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May 6, 2015
NND-15-0195
10 CFR 50.90
10 CFR 52.63

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

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

Subject: LAR 14-18: VCSNS Units 2&3 Request for License Amendment and Exemption: Containment Hydrogen Igniter Changes

References: 1. Southern Nuclear Operating Company Vogtle Electric Generating Plant Units 3 and 4 Request for License Amendment and Exemption: Containment Hydrogen Igniter Changes (LAR-15-003) Dated February 6, 2015 (Accession Number ML15037A715)

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

The requested amendment requires changes to the Updated Final Safety Analysis Report (UFSAR) in the form of departures from the incorporated plant-specific Design Control Document (PS-DCD) Tier 2 information including the Technical Requirements Manual (TRM) and involves related changes to COL Appendix C information, with corresponding changes to the associated plant-specific Tier 1 information. 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 proposed departures consist of changes to plant-specific Tier 1 (and COL Appendix C) tables and UFSAR tables, text, and figures related to the addition of two hydrogen igniters above the In-Containment Refueling Water Storage Tank (IRWST) roof vents to improve hydrogen burn capabilities, incorporating consistency changes to a plant-specific Tier 1 table to clarify the minimum surface temperature of the hydrogen igniters and igniter location, removal of hydrogen igniters from the Protection and Safety Monitoring System (PMS) from a plant-specific Tier 1 table, and clarification of hydrogen igniter controls in a Tier 1 table.

The description, technical evaluation, regulatory evaluation (including the Significant Hazards Consideration determination), and environmental considerations for the proposed changes in this license amendment request (LAR) 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 the plant-specific Tier 1 and UFSAR text and tables that are available for disclosure to the public. **Enclosure 4 provides markups depicting the requested changes to the UFSAR figures which are withheld from public disclosure as Security-Related Information, in accordance with 10 CFR 2.390(d).**

This license amendment request is identical in technical content with Reference 1.

SCE&G requests staff approval of this license amendment and exemption by May 6, 2016, to support the installation of the hydrogen igniters. Delayed approval of this licensing request could result in delay of the associated construction activity and subsequent dependent construction activities. SCE&G expects to implement the proposed amendment (through incorporation into the licensing basis documents; e.g., the UFSAR) within 30 days of the approval of the requested changes.

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 Mr. Justin Bouknight by telephone at (803) 941-9828, or by email at justin.bouknight@scana.com.

This letter contains no regulatory commitments.

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

Executed on this 6th day of May, 2015.

Sincerely,

April R. Rice
Manager, Nuclear Licensing
New Nuclear Operations

GT/ARR/gt

Enclosure 1: Request for License Amendment, Containment Hydrogen Igniter Changes (LAR 14-18)

Enclosure 2: Request for Exemption, Containment Hydrogen Igniter Changes (LAR 14-18)

Enclosure 3: Proposed Changes to the Licensing Basis Documents (Publicly Available Information) (LAR 14-18)

Enclosure 4: Proposed Changes to the Updated Final Safety Analysis Report **(Withheld Information)** (LAR 14-18)

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South Carolina Electric & Gas Company

Virgil C. Summer Nuclear Station Units 2 and 3

NND-15-0195

Enclosure 1

Request for License Amendment, Containment Hydrogen Igniter Changes (LAR 14-18)

(This enclosure contains 19 pages including this cover page)

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

1. SUMMARY DESCRIPTION

The proposed changes will revise the Combined Licenses (COLs) to modify the design of the hydrogen ignition subsystem by adding two additional igniters to the In-Containment Refueling Water Storage Tank (IRWST) roof vents. Proposed changes are also made to remove control of the hydrogen igniters from the Protection and Safety Monitoring System (PMS), to clarify the controls available for the hydrogen igniters at the Remote Shutdown Workstation (RSW), and to make changes to the design aspects of the hydrogen igniters to maintain consistency within the Updated Final Safety Analysis Report (UFSAR).

The requested amendment requires changes to the UFSAR in the form of departures from the incorporated plant-specific Design Control Document (PS-DCD) Tier 2 information (as detailed in Section 2) including the Technical Requirements Manual (TRM), and involves related changes to COL Appendix C information, with corresponding changes to the associated plant-specific Tier 1 information. This enclosure requests approval of the license amendment necessary to implement the Tier 2 and COL changes. Enclosure 2 requests the exemption necessary to implement the involved changes to the plant-specific Tier 1 information.

2. DETAILED DESCRIPTION

Background:

The hydrogen ignition subsystem is provided to address the possibility of an event that results in a rapid production of large amounts of hydrogen such that the rate of production exceeds the capacity of the Passive Autocatalytic Recombiners (PARs). Hydrogen production is postulated to occur as the result of a degraded core or core melt accident (severe accident scenario) in which up to 100 percent of the zirconium fuel cladding reacts with steam to produce hydrogen.

The hydrogen ignition subsystem presently consists of 64 hydrogen igniters strategically distributed throughout the containment. The number of hydrogen igniters and their locations are selected considering the behavior of hydrogen in the containment during severe accidents. The primary objective of the hydrogen ignition subsystem is to promote hydrogen burning at a low concentration and, to the extent possible, to burn hydrogen more or less continuously so that the hydrogen concentration does not build up in the containment.

One area of potential hydrogen accumulation is inside the IRWST, therefore igniters are strategically placed inside the IRWST near the roof vents. The proposed change improves the capability of the hydrogen ignition subsystem by placing additional igniters outside the IRWST near the roof vents, thereby ensuring a continuous burn of hydrogen exiting the IRWST.

Addition of Two Igniters Above IRWST Roof Vents Related Changes:

Design reviews in 2011 identified a credible scenario in which the applicable plant damage state meets the core damage frequency cutoff to be considered as part of the severe accident analysis. This resulted in conservatively determining, by engineering judgment, that two additional hydrogen igniters should be installed outside of and at the IRWST roof vents to meet the design criteria for the hydrogen igniters. The new hydrogen igniters are located in accordance with the placement criteria of UFSAR Table 6.2.4-6, *Igniter Location*, bullet 9 (that they be located as close to the exit of the IRWST vents as feasible) as an enhancement to burn hydrogen that may be postulated to be released through the IRWST in a core damage accident. The only pathway for severe accident hydrogen release into the IRWST is through the automatic depressurization system spargers. Within the severe accident regime, multiple failures of ADS stage 4 valves are also necessary to create a scenario in which hydrogen is released through the IRWST. Otherwise the hydrogen is released through the ADS stage 4 valves into the containment loop compartments, bypassing the IRWST. In the AP1000 PRA and confirmed in the most recent AP1000 analyses for diffusion flame and for deflagration to detonation transition, given full success of ADS stages 1, 2 and 3 to minimize the flow resistance to the IRWST, the failure of 2 or more ADS-4 valves must also occur to create a significant hydrogen release into the IRWST. The AP1000 probabilistic risk assessment (Reference 1) plant damage state (PDS) 3D includes scenarios with successful ADS-1/2/3 and multiple ADS-4 valve failures to release hydrogen to the IRWST. PDS 3D has a total frequency of 5.8E-8 per reactor-year. The PCS-induced mixing in the volume above the IRWST where the plume is released from the IRWST vents is too complex to be accurately modeled to either quantitatively confirm the need for additional igniters or confirm that the current design, that includes hydrogen igniters at the IRWST hooded vents near the containment wall and on the steam generator doghouse compartment 30 feet above the IRWST vents, could control the local hydrogen releases from the roof vents. Thus, the hydrogen mitigation strategy is to place igniters at the locations where the potential hydrogen releases can be defined (i.e., above the IRWST spargers, outside the IRWST roof vents, as close to the source as feasible so the hydrogen can be burned as it is released from the vent and mixes with oxygen, preventing localized mixtures that could be susceptible to flame acceleration). Placing igniters at this location is an improvement in burning hydrogen from the postulated preferential venting path through the IRWST roof vents. Containment integrity is not challenged without these igniters and the location of the new igniters is sufficiently away from the containment wall such that the hydrogen burn's zone of influence would not present a challenge to the containment wall.

Hydrogen Igniter Control Related Changes:

COL Appendix C and associated Plant-specific Tier 1 Table 2.5.2-5, *Minimum Inventory of Displays, Alerts, and Fixed Position Controls in the MCR*, lists the hydrogen igniters as having Protection and Safety Monitoring System (PMS) provided fixed position control in the control room. Per UFSAR Section 7.1.1, *The AP1000 Instrumentation and Control Architecture*, the PMS controls safety-related components and initiates reactor trip and actuation of engineered safety features in response to plant conditions. Because the hydrogen igniters are not safety-related (UFSAR Section 6.2.4.2.3, *Hydrogen Ignition*

Subsystem), and do not provide a manual backup to any automatic protection signal provided by the PMS, fixed position controls for the Containment Hydrogen Igniters are not provided in PMS and the hydrogen igniter signals are not processed through the PMS. The Plant Control System (PLS) provides manual component soft level controls for nonsafety-related components, including the hydrogen igniters (per COL Appendix C and associated Plant-specific Tier 1 Table 3.7-2, *PLS D-RAP Control Functions*), at workstations in the Main Control Room (MCR) and the Remote Shutdown Room. As stated in UFSAR Section 7.1.3.3, *Operator Controls and Indication*, the plant control operator interface is a set of soft control devices that replace conventional switch/light or potentiometer/meter assemblies used for operator interface with control systems. These soft control devices provide consistent operator interfaces for the plant control system. The soft controls are located on each operator workstation and the remote shutdown workstation. Each soft control device can control safety-related and nonsafety-related equipment.

The implementation of the soft controls is consistent with the following functional requirements:

- The soft control function does not affect the electrical or functional isolation of the safety-related and nonsafety-related equipment. This isolation is maintained upon a single failure of any equipment performing or supporting the soft control function.

- Failure of the operator displays does not prevent an operator from being able to safely shutdown the plant.

