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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: LAR 13-08 Request for License Amendment: Module Obstructions and Details

In accordance with the provisions of 10 CFR 50.90, South Carolina Electric & Gas Company (SCE&G) requests an amendment to the Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 combined licenses (COLs) numbered NPF-93 and NPF-94, respectively. The proposed license amendment would depart from the VCSNS Units 2 and 3 plant-specific Design Control Document (DCD) Tier 2 and Tier 2* material incorporated into the Updated Final Safety Analysis Report (UFSAR) by revising requirements for design spacing of wall module shear studs and trusses and the design of structural elements of the trusses such as angles and channels. In addition, the proposed amendment revises a weld symbol on a Tier 2* figure and changes the associated Tier 2 text. Because the proposed change impacts Tier 2* material in the site-specific DCD, this activity requires prior NRC approval.

The Description, Technical Evaluation, Regulatory Evaluation (including Significant Hazards Consideration), and Environmental Considerations for the changes proposed in this License Amendment Request (LAR) are contained in Enclosure 1 to this letter. The proposed markups depicting the requested changes to the Updated Final Safety Analysis Report (UFSAR), which incorporates the plant-specific DCD material, are contained in Enclosure 2 to this letter.

In order to support the VCSNS Unit 2 construction schedule, SCE&G requests NRC staff review and approval of this license amendment by June 13, 2013. This license amendment will be implemented by SCE&G within 30 days of approval.

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NRO

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.

This letter contains no regulatory commitments.

Should you have any questions, please contact me by telephone at (803) 941-9876, or by email at apaglia@scana.com.

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

Executed on this 28 day of FEBRUARY, 2013.

Sincerely,

Alfred M. Paglia
Manager
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DK/RAJ/dk

Enclosure 1: Virgil C. Summer Nuclear Station Units 2 and 3 – Request for License Amendment: Module Obstructions and Details

Enclosure 2: Virgil C. Summer Nuclear Station Units 2 and 3 – Licensing Basis Documents Proposed Changes

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NND-13-0123

Enclosure 1

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

Request for License Amendment Regarding Module Obstructions and Details

LAR 13-08

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

1. Summary Description

The proposed changes in the requirements for detailed design of structural modules are necessary to address regulatory compliance for design of shear studs and internal trusses.

The proposed changes would depart from plant-specific Design Control Document (DCD) Tier 2* and associated Tier 2 material incorporated into the Updated Final Safety Analysis Report (UFSAR) by revising requirements for design spacing of shear studs and wall module trusses and the design of structural elements of the trusses such as angles and channels. These revisions are to address interferences and obstructions that may cause a change to the design spacing in a local area. In each case where the spacing exceeds the design maximum, an evaluation supporting the increase will be completed to demonstrate that the revised spacing is in conformance with design and analysis requirements identified in the UFSAR. The proposed changes also include an addition to clarify the Tier 2* requirements for minimum spacing of the shear studs.

The proposed changes include revision of the weld symbol on a Tier 2* figure to change the symbol to a symbol that indicates complete joint penetration and change to the associated Tier 2 text to clarify that the weld symbol used in the figure indicates complete joint penetration.

2. Detailed Description

Modular construction techniques are used extensively in the containment internal structures and for portions of the auxiliary building. Subassemblies are initially fabricated both offsite and onsite. Module assembly consists of combining the subassemblies into structural modules after which they are installed in the plant. Following placement of the modules within the plant, the hollow wall structures are filled with concrete.

The structural modules for the containment internal structures and the auxiliary building have an internal structure consisting of trusses and shear studs and other internal elements including backup structures, reinforcements, embedments, and leak chases. In addition, penetrations, piping and conduit that serve other plant systems are embedded within the modules and are not considered part of the structural system of the module. While the shear studs and trusses are spaced at regular design intervals, the backup structures, leak chases, penetrations, piping, and conduit appear irregularly based on their functional requirements and on the needs of the other plant systems they serve.

Design finalization of the modules and fabrication experience in the shop environment has identified issues related to interferences between the internal structural components of the modules (shear studs and trusses) and the other interferences including those associated with backup structures, leak chases, penetrations, piping, and conduit contained within the modules. As a result of these local interferences there is a recurring need to revise the typical design spacing of the shear studs by moving or removing studs in the area of the interference. The design and spacing of trusses in close proximity to interferences may be revised by moving or removing channels or shifting the truss. In some cases, this revised spacing may exceed the design spacing described in the UFSAR.

