April Rice
Manager
New Nuclear Licensing

November 28, 2016
NND-16-0468
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 and 3
Combined License Nos. NPF-93 and NPF-94
Docket Nos. 52-027 & 52-028

Subject: VCSNS Units 2 & 3: Request for License Amendment and Exemption: ADS and IRWST Injection Block (LAR 16-15)

References: Vogtle Electric Generating Plant Units 3 and 4, Request for License Amendment and Exemption: ADS and IRWST Injection Block (LAR-16-018), dated October 14, 2016 (ND-16-1359)

In accordance with the provisions of 10 CFR 50.90, South Carolina Electric & Gas Company (SCE&G), acting on behalf of itself and the South Carolina Public Service Authority (Santee Cooper), requests an amendment to the Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 combined license (COL) numbers NPF-93 and NPF-94, respectively. The requested amendment proposes to depart from Tier 2* and associated Tier 2 information in the Updated Final Safety Analysis Report (UFSAR) (which includes the plant-specific Tier 2 information), and involves related changes to plant-specific Design Control Document (DCD) Tier 1 information, with corresponding changes to the associated COL Appendix C information. Additionally, this amendment request involves changes to the VCSNS Units 2 and 3 COL Appendix A, Technical Specifications (TS). Because the amendment request requires a departure from Tier 1 information, an exemption is requested from the requirements of the Generic AP1000 DCD Tier 1 pursuant to the provisions of 10 CFR 52.63(b) and 10 CFR 52.7.

The requested amendment proposes changes to provide additional design details related to the automatic depressurization system (ADS) actuation blocking device, which is used to reduce the potential for spurious actuations of the ADS valves. The blocking device is currently described in UFSAR subsection 7.3.1.2.4.1, “Block to Prevent ADS Spurious Actuation.” The additional design details for the blocking device describe how and where it interfaces with the protection and safety monitoring system (PMS). In addition, the requested amendment adds the blocking device to the in-containment refueling water storage tank (IRWST) injection valve actuation logic. The requested amendment and exemption are identical in content to Southern Nuclear Operating Company’s LAR, dated October 14, 2016 (Reference 1).

Enclosure 1 provides the description, technical evaluation, regulatory evaluation (including the Significant Hazards Consideration determination), and environmental considerations for the proposed changes. The information in Enclosure 1 may be made available for disclosure to the public.

Enclosure 2 provides the background and supporting basis for the requested exemption.

Enclosure 3 provides markups depicting the requested changes to the licensing basis documents requiring NRC staff approval. The information in Enclosure 3 may be made available for disclosure to the public.

Enclosures 1 and 3 provide the redacted versions of Enclosures 4 and 5, respectively. **These later Enclosures include information that is considered to be proprietary; therefore, Enclosures 4 and 5 are requested to be withheld from disclosure to the public under 10 CFR 2.390.**

An affidavit from SCE&G supporting withholding under 10 CFR 2.390 is provided as Enclosure 6. Enclosure 7 is Westinghouse's Application for Withholding Proprietary Information from Public Disclosure, Affidavit CAW-16-4448, Proprietary Information Notice, and Copyright Notice. The affidavit sets forth the basis upon which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.390 of the Commission's regulations. Accordingly, it is respectfully requested that the information that is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR 2.390 of the Commission's regulations.

Correspondence with respect to the copyright or proprietary aspects of the items listed above or the supporting Westinghouse affidavit should reference CAW-16-4448 and should be addressed to James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 3 Suite 310, Cranberry Township, Pennsylvania 16066. Correspondence with respect to proprietary aspects of this letter and its enclosures should also be addressed to April R. Rice at the contact information within this letter.

Enclosure 8 provides conforming TS Bases changes for reference only. The TS Bases changes are controlled by Technical Specification 5.5.6, "Technical Specifications (TS) Bases Control Program," and are not within the scope of the LAR, but will be updated to be consistent with the changes to the TS proposed in the LAR in accordance with the TS Bases Control Program.

SCE&G requests NRC staff approval of the license amendment by June 22, 2017, to support installation of PMS cabinets. Delayed approval of this license amendment could result in a delay of dependent construction activities. SCE&G expects to implement this proposed amendment within the VCSNS Units 2 and 3 TS and UFSAR within 60 days of approval of the requested changes. However, in accordance with License Condition 2.D.(9), the technical specifications in Appendix A to these licenses would not become effective until a Commission finding that the acceptance criteria in this license (ITAAC) are met in accordance with 10 CFR 52.103(g). There is no requested amendment to this license condition.

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 Nick Kellenberger by telephone at (803) 941-9834, or by email at nicholas.kellenberger@scana.com.

This letter contains no regulatory commitments.

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

Executed on this 28th day of November, 2016.

Sincerely,

April Rice
Manager
New Nuclear Licensing

AJC/ARR/ajc

Enclosures: 1) Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3– Request for License Amendment Regarding ADS and IRWST Injection Block (Publicly Available Information) (LAR 16-15)

2) Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3– Exemption Request for Tier 1 Changes Related to ADS and IRWST Injection Block (LAR 16-15)

3) Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3– Proposed Changes to Licensing Basis Documents (Publicly Available Information) (LAR 16-15)

4) Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3– Request for License Amendment Regarding ADS and IRWST Injection Block (Withheld Information) (LAR 16-15)

5) Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3– Proposed Changes to Licensing Basis Documents (Withheld Information) (LAR 16-15)

6) Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3– Affidavit for Withholding SCE&G's Information in Accordance With 10 CFR 2.390 (LAR 16-15)

7) Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3– Westinghouse Authorization Letter CAW-16-4448, Affidavit, Proprietary Information Notice, and Copyright Notice (LAR 16-15)

8) Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3– Conforming Technical Specification Bases Changes (LAR 16-15) (For Information Only)

c (w/ enclosures):
Billy Gleaves
Ruth Reyes
Chandu Patel
Paul Kallan
Tom Fredette
Tomy Nazario
Catherine Haney
Jim Reece
DCRM-EDMS@SCANA.COM

c (w/o enclosures 4 and 5):
Stephen A. Byrne
Jeffrey B. Archie
Ronald A. Jones
Alvis J. Bynum
Kathryn M. Sutton
April Rice
Nick Kellenberger
Matt Kunkle
Mory Diane
Bryan Barwick
Dean Kersey
Arnie Cribb
Margaret Felkel
Cynthia Lanier
Lisa Spears
Frederick Willis
Neil Haggerty
Pat Young
Zach Harper
Brian McIntyre
Brian Bedford
Carl Churchman
Joseph Cole
Chuck Baucom
Lisa Alberghini
Curt Castell
Jeff Hawkins
Susan E. Jenkins
William M. Cherry
Rhonda O'Banion
Frederick Willis, SNC
Keith Armstrong - Fluor
VCSummerMail@westinghouse.com
vcsummer2&3project@westinghouse.com
VCSNNDCorrespondence@scana.com

South Carolina Electric & Gas Co.

NND-16-0468

Enclosure 1

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

Request for License Amendment Regarding ADS and IRWST Injection Block (Publicly Available Information) (LAR 16-15)

(This Enclosure consists of 31 pages, including this cover page.)