When the operator desires to operate a component, the graphical operator display which is indicating the component status is presented on the operator control console. This results in a message being sent to the soft control device. The soft control device then displays the appropriate control template. The operator then selects the desired control action on the template. After the operator verifies that the desired control action is properly selected, the operator then actuates the control action, causing the selected control action to be transmitted to the control device.

In addition, per UFSAR Section 7.7.1.11, *Diverse Actuation System*, the Diverse Actuation System (DAS) provides manual system level switches for the containment hydrogen igniter control at a dedicated panel in the MCR. The nonsafety-related hydrogen igniters are actuated by the nonsafety-related PLS by soft level (workstation) controls in the MCR and the Remote Shutdown Room, and by fixed system level controls (to provide a diverse actuation method) on the nonsafety-related DAS panel in the MCR and the secondary DAS station in the auxiliary building. Soft controls are appropriate in the MCR and Remote Shutdown Room and permit the igniters to perform their intended function to control hydrogen in containment.

During post-accident activities, the MCR may not be habitable. Therefore, controls are transferred to the Remote Shutdown Workstation (RSW). The RSW contains the indications and controls that allow an operator to achieve and maintain safe shutdown of the plant following an event when the main control room is unavailable. The data display and processing system (DDS) states in COL Appendix C and associated Plant-specific Tier 1 Section 2.5.4, *Data Display and Processing System, Design Description*, that the DDS, in conjunction with the operator workstations, provides the minimum inventory of displays,

visual alerts, and fixed position controls at the remote shutdown workstation (RSW) as identified in COL Appendix C and associated Plant-specific Tier 1 Table 2.5.4-1, *Minimum Inventory of Controls, Displays, and Alerts at the RSW*. This Table and UFSAR Table 18.12.2-1, *Minimum Inventory of Fixed Position Controls, Displays, and Alerts*, list the Manual Containment Hydrogen Igniter (Nonsafety-related) with controls at the RSW. The available controls for the Hydrogen Igniters at the RSW are soft controls, versus fixed position controls. The Hydrogen Igniter entry into COL Appendix C and associated Plant-specific Tier 1 Table 2.5.4-1 and UFSAR Table 18.12.2-1 could be interpreted to imply that fixed position controls are available at the RSW for the Hydrogen Igniters.

Plant-Specific Tier 1 Consistency Related Changes:

The minimum surface temperature of the hydrogen igniters has been set sufficiently high above the flammability limit to ensure hydrogen burning at the lowest hydrogen concentrations. The minimum surface temperature of the hydrogen igniters is stated as "exceeds 1700°F" in COL Appendix C and associated Plant-specific Tier 1 Table 2.3.9-3, *Inspections, Tests, Analyses, and Acceptance Criteria*; however, this value is not consistent within the entirety of the UFSAR. Tier 2 Section 6.2.4.5.2, *In-service Testing, Hydrogen Ignition Subsystem*, states that the surface temperature "exceeds" the value in Table 6.2.4-3. Tier 2 Table 6.2.4-3, *Component Data – Hydrogen Igniter (Nominal)*, and Table 14.3-8, *Severe Accident Analysis*, cite the minimum surface temperature as a range (1600 -1700°F) versus a minimum bound and a lower bound (>1600°F) than the actual, respectively.

The locations of the igniters are shown in COL Appendix C and associated Plant-specific Tier 1 Table 2.3.9-2 and on Tier 2 Figures 6.2.4-5 through 6.2.4-13. During subsequent reviews, it was determined that the location room for hydrogen igniter APP-VLS-EH-30 (Igniter 30) cited in COL Appendix C and associated Plant-specific Tier 1 Table 2.3.9-2 is not consistent with the location shown to UFSAR Figure 6.2.4-9, *Hydrogen Igniter Locations Plan View Elevation 118'-6"*. The location noted in COL Appendix C and associated Plant-specific Tier 1 Table 2.3.9-2 is room 11400, the lower compartment area of the containment and valve area; while UFSAR Figure 6.2.4-9 shows the igniter to be located in Room 11401, Loop compartment 01 (Steam Generator RCS-MB-01 compartment). The UFSAR Figure 6.2.4-9 location has been verified as the correct location by comparison to other design documents.

Proposed Licensing Basis Change Descriptions

This section describes the licensing basis changes associated with each of the change activities described above. Table 2-1, below, lists the changes to the licensing basis text, tables, and figures sought with regard to the following proposed change descriptions, and organizes the changes to identify the Tier 2 changes with their associated COL Appendix C and corresponding Plant-specific Tier 1 changes.

Addition of Two Igniters Above IRWST Roof Vents Related Changes:

- COL Appendix C and corresponding Plant-specific Tier 1 Table 2.2.3-6 a change is proposed to revise the tag number column entry for the Hydrogen Igniters to "VLS-EH-01 through 66" to reflect the addition of Igniters 65 and 66.

- COL Appendix C and corresponding Plant-specific Tier 1 Table 2.3.9-2 a change is proposed to include Hydrogen Igniters VLS-EH-65 and -66 with other information consistent with the other Hydrogen Igniters.

- COL Appendix C and corresponding Plant-specific Tier 1 Table 2.3.9-3, *Inspections, Tests, Analyses, and Acceptance Criteria*, a change is proposed to revise in item 3.i) to reflect the change in number of hydrogen igniters to “66”.

- COL Appendix C and corresponding Plant-specific Tier 1 Table 3.7-1, *Risk-Significant Components*, a change is proposed to revise the tag number column entry for the Hydrogen Igniters to “VLS-EH-01 through 66” to reflect the addition of Igniters 65 and 66.

- Tier 2 Subsection 6.2.4.2.3, *Hydrogen Ignition Subsystem*, second paragraph a change is proposed to note that the hydrogen ignition subsystem consists of 66 igniters to reflect the two additional igniters.

- Tier 2 Subsection 6.2.4.5.1, *Preoperational Inspection and Testing, Hydrogen Injection Subsystem*, a change is proposed to revise, in the first paragraph, the number of igniters to “66” to reflect the addition of the two new igniters.

- Tier 2 Table 6.2.4-3, *Component Data - Hydrogen Igniter (Nominal)*, a change is proposed to revise the number of hydrogen igniters to 66.

- Tier 2 Table 6.2.4-6, *Igniter Location*, a change is proposed to revise the IRWST vent igniter locations in the table to eliminate the number of vents fitted with hydrogen igniters to account for more than four vents currently noted.

- Tier 2 Table 6.2.4-7, *Subcompartment/Area Igniter Coverage*, a change is proposed to revise the table to add the new IRWST Roof Vent hydrogen igniters, with appropriate power group designations and installed elevation.

- (SUNSI) Tier 2 Figure 6.2.4-10, *Hydrogen Igniter Locations Plan View Elevation 135'-3"*, a change is proposed to show the location of added hydrogen igniters 65 and 66.

- Tier 2 Table 14.3-6 (sheet 3 of 10), *Probabilistic Risk Assessment*, a change is proposed to revise the Section 6.2.4.2.3 Reference Design Feature to reflect that there are at least 66 hydrogen igniters provided.

- Tier 2 Table 14.3-8, *Severe Accident Analysis*, a change is proposed to note at Reference Section 6.2.4.2.3 that the hydrogen igniter subsystem consists of 66 igniters.

- Tier 2 TRM Table TR 3.6.2-1, *Hydrogen Ignitors*, a change is proposed to add the IRWST Roof Vent Hydrogen Igniters, Igniter 65 and Igniter 66, and the number required as “2”.

- Tier 2 Table 17.4-1, *Risk-Significant SSCs within the Scope of D-RAP (Sheet 1 of 8)*, a change is proposed to revise the System: Containment System (CNS) entry for SSC Hydrogen Igniters to "(VLS-EH-1 through 66)" to reflect the addition of Igniters 65 and 66.

Note: Figures identified as Sensitive Unclassified Non-Safeguards Information (SUNSI) contain security-related information and are withheld from public disclosure in accordance with 10 CFR 2.390(d).

Hydrogen Igniter Control Related Changes:

- COL Appendix C and corresponding Plant-specific Tier 1 Table 2.5.2-5, *Minimum Inventory of Displays, Alerts, and Fixed Position Controls in the MCR*, a change is proposed to eliminate the Containment Hydrogen Igniters as a function controlled by the Protection and Safety Monitoring System as this function does not interface with the PMS because the Hydrogen Igniters are not safety-related.

- COL Appendix C and corresponding Plant-specific Tier 1 Table 2.5.4-1, *Minimum Inventory of Controls, Displays, and Alert at the RSW*, a change is proposed to add clarifying note (2) to the Manual Containment Hydrogen Igniter (Nonsafety-related) Description entry that further defines the hydrogen igniter control as soft control.

- Tier 2 Table 18.12.2-1, *Minimum Inventory of Fixed Position Controls, Displays, and Alerts*, a change is proposed to add a clarifying note that relates the Manual Hydrogen Igniter control at the remote shutdown workstation is provided as soft control.

Plant-Specific Consistency Related Changes:

- COL Appendix C and corresponding Plant-specific Tier 1 Table 2.3.9-2 a change is proposed to revise the location of Igniter 30 from Location and Room No. "Lower Containment area (CMT and valve area) 11400" to "Loop compartment 01 11401" as a change to be consistent with Tier 2 Figure 6.2.4-9, *Hydrogen Igniter Locations Plan View Elevation 118'-6"*.

- COL Appendix C and corresponding Plant-specific Tier 1 Table 2.3.9-3, *Inspections, Tests, Analyses, and Acceptance Criteria*, a change is proposed to revise in item 3.ii) to maintain consistency within the UFSAR by specifying the minimum surface temperature of the igniters "meets or" exceeds 1700°F.

- Tier 2 Subsection 6.2.4.2.3, *Hydrogen Ignition Subsystem*, sixth paragraph a change is proposed to revise the discussion of the minimum surface temperature to reflect that it will reach a minimum surface temperature of 1700°F to maintain consistency in the UFSAR.

- Tier 2 Subsection 6.2.4.5.2, *In-service Testing, Hydrogen Ignition Subsystem*, a change is proposed to revise the surface temperature of the igniters to a meets or exceeds temperature to maintain consistency within the UFSAR.