The UFSAR notes that the shear stud and truss design spacing is Tier 2* information. Subsection 3.8.3.1.3 further states this is the maximum spacing of the studs, trusses, and channels in the trusses in the structural modules "in locations away from openings and penetrations in the walls." This statement is understood to mean that the design spacing of studs, etc. may be revised near wall openings and penetrations. However, the UFSAR did not specifically identify other examples of interferences to the regularly spaced stud and truss design intervals, nor did it identify specific criteria to be applied when determining the stud spacing near wall openings and penetrations.

The proposed change activity is the revision of Tier 2* text in the UFSAR to acknowledge the various other types of interferences that may cause a change of the design spacing of shear studs and the design and spacing of wall module trusses in a local area and to provide the appropriate criteria for such increases. The interferences include leak chases, penetrations, internal structures such as reinforcements, embedments, and backup structures, and internal conduit and piping. In each case where the spacing is revised from the typical design spacing, an evaluation supporting the revised design spacing is required to demonstrate that the revised spacing is in conformance with design and analysis requirements identified in the UFSAR.

UFSAR Subsection 3.8.3.5.3.5 identifies the function and design requirements for module trusses. Changes to the Tier 2 information are proposed to clarify the use of the trusses in the evaluation of the structural modules and the basis of the design requirements. UFSAR Subsection 3.8.3.5.3.6 identifies the design and evaluation requirements for stud spacing. A revision to these Tier 2 requirements is proposed to refer to the requirements for design and spacing of the shear studs in Subsection 3.8.3.1 and delete redundant requirements.

Design finalization of the modules, fabrication experience in the shop environment, and the comparison of text and figures presented in the UFSAR with shop assembly drawings have identified the need to revise the licensing basis information related to welding of the structural module faceplates. UFSAR Figure 3.8.3-8 Sheet 1 uses the weld symbol for square groove weld for the welding together of faceplates. This symbol is used in two places. This does not reflect the preferred weld design for module fabrication. Any weld that provides complete joint penetration including bevel and V-groove welds is acceptable and satisfies the design requirements and other regulatory commitments. The proposed change activity for the weld symbol is revision to Tier 2* Figure 3.8.3-8 to change the symbol to a symbol that indicates complete joint penetration and revision to Tier 2 UFSAR Subsection 3.8.3.1.3 to clarify that the weld symbol used in Figure 3.8.3-8 indicates complete joint penetration.

<u>Licensing Basis Change Descriptions</u>

The affected UFSAR subsections, table and figures are proposed to be modified as discussed below

- UFSAR Subsection 3.8.3.1, "Description of the Containment Internal Structures," criteria are added to address changes in design spacing of studs and trusses because of obstructions and interferences.

- UFSAR Subsection 3.8.3.1.3, "Structural Wall Modules," information is added to note that spacing for studs and trusses may vary from that shown on Figure 3.8.3-3

- UFSAR Subsection 3.8.3.1.3 information is also added to clarify the use of weld symbols on Figure 3.8.3-8.

- UFSAR Subsection 3.8.3.5.3.5, "Design of Trusses," information is revised to clarify the use of the trusses in the evaluation of the structural modules.

- UFSAR Subsection 3.8.3.5.3.6, "Design of Shear Studs," information is added to clarify the requirements for minimum design spacing for the shear studs.

- UFSAR Figure 3.8.3-8 Sheet 1, "Structural Modules – Typical Design Details," the weld symbol for faceplate welds is changed to show a complete joint penetration weld.

3. Technical Evaluation

<u>Structure, System, Component and/or Analysis Description</u>

The nuclear island structures, consisting of the containment, shield building, and auxiliary building are founded on the 6-foot-thick, cast-in-place, reinforced concrete basemat foundation. The nuclear island basemat provides the interface between the nuclear island structures and the supporting soil or rock. The primary functions of the nuclear island structures are to provide support, protection, and separation for the seismic Category I mechanical and electrical equipment located in the nuclear island.

The nuclear island structures provide protection for the safety-related equipment against the consequences of either a postulated internal or external event. The nuclear island structures are designed to withstand the effects of natural phenomena such as hurricanes, floods, tornados, tsunamis, and earthquakes without loss of capability to perform safety functions. The nuclear island structures are designed to withstand the effects of postulated internal events such as fires and flooding without loss of capability to perform safety functions.