Table of Contents

1. Summary Description
2. Detailed Description
3. Technical Evaluation
4. Regulatory Evaluation
   - 4.1. Applicable Regulatory Requirements/Criteria
   - 4.2. Precedent
   - 4.3. Significant Hazards Consideration Determination
   - 4.4. Conclusions
5. Environmental Considerations
6. References

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

1. Summary Description

The proposed changes would revise the licenses basis documents to add design detail to the automatic depressurization system (ADS) blocking device and to add the blocking device to the design of the in-containment refueling water storage tank (IRWST) injection squib valves actuation logic. The ADS and IRWST injection blocking device is designed to prevent spurious actuations of ADS and IRWST injection valves primarily due to a software common cause failure (CCF) of the protection and safety monitoring system (PMS).

The requested amendment requires a change to Technical Specifications (Combined License [COL] Appendix A), as well as plant-specific Tier 2, Tier 2*, and COL Appendix C (and corresponding plant-specific Tier 1). This enclosure requests approval of the license amendment necessary to implement these changes and their involved UFSAR changes. Enclosure 2 requests the exemption necessary to implement the involved changes to the plant-specific Tier 1 information.

2. Detailed Description

General System Description

Passive Core Cooling System: The primary function of the passive core cooling system (PXS) is to provide emergency core cooling following postulated design-basis events. The PXS provides reactor coolant system (RCS) makeup and boration during transients or accidents where the normal RCS makeup supply from the chemical and volume control system (CVS) is lost or is insufficient. The PXS provides safety injection to the RCS to provide adequate core cooling for the complete range of loss of coolant accident (LOCA) events. The PXS consists of two core makeup tanks (CMTs), an IRWST, a passive residual heat removal heat exchanger, two accumulators, and other supporting equipment.

Core Makeup Tanks: The two CMTs inject borated water into the RCS to replenish coolant lost in a postulated LOCA. The CMTs are actuated by the PMS or the Diverse Actuation System (DAS) by opening discharge valves at the bottom of the tanks. The borated water flows into the RCS by gravity.

In-containment Refueling Water Storage Tank: The IRWST contains cold borated water. The bottom of the IRWST is above the RCS loop elevation so that the borated water can drain by gravity into the RCS after it is sufficiently depressurized. The IRWST is connected to the RCS through two direct vessel injection lines. The isolation valves for each gravity injection line are arranged in two parallel paths, each path having one squib valve backed up by one check valve.

Automatic Depressurization System: The ADS consists of four different stages of valves. The first three stages each have two lines and each line has two normally closed valves in series. The fourth stage has four lines with each line having two valves, one normally open and one normally closed, in series. The first stage, second stage, and third stage valves have dc motor operators. The normally closed fourth stage valves are squib valves. The ADS valves are designed to automatically open when actuated and to remain open for the duration of an automatic depressurization event. ADS stages 1 and 4 valves actuate at discrete CMT levels, as either tank's level decreases during injection. ADS stages 2 and 3 valves actuate based upon a time delay after the preceding stage is sent a signal to open. This opening sequence provides a controlled depressurization of the RCS. By depressurizing the RCS, the ADS allows lower pressure injection sources, such as the IRWST, to perform their safety injection function.

Remote Shutdown Room Transfer Switch: The PMS provides for the transfer of control capability from the Main Control Room (MCR) to the remote shutdown workstation (RSW) using multiple transfer switches. Each individual transfer switch is associated with a single safety-related group or with nonsafety-related control capability. This deactivation of operator control capability in the MCR includes deactivation of operator control capability provided by the soft control devices and deactivation of all operator control capability provided by dedicated switches.

Purpose of ADS and IRWST Injection Blocking Device

The ADS blocking device prevents a spurious actuation of the four stages of ADS valves, and a subsequent release of reactor coolant to containment, which could occur as a result of a software CCF. The addition of the ADS blocking device in the Design Control Document (DCD)/Updated Final Safety Analysis Report (UFSAR) resulted from a commitment made by Westinghouse to the NRC in letter DCP_NRC_003090, dated November 17, 2010 [Accession No. ML103230126] during AP1000 design certification. Westinghouse letter DCP_NRC_003102 to the NRC dated December 9, 2010 committed to include the ADS block design in WCAP-16438 (Proprietary and Non-Proprietary), "FMEA of AP1000 Protection and Safety Monitoring System," and WCAP-16675 (Proprietary and Non-Proprietary), "AP1000 Protection and Safety Monitoring System Architecture Technical Report."

Specific design details of the ADS blocking device were not available at the time of the AP1000 DCD certification. Therefore, the proposed change adds design function details for the ADS blocking device and new PMS logic to depict how and where the ADS blocking signal interfaces with the PMS. The inclusion of this additional information relates to Advisory Committee on Reactor Safeguards (ACRS) Action Item 72 (AP1000 ACRS Subcommittee Meeting of December 1, 2010 - Meeting minutes issued March 18, 2011 [Accession No. ML110180343]). The blocking device and new PMS logic are also applied to IRWST injection squib valves to prevent spurious IRWST injection valve opening, which could also result in a loss of reactor coolant.

The AP1000 design includes a number of provisions to reduce the likelihood of spurious actuation of Engineered Safety Features Actuation System (ESFAS) functions in the PMS design. The AP1000 already has design features aimed at reducing the probability of spurious ADS and IRWST actuations. For ADS actuation, this includes appropriate interlocks, 2-out-of-4 instrument actuation, fail as-is valves, redundant closed first, second, and third stage valves in each line, and a squib valve controller circuit that requires two signals ('ARM' and 'FIRE') in proper sequence from two different processors for fourth stage valves. For IRWST injection actuation, this includes appropriate interlocks, 2-out-of-4 instrument actuation, fail as-is valves, and a squib valve controller circuit that requires two signals ('ARM' and 'FIRE') in proper sequence from two different processors. Nevertheless, it was postulated that a software CCF could lead to a spurious system level actuation in one or more of the PMS safety divisions. This is of particular concern for the ADS and IRWST injection functions, because the consequence of a spurious ADS and IRWST injection actuation is an inadvertent LOCA. Therefore, to further protect against an inadvertent LOCA, the ADS and IRWST injection actuation blocking device is provided.

Functional Description of Blocking Device

The ADS and IRWST injection blocking device is used to block ADS and IRWST injection actuation unless the relevant plant parameters indicate an actual LOCA event is in process. If the relevant input signals indicate an actual LOCA event, then the ADS and IRWST injection actuation block is removed and the ADS and IRWST injection valves are permitted to open. The blocking signal is removed if any of the following inputs signals are true:

- **Low Core Makeup Tank (CMT) Upper Narrow Range (NR) level**

  The CMTs will not drain if their discharge valves are inadvertently opened under normal operating conditions. In this case, any water leaving the tank will be replenished through the connection from the RCS cold leg to the top of the CMT. Therefore, the measured water level in the CMT is a good indicator of an actual LOCA.

  CMT water level is measured by the PMS in two narrow ranges, one near the top of the tank and the other near the bottom. The upper narrow range level signal is used by the PMS to actuate the ADS Stages 1, 2, and 3 when level is below CMT Level – Low 1 (COL Appendix A, Technical Specifications (TS), Table 3.3.8-1, Function 15). The lower narrow range level signal is used by PMS to actuate ADS Stage 4 and IRWST injection when level is below CMT Level - Low 2 (COL Appendix A, TS, Table 3.3.8-1, Function 16). The blocking device will automatically unblock actuation signals for the ADS valves and the IRWST injection valves (i.e., allow the valves to be commanded open) when the CMT upper narrow range level signal is at a setpoint above the automatic actuations for ADS and IRWST injection valves. The blocking device receives one upper narrow range level signal from each of the two CMTs. Unblock will occur if either of the two upper narrow range level signals falls

below the setpoint. Therefore, the automatic unblock will occur prior to reaching the ADS Stage 1, 2, or 3 actuation setpoint or the ADS Stage 4 and IRWST injection setpoint.