- Tier 2 Table 6.2.4-3, *Component Data - Hydrogen Igniter (Nominal)*, a change is proposed to revise the surface temperature for the hydrogen igniters to ≥1700, to maintain consistency in the UFSAR.

- Tier 2 Subsection 14.2.9.1.11, *Containment Hydrogen Control System Testing*, at item c) of General Test Acceptance Criteria and Methods, a change is proposed to revise the last sentence to note the igniter surface temperature "meets or" exceeds the temperature of subsection 6.2.4 to maintain consistency in the UFSAR.

- Tier 2 Table 14.3-8, *Severe Accident Analysis*, a change is proposed to revise the Section 6.2.4-3 value to ≥1700 to maintain consistency in the UFSAR.

- Tier 2 TRM TRS 3.6.2.1, *Technical Requirement Surveillance*, a change is proposed to revise the surface temperature for the igniters to be ≥1700°F to maintain consistency in the UFSAR.

- Tier 2 TRM Subsection 3.6.2, *Bases*, third paragraph, third sentence, a change is proposed to revise the surface temperature for the igniters to be ≥1700°F to maintain consistency in the UFSAR.

Table 2-1 Licensing Basis Changes

	Description of Proposed Change	Plant Specific Licensing Basis Change	
		UFSAR Tier 2	**COL Appendix C (and Tier 1)**
1	Addition of two hydrogen igniters	• Subsection 6.2.4.2.3 • Subsection 6.2.4.5.1 • Table 6.2.4-3 • Table 6.2.4-6 • Table 6.2.4-7 • Figure 6.2.4-10 (SUNSI) • Table 14.3-6 (sheet 3 of 10) • Table 14.3-8 • Table 17.4-1 • TRM Table TR 3.6.2-1	• Tier 1 Table 2.2.3-6 • Tier 1 Table 2.3.9-2 • Tier 1 Table 2.3.9-3 • Tier 1 Table 3.7-1
2	Hydrogen Igniter Control Changes		
	a. Removal of PMS control of containment hydrogen igniters		Tier 1 Table 2.5.2-5
	b. RSW hydrogen igniter controls are changed to soft controls.	Table 18.12.2-1	Tier 1 Table 2.5.4-1
3	Consistency Tier 1 changes		
	a. Igniter 30 from Location and Room No.		Tier 1 Table 2.3.9-2
	b. Minimum surface temperature of the igniters “meets or” exceeds 1700°F	• Subsection 6.2.4.2.3 • Subsection 6.2.4.5.2 • Table 6.2.4-3 • Subsection 14.2.9.1.11 • Table 14.3-8 • TRS 3.6.2.1 • TRM Subsection 3.6.2 Bases	Tier 1 Table 2.3.9-3

3. TECHNICAL EVALUATION

The IRWST roof vents along the steam generator doghouse wall is a likely area, based on engineering judgment, where hydrogen will be released. While there are igniters located inside the IRWST (Igniters 9 and 10) and at the hooded vents along the containment wall (Igniters 35, 36, 37, and 38), the roof vents do not have igniters located directly at their exit exterior to the IRWST. The closest igniters that would be effective are approximately 30 feet above the vent exits. The IRWST vents have a design strategy to mitigate the potential for diffusion flames burning at the hooded vents located near the containment shell or at the overflow weir to the refueling canal. Roof vents are provided along the steam generator doghouse wall as the primary exit path for hydrogen escaping the IRWST. The roof vents have covers that open at a low differential pressure (1380 Pa) and remain open after the pressure has been relieved. The hooded vents and the weirs have louvers that open at a differential pressure that is twice the opening pressure of the roof vents (2760 Pa) and close again once the pressure has been relieved. The hydrogen releases are low pressure releases from the spargers because the ADS valves must be open for the hydrogen to be directed through the IRWST. Therefore, the hydrogen will be preferentially released from the roof vents located away from the containment shell.

The closest igniters to the IRWST roof vents are located approximately 30 feet above the IRWST (Igniters 39 and 48). These igniters are intended to control hydrogen in the lower compartment of containment. They are mounted on the steam generator doghouse wall. The IRWST roof vents are located at an approximate elevation of 137 feet. Igniters 39 and 48 are at approximate elevation of 166 feet. There are four igniters (Igniters 35, 36, 37, and 38) located at the IRWST hooded vents located along the containment wall, two igniters (Igniters 15 and 16) located at the inlet vents of the IRWST and two igniters located inside of the IRWST on the roof (Igniters 9 and 10).

Because the roof vents are located where, based on engineering judgment, hydrogen may be preferentially released from the IRWST during a postulated scenario wherein the steam and hydrogen discharge from the ADS spargers to the IRWST creates an oxygen-depleted environment within the IRWST. Adding two igniters exterior to the IRWST at the IRWST vents is consistent with the igniter placement criteria in UFSAR Table 6.2.4-6, *Igniter Location*, Sheet 1 of 3 (that they be located as close to the exit of the IRWST vents as feasible) and will provide an improvement in igniter coverage for this area. While there are igniters located at the hooded vents along the containment wall, these vents rarely, if ever, open for hydrogen releases. Additionally, these vents will reclose if the pressure drops below the opening pressure, whereas once the roof vents open they remain open. The igniters located on the interior roof of the IRWST may not be useful for burning hydrogen due to the postulated lack of oxygen inside the IRWST in a scenario as cited above.

The applicable plant damage state meets the core damage frequency cutoff to be considered as part of the severe accident analysis. As previously stated, placing igniters at this location would be consistent with the igniter placement criteria (UFSAR Table 6.2.4-6, sheet 1 of 3). These criteria are a part of the licensing basis for the hydrogen control design for the AP1000. One of these criteria states that igniters should be located as close as feasible to the source of hydrogen.

In locations where the potential hydrogen release location can be defined, i.e. above the IRWST spargers, at IRWST vents, etc igniter coverage is provided as close to the source as feasible.

While there are igniters inside the IRWST which are located near these vents, providing additional igniters, based on engineering judgment, near the vents on the exterior of the IRWST will provide an improvement in hydrogen control at this location. Therefore, to ensure consistency is maintained with the placement criteria of UFSAR Table 6.2.4-6, two igniters are proposed to be added outside the IRWST near the exit of these roof vents. The igniters should be placed as close as practical to be above the largest roof vents which are vents 1 and 4. This placement above these vents will allow any hydrogen potentially escaping the IRWST to be burned as it enters the containment atmosphere before it has a chance to become well mixed.

The addition of igniters is proposed because to move igniters from another location would then create vulnerability in the location where the igniters were moved from and potentially alter the existing hydrogen combustion analysis already done. The addition of two igniters will not negatively impact the existing hydrogen control analysis. This proposed change is an improvement to the existing igniter system and provides additional conservatism to a system which is already capable of meeting the design requirements for hydrogen control. All of the current 64 igniters were placed for a specific reason as detailed in the location rationale (UFSAR Table 6.2.4-6, sheets 2 and 3). The proposed changes to add two hydrogen igniters in the identified locations are consistent with the criteria in Table 6.2.4-6 and therefore do not alter the design function of the igniters, have no effect on any analysis or analysis method, and do not affect the performance or controls of hydrogen control functions. The PRA insights that have informed Section 16.3, *Investment Protection*, are not affected by this addition of the two additional igniters.

COL Appendix C and associated Plant-specific Tier 1 Table 2.5.2-5, *Minimum Inventory of Displays, Alerts, and Fixed Position Controls in the MCR*, lists the hydrogen igniters as having Protection and Safety Monitoring System (PMS) provided fixed position control in the control room. PMS does not provide manual or automatic control for the hydrogen igniters because they are not safety-related. The Plant Control System (PLS) provides manual component soft level controls for the hydrogen igniters at workstation in the Main Control Room (MCR) and the Remote Shutdown Room. As stated in UFSAR Section 7.1.3.3, *Operator Controls and Indication*, the plant control operator interface is a set of soft control devices that replace conventional switch/light or potentiometer/meter assemblies used for operator interface with control systems. These soft control devices provide consistent operator interfaces for the plant control system. The soft controls are located on each operator workstation and the remote shutdown workstation. Each soft control device can control safety-related and nonsafety-related equipment. The Diverse Actuation System provides manual system level switches for the containment hydrogen igniter control at a dedicated panel in the MCR. The proposed change to Table 2.5.2-5 will remove the Containment Hydrogen Igniter entry from the table.

The data display and processing system (DDS) states in COL Appendix C and associated Plant-specific Tier 1 Section 2.5.4, *Design Description*, that the DDS, in conjunction with the operator workstations, provides the minimum inventory of displays, visual alerts, and fixed position controls at the remote shutdown workstation (RSW) as identified in COL Appendix

C and associated Plant-specific Tier 1 Table 2.5.4-1, *Minimum Inventory of Controls, Displays, and Alerts at the RSW*. The Table lists the Manual Containment Hydrogen Igniter (Nonsafety-related) with controls at the RSW. The same hydrogen igniter information is also reflected in Tier 2 Table 18.12.2-1, *Minimum Inventory of Fixed Position Controls, Displays, and Alerts*. As stated previously, the available controls for the Hydrogen Igniters at the RSW are soft controls, versus fixed position controls. The Hydrogen Igniter entry into COL Appendix C and associated Plant-specific Tier 1 Table 2.5.4-1 and Tier 2 Table 18.12.2-1 could be interpreted to imply that fixed position controls are available at the RSW for the Hydrogen Igniters and the proposed change clarifies the controls by notes made to the COL Appendix C and associated Plant-specific Tier 1 and Tier 2 Tables.

