Consequently, the plant response to previously evaluated accidents or external events is not adversely affected, nor does the proposed change create any new accident precursors.

Therefore, the proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated.

4.3.2 Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

The proposed change does not affect the operation of any systems or equipment that may initiate a new or different kind of accident, or alter any SSC such that a new accident initiator or initiating sequence of events is created. The proposed change to specify the inspection of the excore source, intermediate, and power range detectors is done to verify that aluminum surfaces are contained in stainless steel or titanium, and avoids the introduction of aluminum into the post-LOCA containment environment due to detector materials. In addition, the proposed change to the ITAAC verified materials of construction does not alter the design function of the excore detectors. The detector canning materials of construction are compatible with the post-LOCA containment environment and do not contribute a significant amount of hydrogen or chemical precipitates. The change to the ITAAC aligns the inspection with the Tier 2 design feature. Consequently, because the excore detectors functions are unchanged, there are no adverse effects on accidents previously evaluated in the UFSAR.

Therefore, the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

4.3.3 Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No

The proposed change to specify the inspection of the excore source, intermediate, and power range detectors is done to verify that aluminum surfaces are contained in stainless steel or titanium, and avoids the introduction of aluminum into the post-LOCA containment environment, does not alter any safety-related equipment, applicable design codes, code compliance, design function, or safety analysis. Consequently, no safety analysis or design basis

acceptance limit/criterion is challenged or exceeded by the proposed change, thus the margin of safety is not reduced.

Therefore, the proposed amendment does not involve a significant reduction in a margin of safety.

Based on the above, it is concluded that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by 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 to the common defense and security or to the health and safety of the public. Pursuant to 10 CFR 50.92, the requested change does not involve a Significant Hazards Consideration.

5. ENVIRONMENTAL CONSIDERATION

The details of the proposed changes are provided in Sections 2 and 3 of this license amendment request.

The proposed changes would revise the Combined Licenses (COLs) in regard to the inspection of the excore source, intermediate, and power range detector nuclear instruments.

The proposed change requires changes to Updated Final Safety Analysis Report (UFSAR) information, which involves a change to the COL Appendix C and corresponding plant-specific Tier 1 information.

This review has determined the proposed change requires an amendment to the COL. However, a review of the anticipated construction and operational effects of the requested amendment has determined the requested amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9), in that:

(i) There is no significant hazards consideration.

As documented in Section 4.3, Significant Hazards Consideration Determination, of this license amendment request, an evaluation was completed to determine whether or not a significant hazards consideration is involved by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment." The Significant Hazards Consideration determined that (1) the requested amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated; (2) the requested amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated; and (3) the requested amendment does not involve a significant reduction in a margin of safety. Therefore, it is concluded that the requested amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of "no significant hazards consideration" is justified.

- (ii) *There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.*

The proposed change in the requested amendment specifies that the inspection of the excore source, intermediate, and power range detectors is done to verify that aluminum surfaces are contained in stainless steel or titanium to avoid the introduction of aluminum into the post-loss of coolant accident (LOCA) containment environment from detector materials. The proposed change is unrelated to any aspect of plant construction or operation that would introduce any change to effluent types (e.g., effluents containing chemicals or biocides, sanitary system effluents, and other effluents), or affect any plant radiological or non-radiological effluent release quantities. Furthermore, the proposed change does not affect any effluent release path or diminish the functionality of any design or operational features that are credited with controlling the release of effluents during plant operation. Therefore, it is concluded that the requested amendment does not involve a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite.

- (iii) *There is no significant increase in individual or cumulative occupational radiation exposure.*

The proposed change specifies that the inspection of the excore detectors verifies the excore detectors do not introduce aluminum into the containment post-LOCA environment. Plant radiation zones (addressed in UFSAR Section 12.3) are not affected, and controls under 10 CFR 20 preclude a significant increase in occupational radiation exposure. Therefore, the requested amendment does not involve a significant increase in individual or cumulative occupational radiation exposure.