COL Appendix A TS 3.5.2 requires both CMTs to be operable only in Modes 1, 2, and 3, and Mode 4 with the RCS not being cooled by the Normal Residual Heat Removal System (RNS). Outside of these Modes, less than two CMTs are allowed to be operable. Since the blocking device relies on both CMTs being operable, the proposed TS require unblocking the blocking device any time less than two CMTs are allowed to be operable. When only one CMT is operable for injection, such that a low level unblock signal would not be assured, a situation where a single failure in the remaining CMT (e.g., a CMT level fails high) would prohibit the blocking device from removing a block signal in a division.

In summary, the ADS and IRWST injection actuation will be blocked when both CMTs are full and will be unblocked when the water level in either CMT falls below a setpoint that is above that used by the PMS to actuate ADS Stages 1, 2, 3, and 4 and IRWST injection valves. The blocking device is also unblocked during plant conditions where less than two CMTs are allowed to be operable.

- **Low battery charger input voltage (for the battery charger used to charge the Class 1E battery bank)**

There is an ADS timer in the PMS which causes an actuation of the ADS on low battery charger input voltage. The timer circuit causes an actuation of the ADS after a certain amount of time has passed since receiving the low battery charger input voltage signal. Therefore, it is necessary to remove the ADS and IRWST injection block signal for a low battery charger input voltage to allow the timer circuit to actuate the ADS following a prolonged loss of AC power.

- **Manual switch on the Secondary Dedicated Safety Panel (SDSP) in the unblock position**

The operator manually unblocks the ADS and IRWST injection blocking device to permit manual actuation of the ADS and IRWST injection valves. This would be necessary in the event that automatic actuation does not occur. The manual unblock is also used during shutdown modes when it is permissible to have less than two CMTs operable. There is one hardwired fixed position control switch for each PMS division on the SDSP to unblock and reset the block signal (WCAP-16675 also refers to this as the override switch).

- **Remote Shutdown Workstation (RSW) operation enabled (Main Control Room (MCR)/RSW transfer switch in the Remote Shutdown Room (RSR) position)**

Manual actuation of the ADS and IRWST injection from the Remote Shutdown Workstation (RSW) may be needed if the MCR is not habitable. The existing divisional MCR/RSW

transfer switches are used to transfer control from the MCR to the RSW. Each divisional MCR/RSW transfer switch removes the block so that actuation from the RSW is possible. The procedure for transferring control to the RSW requires the reactor to be tripped prior to the transfer.

Physical Description of Blocking Device

There is one ADS and IRWST injection blocking device per PMS division. Each blocking device will be physically located within one of the two PMS Bistable/Coincident Logic Cabinets (BCC). They will be Class 1E devices covering both ADS and IRWST injection actuation for each of the PMS divisions. Westinghouse (i.e., the vendor for the blocking device components) has indicated that the blocking device is composed of commercial-off-the-shelf (COTS) components that have been commercially dedicated. These standard components include a DC/DC converter, alarm modules, and relays. Each blocking device will provide output signals to the Component Interface Modules (CIMs) that control the ADS and IRWST injection valves assigned to the respective division. There are no inter-divisional connections between the blocking devices or any coincidence voting. [

]^{a,c}

A [ ]^{a,c} command is issued to the CIM when ADS and IRWST injection actuation is blocked. The [ ]^{a,c} command is removed (i.e., ADS and IRWST injection actuation is unblocked) if plant conditions change in such a way that indicates a possible actual LOCA, as described above. When the [ ]^{a,c} command is removed, the proposed PMS logic change latches this unblock signal until plant conditions return to normal plant operating conditions and the operators reset the latch by toggling the hardwired manual Normal/Reset-Unblock switch on the SDSP from the “Normal/Reset” position to the “Unblock” position and then back to “Normal/Reset”.

Each divisional blocking device blocks up to four ADS valves, as shown in Table 1. As noted in the table, each ADS stage 4 valve is actuated by two divisions of the PMS. It is necessary to block both divisions to prevent spurious actuation. Table 1 also shows the divisional blocking assignment for the IRWST injection valves.

Table 1: ADS and IRWST injection blocking device Divisional Assignments

	PMS Division A	PMS Division B	PMS Division C	PMS Division D
ADS Stage 1	RCS-PL-V001A	RCS-PL-V001B	--	--
ADS Stage 2	--	--	RCS-PL-V002A	RCS-PL-V002B
ADS Stage 3	RCS-PL-V003A	RCS-PL-V003B	--	--
ADS Stage 4	RCS-PL-V004A	RCS-PL-V004B	RCS-PL-V004A	RCS-PL-V004B
	RCS-PL-V004C	RCS-PL-V004D	RCS-PL-V004C	RCS-PL-V004D
IRWST Injection	PXS-PL-V123B	PXS-PL-V123A	PXS-PL-V125B	PXS-PL-V125A

The blocking device uses conventional analog components and does not rely on software. The device receives two 4-20 mA input signals. This includes one signal from each of the two CMT narrow range upper level sensors. The device can provide up to six dry contact (voltage free that does not break or make current) outputs. This includes one output to each of the CIM [ ]^{a,c} of the ADS stages 1, 2, 3, and 4 valves and the IRWST injection valves. The six outputs provide the block signal to each of the ADS and IRWST injection valve CIMs during normal operating conditions. The PMS and the blocking device share input and output connections and a power supply. All other components are separate. The blocking device is independent of the PMS processor hardware and software. Monitoring of the status of the block signal will be performed [

]^{a,c}

The low CMT level signals, the low battery charger input voltage signals, the manual unblock signal, and the remote shutdown workstation (RSW) transfer signal are logically OR'ed (OR logic gate) together in the circuitry of the ADS and IRWST injection blocking device in each division. The result of this OR'ing is used to remove the block signal to the CIMs. This design feature is reflected in the proposed revision to UFSAR Figure 7.2-1 (Sheets 15 and 19).

Proposed Licensing Basis Changes

The following plant-specific Tier 1 and COL Appendix C changes are proposed for revision to include design function details of the ADS actuation and IRWST injection valves blocking device.

Table 2, Proposed Plant-Specific Tier 1 and corresponding COL Appendix C Changes	
Text, Table, or Figure	**Description of the Proposed Change**
Table 2.5.2-5, "Minimum Inventory of Displays, Alerts, and Fixed Position Controls in the MCR"	• Added a new row for the manual ADS and IRWST injection unblock control feature. The Control column is marked with a "Yes." The Display and Alert columns are blank.
Table 2.5.2-6, "PMS Blocks"	• Added "ADS and IRWST Injection Actuation" under Engineered Safety Features.

The following UFSAR Tier 2 and Tier 2* figures, subsections, and tables are proposed for revision or addition to the ADS actuation and IRWST injection valves blocking device design function.

Table 3, Proposed Tier 2 and Tier 2* Licensing Basis Changes	
Text, Table, or Figure	**Description of the Proposed Change**
Table 1.6-1, "Material Referenced,"	• Added note to WCAP-16674, Revision 4 (Proprietary and Non-Proprietary) and WCAP-16675, Revision 5 (Proprietary and Non-Proprietary) to indicate the documents are modified by changes provided in UFSAR Appendix 7A. Note: WCAP-16438 Revision 3, WCAP-17179 Revision 2, and WCAP-15776 Revision 0 are also impacted by this activity and the changes are shown in UFSAR Appendix 7A. However, WCAP-16438, WCAP-17179, and WCAP-15776 already have a note to indicate that they are modified by changes provided in UFSAR Appendix 7A.
Subsection 6.3.2.2.8.9, "Explosively Opening (Squib) Valves"	• Added a statement to indicate a blocking device is used on the IRWST injection squib valves to prevent spurious actuation.