The proposed consistency changes to the location of the Igniter 30 on COL Appendix C and associated Plant-specific Tier 1 Table 2.3.9-2 are included to provide a complete and accurate description of Igniter 30 that is consistent with Tier 2 Figures 6.2.4-6 through 6.2.4-13. The location room for hydrogen igniter VLS-EH-30 (Igniter 30) cited in COL Appendix C and associated Plant-specific Tier 1 Table 2.3.9-2 is not consistent with the location shown to UFSAR Figure 6.2.4-9, *Hydrogen Igniter Locations Plan View Elevation 118'-6"*. The location of the igniter is in Room 11401, Loop compartment 01 (Steam Generator RCS-MB-01 compartment). The location in COL Appendix C and associated Plant-specific Tier 1 Table 2.3.9-1 (and corresponding COL Appendix C Table 2.3.9-1) will be changed to be consistent with Tier 2 Figure 6.2.4-9.

The proposed consistency changes in relation to the minimum surface temperature for the hydrogen igniters are included to provide consistency with the UFSAR and with engineered component specifications. The minimum surface temperature of the hydrogen igniters is given as “exceeds 1700°F” in COL Appendix C and associated Plant-specific Tier 1 Table 2.3.9-3, *Inspections, Tests, Analyses, and Acceptance Criteria*. Several other citations of the minimum surface temperature note this as a minimum of 1600°F or a range between 1600°F to 1700°F. The minimum temperature is not an absolute temperature within a range, but rather a minimum temperature with no upper bound. The minimum surface temperature for the igniters installed within the AP1000 is 1700°F which can be met or exceeded. COL Appendix C and associated Plant-specific Tier 1 Table 2.3.9-3, Tier 2 Section 6.2.4.3, Section 6.2.4.5.2, Section 14.2.9.1.11 and the Technical Requirements Manual (TRM) Section 3.6.2 will be revised to reflect that the minimum temperature is 1700°F.

The proposed changes to the Containment Hydrogen Ignition subsystem do not affect its function to effectively reduce hydrogen build-up following the beyond design basis accident as postulated in accordance with 10 CFR 50.44(c). The 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 affected. The igniters are proposed to be located sufficiently away from the containment wall such that the hydrogen burn's zone of influence would not present a challenge to the containment wall. 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 UFSAR. 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 Containment Hydrogen Ignition subsystem does not interface with/affect safety-related equipment or a fission product barrier. The subsystem is provided to address the production of hydrogen following a beyond design basis accident in accordance with 10CFR50.44(c). The hydrogen ignition subsystem is a non-Class 1E subsystem and does not interface with any safety related system; thus, no system or design function or equipment qualification is affected by the proposed changes. The changes do not result in a new failure mode, malfunction or sequence of events that could 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 Containment Hydrogen Ignition subsystem will continue to perform it's beyond design basis function as defined in the UFSAR. The hydrogen ignition subsystem does not affect safety-related equipment or equipment whose failure could initiate an accident. The changes do not involve safety-related equipment or a radioactive material barrier. The proposed changes do not affect any safety-related equipment, design code limit (allowable value), safety-related function or design analysis, nor do they adversely affect any safety analysis input or result, or design/safety margin.

Physical Security Evaluation

There is no change to any perimeter walls acting as a security barrier or other aspects of the structures that could affect physical security.

Summary

The proposed additions of containment hydrogen igniters affect various UFSAR text, tables, and figures. The UFSAR text, table and figure changes require corresponding changes to COL Appendix C and associated plant-specific Tier 1 Tables Table 2.2.3-6, Table 2.3.9-2,Table 2.3.9-3, and Table 3.7-1. The proposed change in control of the hydrogen igniters require changes in Tier 1 Table 2.5.2-5 and Table 2.5.4-1 and UFSAR Table 18.12.2-1. The location of Igniter 30 in COL Appendix C and associated Plant-specific Tier 1 Table 2.3.9-2 is proposed to be revised to be consistent with Tier 2 Figure 6.2.4-9. The proposed clarification of the minimum surface temperature of the containment hydrogen igniters affected various UFSAR text and tables. The UFSAR text and table changes require corresponding changes to COL Appendix C and associated plant-specific Tier 1 Table 2.3.9-3. This license amendment request describes and evaluates the UFSAR Tier 2 changes and the plant-specific Tier 1 changes that are associated with those Tier 2 changes.

The 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 COL. This activity involves a change to COL

Appendix C, and a corresponding departure from plant-specific Tier 1 information, Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) information; therefore, this activity requires an amendment to the COL. Accordingly, NRC approval is required prior to making the plant-specific changes requested by this license amendment request.

10 CFR 52, Appendix D, Section VIII.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. This change involves revisions to plant-specific Tier 1 information (and corresponding COL Appendix C information), and thus requires NRC approval for the Tier 1, and associated Tier 2 departures.

10 CFR 50, Appendix A, Criterion 41—Containment atmosphere cleanup, requires systems to control fission products, hydrogen, oxygen, and other substances which may be released into the reactor containment to be provided as necessary to reduce, consistent with the functioning of other associated systems, the concentration and quality of fission products released to the environment following postulated accidents, and to control the concentration of hydrogen or oxygen and other substances in the containment atmosphere following postulated accidents to assure that containment integrity is maintained. The addition of hydrogen igniters is consistent with the hydrogen ignition subsystem design as certified and approved in the plant specific-DCD and presented in the COL, and assures compliance with this criterion.

10 CFR 50.34(f)(2)(ix) requires a system be provided for hydrogen control that can safely accommodate hydrogen generated by the equivalent of a 100% fuel-clad metal water reaction. The hydrogen control system and associated systems shall provide, with reasonable assurance, that: (A) Uniformly distributed hydrogen concentrations in the containment do not exceed 10% during and following an accident that releases an equivalent amount of hydrogen as would be generated from a 100% fuel clad metal-water reaction. (B) Combustible concentrations of hydrogen will not collect in areas where unintended combustion or detonation could cause loss of containment integrity or loss of appropriate mitigating features. (C) Equipment necessary for achieving and maintaining safe shutdown of the plant and maintaining containment integrity will perform its safety function during and after being exposed to the environmental conditions attendant with the release of hydrogen generated by the equivalent of a 100% fuel-clad metal water reaction including the environmental conditions created by activation of the hydrogen control system The addition of hydrogen igniters is consistent with the hydrogen ignition subsystem design as certified and approved in the plant specific-DCD and presented in the COL, and assures compliance with this requirement.

10 CFR 50.44(c) requires that all combined licenses under 10 CFR 52 must meet requirements to ensure a mixed containment atmosphere; provide means to limit hydrogen concentrations in containment during and following an accident that releases an equivalent amount of hydrogen as would be generated by 100 percent fuel clad-coolant reaction, uniformly distributed, to less than 10 percent by volume and maintain containment structural integrity and appropriate accident mitigating features; establish and ensure safe shutdown and containment integrity with systems and components

capable of performing their functions during and after exposure to environmental conditions by burning of hydrogen; provide equipment for monitoring hydrogen in containment; and must perform an analysis to demonstrate containment structural integrity that addresses an accident that releases hydrogen generated from 100 percent fuel-cladding reaction accompanied by hydrogen burning. The addition of hydrogen igniters is consistent with the hydrogen ignition subsystem design as certified and approved in the plant specific-DCD and presented in the COL, and assures compliance with this requirement.

4.2 Precedent

No precedent is identified.

4.3 Significant Hazards Consideration Determination

The proposed changes will revise the Updated Final Safety Analysis Report (UFSAR) including the Technical Requirements Manual (TRM) and Combined Licenses (COLs) to modify the design of the Containment Hydrogen Ignition subsystem by adding two additional igniters above the In-Containment Refueling Water Storage Tank (IRWST) roof vents. Proposed changes are also made to remove controls for the containment hydrogen igniters from the Protection and Safety Monitoring System (PMS) and clarify the controls available for the containment hydrogen igniters at the Remote Shutdown Workstation. Also, proposed are to make changes to the design aspects of the hydrogen igniters to maintain consistency within the UFSAR.

An evaluation to determine whether or not a significant hazards consideration is involved with the requested 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 addition of hydrogen igniters and clarifying changes to the hydrogen ignition subsystem does not affect any safety-related equipment or function. The hydrogen ignition subsystem is designed to mitigate beyond design basis hydrogen generation in the containment. The hydrogen ignition subsystem changes do not involve any accident, initiating event or component failure; thus, the probabilities of the accidents previously evaluated are not affected. The modified system will maintain its designed and analyzed beyond design basis function to maintain containment integrity. The maximum allowable leakage rate specified in the Technical Specifications is unchanged, and radiological material release source terms are not affected; thus, the radiological releases in the accident analyses are not affected.

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 addition of hydrogen igniters and clarifying changes to the hydrogen ignition subsystem will maintain the beyond design basis function of the hydrogen ignition subsystem. The hydrogen igniter subsystem changes do not impact its function to maintain containment integrity during beyond design basis accident conditions, and, thus does not introduce any new failure mode. The proposed changes do not create a new fault or sequence of events that could result in a radioactive release. The proposed changes would not affect any safety-related accident mitigating function.

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

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

Response: No

The proposed addition of hydrogen igniters and clarifying changes to the hydrogen ignition subsystem will maintain the beyond design basis function of the hydrogen ignition subsystem. The proposed changes do not have any effect on the ability of safety-related structures, systems, or components to perform their design basis functions. The proposed changes do not affect the ability of the hydrogen igniter subsystem to maintain containment integrity following a beyond design basis accident. The hydrogen igniter subsystem continues to meets the requirements for which it was designed, and continues to meet the regulations.

No safety analysis or design basis acceptance limit/criterion is challenged or exceeded by the proposed changes, thus no margin of safety is 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 proposed changes would revise the Combined Licenses (COLs) by revising the design of the containment hydrogen ignition subsystem by adding two additional igniters above the In-Containment Refueling Water Storage Tank (IRWST) roof vents. Proposed changes are also made to remove controls for the containment hydrogen igniters from the Protection and Safety Monitoring System (PMS) and clarify the controls available for the containment hydrogen igniters at the Remote Shutdown Workstation. Also, proposed are to make changes to the design aspects of the hydrogen igniters to maintain consistency within the Updated Final Safety Analysis Report (UFSAR).

The requested amendment involves changes to UFSAR information, which involve changes to COL Appendix C information. This enclosure requests approval of the license amendment necessary to implement the COL Appendix C changes, and their associated UFSAR Tier 2 changes.