Based on the above review of the requested amendment, it has been determined that anticipated construction and operational effects of the requested amendment do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in the individual or cumulative occupational radiation exposure. Accordingly, the requested amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), an environmental impact statement or environmental assessment of the proposed exemption is not required.

6. REFERENCES

None

South Carolina Electric and Gas (SCE&G)

NND-16-0347

Enclosure 2

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

Exemption Request:

**Nuclear Instrumentation System Excore Detector
Surface Material Inspection Clarification (LAR 16-09)**

(This enclosure contains seven pages, including this cover sheet.)

1.0 PURPOSE

South Carolina Electric and Gas (the Licensee) requests a permanent exemption from the provisions of 10 CFR 52, Appendix D, Section III.B, *Design Certification Rule for the AP1000 Design, Scope and Contents*, to allow a departure from elements of the certification information in Tier 1 of the generic AP1000 Design Control Document (DCD). The regulation, 10 CFR 52, Appendix D, Section III.B, requires an applicant or licensee referencing Appendix D to 10 CFR Part 52 to incorporate by reference and comply with the requirements of Appendix D, including certified information in DCD Tier 1. The Tier 1 information for which a plant-specific departure and exemption is being requested includes clarifications related to the inspections of the excore detectors.

This request for exemption provides the technical and regulatory basis to demonstrate that 10 CFR 52.63, §52.7, and §50.12 requirements are met and will apply the requirements of 10 CFR 52, Appendix D, Section VIII.A.4 to allow departures from generic Tier 1 information due to proposed clarifications to Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) Table 2.2.3-4 ITAAC Item 8.c) xiv) for the inspections of the excore source range, intermediate range and power range detectors.

2.0 BACKGROUND

The Licensee is the holder of Combined License Nos. NPF-93 and NPF-94, which authorize construction and operation of two Westinghouse Electric Company AP1000 nuclear plants, named Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3, respectively.

As described in UFSAR Subsection 6.1.1.4, "Material Compatibility with Reactor Coolant System Coolant and Engineered Safety Features Fluids," in the post-accident environment, both aluminum and zinc surfaces in the containment are subject to chemical attack resulting in the production of hydrogen and/or chemical precipitants that can affect long-term core cooling. The amount of aluminum allowed in the containment below the maximum flood level of a design basis loss-of-coolant accident (LOCA) will be limited during operating conditions.

A large potential source of aluminum in containment is the nuclear instrumentation excore (source range, intermediate range, and power range) detectors. The flooded surfaces of the detectors would be wetted by water containing boric acid and trisodium phosphate from the containment sump. To avoid sump water contact with the aluminum canning of the excore detectors, the source, intermediate, and power range detectors' aluminum is completely enclosed in stainless steel or titanium housings during manufacture of the detectors. Because the aluminum material of the detectors is encased in stainless steel or titanium, the amount of aluminum in the excore detector is not applied to the aluminum restriction as they are not subject to the design basis accident environment as a result of the stainless steel/titanium encasement.

Plant-specific DCD Tier 1 Table 2.2.3-4 specifies the ITAAC related to the passive core cooling system (PXS). The inspections and acceptance criteria of Tier 1 Table 2.2.3-4 ITAAC Item 8.c) xiv) verify the excore source, intermediate and power range detectors are designed and manufactured in such a manner that the aluminum content of the detectors is properly contained and will not present a hydrogen generation or chemical precipitate source in the containment post-LOCA environment. Tier 1 Table 2.2.3-4

ITAAC Item 8.c) xiv) is changed to clarify that inspections of the excore source, intermediate, and power range detectors will be conducted, and specify in the ITAAC Acceptance Criterion that a report exists that concludes that the aluminum surfaces of the detectors are encased in stainless steel or titanium.