Table 3, Proposed Tier 2 and Tier 2* Licensing Basis Changes	
Text, Table, or Figure	**Description of the Proposed Change**
Subsection 7.1.7, “References”	• Added note to WCAP-16674, Revision 4 (Proprietary and Non-Proprietary) and WCAP-16675, Revision 5 (Proprietary and Non-Proprietary) to indicate the documents are modified by changes provided in UFSAR Appendix 7A.
Figure 7.2-1, Sheet 15 of 21, “Automatic RCS Depressurization Valve Sequencing”	• Added note next to the IRWST injection valves open signal to state that the open signal is blocked under certain conditions set forth by the ADS and IRWST injection actuation unblock logic. • Added signal for a Low Battery Charger Input Voltage to unblock ADS and IRWST injection valve actuation.
Figure 7.2-1, Sheet 16 of 21, “In-containment Refueling Water Storage Tank Actuations”	• Added note next to the IRWST injection valves open signal to state that the open signal is blocked under certain conditions set forth by the ADS and IRWST injection actuation unblock logic.

Table 3, Proposed Tier 2 and Tier 2* Licensing Basis Changes	
Text, Table, or Figure	**Description of the Proposed Change**
Figure 7.2-1, Sheet 19 of 21, "Containment Vacuum Relief Protection"	• Added new logic to show how the ADS and IRWST injection block and unblock signals interface with the PMS. Three inputs are shown (Manual ADS and IRWST Injection Actuation Unblock Control, Core Makeup Tank Level, and Low Battery Charger Input Voltage) which, when actuated, unblock actuation of the ADS and IRWST injection components. • Added Note 4 to state that the logic is implemented without using computer software. • Added Note 5 to state that separate controls are used one in each division, to manually unblock the ADS and IRWST injection actuation blocking device. • Added Note 6 to state that the MCR / RSW transfer switch also unblocks the ADS and IRWST injection actuation blocking device when control is transferred to the RSW.
Subsection 7.3.1.2.2, "In-Containment Refueling Water Storage Tank Injection"	• Revised to identify that the proposed blocking device prevents spurious actuation of the ADS and IRWST injection.
Subsection 7.3.1.2.4.1, "Block to Prevent ADS Spurious Actuation"	• Added detail to the design functions and design of the ADS and IRWST blocking device: o Applied the blocking device to the IRWST injection valves. o Clarified that the ADS and IRWST injection blocks are independent of the PMS processor hardware and software. o Clarified that there will be no coincidence voting among the blocking devices. o Added details to describe how the ADS and IRWST injection block is removed.

Table 3, Proposed Tier 2 and Tier 2* Licensing Basis Changes	
Text, Table, or Figure	**Description of the Proposed Change**
Table 7.3-1, "Engineered Safety Features Actuation Signals"	• Added Note 9 to the bottom of the table, which states spurious ADS and IRWST injection actuations, both manual and automatic, are blocked as described in subsection 7.3.1.2.4.1. o Applied Note 9 to Actuation Signal 3 "Automatic Depressurization System" o Applied Note 9 to Actuation Signal 21 "Open In-Containment Refueling Water Storage Tank (IRWST) Injection Line Valves" • Added reference to Figure 7.2-1 Sheet 19 for Actuation signals 3 and 21.
Section 7A.2, "[*WCAP-17179-P and WCAP-17179-NP, AP1000™ Component Interface Module Technical Report*]*"	• References: Added WCAP-16438-P (Proprietary) (Reference 15), changed Revision 2 to Revision 3, for consistency with the revision as cited in UFSAR Table 1.6-1, and added note to indicate the document is modified by changes provided in UFSAR Appendix 7A. • Section 2.1: Deleted text that says the Z Port is not used in the AP1000. Added text that says a subset of CIMs receives Z Port input. • Section 2.3.1.1.4: Deleted text that says the Z Port is not used in the AP1000. [ ]^{a,c} • Section 2.3.1.2.4: Deleted text that says the Z Port is not used in the AP1000.

Table 3, Proposed Tier 2 and Tier 2* Licensing Basis Changes	
Text, Table, or Figure	**Description of the Proposed Change**
Section 7A.4, "WCAP-16438-P and WCAP-16438-NP, FMEA of AP1000™ Protection and Safety Monitoring System"	• Section 2.15: Revised section to support the proposed text in UFSAR Subsection 7.3.1.2.4.1. Section 4.12: Revised the FMEA for the ADS blocking device to include IRWST. Editorially revised the [ ]^{a,c} column for the failure [ ]^{a,c}.
Section 7A.5, "WCAP-15776, Safety Criteria for the AP1000 Instrumentation and Control Systems April 2002"	• Added a new row in Table 2-3 for the manual ADS and IRWST injection unblock control feature. The Control column is marked with an "X." The Display and Alert columns are blank. Note 5 is added to the table to indicate that the manual ADS and IRWST injection unblock switches are not needed at the RSW.
Section 7A.7, "WCAP-16674-P and WCAP-16674-NP, AP1000 I&C Data Communication and Manual Control of Safety Systems and Components"	• Added new section 7A.7 • References: Added note to WCAP-16675-P, Revision 5 (Reference 7) to indicate the document is modified by changes provided in UFSAR Appendix 7A. • Section 6, "Component Interface Module": Added new paragraph regarding the CIM [ ]^{a,c} and how it is used in the AP1000 design to implement an ADS and IRWST injection block.

Table 3, Proposed Tier 2 and Tier 2* Licensing Basis Changes	
Text, Table, or Figure	**Description of the Proposed Change**
Section 7A.8, "WCAP-16675-P and WCAP-16675-NP, AP1000 Protection and Safety Monitoring System Architecture Technical Report"	• Added new section 7A.8 • References: Changed WCAP-16674-P (Reference 30) to Revision 4, for consistency with the revision cited in UFSAR Table 1.6-1, and added note to indicate the document is modified by changes provided in UFSAR Appendix 7A. • Section 2.2.9: Added new section with text to align with the proposed text in UFSAR Subsection 7.3.1.2.4.1 and WCAP-16438. [ ]^{a,c} • Section 5.1.8: Added new section to provide information on the inputs and outputs of the blocking device.
Table 18.12.2-1, "Minimum Inventory of Fixed Position Controls, Displays, and Alerts"	• Added a new row for the manual ADS and IRWST injection unblock control feature. The Control column is marked with an "X." The Display and Alert columns are blank. Note 5 is added to the table to indicate that the ADS and IRWST injection unblock switches are not needed at the RSW.

The following COL Appendix A Technical Specification additions are proposed:

Table 4, Proposed TS Changes	
Technical Specifications	**Description of the Proposed Change**
LCO 3.3.20	• Added new TS for the operability of the ADS and IRWST injection blocking devices o LCO: Four divisions of the blocking device are required to be operable. o Applicability: Table 3.3.20-1 is added to show the applicability of the blocking device. The device is required to be capable of automatic and manual unblocking in various plant Modes. o Actions: Actions are added to put the system in the appropriate configuration if the appropriate conditions are not met. o Surveillance Requirements are added to perform a channel check, channel operational test, channel calibration, verification of ADS and IRWST Injection Block switch position, actuation logic test at various frequencies, and trip actuating device operational test. CMT surveillance requirements are also referenced for their impact on operability.