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 changes in the requested amendment changes are to improve performance of the hydrogen ignition subsystem in maintaining containment integrity following a beyond design basis accident. 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 changes modify the hydrogen ignition subsystem within the containment. Plant radiation zones (addressed in UFSAR Section 12.3) are not affected, and controls under 10 CFR Part 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 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 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

1. APP-GW-GL-022, AP1000 Probabilistic Risk Assessment, Revision 8.

South Carolina Electric & Gas Company

Virgil C. Summer Nuclear Station Units 2 and 3

NND-15-0195

Enclosure 2

Request for Exemption,
Containment Hydrogen Igniter Changes
(LAR 14-18)

(This enclosure contains 8 pages including this cover page)

1.0 Purpose

South Carolina Electric & Gas Company (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. Tier 1 includes ITAAC that must be satisfactorily performed prior to fuel load. The design details to be verified by these ITAAC are specified in the tables that are referenced in each individual ITAAC. The Tier 1 information for which a plant-specific departure and exemption is being requested includes system and non-system based design descriptions and other detailed information related to these design descriptions and the associated ITAAC, such as changes to the number and control of hydrogen igniters.

This request for exemption will apply the requirements of 10 CFR 52, Appendix D, Section VIII.A.4 to allow changes to Tier 1 information due to the following proposed changes to the system and non-system based design descriptions and ITAAC tables:

- Table 2.2.3-6 revise the tag number column entry for the Hydrogen Igniters to “VLS-EH-01 through 66” to reflect the addition of Igniters 65 and 66.

- Table 2.3.9-2 Hydrogen Igniter information revise as follows:

    - Include Hydrogen Igniters VLS-EH-65 and -66 with information consistent with the original Hydrogen Igniters.

    - Change location of Igniter 30 from Location and Room No. “Lower Containment area (CMT and valve area) 11400” to “Loop compartment 01 11401”.

- Table 2.3.9-3, *Inspections, Tests, Analyses, and Acceptance Criteria*, revise item 3.i) to reflect the change in number of hydrogen igniters to “66”, and in item 3.ii) a change to maintain consistency within the UFSAR by specifying the minimum surface temperature of the igniters “meets or” exceeds 1700°F.

- Table 2.5.2-5, *Minimum Inventory of Displays, Alerts, and Fixed Position Controls in the MCR*, revise to eliminate the hydrogen igniters as a function controlled by the Protection and Safety Monitoring System.

- Table 2.5.4-1, *Minimum Inventory of Controls, Displays, and Alerts at the RSW*, revise to add clarifying note (2) to the Manual Containment Hydrogen Igniter (nonsafety-related) description entry that further defines the hydrogen igniter control as soft control.

- Table 3.7-1, *Risk-Significant Components*, revise to change the tag number column entry for the Hydrogen Igniters to “VLS-EH-01 through 66”.

This request will apply the requirements for granting exemptions from design certification information, as specified in 10 CFR Part 52, Appendix D, Section VIII.A.4, 10 CFR 52.63, §52.7, and §50.12.

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. Hydrogen igniters are added to the In-Containment Refueling Water Storage Tank (IRWST) roof vents exits because it has been determined that igniter coverage can be improved to burn any hydrogen that may potentially exit through the IRWST roof vents. Burning of hydrogen near the vents before it can be combined with the containment atmosphere will prevent potentially detonable mixture from being created. The control of the hydrogen igniters is also removed from the Protection and Safety Monitoring System because they are not safety-related. Also, the soft controls of the igniters are clarified in the Remote Shutdown Workstation. These activities request exemptions from the generic DCD Tier 1 descriptions, tables and figures that are involved with the plant-specific DCD Tier 2 departures, and which support the associated COL Appendix C ITAAC.

These activities request exemptions from elements of the AP1000 (Tier 1) design information to allow a departure from tables associated ITAAC for the hydrogen igniters. The proposed departure would increase the number of hydrogen igniters by two, and revise descriptive information in Tier 1 Table 2.2.3-6, Table 2.3.9-2, Table 2.3.9-3, and Table 3.7-1 to more accurately reflect the descriptions in UFSAR Tier 2 text and tables; and remove control of the igniters from the Protection and Safety Monitoring System in Tier 1 Table 2.5.2-5; and clarify the control of the igniters on the Remote Shutdown Workstation as soft controls in Tier 1 Table 2.5.4-1.

As discussed above, an exemption from elements of the AP1000 certified (Tier 1) design information is requested to allow plant-specific departures to be taken from system and non-system based design description and ITAAC Figures and Tables.

3.0 Technical Justification of Acceptability

An exemption is requested to depart from AP1000 generic Design Control Document (DCD) Tier 1 material by departing from the description of the containment hydrogen igniters in Tier 1 Table 2.2.3-6, Tier 1 Table 2.3.9-2, Tier 1 Table 2.3.9-3, *Inspections, Tests, Analyses, and Acceptance Criteria*, Tier 1 Table 2.5.2-5, *Minimum Inventory of Displays, Alerts, and Fixed Position Controls in the MCR*, Tier 1 Table 2.5.4-1, *Minimum Inventory of Controls, Displays, and Alerts at the RSW*, and Tier 1 Table 3.7-1, *Risk-Significant Components*. The proposed changes are necessary to improve hydrogen burn coverage and prevent potentially detonable mixture from being created. The proposed changes do not adversely impact the design function of the Containment Hydrogen Ignition subsystem to effectively reduce hydrogen build-up following the beyond design basis accident.

Therefore, the Containment Hydrogen Ignition subsystem will continue to meet its required functionality following implementation of the proposed changes.

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. Because the Licensee has identified changes to the Tier 1 information related to the containment hydrogen ignition subsystem as a result of design finalization activities, 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)(ii)]; 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 to change the number and control of the containment hydrogen igniters 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 changes to containment hydrogen ignition subsystem do not represent any adverse impact to their design functions or the systems, structures and components therein and will continue to protect the health and safety of the public in the same manner. The containment hydrogen ignition subsystem changes do not introduce any new industrial, chemical, or radiological hazards that would represent a public health or safety risk, nor do they modify or remove any design or operational controls or safeguards intended to mitigate any existing on-site hazards. Furthermore, the proposed changes would not allow for a new fission product release path, result in a new fission product barrier failure mode, or create a new sequence of events that would result in fuel cladding failures. Accordingly, these changes do 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 exemption from the requirements of 10 CFR 52, Appendix D, Section III.B would change elements of the containment hydrogen ignition subsystem as presented in the system and non-system based design descriptions and ITAAC figures and tables in the plant-specific DCD Tier 1, thereby departing from the AP1000 certified (Tier 1) design information. The proposed exemption will enable performance of the ITAAC associated with these changed elements, by reflecting the current design information in the text, tables, and figures that are referenced in these ITAAC. The exemption does not adversely impact the design, function, or operation of any plant SSCs associated with the facility's physical or cyber security, and therefore does not adversely affect any plant equipment that is necessary to maintain a safe and secure plant status. The proposed exemption has no adverse impact on plant security or safeguards.

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 allow changes to increase the number and change the control of the containment hydrogen igniters, and enhance the accuracy of details presented in Tier 1 ITAAC tables.

Hydrogen igniters are proposed to be added to the In-Containment Refueling Water Storage Tank (IRWST) roof vents exits because it has been determined that igniter coverage can be improved to burn any hydrogen that may potentially exit through the IRWST roof vents. Burning of hydrogen near the vents before it can be combined with the containment atmosphere will prevent potentially detonable mixture from being created. The control of the hydrogen igniters is also proposed to be removed from the Protection and Safety Monitoring System and soft controls are proposed to be clarified in the Remote Shutdown Workstation. The editorial changes to the Tier 1 ITAAC tables are proposed to more accurately describe the igniters' location and minimum operating temperature. These changes have been evaluated and confirmed to support the conclusions of the hydrogen control analysis.

The proposed changes described above maintain the design functions of the hydrogen ignition subsystems. This change does not impact the ability of any SSCs to perform their functions or negatively impact safety. Accordingly, this change to the certified information will enable the licensee to safely construct, maintain, and operate the AP1000 facility consistent with the design certified by the NRC in 10 CFR Part 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

The exemption from the requirements of 10 CFR 52, Appendix D, Section III.B would change elements of the plant-specific DCD Tier 1 by departing from standard AP1000 certified (Tier 1) design information. This exemption would allow a change to the system and non-system based ITAAC tables. Based on the nature of the proposed changes to the generic Tier 1 information and the understanding that these changes were identified during the design finalization process for the AP1000, it is expected that this exemption will be requested by other AP1000 licensees and applicants. However, 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 hydrogen ignition subsystem 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 proposed exemption would allow changes to increase the number and change the control of the containment hydrogen igniters, and enhance the accuracy of details presented in Tier 1 ITAAC tables. The proposed changes do not have any effect on the ability of safety-related structures, systems, or components to perform their design basis functions. The proposed changes do not affect the ability of the hydrogen igniter subsystem to maintain containment integrity following a beyond design basis accident.

As a result of the limited-scope and nature of the proposed changes associated with this exemption request, no systems or equipment will be adversely impacted such that there are new failure modes introduced by these changes and the level of safety provided by the current hydrogen ignition subsystems and equipment contained therein will be maintained.

Because the proposed changes to the containment hydrogen igniters will not adversely affect the ability of this subsystem to perform its design functions and the level of safety provided by the current subsystems and equipment contained therein is unchanged, it is concluded that the design change associated with the proposed exemption will not result in a significant decrease 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 identified.