3.0 TECHNICAL JUSTIFICATION OF ACCEPTABILITY

The proposed change to specify the inspection of the excore source, intermediate, and power range detectors verifies that the aluminum surfaces are contained in non-reactive materials (stainless steel or titanium) avoiding the introduction of aluminum into the post-LOCA containment environment. The presence of aluminum in the post-LOCA environment creates the potential for hydrogen generation and creation of chemical precipitates. Hydrogen in the containment atmosphere can create an ignition or detonation potential which could challenge containment integrity. The creation of chemical precipitates could reduce flow through the containment recirculation screens or reduce heat transfer in the reactor core by blocking cooling channels. The inspections and acceptance criteria of Tier 1 Table 2.2.3-4 ITAAC Item 8.c) xiv) verify the excore detectors are designed and manufactured in such a manner that the aluminum content of the detectors is properly contained and will not present a hydrogen generation or chemical precipitate problem in the containment post-LOCA environment.

The change to the inspections and acceptance criteria for the excore detectors has no impact on the ability of the intermediate range excore detectors to monitor post-accident conditions of the reactor, or the ability of the source, intermediate, and power range detectors to measure leakage neutrons and provide signals to the nuclear instrumentation system. Encasing the aluminum of the excore detectors in stainless steel or titanium prevents hydrogen generation and the formation of chemical precipitates which could lead to challenges to containment integrity or block PXS containment recirculation screens. The proposed change does not affect any function or feature used for the prevention and mitigation of accidents or their safety analyses. No safety-related structure, system, component (SSC) or function is involved.

Detailed technical justification supporting this request for exemption is provided in Section 3 of the associated License Amendment Request in Enclosure 1 of this letter.

4.0 JUSTIFICATION OF EXEMPTION

10 CFR Part 52, Appendix D, Section VIII.A.4 and 10 CFR 52.63(b)(1) govern the issuance of exemptions from elements of the certified design information for AP1000 nuclear power plants. Since SCE&G has identified changes to the Tier 1 information as discussed in Enclosure 1 of the accompanying License Amendment Request, an exemption from the certified design information in Tier 1 is needed.

10 CFR Part 52, Appendix D, and 10 CFR 50.12, §52.7, and §52.63 state that the NRC may grant exemptions from the requirements of the regulations provided six conditions are met: 1) the exemption is authorized by law [§50.12(a)(1)]; 2) the exemption will not present an undue risk to the health and safety of the public [§50.12(a)(1)]; 3) the exemption is consistent with the common defense and security [§50.12(a)(1)]; 4) special circumstances are present [§50.12(a)(2)]; 5) the special circumstances outweigh any

decrease in safety that may result from the reduction in standardization caused by the exemption [§52.63(b)(1)]; and 6) the design change will not result in a significant decrease in the level of safety [Part 52, App. D, VIII.A.4].

The requested exemption satisfies the criteria for granting specific exemptions, as described below.

1. This exemption is authorized by law

The NRC has authority under 10 CFR 52.63, §52.7, and §50.12 to grant exemptions from the requirements of NRC regulations. Specifically, 10 CFR 50.12 and §52.7 state that the NRC may grant exemptions from the requirements of 10 CFR Part 52 upon a proper showing. No law exists that would preclude the changes covered by this exemption request. Additionally, granting of the proposed exemption does not result in a violation of the Atomic Energy Act of 1954, as amended, or the Commission's regulations.

Accordingly, this requested exemption is "authorized by law," as required by 10 CFR 50.12(a)(1).

2. This exemption will not present an undue risk to the health and safety of the public

The proposed exemption from the requirements of 10 CFR 52, Appendix D, Section III.B would allow changes to elements of the plant-specific Tier 1 DCD to depart from the AP1000 certified (Tier 1) design information. The plant-specific DCD Tier 1 will continue to reflect the approved licensing basis for VCSNS Units 2 and 3, and will maintain a consistent level of detail with that which is currently provided elsewhere in Tier 1 of the DCD. Therefore, the affected plant-specific DCD Tier 1 ITAAC will continue to serve its required purpose.