Technical Specifications Bases revisions are provided in Enclosure 8 for information only. The Bases revisions are made after the approval of the amendment request, in accordance with the Bases Control Program.

3. Technical Evaluation

Independence of Blocking Device

The ADS and IRWST injection blocking device is independent of the PMS failure modes that could lead to a spurious valve actuation. As stated above, though the blocking device is physically located within the PMS cabinets, the PMS and blocking device only share input and output connections and a power source.

- **Shared Power Source**

The preferred failure mode of the PMS on loss of power is to *not* actuate its ESF outputs. Therefore, a loss of power will not cause a spurious actuation even though it would remove the blocking signals.

- **Shared Output Connections**

The ADS and IRWST injection blocking device uses the CIM [ ]^{a,c} as its means to carry out the block function. The CIM was chosen for this function because it provides valuable monitoring and maintenance features that would not be provided by external signal blocking components. This sharing of the CIM as an output device does not compromise the independence of the block function because the CIM itself is not a credible source of a postulated spurious actuation, because of the following considerations:

- Precise sequencing and timing are needed to actuate the squib and open the valve.
- Spurious actuation of any of the ADS or IRWST injection paths would require action by two CIMs in the same division. These two CIMs are located in different PMS cabinets and are operated by different PMS processor modules.
- There are no interconnections of the two CIMs in a division that would be needed to open an ADS or IRWST injection path; there is no mechanism for failure of one CIM to cascade to the other.
- The commands received by the CIM from the PMS processor modules are simple [ ]^{a,c} commands related to the valve being controlled. There are no commands to otherwise affect the CIM such as to change mode or any other such behavior.
- The commands from the PMS processor modules are received at the CIM via serial data link with error checking. Corrupted messages will be discarded.
- There are no "global commands" to the CIMs from the PMS processor modules. Each CIM responds only to its unique input/output (I/O) address.
- The default action by the CIM on loss of all commands from the PMS processor modules is to not actuate its outputs.
- Using the [ ]^{a,c} the CIM does not add new failure modes. These circuits are present whether or not they are used, and are accounted for by the reliability of the module.
- The CIM is designed to prevent inadvertent turning on of its outputs. Dual solid state devices turn on both sides of the load to actuate. These devices are driven by separate output signals from the field programmable gate array (FPGA) logic. Therefore, a single failure of one of the dual solid state devices would de-

energize the load, but two solid state device failures would energize/actuate the load. Therefore, a majority of the failures of the CIM components will cause its outputs to be de-energized instead of energized.

- Self-diagnostics are performed by the CIM to immediately detect and report failures.
- Although software is involved in the design and programming of the CIM logic, the FPGA on the CIM is converted to hardware in its installed condition. The program that is burned into the device consists of links between physical logic gates rather than software running on a runtime operating system.
- The application logic stored in the FPGA of the CIM is highly transparent and verifiable. There is a high degree of correlation between logic gates of the functional design documents and the physical devices on the chip. This facilitates comprehensive testing of the design.
- Each manufactured CIM undergoes factory testing for acceptability prior to being placed into service.

- **Shared Input Connections**

Both the PMS and blocking devices use the two upper narrow range CMT level signals. However, the sharing of these signals will not compromise the independence of the block function nor will it lead to a spurious ADS or IRWST injection actuation because these signals are continuously monitored by comparison to redundant measurements on the same tank by other divisions. For ADS and IRWST injection valves, a CMT low level signal itself does not cause an actuation. Other signals, such as low pressurizer signal, would need to be present to initiate an actuation. As shown in the proposed UFSAR Section 7.3.1.2.4.1 markups, the unblock setpoint for low CMT upper narrow range level is required to be set above the CMT level setpoint for ADS Stages 1, 2, and 3 actuation. The setpoint uncertainty for the blocking device is required to be considered for CMT low level. Even with considering setpoint uncertainty, there will be no overlap in the setpoints for unblocking and ADS actuation. Margin will exist between the setpoints to allow the unblock function to occur prior to the need to actuate ADS valves.

Battery charger input undervoltage relay inputs are also shared. The relays send an undervoltage signal to both the PMS and the blocking device. An ADS and IRWST injection unblock occurs on low battery charger input voltage via the blocking device. A low battery charger input voltage also causes a timer to start and, after 22 hours, the ADS valves are opened via PMS. Therefore, there is no credible failure mode that could request the opening of the ADS valves yet prevent the blocking device from unblocking.

The blocking device is designed with "fail safe" principles in that the majority of failures will either cause the block to be removed as a consequence of the failure, or will not prevent the block from being removed when any of the inputs go below a threshold value. An example

of a failure that is not "fail safe" is a short across a blocking device output on one of its six dry contacts. This failure would prevent the removal of a blocking signal from the CIM [ ]^{a,c} for a single ADS or IRWST injection valve. However, a failure of a blocking device dry contact output would affect no more than one of the ADS or IRWST injection valves. Because the ADS Stage 1, 2, and 3 valves are routed in parallel to each other, a failure to unblock one valve would not prevent ADS Stage 1, 2, and 3 from performing its depressurization design function. The IRWST injection valves are also in parallel to each other; therefore, a failure to unblock one IRWST injection valve would not prevent IRWST injection. A given ADS Stage 4 valve can be unblocked by two PMS divisions. Therefore, if one divisional blocking device fails to unblock an ADS Stage 4 valve when required, the other PMS division will unblock it. Furthermore, there are three other ADS Stage 4 valves that would be available for depressurization.

Equipment Qualification

The ADS and IRWST injection blocking devices, located within four PMS BCCs, are included in the PMS equipment qualification (EQ) program.

Plant Operation Considerations

- **Manual ADS / IRWST Injection Actuation**

An operator will first have to unblock each divisional ADS / IRWST injection valve blocking device prior to manually actuating ADS or IRWST injection valves. Therefore, the four switches on the SDSP must be actuated as part of the manual actuation of ADS and IRWST injection valves. As discussed in the PRA section below, this additional action has no substantial impact on the core damage frequency (CDF) and large release frequency (LRF).

These manual switches are added to the minimum inventory list in UFSAR Table 18.12.2-1 because they meet the following minimum inventory selection criteria set forth in UFSAR Section 18.12.2:

- Dedicated controls for manual safety-related system actuation (reactor trip, turbine trip, engineered safety feature actuation)

- Controls necessary to maintain the critical safety functions and safe shutdown conditions

The proposed TS changes contain new operability requirements for the four switches on the SDSP to support this TS required manual initiation function.

- **Technical Specifications**

  The unblocking function provided by the ADS and IRWST injection blocking device satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii) which provides criteria for establishing limiting conditions for operation within the TS. Therefore, the proposed blocking device limiting condition for operability (LCO) requirement is LCO 3.3.20, "Automatic Depressurization System (ADS) and In-containment Refueling Water Storage Tank (IRWST) Injection Blocking Device." As stated above, the ADS and IRWST injection blocking device receives one CMT upper narrow range level input from each of the two CMTs. The blocking device unblocks if one level sensor falls below the setpoint. Therefore, if one of the CMTs is not operable, the divisional blocking device only has one CMT level transmitter to perform its block / unblock function and would lose its redundancy within its division. COL Appendix A TS 3.5.2, "Core Makeup Tanks (CMTs) – Operating" allows for less than two CMTs to be operable in Modes 4 (with RCS cooling provided by the RNS), 5, and 6. As such, in these Modes of operation the CMT Level automatic unblocking function of the ADS and IRWST Blocking Device is not required to be operable. In these Modes of operation TS Table 3.3.20-1, Surveillance Requirement (SR) 3.3.20.2 requires the manual unblocking switch to be in the "unblock" positon.