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 Licensee requests a permanent exemption for elements of AP1000 design certification information reflected in Tier 1. The proposed changes to Tier 1 are necessary to revise ITAAC tables in the plant-specific DCD Tier 1 to reflect proposed plant-specific design. The proposed exemption would allow departure from AP1000 generic Tier 1 DCD information by adding two additional igniters to the In-Containment Refueling Water Storage Tank (IRWST) roof vents, removal of control of the hydrogen igniters from the Protection and Safety Monitoring System, clarification of the controls available for the hydrogen igniters at the Remote Shutdown Workstation, and enhancing the accuracy of details presented in a Tier 1 ITAAC table. 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 & Gas Company

Virgil C. Summer Nuclear Station Units 2 and 3

NND-15-0195

Enclosure 3

Proposed Changes to the Licensing Basis Documents (Publicly Available Information)

(LAR 14-18)

(This enclosure contains 19 pages including this cover page)

Tier 1 (and COL Appendix C) Table 2.2.3-6

Revise VCSNS Tier 1, pg 2.2.3-29, VCSNS Unit 2 COL, Appendix C, pg C-142 and VCSNS Unit 3 COL, Appendix C, pg C-142 information by changing the number of hydrogen igniters, as shown below:

Table 2.2.3-6		
Equipment	**Tag No.**	**Function**
Hot Leg Sample Isolation Valves	PSS-PL-V001A/B	Transfer open
Liquid Sample Line Containment Isolation Valves IRC	PSS-PL-V010A/B	Transfer open
Containment Pressure Sensors	PCS-012, 013, 014	Sense pressure
RCS Wide Range Pressure Sensors	RCS-191A, B, C, D	Sense pressure
SG1 Wide Range Level Sensors	SGS-011, 012, 015, 016	Sense level
SG2 Wide Range Level Sensors	SGS-013, 014, 017, 018	Sense level
Hydrogen Monitors	VLS-001, 002, 003	Sense concentration
Hydrogen Igniters	VLS-EH-01 through ~~64~~66	Ignite hydrogen
Containment Electrical Penetrations	P01, P02, P03, P06, P07, P09, P10, P11, P12, P13, P14, P15, P16, P17, P18, P19, P20, P21, P22, P23, P24, P25, P26, P27, P28, P29, P30, P31, P32	Maintain containment boundary

Tier 1 (and COL Appendix C) Table 2.3.9-2

Revise VCSNS Tier 1, pg 2.3.9-4 & 5, VCSNS Unit 2 COL, Appendix C, pg C-246 & C-247 and VCSNS Unit 3 COL, Appendix C, pg C-246 & C-247 information by changing the room description and number for Hydrogen Igniter 30 and adding the IRWST Roof Vent Igniters, as shown below:

Table 2.3.9-2 (cont.)

Equipment Name	Tag Number	Function	Power Group Number	Location	Room No.
Hydrogen Igniter 25	VLS-EH-25	Energize	2	Lower compartment area (CMT and valve area)	11400
Hydrogen Igniter 26	VLS-EH-26	Energize	2	Lower compartment area (CMT and valve area)	11400
Hydrogen Igniter 27	VLS-EH-27	Energize	1	Lower compartment area (CMT and valve area)	11400
Hydrogen Igniter 28	VLS-EH-28	Energize	1	Lower compartment area (CMT and valve area)	11400
Hydrogen Igniter 29	VLS-EH-29	Energize	1	Lower compartment area (CMT and valve area)	11400
Hydrogen Igniter 30	VLS-EH-30	Energize	2	~~Lower~~Loop compartment 01~~area (CMT and valve area)~~	1140~~0~~1
Hydrogen Igniter 31	VLS-EH-31	Energize	1	Lower compartment area (CMT and valve area)	11400
Hydrogen Igniter 32	VLS-EH-32	Energize	1	Lower compartment area (CMT and valve area)	11400
Hydrogen Igniter 33	VLS-EH-33	Energize	2	North CVS equipment room	11209
Hydrogen Igniter 34	VLS-EH-34	Energize	1	North CVS equipment room	11209
Hydrogen Igniter 35	VLS-EH-35	Energize	1	IRWST	11305
Hydrogen Igniter 36	VLS-EH-36	Energize	2	IRWST	11305
Hydrogen Igniter 37	VLS-EH-37	Energize	1	IRWST	11305
Hydrogen Igniter 38	VLS-EH-38	Energize	2	IRWST	11305
Hydrogen Igniter 39	VLS-EH-39	Energize	1	Upper compartment lower region	11500
Hydrogen Igniter 40	VLS-EH-40	Energize	2	Upper compartment lower region	11500
Hydrogen Igniter 41	VLS-EH-41	Energize	2	Upper compartment lower region	11500
Hydrogen Igniter 42	VLS-EH-42	Energize	1	Upper compartment lower region	11500

Table 2.3.9-2 (cont.)

Equipment Name	Tag Number	Function	Power Group Number	Location	Room No.
Hydrogen Igniter 43	VLS-EH-43	Energize	1	Upper compartment lower region	11500
Hydrogen Igniter 44	VLS-EH-44	Energize	1	Upper compartment lower region	11500
Hydrogen Igniter 45	VLS-EH-45	Energize	2	Upper compartment lower region	11500
Hydrogen Igniter 46	VLS-EH-46	Energize	2	Upper compartment lower region	11500
Hydrogen Igniter 47	VLS-EH-47	Energize	1	Upper compartment lower region	11500
Hydrogen Igniter 48	VLS-EH-48	Energize	2	Upper compartment lower region	11500
Hydrogen Igniter 49	VLS-EH-49	Energize	1	Pressurizer compartment	11503
Hydrogen Igniter 50	VLS-EH-50	Energize	2	Pressurizer compartment	11503
Hydrogen Igniter 51	VLS-EH-51	Energize	1	Upper compartment mid-region	11500
Hydrogen Igniter 52	VLS-EH-52	Energize	2	Upper compartment mid-region	11500
Hydrogen Igniter 53	VLS-EH-53	Energize	2	Upper compartment mid-region	11500
Hydrogen Igniter 54	VLS-EH-54	Energize	1	Upper compartment mid-region	11500
Hydrogen Igniter 55	VLS-EH-55	Energize	1	Refueling cavity	11504
Hydrogen Igniter 56	VLS-EH-56	Energize	2	Refueling cavity	11504
Hydrogen Igniter 57	VLS-EH-57	Energize	2	Refueling cavity	11504
Hydrogen Igniter 58	VLS-EH-58	Energize	1	Refueling cavity	11504
Hydrogen Igniter 59	VLS-EH-59	Energize	2	Pressurizer compartment	11503
Hydrogen Igniter 60	VLS-EH-60	Energize	1	Pressurizer compartment	11503
Hydrogen Igniter 61	VLS-EH-61	Energize	1	Upper compartment-upper region	11500
Hydrogen Igniter 62	VLS-EH-62	Energize	2	Upper compartment-upper region	11500
Hydrogen Igniter 63	VLS-EH-63	Energize	1	Upper compartment-upper region	11500
Hydrogen Igniter 64	VLS-EH-64	Energize	2	Upper compartment-upper region	11500
Hydrogen Igniter 65	VLS-EH-65	Energize	1	IRWST roof vents	11500
Hydrogen Igniter 66	VLS-EH-66	Energize	2	IRWST roof vents	11500

Tier 1 (and COL Appendix C) Table 2.3.9-3, *Inspections, Tests, Analyses, and Acceptance Criteria*

Revise VCSNS Tier 1, pg 2.3.9-6, VCSNS Unit 2 COL, Appendix C, pg C-247 & C-248 and VCSNS Unit 3 COL, Appendix C, pg C-247 & C-248 information by changing the number of hydrogen igniters and revising the minimum surface temperature, as shown below:

Table 2.3.9-3
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The functional arrangement of the VLS is as described in the Design Description of this Section 2.3.9.	Inspection of the as-built system will be performed.	The as-built VLS conforms with the functional arrangement as described in the Design Description of this Section 2.3.9.
2.a) The hydrogen monitors identified in Table 2.3.9-1 are powered by the non-Class 1E dc and UPS system.	Testing will be performed by providing a simulated test signal in each power group of the non-Class 1E dc and UPS system.	A simulated test signal exists at the hydrogen monitors identified in Table 2.3.9-1 when the non-Class 1E dc and UPS system is provided the test signal.
2.b) The components identified in Table 2.3.9-2 are powered from their respective non-Class 1E power group.	Testing will be performed by providing a simulated test signal in each non-Class 1E power group.	A simulated test signal exists at the equipment identified in Table 2.3.9-2 when the assigned non-Class 1E power group is provided the test signal.
3. The VLS provides the nonsafety-related function to control the containment hydrogen concentration for beyond design basis accidents.	i) Inspection for the number of igniters will be performed. ii) Operability testing will be performed on the igniters. iii) An inspection of the as-built containment internal structures will be performed.	i) At least ~~64~~66 hydrogen igniters are provided inside containment at the locations specified in Table 2.3.9-2. ii) The surface temperature of the igniter meets or exceeds 1700°F. iii) The minimum distance between the primary openings through the ceilings of the passive core cooling system valve/accumulator rooms (11206, 11207) and the containment shell is at least 19 feet. Primary openings are those that constitute 98% of the opening area. Other openings through the ceilings of these rooms must be at least 3 feet from the containment shell.

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Tier 1 (and COL Appendix C) Table 2.5.2-5, *Minimum Inventory of Displays, Alerts, and Fixed Position Controls in the MCR*

Revise VCSNS Tier 1, pg 2.5.2-9, VCSNS Unit 2 COL, Appendix C, pg C-295 and VCSNS Unit 3 COL, Appendix C, pg C-295 information by removing Manual Hydrogen Igniter control from the PMS functions, as shown below:

Table 2.5.2-5 (cont.)
Minimum Inventory of Displays, Alerts, and Fixed Position Controls in the MCR

Description	Control	Display	Alert(1)
Passive Containment Cooling System (PCS) Storage Tank Water Level	-	Yes	No

****

Manual PRHR Actuation	Yes	-	-
Manual Containment Cooling Actuation	Yes	-	-
Manual IRWST Injection Actuation	Yes	-	-
Manual Containment Recirculation Actuation	Yes	-	-
Manual Containment Isolation	Yes	-	-
Manual Main Steam Line Isolation	Yes	-	-
Manual Feedwater Isolation	Yes	-	-
~~Manual Containment Hydrogen Igniter (Nonsafety-related)~~	~~Yes~~	~~-~~	~~-~~
Manual Containment Vacuum Relief	Yes		

Note: Dash (-) indicates not applicable.