The clarification for the inspections of the excore source, intermediate, and power range detectors, does not represent any adverse impact to the design function of the excore detectors or the systems, structures and components therein and will continue to protect the health and safety of the public in the same manner. The clarification for the inspections on the excore source, intermediate, and power range detectors does 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 change 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 fuel cladding failures. Accordingly, this change does not present an undue risk from any existing or proposed equipment or systems.

Therefore, the requested exemption from 10 CFR 52, Appendix D, Section III.B would not present an undue risk to the health and safety of the public.

3. The exemption is consistent with the common defense and security

The requested exemption from the requirements of 10 CFR 52, Appendix D, Section III.B would allow the licensee to depart from elements of the plant specific DCD Tier 1 design information. The proposed exemption does not alter the design, function, or operation of any structures or plant equipment that is necessary to maintain a safe and

secure status of the plant. The proposed exemption has no impact on plant security or safeguards procedures.

Therefore, the requested exemption is consistent with the common defense and security.

4. Special circumstances are present

10 CFR 50.12(a)(2) lists six “special circumstances” for which an exemption may be granted. Pursuant to the regulation, it is necessary for one of these special circumstances to be present in order for the NRC to consider granting an exemption request. The requested exemption meets the special circumstances of 10 CFR 50.12(a)(2)(ii). That subsection defines special circumstances as when “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 rule under consideration in this request for exemption is 10 CFR 52, Appendix D, Section III.B, which requires that a licensee referencing the AP1000 Design Certification Rule (10 CFR Part 52, Appendix D) shall incorporate by reference and comply with the requirements of Appendix D, including Tier 1 information. The VCSNS Units 2 and 3 COLs reference the AP1000 Design Certification Rule and incorporate by reference the requirements of 10 CFR Part 52, Appendix D, including Tier 1 information. The underlying purpose of Appendix D, Section III.B is to describe and define the scope and contents of the AP1000 design certification, and to require compliance with the design certification information in Appendix D.

The proposed exemption would clarify the inspections for the excore source, intermediate, and power range detectors.

The proposed clarification for the inspections on the excore source, intermediate, and power range detectors, discussed in Section 2.0, maintains the required design functions of the excore detectors to measure leakage neutrons and provide signals to the nuclear instrumentation system. Encasing the aluminum of the excore detectors in stainless steel or titanium prevents hydrogen generation and the formation of chemical precipitates which could lead to challenges to containment integrity or block passive core cooling system containment recirculation screens. The proposed changes do not affect any function or feature used for the prevention and mitigation of accidents or their safety analyses. No safety-related structure, system, component (SSC) or function is involved.

The proposed changes do not involve nor interface with any SSC accident initiator or initiating sequence of events related to the accidents evaluated and therefore do not have an adverse effect on any SSC’s design function. Accordingly, this exemption from the certification information will enable the Licensee to safely construct and operate the AP1000 facility consistent with the design certified by the NRC in 10 CFR 52, Appendix D.

Therefore, special circumstances are present, because application of the current generic certified design information in Tier 1 as required by 10 CFR Part 52, Appendix D, Section III.B, in the particular circumstances discussed in this request is not necessary to achieve the underlying purpose of the rule.

5. The special circumstances outweigh any decrease in safety that may result from the reduction in standardization caused by the exemption.

Based on the nature of the changes to the plant-specific Tier 1 information and the understanding that these changes support the design function of the excore detectors, it is expected that this exemption may be requested by other AP1000 licensees and applicants. However, a review of the reduction in standardization resulting from the departure from the standard DCD determined that even if other AP1000 licensees and applicants do not request this same departure, the special circumstances will continue to outweigh any decrease in safety from the reduction in standardization because the key design functions of the structures associated with this request will continue to be maintained. Furthermore, the justification provided in the license amendment request and this exemption request and the associated mark-ups demonstrate that there is a limited change from the standard information provided in the generic AP1000 DCD, which is offset by the special circumstances identified above.

Therefore, the special circumstances associated with the requested exemption outweigh any decrease in safety that may result from the reduction in standardization caused by the exemption.