  No TS is added for the undervoltage relay inputs to the blocking device because the undervoltage relay ADS actuation timer itself does not satisfy the criteria of 10 CFR 50.36(c)(2)(ii), and therefore does not have a TS LCO.

  - Limiting Condition for Operation
    TS LCO 3.3.20 is added to require four divisions of ADS and IRWST injection blocking devices to be operable for automatic and manual unblocking. The applicability is captured in Table 3.3.20-1.

  - Applicability
    - Table 3.3.20-1, Function 1 requires the blocking device to be operable for automatic unblocking during Modes where two CMTs are required to be operable. This includes Mode 1, Mode 2, Mode 3, and Mode 4 with the RCS not being cooled by the RNS. The blocking device operability for automatic unblocking is not required if the blocking switch is in the unblock position.

    - Table 3.3.20-1, Function 2 requires the ADS and IRWST injection block switches to be operable for manual unblocking during Modes 1, 2, 3, 4, 5, and 6. This aligns with the Applicability for the manual actuation functions for ADS and IRWST injection required by LCO 3.3.9, "Engineered Safety Feature Actuation System (ESFAS) Manual Initiation," which requires the

function of the manual unblock switches to enable the manual actuation of ADS and IRWST injection.

In Mode 4 with the RCS being cooled by the RNS, in Mode 5, and Mode 6, ADS and IRWST injection block switches are required to be in the unblock position. This requires the block switches to be in the unblock position whenever TS 3.5.2 allows for less than two CMTs to be operable.

- Actions

  The actions associated with the TS address the situation where one or more divisions of the ADS and IRWST injection blocking devices for automatic or manual unblocking are inoperable. In this condition, the CIM [ ]^{a,c} in the affected division is required to be unblocked within 8 hours. If this does not occur within the associated completion time, then the affected ADS and IRWST injection valves are declared inoperable. Declaring the affected valves inoperable allows the supported system Actions (i.e., for ADS and IRWST inoperable valves) to dictate the required measures. The ADS and/or IRWST LCO(s) provide appropriate actions for the inoperable components. This action is in accordance with LCO 3.0.6, which requires that the applicable Conditions and Required Actions for valves declared inoperable shall be entered in accordance with LCO 3.0.2.

- Surveillance Requirements

  The following surveillance requirements are included with this TS to periodically check the ability of the blocking device to automatically and manually unblock:

  - SR 3.3.20.1 requires performance of a channel check once every 12 hours. This surveillance is a comparison of the parameter indicated on one CMT upper narrow range level channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels. A channel check will detect gross channel failure. The 12 hour surveillance frequency is based on operating experience that demonstrates that channel failure is rare.
  - SR 3.3.20.2 verifies the position of the block switches are in the unblock position once every 7 days when the plant is in Mode 4 with the RCS being cooled by the RNS, in Mode 5, and Mode 6. This prevents the blocking of ADS and IRWST injection when there may be reduced or no capability for automatic unblocking from CMT level. The 7 day surveillance frequency is

adequate considering the fact that the [ ]^{a,c}

- SR 3.3.20.3 requires the performance of a channel operational test every 92 days. It confirms that the block is removed when CMT level drops below the appropriate setpoint. The 92 day surveillance frequency is based on WCAP-10271, "Evaluation of Surveillance Frequencies and Out of Service Times for the Reactor Protection Instrumentation System, June 1996" Supplement 2. WCAP-10271 concludes analog channel testing can be conducted quarterly (i.e., 92 days) instead of monthly. Furthermore, the proposed channel operational test and channel calibration surveillances are required to be in accordance with the Setpoint Program required by TS 5.5.14. The justification for using a quarterly frequency is based on two points:
  1) The general insensitivity of engineered safety feature unavailability to failures in analog channels.
  2) The generally insignificant increase in the core melt frequency and radiation exposure by using a quarterly frequency instead of a monthly frequency.

  In addition, WCAP-10271, Supplement 1, lists various benefits of performing analog channel testing at a quarterly interval instead of a monthly interval.
  1) Using less time on surveillance testing will allow manpower to be redirected to other, possibly more important, tasks and improve the effectiveness of the operating staff.
  2) Hardware unavailability will decrease.
  3) An adverse impact on hardware failure rates is not expected.
- SR 3.3.20.4 is the performance of a channel calibration every 24 months. It is a complete check of the instrument loop. The 24 month surveillance frequency is based on operating experience and consistency with the refueling cycle.
- SR 3.3.20.5 is the performance of an actuation logic test for automatic unblocking every 24 months. This test, in conjunction with ESF actuation logic test (i.e., SR 3.3.15.1 and SR 3.3.16.1), overlaps the ADS and IRWST injection functional tests (i.e., SR 3.4.11.4, SR 3.4.11.5, and SR 3.5.6.9) that verify actuation on an actuation signal, to provide complete testing of the safety function. The surveillance frequency of 24 months is based on the need to perform this SR during periods in which the plant is shut down for refueling to prevent any additional risks associated with inadvertent operation of the ADS and IRWST injection valves.
- SR 3.3.20.6 is the performance of a trip actuating device operational test of the blocking device manual switch every 24 months. The surveillance

frequency is based on the known reliability of the manual switch functions and has been shown to be acceptable through operating experience.

- SR 3.3.20.7 requires performance of LCO 3.5.2 Surveillances associated with ensuring CMTs are capable of injecting to the RCS. As stated above, CMT injection supports the operability of the ADS and IRWST injection blocking devices for automatic unblocking. All four divisions of ADS and IRWST injection blocking devices are inoperable if one or both CMTs are inoperable for injection. Therefore, SRs 3.5.2.3, 3.5.2.6, and 3.5.2.7 are required to be met.

- **Returning Safety System to Normal Conditions**

In order to prevent the potential for an automatic reintroduction of a block after an initiation of the ADS and IRWST Injection, a set/reset (S/R) latch logic gate is included in the PMS logic (see Figure 7.2-1 Sheet 19). The S/R latch logic gate latches the output in the unblocked state even if the inputs to the blocking device return to blocking conditions. With this design feature, the PMS logic satisfies IEEE 603-1991 Section 5.2, “Completion of Protective Action” which requires the safety system to be designed so that the intended sequence of protective actions continue until completion. The blocking feature will be manually reinstated when a plant startup is in progress, ADS valves are closed, and both CMTs are operable.

- **Transferring Control from MCR to RSW**

The ability of the MCR-to-RSW transfer switch to automatically unblock the ADS and IRWST injection blocking device does not necessitate additional action by the operator when transferring control from the MCR to the RSW. TS 3.3.18, “Remote Shutdown Workstation (RSW),” SR 3.3.18.1 includes demonstration that the ADS and IRWST injection block is automatically unblocked by the RSW transfer switch. Therefore, this feature does not have a significant effect on PRA results.

Diverse Actuation System (DAS)

The DAS is also capable of actuating the ADS and IRWST injection valves. However, DAS actuation is only in response to operator manual actions and is done through control circuits that are normally de-energized during plant operation. Multiple switches in different locations must be actuated in order to energize a circuit for a manual DAS command. Thus, no similar blocking device is needed for the DAS.