Modular construction techniques are used extensively in the containment internal structures and for portions of the auxiliary building. Subassemblies are initially fabricated both offsite and onsite. Module assembly consists of combining the subassemblies into structural modules after which they are installed in the plant. Following placement of the modules within the plant, the hollow wall structures are filled with concrete. Structural modules are designed as reinforced concrete elements with the steel faceplates serving as reinforcement. Because the faceplates do not have deformation patterns typical of reinforcement, shear studs are welded to the inside of the module faceplates. After the modules are filled with concrete and cured, shear forces caused by design basis loads are transferred to the faceplates by the studs so that the concrete and steel respond in a composite manner. In addition shear studs provide anchorage into the concrete for piping and electrical raceway supports and other items attached to the module faceplates.

The shear studs are welded to the faceplates on the inside of the modules and are designed to requirements based on American Institute of Steel Construction (AISC) N690-1994, "Specification for the Design, Fabrication and Erection of Steel Safety Related Structures for Nuclear Facilities" and additional criteria included in the UFSAR. Stud spacing and sizing are such that stud loadings are within acceptable limits and that the steel and concrete portions of the structural module act in a composite manner. The composite action is accomplished by considering the combined action of the concrete and faceplate augmented by the shear transfer capability of the welded studs. The studs are sized and spaced such that an equivalent cross section of steel over a specific area under design basis loading is credited with transferring and transforming the shear forces from the concrete into the yield stress of the faceplate. The composite section resists bending moments by one face resisting tension and the other face resisting compression when subjected to a bending moment.

The trusses consist of angles welded vertically to the faceplates and connected by horizontal channels that are welded to the angles and faceplates to form a rectangular pattern between opposite faceplates. The trusses provide a structural framework for the modules, maintain the separation between the faceplates, support the modules during transportation and erection, and act as "form ties" between the faceplates when concrete is being placed. In addition, the trusses provide for in-plane shear transfer between the steel plates and concrete as well as out-of-plane shear strength similar to that provided by shear ties in reinforced concrete. The design requirements for the trusses and evaluation of the trusses for shear transfer are similar to that for the studs.

The welds between module faceplates in subassemblies and completed modules are required to be complete joint penetration welds. Any weld that provides complete joint penetration including bevel and V-groove welds and that satisfies design requirements and other regulatory commitments is acceptable. Figure 3.8.3-8 Sheet 1 uses the weld symbol for square groove weld for the welding together of faceplates. The square groove weld is one type of complete joint penetration weld. The designation of a square groove weld does not reflect the preferred weld design for module fabrication.

Supporting Technical Details

The shear studs and trusses are welded to the plates on the inside of the modules and are designed to requirements based on AISC-N690-1994. The spacing of the studs and trusses was established in part based on the criteria and requirements in AISC N690. Other considerations, including fabrication, result in a design spacing that includes some margin in developing the faceplate strength. The design requirement is that stud spacing and sizing are such that stud loadings are within acceptable limits and that the structural module acts in a composite manner. Composite action to resist design loading is accomplished by considering the combined action of the concrete and steel faceplate augmented by the shear transfer capability of the welded studs. The composite section resists an out-of-plane bending moment by one face resisting tension and the other face resisting compression. In-plane forces are resisted by composite action of the steel faceplates and concrete infill.

The evaluation of the structural modules considers the interfacial shear force transferred through several studs in an analyzed area. As a part of the design activities that supported design certification the area required for the transferring the shear load is included with other engineering factors to determine the design spacing and size of the studs. For example, the choice of shear stud size was limited to standard sizes so that a custom size did not have to be designed and qualified. In addition, trusses and other structural features within the module walls also provide for shear transfer. Spacing of the studs was selected to provide an even spacing of studs between the trusses and the same horizontal and vertical spacing. These factors result in a design size and spacing of the studs that provide a shear connection that develops the steel faceplate yield strength within a maximum of 7.5 feet. Because there is excess capacity in faceplate strength development due to the design stud and truss spacing, studs at local interferences may be removed from the normal pattern of studs without an adverse effect on the composite action of the module.

The evaluation required for local variation of the design spacing includes verification of the capacity of the shear connections (for example, shear studs) within the area surrounding the localized variation to develop the yield strength of the faceplate. The acceptance criteria for this evaluation are based on provisions in AISC N690 and design criteria for structural modules described in Subsection 3.8.3.5.3. The criterion for developing the yield strength of the plate over about 7.5 ft is derived from the requirements of AISC N690 Q1.11.4 for full composite behavior of a composite beam. The span for the main structural module walls is approximately 30 feet, with the maximum moment occurring at the midspan. The stud and truss spacing is designed to develop the yield strength of the face plate in tension in one fourth of the nominal span (the approximate distance between the point of inflection and maximum moment); this corresponds to 7.5 ft or three times the wall thickness for the typical wall size, 30 inches. The distance of 7.5 ft is analogous to the development length for reinforcing bar and this spacing criterion is used for all wall spans and thicknesses. Conformance of the design of the structure with the design requirements in UFSAR Subsection 3.8.3 is maintained.