6. The design change will not result in a significant decrease in the level of safety.

The exemption revises the plant-specific DCD Tier 1 information by clarifying the inspections on the excore source, intermediate, and power range detectors as discussed in Section 2.0. The clarification for the inspections on the excore source, intermediate, and power range detectors does not change the design requirements of the excore detectors. Because these functions continue to be met, there is no reduction in the level of safety.

5.0 RISK ASSESSMENT

A risk assessment was not determined to be applicable to address the acceptability of this proposal.

6.0 PRECEDENT EXEMPTIONS

None

7.0 ENVIRONMENTAL CONSIDERATION

The Licensee requests a departure from elements of the certified information in Tier 1 of the generic AP1000 DCD. The Licensee has determined that the proposed departure would require a permanent exemption from the requirements of 10 CFR 52, Appendix D, Section III.B, *Design Certification Rule for the AP1000 Design, Scope and Contents*, with respect to installation or use of facility components located within the restricted area, as defined in 10 CFR Part 20, or which changes an inspection or a surveillance requirement; however, the Licensee evaluation of the proposed exemption has determined that the proposed exemption meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9).

Based on the above review of the proposed exemption, the Licensee has determined that the proposed activity does not involve (i) a significant hazards consideration, (ii) a

significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in the individual or cumulative occupational radiation exposure. Accordingly, the proposed 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), an environmental impact statement or environmental assessment of the proposed exemption is not required.

Specific details of the environmental considerations supporting this request for exemption are provided in Section 5 of the associated License Amendment Request provided in Enclosure 1 of this letter.

8.0 CONCLUSION

The proposed changes to Tier 1 are necessary to clarify the inspections on the excore source, intermediate, and power range detectors. The exemption request meets the requirements of 10 CFR 52.63, *Finality of design certifications*, 10 CFR 52.7, *Specific exemptions*, 10 CFR 50.12, *Specific exemptions*, and 10 CFR 52 Appendix D, *Design Certification Rule for the AP1000*. Specifically, the exemption request meets the criteria of 10 CFR 50.12(a)(1) in that the request is authorized by law, presents no undue risk to public health and safety, and is consistent with the common defense and security. Furthermore, approval of this request does not result in a significant decrease in the level of safety, satisfies the underlying purpose of the AP1000 Design Certification Rule, and does not present a significant decrease in safety as a result of a reduction in standardization.

9.0 REFERENCES

None

South Carolina Electric and Gas (SCE&G)

NND-16-0347

Enclosure 3

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

Proposed Changes to the Licensing Basis Documents

(LAR 16-09)

**Insertions Denoted by Blue Underline and Deletions by ~~Red~~ Strikethrough
Omitted text is identified by three asterisks (* * *)**

(This enclosure contains three pages, including this cover sheet.)

Revise COL Appendix C Table 2.2.3-4 and corresponding Plant-Specific Tier 1 Table 2.2.3-4, as shown below, to clarify the inspections of the source range, intermediate range, and power range detectors.

Table 2.2.3-4 (cont.)
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
***	***	***
8.c) The PXS provides RCS makeup, boration, and safety injection during design basis events.	<p>***</p> <p>xiv) Inspections will be conducted of the exposed surfaces of the <u>excore</u> (source range, intermediate range, and power range) detectors.</p>	<p>***</p> <p>xiv) <u>A report exists and concludes that the aluminum</u> These surfaces are made of the excore <u>detectors are encased in a watertight</u> stainless steel or titanium <u>housing</u>.</p>

UFSAR Table 14.3-2 “Design Basis Accident Analysis” is revised, as shown below, to specify the design feature for Reference Section 6.1.1.4 is that the aluminum surfaces of the excore detectors are encased in stainless steel or titanium.

Table 14.3-2
Design Basis Accident Analysis

Reference	Design Feature	Value
***	***	***
Section 6.1.1.4	The exposed <u>aluminum</u> surfaces of the excore <u>(source range, intermediate range, and power range)</u> detectors are made-of <u>encased in a watertight</u> stainless steel or titanium <u>housing</u> .	
***	***	***