ADS, PXS, and IRWST Design Functions

This change will have no adverse effect on the ADS and IRWST injection valves functionality. The ADS valves would continue to function together with the PXS and IRWST to satisfy the LOCA performance requirements and provide effective core cooling after a LOCA from the time of PXS actuation through the long-term cooling mode. The PXS CMT water level instrumentation would continue to provide narrow range level channels for actuation of ADS valves and for actuation of the IRWST injection into the direct vessel injection lines for LOCA. Therefore, the ADS, PXS, and IRWST will continue to adequately perform their design functions as described in the current licensing basis.

Probabilistic Risk Assessment (PRA)

The ADS and IRWST injection blocking devices are included in the PRA model with the appropriate ADS and IRWST injection valve CIMs. The probability of a significant CCF causing the block not to be removed when needed, with the surveillance testing taken into account in the PRA model, is acceptably low.

Two scenarios have been assessed to provide an estimate of the effect of the blocking device failure on plant safety.

- Scenario 1: The blocking device fails in a way that prevents a necessary ADS or IRWST injection valve opening.

  This failure will be detected by the periodic surveillance testing. The proposed TS 3.3.20 requires the blocking device to be capable of automatically unblocking if the block switch is not in the unblock position. Therefore, if a random undetected failure does occur, the ADS actuation or IRWST injection valve opening of that division would be out of service for an average of one half of the surveillance interval. Each division would be surveillance tested via a channel operational test every 92 days. Therefore, the probability of failure on demand due to the ADS or IRWST injection blocking device is estimated to be acceptably low. Specifically, the risk results associated with the proposed change are within the low 10^{-7} Core Damage Frequency (CDF) range and low 10^{-7} Large Release Frequency (LRF) range. In addition, the key insights are not impacted.

  Failure of the ADS actuation or IRWST injection valve opening in a division could also result from concurrent failure of the two CMT level sensors in one division, with both sensors erroneously reading above the blocking setpoint when actual level is below the actuation setpoint. The ADS and IRWST injection actuation for that division should actuate on the result of 2-out-of-4 coincidence logic for low CMT level based on inputs from other divisions, but would be blocked by the ADS or IRWST injection valve blocking device in this scenario. Some failures of the level sensors would be detected via the proposed channel check surveillance test which is performed every 12 hours. The mean time to restore the level sensors to service is estimated to be 72 hours due to their inaccessible location. However, even in this case, the failure of the ADS or IRWST injection valve blocking device itself will

dominate. Given that failure of a single division will not fail the ADS or IRWST injection functions in the other divisions, the expected consequence of this failure will not prevent ADS or IRWST injection from performing their safety functions.

- Scenario 2: The blocking device does not provide a block signal and a spurious actuation is generated from the PMS.

In this case, the removal of the block signal from the blocking device will be immediately revealed, because [ ]^{a,c} The ADS or IRWST injection valve blocking devices are a modular design and easily replaceable. Furthermore, the blocking device failing to provide a block signal does not in itself cause a spurious actuation.

For PRA scenarios assuming operator action to open the ADS and IRWST injection valves, as stated above, the blocking device requires the four switches on the SDSP to be actuated as part of the manual actuation of ADS and IRWST injection. The PRA model evaluated the new manual actuation process and estimated the change in the probability value of the block not being removed. The results of the PRA evaluation show that the AP1000 CDF and LRF at-power remain within the low 10^{-7} CDF range and low 10^{-7} LRF range.

Reliability

The proposed changes would not affect any safety-related design code, function, design analysis, safety analysis input or result, or design/safety margin. No safety analysis or design basis acceptance limit/criterion is challenged or exceeded by the proposed changes. The proposed changes would not involve, nor interface with, any SSC accident initiator or initiating sequence of events. The changes maintain the ADS and IRWST injection functions used to mitigate an accident. The accidents evaluated in the UFSAR are not affected.

Severe Accident Considerations

The proposed changes would not affect a design basis limit for a fission product barrier. This activity would not allow for a new fission product release path, result in a new fission product barrier failure mode, or create a new sequence of events that would result in significant fuel cladding failures. The proposed changes are unrelated to any aspects of plant construction or operation that would introduce any changes to effluent types (e.g., effluents containing chemicals or biocides, sanitary system effluents, and other effluents) or affect any plant radiological or non-radiological effluent release quantities. Furthermore, the proposed changes do not diminish the functionality of any design or operational features that are credited with controlling the release of effluents during plant operation. The proposed changes to include additional Class 1E devices within each of the PMS divisions only affect areas of the plant that contain non-radioactive plant systems. Plant radiation zones would not be affected. The

proposed changes do not involve an adverse change to the method of evaluation for establishing design bases or safety analyses. It does not represent a change to an SSC design feature credited in the ex-vessel severe accident assessment. Tests, experiments, and procedures described in the licensing basis are unchanged by this activity.

Summary

Design detail is added to the licensing basis for the ADS blocking device. The blocking device is also being applied to the IRWST injection valves. The ADS actuation and IRWST injection blocking device is designed to prevent spurious actuations of ADS and IRWST injection valves, because these valves, if spuriously actuated, could cause a loss of reactor coolant. The blocking device prevents the ADS and IRWST injection valves from opening unless other plant parameters indicate an actual LOCA. The blocking device is independent of the PMS failure modes that could lead to such a spurious valve actuation. The shared power source and input and output connections do not compromise the independence of the blocking device. Since the blocking device is located within the PMS BCCs, they are included in the PMS equipment qualification. Additional operational controls are required due to this proposed change. New TS and surveillance requirements are proposed in order to ensure that the blocking device is capable of automatically removing the block and being manually unblocked, depending on the given plant configuration. The blocking device, along with the added operational considerations, has no substantial impact on the CDF or LRF. The overall functionality of the PXS, IRWST, and ADS are not adversely impacted. The blocking device does not interfere with their safety related functions, nor are the accidents evaluated in UFSAR Chapter 15 negatively affected.

4. Regulatory Evaluation

4.1 Applicable Regulatory Requirements/Criteria

10 CFR 52.98(f) requires NRC approval for any modification to, addition to, or deletion from the terms and conditions of a Combined License (COL). This activity involves a change to COL Appendix A, Technical Specifications, as well as a departure from plant-specific Tier 1 information, and a corresponding change to COL Appendix C, Inspections, Tests, Analyses and Acceptance Criteria information; therefore, this activity requires an amendment to the COL. Accordingly, NRC approval is required prior to making the plant-specific changes in 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. Proposed Tier 2 changes involve revisions to plant-specific Tier 1 information (and corresponding COL Appendix C information), Tier 2*

information, and COL Appendix A Technical Specifications, and thus require prior NRC approval.

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. 10 CFR 52, Appendix D, VIII.A.4 requires that a proposed change to Tier 1 shall not result in a significant decrease in the level of safety otherwise provided by the design. The plant design change and its associated Tier 1 information change do not adversely affect any safety-related SSC, function, design analysis, or safety analysis, and do not adversely affect the ADS or IRWST functions or analyses. Therefore, the requested changes will not result in a decrease in the level of safety otherwise provided by the design. Additional exemption request justification demonstrating compliance with 10 CFR 52.7 is provided in Enclosure 2.

10 CFR 52, Appendix D, VIII.C.6 states that after issuance of a license, "Changes to the plant specific TS will be treated as license amendments under 10 CFR 50.90." 10 CFR 50.90 addresses the applications for amendments of licenses, construction permits, and early site permits. As discussed above, a change to COL Appendix A is requested, and thus a license amendment request (LAR) (as supplied herein) is required.