The design includes increased face plate thickness in localized areas to accommodate welding of through wall backup structures or supports (for example steam generator lateral supports). These localized areas of increased thickness are utilized to support fabrication and to permit larger attachments or connection loads without the use of overlay plates or additional backup structures. Although the face plate is thickened (up to 1.5 inches) in these locations the face plate is credited to be only 0.5 inch for design demands. The shear connection provided by the studs and trusses are sized and spaced to develop the 0.5 inch plate thickness required for design. The increase in face plate thickness is not a change to be included in the license amendment.

The criterion for minimum clear spacing between studs and adjacent embedded items is based on ACI 349 spacing limits for reinforcement to preclude honeycombing and voiding in reinforced concrete. Evaluation of the concrete mix design validates the criterion for minimum clear spacing between studs and adjacent embedded items. The minimum clear spacing is also considered in the evaluation of shear connections that develops the steel faceplate yield strength. This clear spacing limit between studs does not apply to studs that are perpendicular (for example in the corners of modules).

The condition to maintain 3/4 inch clear to exposed surface is based on ACI 349 Section 7.7.1 for protection of reinforcement. The minimum center-to-center spacing limit is derived from ACI 349 Section B.8.3 for cast-in anchors and AISC N690 for spacing of shear connectors transverse to the longitudinal axis of the supporting composite beam.

The evaluations that will be performed when the specified conditions are not satisfied will consider adjacent studs or obstructions. The capacity of the stud may be reduced by adjacent studs or obstructions in determining the development of the faceplate yield or buckling strength. Typical examples of configurations where the spacing is changed due to interferences have been evaluated to demonstrate that such a change is acceptable using the criteria of AISC N690. The most common example occurs when one or two studs are removed from the pattern because of the interference of an embedment or backup structure. Embedments are used to provide additional capacity to transfer load into the concrete at the location of piping or component supports. The embedments may consist of deformed bars extending from the faceplate into the concrete a distance greater than the length of the studs or the deformed bars are connected to an anchor positioned in the mass of concrete. Backup structures are provided for larger loads such as a wall or floor. Backup structures are constructed of steel plates or structural shapes that in many cases span the thickness of the module. Evaluation of typical cases has demonstrated that there is margin in the shear transfer capacity from the remaining shear studs surrounding the removed studs.

In cases where one side of the module provides the side wall of a pool or tank, the welds that join the faceplates are backed up by leak chases. These leak chases may interfere with the attachment of the shear studs and require that shear studs be shifted away from the leak chase. Evaluation of stud spacing variance examples at representative leak chase locations has been completed to support this departure. This evaluation demonstrates that the shear capacity from the resulting configuration of shear studs is sufficient to satisfy the requirements and criteria for shear capacity which are based on AISC N690-1994 Table Q1.11.4.

At corner locations where module wall assemblies are connected, studs in the adjacent wall or internal structures such as internal diaphragms may result in an interference that causes a larger spacing than the identified design maximum between the last row of studs and the edge of the plate. Evaluation of a representative example of interferences in a corner demonstrates that the shear capacity from the remaining shear studs and the corner geometry is sufficient and the design criteria for structural modules described in Subsection 3.8.3.5.3 are satisfied.

The trusses consist of angles welded vertically to the faceplates and connected by channels welded in a rectangular pattern. When embedments or backup structures are located at or adjacent to the trusses, the channels may be shifted or removed or the truss shifted. The embedments and backup structures extend well into the concrete beyond the shear studs and are included in the evaluation of the handling loads and in the evaluation of wet concrete loads. The structural elements of the trusses (angles and channels) provide shear connections between the faceplates and concrete. Internal interferences may require that the truss design is modified from the typical configuration. The modifications include shifting or reorienting the channels or interrupting the angles. Evaluations of representative modified truss examples demonstrate that the capacity of the revised design is adequate to satisfy the design requirements of the truss in the structural module design.

UFSAR Subsection 3.8.3.5.3.5 identifies requirements for design of trusses. The proposed change revises the discussion to clarify the function of the trusses. The truss spacing is such that the truss replaces a row of studs, and the revised discussion recognizes that the truss provides resistance to interfacial shear.