2. These instruments are not required after 24 hours.

Tier 1 (and COL Appendix C) Table 2.5.4-1, *Minimum Inventory of Controls, Displays, and Alerts at the RSW*

Revise VCSNS Tier 1, pg 2.5.4-3, VCSNS Unit 2 COL, Appendix C, pg C-310 and VCSNS Unit 3 COL, Appendix C, pg C-310 information by adding note 2 to indicate the manual hydrogen igniter controls are soft controls, as shown below:

Table 2.5.4-1 (cont.)
Minimum Inventory of Controls, Displays, and Alerts at the RSW

Description	Control	Display	Alert(1)
PRHR Outlet Temperature	-	Yes	Yes

****

Manual ADS Stage 4 Actuation	Yes	-	-
Manual PRHR Actuation	Yes	-	-
Manual Containment Cooling Actuation	Yes	-	-
Manual IRWST Injection Actuation	Yes	-	-
Manual Containment Recirculation Actuation	Yes	-	-
Manual Containment Isolation	Yes	-	-
Manual Main Steam Line Isolation	Yes	-	-
Manual Feedwater Isolation	Yes	-	-
Manual Containment Hydrogen Igniter (Nonsafety-related)(2)	Yes	-	-

Note: Dash (-) indicates not applicable.

1. These parameters are used to generate visual alerts that identify challenges to the critical safety functions. For the RSW, the visual alerts are embedded in the nonsafety-related displays as visual signals.

2. Containment hydrogen igniter control is provided as a "soft" control.

Tier 1 (and COL Appendix C) Table 3.7-1, *Risk-Significant Components*

Revise VCSNS Tier 1, pg 3.7-1, VCSNS Unit 2 COL, Appendix C, pg C-450 and VCSNS Unit 3 COL, Appendix C, pg C-450 information by changing the number of hydrogen igniters, as shown below:

Table 3.7-1
Risk-Significant Components

Equipment Name	Tag No.
Component Cooling Water System (CCS)	
Component Cooling Water Pumps	CCS-MP-01A/B
Containment System (CNS)	
Containment Vessel	CNS-MV-01
Hydrogen Igniters	VLS-EH-1 through -~~64~~66
Chemical and Volume Control System (CVS)	
Makeup Pumps	CVS-MP-01A/B
Makeup Pump Suction and Discharge Check Valves	CVS-PL-V113 CVS-PL-V160A/B
Letdown Discharge Isolation Valves	CVS-PL-V045 CVS-PL-V047
Diverse Actuation System (DAS)	
DAS Processor Cabinets and Control Panel (used to provide automatic and manual actuation)	DAS-JD-001 DAS-JD-002 DAS-JD-003 DAS-JD-004 OCS-JC-020

UFSAR Subsection 6.2.4.2.3, *Hydrogen Ignition Subsystem*

Revise Tier 2 information by changing the number of igniters in the second paragraph, first sentence, and revising the minimum surface temperature in the sixth paragraph, first sentence, as shown below:

****

The hydrogen ignition subsystem consists of ~~64~~66 hydrogen igniters strategically distributed throughout the containment. Since the igniters are incorporated in the design to address a low-probability severe accident, the hydrogen ignition system is not Class 1E. Although not class 1E, the igniter coverage, distribution and power supply has been designed to minimize the potential loss of igniter protection globally for containment and locally for individual compartments. The igniters have been divided into two power groups. Power to each group will be normally provided by offsite power, however should offsite power be unavailable, then each of the power groups is powered by one of the onsite nonessential diesels and finally should the diesels fail to provide power then approximately 4 hours of igniter operation is supported by the non-Class 1E batteries for each group. Assignment of igniters to each group is based on providing coverage for each compartment or area by at least one igniter from each group.

****

The igniter assembly is designed to ~~maintain the~~reach a minimum surface temperature ~~within a range of 1600° to~~of 1700°F in the anticipated containment environment following a loss of coolant accident. A spray shield is provided to protect the igniter from falling water drops (resulting from condensation of steam on the containment shell and on nearby equipment and structures). Design parameters for the igniters are provided in Table 6.2.4-3.

UFSAR Subsection 6.2.4.5.1, *Preoperational Inspection and Testing, Hydrogen Ignition Subsystem*,

Revise Tier 2 information by changing the number of igniters in the first paragraph, second sentence, as shown below:

Pre-operational testing and inspection is performed after installation of the hydrogen ignition system and prior to plant startup to verify operability of the hydrogen igniters. It is verified that ~~64~~66 igniter assemblies are installed at the locations defined by Figures 6.2.4-5 through 6.2.4-11. Operability of the igniters is confirmed by verification of the surface temperature in excess of the value specified in Table 6.2.4-3. This temperature is sufficient to ensure ignition of hydrogen concentrations above the flammability limit.

UFSAR Subsection 6.2.4.5.2, *In-service Testing, Hydrogen Ignition Subsystem*,

Revise Tier 2 information by changing the discussion of the minimum igniter surface temperature in the second sentence, as shown below:

Periodic inspection and testing are performed to confirm the continued operability of the hydrogen ignition system. Operability testing consists of energizing the igniters and confirming the surface temperature ~~exceeds the value~~as specified in Table 6.2.4-3.

UFSAR Table 6.2.4-3, *Component Data - Hydrogen Igniter (Nominal)*,

Revise Tier 2 information by changing the number of hydrogen igniters and the igniter surface temperature, as shown below:

Table 6.2.4-3
Component Data - Hydrogen Igniter
(Nominal)

Number	~~64~~66
Surface Temperature (°F)	~~1600 to~~ ≥1700

UFSAR Table 6.2.4-6, *Igniter Location*

Revise Tier 2 information by changing the number of vents fitted with hydrogen igniters in the IRWST location, as shown below:

Table 6.2.4-6 (Sheet 3 of 3)
Igniter Location

- **East Valve, Northeast Accumulator, and Northeast Valve Room –** Hydrogen releases within the east valve, northeast accumulator or valve rooms will rise with the mass and energy releases to near the ceiling and exit either through the enlarged vent area surrounding the discharge piping from the core makeup tank located at the 107′ 2″ elevation and through other piping penetration holes in the ceiling. The hydrogen control protection is provided by three igniters, one located near the ceiling of each of the adjoining rooms. The igniters are powered by different power groups and provide backup control for each other.
- **North CVS Equipment Room –** Hydrogen releases within the CVS equipment room will rise from the piping or equipment located on the CVS module to near the ceiling, pass over the outer barrier wall and flow up through the stairwell or ceiling grating. Hydrogen control is provided by two igniters located near the ceiling of the equipment room between the equipment module and the major relief paths from the compartment. The igniters are powered by different power groups.
- **IRWST –** Hydrogen releases into the IRWST are controlled by the distribution of igniters internal to the IRWST and within the vents from and into the IRWST. Two igniters on different power groups are located within the IRWST just below the tank roof of the IRWST and near the spargers. In the event of hydrogen releases via the spargers, the igniters near the release points will provide the most immediate point of recombination. Should the environment within the IRWST be inerted or otherwise not be ignited by the assemblies near the sparger, the hydrogen will be ignited as it exhausts from the IRWST at any of ~~four of~~ the vents fitted with igniter assemblies. Half~~Two~~ of the ~~four~~ igniters are powered by one power group and ~~two~~half by the second power group. Finally, in the event that the IRWST is hydrogen rich and air is drawn into the IRWST the mixture will become flammable. In order to provide this recombination, the two inlet vents on the other side of the IRWST from the sparger and primary exhaust vents are each fitted with an igniter.
- **Lower Compartment Area –** Hydrogen releases within the lower compartment will rise with the mass and energy releases to near the ceiling and exit either through the north stairwell or along the circumferential gap between the operating deck and the containment shell. The hydrogen control protection is provided by eleven igniters spread over the potential release areas and located either just above the mezzanine deck elevation or near the ceiling. This approach provides wide coverage over the entire compartment area at two separate elevations. The igniters are split between the two separate power groups.
- **Upper Compartment –** Hydrogen control is provided at three separate levels within the upper compartment. At the 162-166 foot elevations, 10 igniters are distributed over the area primarily above the major release flow paths including the loop compartments, refueling cavity, pressurizer compartment and above the stairwell from the lower compartment area. The igniters are split between the two power groups. At 233 foot elevation, an igniter is provided in each quadrant at the mid region of the upper compartment with two igniters on each of the two power groups. At the upper region elevation of 258 feet, four additional igniters are located to initiate recombination of hydrogen not ignited at either the source or along its flow path. The four igniters are split between the two power groups.

UFSAR Table 6.2.4-7, *Subcompartment/Area Igniter Coverage*

Revise Tier 2 information by adding the new IRWST Roof Vent hydrogen igniters, as shown below:

Table 6.2.4-7
Subcompartment/Area Igniter Coverage

	Igniter Coverage (Elevation)[1]	
Subcompartment	**Power Group 1**	**Power Group 2**
Reactor Cavity	1(El 91′) 3 (El 95′) 13, 5, 55 (El 120′) 58 (El 132′) 8, 12 (El 139′)	4 (El 95′) 2 (El 99′) 11, 7, 56 (El 120′) 57 (El 132′) 6, 14 (El 139′)
Loop Compartment 01	13 (El 120′) 12 (El 139′)	11 (El 120′) 14 (El 139′)

****

IRWST Interior	9 (El 133′)	10 (El 133′)
IRWST Inlet	16 (El 133′)	15 (El 133′)
IRWST Roof Vents	65 (El 137′)	66 (El 137′)
Refueling Cavity	55 (El 120′) 58 (El 132′)	56 (El 120′) 57 (El 132′)

****

UFSAR Subsection 14.2.9.1.11 *Containment Hydrogen Control System Testing*,

Revise Tier 2 information by changing the discussion of the minimum igniter surface temperature in item c) of General Test Acceptance Criteria and Methods, the last sentence, as shown below:

Manual actuation and operation of the hydrogen igniters confirm that the igniters are supplied by two power groups from two subsystems of the non-Class 1E dc and UPS system. Operability of the igniters is confirmed by verification that the igniter surface temperature meets or exceeds the temperature specified in Subsection 6.2.4.