UFSAR Subsection 3.8.3.5.3.6 identifies requirements for design spacing of the studs. These requirements are for the overall spacing away from interferences and obstructions. The proposed change adds a reference to the requirements for design spacing for the shear studs identified in Subsection 3.8.3.1.

Module faceplates are required by the design criteria discussed in the UFSAR to be joined with complete joint penetration welds to provide that the capacity of the plates is developed across the weld seam. A properly welded complete joint penetration provides this capacity. A square groove weld is not the only means to achieve a complete joint penetration weld. Other groove welds such as a bevel or V-groove weld also provide a complete joint penetration weld and with greater facility than a square groove weld.

No test of plant systems or experiments is involved with this departure. The attachment of the shear studs and trusses to the steel plates, assembly of modules, and placement within the concrete is not changed in service or during operation of the plant. No procedures or controls for plant systems and components would change the performance of the shear stud or structural module design function.

The proposed activity has no adverse effect on the ex-vessel severe accident. The geometry and strength of the structures are not altered. The material of the steel plates is not altered. The thickness of the structures and steel plates are not reduced. The properties of the concrete included in the containment internal structures are not altered. The design and material selection of the concrete floor beneath the reactor vessel is not altered. The response of the containment to a postulated reactor vessel failure, including direct containment heating, ex-vessel steam explosions, and core concrete interactions is not altered by the changes to the shear stud or truss spacing. The design of the reactor vessel and the response of the reactor vessel to a postulated severe accident are not altered by the changes to the shear stud spacing, truss design and spacing, or welding of the faceplates.

The proposed activity has no impact on the Aircraft Impact Assessment. The changes described are to structures internal to the containment and the auxiliary building. There is no change to protection of plant structures, systems, and components provided by the design of the shield building and the auxiliary building. The activity described does not change the design or construction of the shield building.

The proposed change activity has no impact on emergency plans or physical security plans. There is no change to systems or the response of systems to postulated accident conditions. There is no change to perimeter walls or other aspects of the structures that could impact physical security.

The proposed changes associated with this license amendment request include a change in the design of internal structures. These changes do not affect the containment, control, channeling, monitoring, processing or releasing of radioactive and non-radioactive materials.

The permeability and waterproofing of the concrete for the walls below grade and the basemat is not changed. No effluent release path is affected. The types and quantities of expected effluents are not changed. Therefore, radioactive or non-radioactive material effluents are not affected.

The thickness of the wall and density of the concrete are not changed therefore, there is no adverse change to the shielding provided by the structural modules. 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. Plant radiation zones, controls required by 10 CFR Part 20, and expected amounts and types of radiologically controlled materials are not affected by the proposed changes. Therefore, individual and cumulative radiation exposures do not change.

Summary

This activity does not adversely affect any design function. The departure does not involve an adverse change to the method of evaluation for establishing design bases or safety analyses. It does not adversely affect a design feature credited in the ex-vessel severe accident assessment. Tests, experiments, and procedures described in the licensing basis are unchanged by this activity.

4. Regulatory Evaluation

4.1 Applicable Regulatory Requirements/Criteria

10 CFR Part 50, Appendix A, General Design Criterion (GDC) 2 states structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The structures affected by this activity maintain compliance with GDC 2. The thickness, geometry, and strength of the structures are not altered. The response of the structural modules to seismic motions is not altered by the change in the internal design of the structural modules or the clarification of the welding requirements for the faceplates.

10 CFR Part 50, Appendix A, GDC 4 states structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. The structures affected by this activity maintain compliance with GDC 4. The thickness, geometry, and strength of the structures are not altered. The response of the structural modules to the effects of postulated accidents including subcompartment pressurization is not altered by the change in the internal design of the structural modules or the clarification of the welding requirements for the faceplates.

10 CFR Part 52, Appendix D, Section VIII.B requires NRC approval for Tier 2* information departures. Although this departure does not adversely affect safety, it does involve departures from Tier 2* information. Therefore, NRC approval is required prior to implementing the Tier 2* departures addressed in this departure.

4.2 Precedent

No precedent is identified.

4.3 Significant Hazards Consideration

The proposed amendment would revise the plant-specific design control document (DCD) Tier 2* and associated Tier 2 material incorporated into the Updated Final Safety Analysis Report (UFSAR) to acknowledge the various types of interferences (other than wall openings and penetrations) that may necessitate a change in the design spacing of shear studs and the design and spacing of wall module trusses in a local area, and provide the acceptance criteria for those associated spacing variances. The amendment also revises the appropriate design requirements for faceplate welds within the modules.

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 design function of the containment structural modules is to support the reactor coolant system components and related piping systems and equipment. The design functions of the affected structural module in the auxiliary building are to provide support and protection for new and spent fuel and the equipment needed to support fuel handling, cooling, and storage in the spent fuel racks, and to provide support, protection, and separation for the seismic Category I mechanical and electrical equipment located outside the containment building. The design function of the shear studs within the modules is to provide for the concrete and steel faceplates to act in a composite manner and transfer loads into the concrete of the structural modules. The structural modules are Seismic Category I structures and are designed for dead, live, thermal, pressure, safe shutdown earthquake loads, and loads due to postulated pipe breaks. The loads and load combinations applicable to the structural modules in the auxiliary building are the same as for the containment internal structures except that there are no design basis accident loadings due to the automatic depressurization system or pressure loads due to pipe breaks. The proposed changes to the UFSAR are to identify and address additional types of interferences other than wall openings and penetrations that may necessitate a change in the design spacing of shear studs and the design and spacing of wall module trusses in a local area. In each case where the spacing is revised from the design spacing, an evaluation supporting the change is completed to demonstrate that the revised spacing continues to be in conformance with the design and analysis requirements identified in the UFSAR. The proposed changes include adding acceptance criteria for evaluating changes to the typical design spacing for the shear studs and trusses. The proposed changes also include a specification for implementing other types of complete joint penetration welds to construct the modules versus utilizing only one specific type of complete joint penetration weld. The proposed changes do not alter the thickness, geometry, or strength of the structures, nor do they alter the material of the steel plates. The properties of the concrete included in the structural modules are not altered by the proposed changes. Because the basic design requirements and analysis of the structural modules are maintained, the design function of the structural modules is not adversely affected by the proposed changes. Because the design functions of the modules are not altered and there is no change to plant systems, the plant response to previously evaluated accidents or external events is not adversely affected by the change, and no new accident precursors are introduced. There is no change to the predicted radioactive releases due to normal operation or postulated accident conditions. 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 changes to the UFSAR acknowledge the types of interferences (other than wall openings and penetrations) that may cause a change in the typical design spacing of shear studs and the design and spacing of wall module trusses in a local area. In each case where the spacing is revised from the typical design spacing, an evaluation supporting the change is completed to demonstrate that the revised spacing continues to be in conformance with the design and analysis requirements identified in the UFSAR. Stud spacing and sizing are evaluated to demonstrate that stud loadings and shear transfer capability are within acceptable limits and that the structural module acts in a composite manner. The proposed change includes adding information to clarify the requirements for minimum design spacing for the shear studs. An additional proposed change is to revise a requirement to allow for different types of complete joint penetration welds. Since the thickness, geometry, and strength of the structures are not adversely altered, the materials of the steel plates are not altered, and the properties of the concrete included in the structural modules are not altered, the functionality of the structural modules are not changed. Because the structural modules maintain their original design functions as described in the UFSAR, no new failure modes or equipment failure initiators are introduced by the proposed changes. 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

Structural modules are designed as reinforced concrete elements with the steel faceplates and welded studs spaced at intervals serving as reinforcement such that the steel and concrete elements in the modules act in a composite manner. Composite action to resist design loading is accomplished by considering the combined action of the concrete and steel faceplate augmented by the shear transfer capability of the welded studs. The proposed changes to the UFSAR acknowledge the types of interferences (other than wall openings and penetrations) that may cause a change in the typical design spacing of shear studs and the design and spacing of wall module trusses in a local area. In each case where the spacing is revised from the typical design spacing, an evaluation supporting the change is completed to demonstrate that the revised spacing continues to be in conformance with the design and analysis requirements identified in the UFSAR. These UFSAR requirements are consistent with the original design requirements for the structural modules. The proposed change to allow the use of additional types of complete joint penetration welds between module faceplates in subassemblies and completed modules is consistent with existing design requirements and other regulatory commitments, so there is no change to the capacity of the weld or to the design requirements of the modules from this proposed change. There is no change to the method of evaluation from that used in the design basis calculations. Because these requirements are consistent with the intent of the original design, there is no significant reduction in a margin of safety. Therefore the proposed amendment does not result in 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.