UFSAR Table 14.3-6 (sheet 3 of 10), *Probabilistic Risk Assessment*,

Revise Tier 2 information by changing the number of hydrogen igniters in the Section 6.2.4.2.3 Reference Design Feature, as shown below:

Table 14.3-6 (Sheet 3 of 10)
Probabilistic Risk Assessment

Reference	Design Feature	Value
Section 5.4.7	The normal residual heat removal system (RNS) provides a safety-related means of performing the following functions: – Containment isolation for the RNS lines that penetrate the containment – Long-term, post-accident makeup water to the RCS	
Section 5.4.7.1.1	The RNS containment isolation and pressure boundary valves are safety-related. The motor-operated valves are powered by Class 1E dc power.	
Section 5.4.7.1.2.1	The component cooling water system (CCS) provides cooling to the RNS heat exchanger.	
Section 6.2.4	The containment hydrogen control system provides nonsafety-related hydrogen igniters for control of the containment hydrogen concentration for beyond design basis accidents.	
Section 6.2.4.2.3	At least ~~64~~66 hydrogen igniters are provided.	
Section 6.3.1.1.3	The automatic depressurization system provides a safety-related means of depressurizing the RCS.	
Section 6.3	The in-containment refueling water storage tank subsystem provides a safety-related means of performing the following functions: – Low-pressure safety injection – Core decay heat sink during design basis events – Flooding of the lower containment, the reactor cavity and the loop compartment by draining the IRWST into the containment. – Borated water	
Section 6.3.1	The core makeup tanks provide safety-related means of safety injection of borated water to the RCS.	
Section 6.3.1	Passive residual heat removal (PRHR) provides a safety-related means of removing core decay heat during design basis events.	
Section 6.3.2	The ADS valves are powered from Class 1E dc power.	

UFSAR Table 14.3-8, *Severe Accident Analysis*

Revise Tier 2 information by changing the number of hydrogen igniters in the Section 6.2.4.2.3 Reference Design Feature and the minimum surface temperature in the Table 6.2.4-3 Reference Design Feature, as shown below:

Table 14.3-8
Severe Accident Analysis

Reference	Design Feature	Value
Section 1.2	The discharge from the IRWST vents located in the roof of the IRWST next to the containment vessel are oriented away from the containment vessel.	
Section 5.3.1.2	There are no penetrations in the reactor vessel below the core.	
Section 5.3.5	The reflective reactor vessel insulation provides an engineered flow path to allow the ingression of water and venting of steam for externally cooling the vessel. – A flow path exists from the loop compartment to the reactor vessel cavity (ft^2). – A flow path area to vent steam exists between the vessel insulation and the reactor vessel (ft^2).	 ≥ 6 ≥ 12
Section 6.2.4.2.3	The hydrogen ignition subsystem consists of ~~64~~66 hydrogen igniters strategically distributed throughout the containment.	
Table 6.2.4-3	The minimum surface temperature of the hydrogen igniters (°F).	≥ ~~1,600~~1700
Section 6.3	The ADS provides a safety-related means of depressurizing the RCS.	
Section 6.3	The PXS provides a safety-related means of flooding the reactor cavity by draining the IRWST into the containment.	
Section 7.3.1.2.9	Signals to align the IRWST containment recirculation isolation valves are generated by manual initiation.	
Section 7.7.1.11	Initiation of containment recirculation is a diverse manual function.	

UFSAR Table 17.4-1, *Risk-Significant SSCs within the Scope of D-RAP (Sheet 1 of 8)*

Revise Tier 2 information by adding the new IRWST Roof Vent hydrogen igniters in the System: Containment System (CNS) entry for SSC Hydrogen Igniters, as shown below:

Table 17.4-1 (Sheet 1 of 8)
Risk-Significant SSCs Within the Scope of D-RAP

System, Structure, or Component (SSC)[1]	Rationale[2]	Insights and Assumptions
System: Component Cooling Water (CCS)		
Component Cooling Water Pumps (CCS-MP-01A/B)	EP	These pumps provide cooling of the normal residual heat removal system (RNS) and the spent fuel pool heat exchanger. Cooling the RNS heat exchanger is important to investment protection during shutdown reduced-inventory conditions. CCS valve realignment is not required for reduced-inventory conditions.
System: Containment System (CNS)		
Containment Vessel (CNS-MV-01)	EP, L2	The containment vessel provides a barrier to steam and radioactivity released to the atmosphere following accidents.
Hydrogen Igniters (VLS-EH-1 through -~~64~~66)	RAW/CCF, L2, Regulations	The hydrogen igniters provide a means to control H_2 concentration in the containment atmosphere, consistent with the hydrogen control requirements of 10 CFR 50.34f.
System: Chemical and Volume Control System (CVS)		
Makeup Pumps (CVS-MP-01A/B)	EP	These pumps provide makeup to the RCS to accommodate leaks and to provide negative reactivity for shutdowns, steam line breaks, and ATWS.
Makeup Pump Suction and Discharge Check Valves (CVS-PL-V113, -V160A/B)	EP	These CVS check valves are normally closed and have to open to allow makeup pump operation.
Letdown Isolation Valves (CVS-PL-V045, -V047)	RAW	The CVS letdown isolation valves automatically close to prevent excessive reactor coolant letdown and provide containment isolation. These containment isolation valves are important in limiting offsite releases following core melt accidents.
System: Diverse Actuation System (DAS)		
DAS Processor Cabinets and Control Panel (used to provide automatic and manual actuation) (DAS-JD-001, -002, -003, -004, OCS-JC-020)	RAW	The DAS is diverse from the PMS and provides automatic and manual actuation of selected plant features including control rod insertion, turbine trip, passive residual heat removal (PRHR) heat exchanger actuation, core makeup tank actuation, isolation of critical containment lines, and passive containment cooling system (PCS) actuation.
Annex Building UPS Distribution Panels (EDS1-EA-1, EDS1-EA-14, EDS2-EA-1, EDS2-EA-14)	RAW	These panels distribute power to the DAS equipment.

UFSAR Table 18.12.2-1, *Minimum Inventory of Fixed Position Controls, Displays, and Alerts*

Revise Tier 2 information by adding a note clarifying the remote shutdown workstation manual hydrogen igniter control is provided as soft control, as shown below:

Table 18.12.2-1 (Sheet 2 of 2)
Minimum Inventory of
Fixed Position Controls, Displays, and Alerts

Description	Control	Display	Alert[2]
Manual reactor trip (Also initiates turbine trip Figure 7.2-1, sheet 19.)	x		
Manual safeguards actuation	x		
Manual CMT actuation	x		
Manual main control room emergency habitability system actuation[4]	x		
Manual ADS actuation (1-3 and 4)	x		
Manual PRHR actuation	x		
Manual containment cooling actuation	x		
Manual IRWST injection actuation	x		
Manual containment recirculation actuation	x		
Manual containment isolation	x		
Manual main steam line isolation	x		
Manual feedwater isolation	x		
Manual containment hydrogen igniter (nonsafety-related)[5]	x		

Notes:

1. Although this parameter does not satisfy any of the selection criteria of Subsection 18.12.2, its importance to manual actuation of ADS justifies its placement on this list.
2. These parameters are used to generate visual alerts that identify challenges to the critical safety functions. For the main control room, the visual alerts are embedded in the safety-related displays as visual signals. For the remote shutdown workstation, the visual alerts are embedded in the nonsafety-related displays as visual signals.
3. These instruments are not required after 24 hours. (Subsection 7.5.4 includes more information on the class 1E valve position indication signals, specified as part of the post-accident monitoring instrumentation.)
4. This manual actuation capability is not needed at the remote shutdown workstation.
5. At the remote shutdown workstation, containment hydrogen igniter control is provided as a “soft” control.

TRM Table 3.6.2-1, *Technical Requirement Surveillance*

Revise Tier 2 information by changing the minimum igniter surface temperature, as shown below:

TECHNICAL REQUIREMENT SURVEILLANCE

SURVEILLANCE		FREQUENCY
TRS 3.6.2.1	Energize each required hydrogen ignitor and verify the surface temperature is ~~>~~≥ 1700°F.	Each refueling outage

TRM Table 3.6.2-1, *Hydrogen Ignitors*

Revise Tier 2 information by adding the IRWST Roof Vent Hydrogen Igniters and the number available, as shown below:

Table TR 3.6.2-1 (page 1 of 1)
Hydrogen Ignitors

	LOCATION	REQUIRED IGNITORS
1.	Loop Compartment 01	3
	****	
10.	IRWST Inlet	2
11.	IRWST Roof Vents	2
~~11.~~ 12.	Refueling Cavity	3
~~12.~~ 13.	Upper Compartment - Lower Region	9
~~13.~~ 14.	Upper Compartment - Mid Region	2
~~14.~~ 15.	Upper Compartment - Upper Region	2

NOTE:
(1) Ignitor 18 and either Ignitor 17 or Ignitor 19.

TRM Section 3.6.2, *Bases*

Revise Tier 2 information by changing the minimum igniter surface temperature in the third paragraph, third sentence, as shown below:

The ignitors are distributed in the containment to limit the buildup of hydrogen in local areas. Two groups of ignitors are provided in each area; one of which is sufficient to limit the buildup of hydrogen. When an ignitor is energized, the ignitor surface heats up to ~~>~~≥ 1700°F. This temperature is sufficient to ignite hydrogen in the vicinity of the ignitor when the lower flammability limit is reached. FSAR subsection 6.2.4 provides additional information.

The following UFSAR figure is Withheld from Public Disclosure (See Enclosure 4 for markups to this figure)

- **UFSAR Section 6.2.4, Tier 2 Figure 6.2.4-10, *Hydrogen Igniter Locations Plan View Elevation 135'-3"***