5. Environmental Consideration

The proposed amendment departs from Tier 2* and associated Tier 2 material in the UFSAR (Section 3.8.) to acknowledge and address the types of interferences (other than wall openings and penetrations) that may cause a change to the design spacing of shear studs and the design and spacing of wall module trusses in a local area. The proposed amendment includes adding information to the UFSAR to clarify the Tier 2* requirements for minimum design spacing for the shear studs. The proposed amendment also departs from information on a Tier 2* figure in the UFSAR by clarifying welding requirements.

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR Part 20, or would change an inspection or surveillance requirement. However, facility construction and operation following implementation of the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion 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, 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 proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated; (2) the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated; and (3) the proposed amendment does not involve a significant reduction in a margin of safety. Therefore, 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.

(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 amendment involves structural design changes which do not change the as built configuration of the plant systems and thus do not introduce any changes 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, these changes do not 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 proposed 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 amendment involves structural design changes within the walls and in the welding used to connect wall plates without impacting the bulk of the material utilized for radiation protection, and thus, do not affect any plant structure, system or component, their function, plant effluent, or radiation controls. This proposed amendment does not change the as-built configuration of the plant systems. Consequently, these changes have no effect on individual or cumulative occupational radiation exposure during plant operation. Therefore, it is concluded that the proposed amendment does not involve a significant increase in individual or cumulative occupational radiation exposure.

Based on the above review of the proposed amendment, it has been determined that anticipated construction and operational impacts of the proposed 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 proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6. References

1) Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 Updated Final Safety Analysis Report (UFSAR), Revision 0, June 2012.

South Carolina Electric & Gas Company

NND-13-0123

Enclosure 2

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

Proposed Changes to Licensing Basis Documents
(LAR 13-08)

Insertions denoted by Green Underline and Deletions by Red Strikethrough

UFSAR Subsection 3.8.3.1

"Description of the Containment Internal Structures"

Revise the fourth paragraph, as follows:

Walls and floors are concrete filled steel plate structural modules. The walls are supported on the mass concrete containment internal structures basemat with the steel surface plate extending down to the concrete floor on each side of the wall. The steel surface plates of the structural modules provide reinforcement in the concrete. The structural modules are anchored to the base concrete by mechanical connections welded to the steel plate as shown in Figure 3.8.3-8, Sheet 2. Figure 3.8.3-1 shows the location of the structural modules. Figures 3.8.3-2 and 3.8.3-15 show the typical structural configuration of the wall modules. Key structural elements of the module design are identified as Tier 2* information in the text and figures of this section. See DCD Introduction, Section 3.5 for a discussion of Tier 2* information. [*The information in Figure 3.8.3-2 that is Tier 2* is the minimum size of the angles and channels used to fabricate the modules. The information in Figure 3.8.3-15 that is Tier 2* is the maximum design spacing between the face plates for the 4-foot-thick refueling canal wall in the containment internal structures and the maximum design spacing between the trusses used to fabricate the modules in locations away from openings or penetrations in the wall.*

The shear studs and trusses are sized and spaced to develop composite action between the concrete and steel faceplate. The stud and truss spacing is designed to fully develop the steel faceplate in tension in 7.5 feet of the wall. The shear capacity of studs is based on the allowable loads values of AISC N690 Table Q1.11.4 with consideration of ACI 349 Paragraph B.6.1.2 Equation B-13.

Local variation in the design of the trusses and spacing of the trusses and shear studs may be required to address internal obstructions and accessibility for fabrication and inspection. The obstructions include features such as leak chases; internal structures such as reinforcements, embedments, and backup structure; and internal conduit and piping. Such localized variations are evaluated to be in conformance with the criteria outlined in the following three paragraphs. This evaluation includes verification of the capacity of the shear connections (for example, shear studs) within the area surrounding the localized variation to develop the yield stress in the faceplate. Localized variations in maximum stud spacing are evaluated considering the utilization ratio for development of the faceplate in tension and buckling of the faceplate in compression.

The minimum center-to-center stud spacing for studs is four times the stud diameter. Localized variations in minimum stud spacing are permissible provided that a specific evaluation based on the capacity of the shear connections (for example, shear studs) is completed to demonstrate development of the faceplate in tension.

The minimum clear spacing between studs and adjacent structural items such as angles, diaphragms, faceplates, or studs welded to adjacent plates is 1 inch. Localized variations are permissible provided that a specific evaluation based on the capacity of the shear connections (for example, shear studs) is completed to demonstrate development of the faceplate in tension.

The minimum clear cover to a free surface (i.e., not to a module steel plate) for studs is 3/4 inch. Localized variations are permissible provided that a specific evaluation based on the capacity of the shear connections (for example, shear studs) is completed to demonstrate development of the faceplate in tension.]*

A typical floor module is shown in Figure 3.8.3-3 and also in Figure 3.8.3-16 combined with the liner module. These structural modules are structural elements built up with welded steel structural shapes and plates. Concrete is used where required for shielding, but reinforcing steel is not normally used.

UFSAR Subsection 3.8.3.1.3

"Description of the Containment Internal Structures"

Revise the second and third paragraphs, as follows:

Structural wall modules consist of steel faceplates connected by steel trusses. The primary purpose of the trusses is to stiffen and hold together the faceplates during handling, erection, and concrete placement. The nominal thickness of the steel faceplates is 0.5 inch. The nominal spacing of the trusses is 30 inches. Shear studs are welded to the inside faces of the steel faceplates. Face plates are welded to adjacent plates with full penetration welds so that the weld is at least as strong as the plate. The full penetration welds are identified in Figure 3.8.3-8 Sheet 1 with the weld symbol that includes the notation CJP for Complete Joint Penetration. Plates on each face of the wall module extend down to the elevation of the adjacent floor. Since the floors in the rooms each side of the wall module are at different elevations, one of the plates extends further than the other. This portion is designated on Figure 3.8.3-1 as "CA Structure Module with Single Surface Plate." A typical configuration is shown in Figure 3.8.3-8. The module functions as a wall above the upper floor level (elevation 103'-0" in Figure 3.8.3-8). The single plate below this elevation is designed to transfer the reactions at the base of the wall into the basemat. This plate also acts as face reinforcement for the basemat. Basemat reinforcement dowels are provided at the bottom of the single plate as shown in Figure 3.8.3-8.

[*The information in Figure 3.8.3-8, Sheet 1 that is considered to be Tier 2* information is the maximum design spacing of the faceplates, trusses, channels in the trusses and the minimum size and maximum design spacing of the headed studs for the modular wall in the containment internal structure*~~*in locations away from openings or penetrations in the walls*~~*. Local variation in the design of the trusses and spacing of the trusses and shear studs may be required to address internal obstructions and accessibility for fabrication and inspection. See subsection 3.8.3.1 for the requirements for evaluation of the variation. The use of full penetration welds to connect the faceplates of the modules is also considered to be Tier 2* information. The information in Figure 3.8.3-8, Sheet 2 that is considered to be Tier 2* information is the use of mechanical connectors and the development length requirement for the mechanical connectors.*]* The detail design of the mechanical connectors is governed by AISC N690 and ACI 349, and the representative design shown is not considered to be Tier 2* information. Sheet 3 of Figure 3.8.3-8 shows a wall of the IRWST that is a steel structure anchored in concrete and is not a concrete filled module. [*The information in Figure 3.8.3-8, Sheet 3 that is considered to be Tier 2* information is the plate thickness for the IRWST wall, the use, spacing, and size of angles and tees to stiffen the wall, the number, size, and use of studs provided to anchor the module, and the number, size, vertical spacing, and development length of the deformed bars provided to connect the module to the mass concrete. The design implemented in fabrication and construction drawings and instructions will have the design shown, an equal design, or a better design for the key structural elements.*]*

UFSAR Subsection 3.8.3.5.3.5

"Design of Trusses"

Revise the first paragraph, as follows:

The trusses provide a structural framework for the modules, maintain the separation between the faceplates, support the modules during transportation and erection, and act as "form ties" between the faceplates when concrete is being placed. ~~After the concrete has cured, the trusses are not required to contribute to the strength or stiffness of the completed modules. However, they do~~The trusses provide additional shear capacity between the steel plates and concrete as well as additional strength similar to that provided by stirrups in reinforced concrete. The truss~~es are designed according to the requirements of~~ design is based on AISC-N690.

UFSAR Subsection 3.8.3.5.3.6

"Description of the Containment Internal Structures"

Revise the second paragraph, as follows:

~~The size and spacing of the shear studs is based on Section Q1.11.4 of AISC-N690 to develop full composite action between the concrete and the steel faceplates.~~See Subsection 3.8.3.1 for the design requirements for the size and spacing of the shear studs.

Tier 2, Figure 3.8.3-8 (Sheet 1 of 3) (Partial)

"Structural Modules – Typical Design Details"

Revise Figure 3.8.3-8 (Sheet 1 of 3) as described and shown below.

In the Detail 1 Plan View, revise the weld symbols to signify Complete Joint Penetration Welds.