10 CFR 50 Appendix A, General Design Criterion 22 requires that the protection system be designed to assure that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident conditions on redundant channels do not result in loss of the protection function, or shall be demonstrated to be acceptable on some other defined basis. Design techniques, such as functional diversity or diversity in component design and principles of operation, shall be used to the extent practical to prevent loss of the protection function. The AP1000 Protection and Safety Monitoring System (PMS) continues to maintain the required independence level and is designed to maintain its functionality during defined failures.

The design change for addition of the blocking device is in accordance with the provisions of Institute of Electrical and Electronics Engineers (IEEE) 603, "Standard Criteria for Safety Systems" – 1991, including basic attributes of reliability, diversity, redundancy, independence, and simplicity of design (e.g., simple open/close valve control demands) for plant operations, surveillance, and maintenance. Specifically, the PMS continues to meet the required single-failure criterion, per IEEE 603-1991 Section 5.1. Independence is maintained with the blocking device, per IEEE 603-1991 Section 5.6. The PMS continues to comply with IEEE 603-1991 Section 7.3 which requires protective actions to execute to completion once initiated. Also, the system continues to comply with the IEEE 603-1991 Section 7.3 requirement which requires deliberate operator action to return a safety system to normal conditions following a reset.

The proposed changes have been evaluated to determine whether applicable regulations continue to be met. It was determined that the proposed changes do not affect conformance with any General Design Criteria (GDC) differently than described in the plant-specific DCD or UFSAR.

4.2 Precedent

No precedent is identified.

4.3 Significant Hazards Consideration Determination

The proposed changes would revise the Combined Licenses (COLs) by adding design details to the Automatic Depressurization System (ADS) blocking device and add the blocking device to the design of the In-Containment Refueling Water Storage Tank (IRWST) injection valves actuation logic. The blocking device is included in the AP1000 design to prevent spurious actuations of ADS and IRWST injection valves due primarily to Protection and Safety Monitoring System (PMS) software common cause failures (CCFs). The blocking device is used for the ADS and IRWST injection valves because the consequence of a spurious actuation on these valves can result in a loss of reactor coolant. Therefore, the probability of a spurious actuation of the ADS or IRWST injection valves resulting in a loss of coolant accident (LOCA) are further minimized with this proposed change.

The requested amendment proposes changes to Updated Final Safety Analysis Report (UFSAR) Tier 2 and Tier 2* information. The changes involve Technical Specifications (TS) and plant-specific Tier 1 changes, along with the corresponding changes to COL Appendix A and Appendix C information.

An evaluation to determine whether or not a significant hazards consideration is involved with the proposed amendment was completed by focusing on the three standards set forth in 10 CFR 50.92(c), “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 AP1000 accident analysis previously evaluated a loss of coolant accident caused by an inadvertent ADS valve actuation. Adding design detail to the ADS blocking device, and applying the blocking device to the IRWST injection valves, does not impact this analysis. Using a blocking device on the ADS and IRWST injection valves is a design feature which further minimizes the probability of a loss of coolant accident caused by a spurious valve actuation. Furthermore, because the blocking device is designed to prevent a spurious valve actuation due to a software CCF and does not adversely

impact any existing design feature, it does not involve a significant increase in the probability of an accident previously evaluated.

The proposed amendment does not affect the prevention and mitigation of abnormal events, e.g., accidents, anticipated operation occurrences, earthquakes, floods, turbine missiles, and fires or their safety or design analyses. This change does not involve containment of radioactive isotopes or any adverse effect on a fission product barrier. There is no impact on previously evaluated accidents source terms. The PMS is still able to actuate ADS and IRWST injection valves for plant conditions which require their actuation. Therefore, the proposed amendment does not involve a significant increase in the consequences of an accident previously evaluated.

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

Response: No

The proposed changes do not involve a new failure mechanism or malfunction, which affects an SSC accident initiator, or interface with any SSC accident initiator or initiating sequence of events considered in the design and licensing bases. There is no adverse effect on radioisotope barriers or the release of radioactive materials. The proposed amendment does not adversely affect any accident, including the possibility of creating a new or different kind of accident from any accident previously evaluated. Therefore, the proposed changes do not create the possibility of a new or different type of accident from any accident previously evaluated.

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

Response: No

The blocking device is independent of PMS processor hardware and software. It is designed to allow for ADS and IRWST injection actuations when the plant parameters indicate an actual LOCA event. Therefore, the ADS and IRWST are still able to perform their safety functions when required. A postulated failure of a blocking device which would prevent necessary ADS and IRWST injection valve opening would be detected by the proposed periodic surveillance testing within the TS. Failure of the ADS actuation or IRWST injection valve opening in a division could also result from concurrent failure of the two Core Makeup Tanks (CMTs) level sensors in one division, with both sensors reading above the blocking setpoint. Failures of the level sensors would be immediately detected due to the deviations in redundant measurements. Furthermore, the proposed TS actions require that the four divisions of blocking devices be capable of automatically

unblocking for each CMT. In addition, the TS require that the blocking devices be unblocked in plant modes which allow for the operability of less than two CMTs.

The blocking device will continue to comply with the existing UFSAR regulatory requirements and industry standards. The proposed changes would not affect any safety-related design code, function, design analysis, safety analysis input or result, or existing design/safety margin. No safety analysis or design basis acceptance limit/criterion is challenged or exceeded by the requested changes.

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

4.4 Conclusions

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(c), the requested change does not involve a Significant Hazards Consideration.

5. Environmental Considerations

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

This Amendment request includes proposed changes to Technical Specifications (Combined License [COL] Appendix A), as well as plant-specific Tier 2, Tier 2*, and Tier 1 (along with the corresponding information in COL Appendix C) changes. The proposed amendment would involve adding design detail to the Automatic Depressurization System (ADS) blocking device and adding the blocking device to the design of the In-Containment Refueling Water Storage Tank (IRWST) injection valves actuation logic. The ADS and IRWST injection blocking device is used in the AP1000 to reduce the potential for spurious actuations of ADS and IRWST injection valves due primarily to Protection and Safety Monitoring System (PMS) software common cause failures (CCFs).

This review has determined the proposed changes require 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 proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated; (2) the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated; and (3) the proposed amendment does not involve a significant reduction in a margin of safety. Therefore, it is concluded that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of "no significant hazards consideration" is justified.

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

The proposed amendment adds design detail related to the ADS blocking device and adds the blocking device to the design of the IRWST injection valves actuation logic. The blocking devices are used to reduce the potential for spurious valve actuations. The changes are unrelated to any aspects of plant construction or operation that would introduce any changes to effluent types (e.g., effluents containing chemicals or biocides, sanitary system effluents, and other effluents) or affect any plant radiological or non-radiological effluent release quantities. Furthermore, the proposed change does not diminish the functionality of any design or operational features that are credited with controlling the release of effluents during plant operation. Therefore, it is concluded that the proposed amendment does not involve a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite.

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

The proposed amendment adds design detail related to the ADS blocking device and adds the blocking device to the design of the IRWST injection valves actuation logic. The change does not affect plant radiation zones (addressed in UFSAR Section 12.3), and controls under 10 CFR 20 preclude a significant increase in occupational radiation exposure. Therefore, the proposed amendment does not involve a significant increase in individual or cumulative occupational radiation exposure.

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

Therefore, pursuant to 10 CFR 51.22(b), an environmental impact statement or environmental assessment of the proposed exemption and amendment is not required.

6. References

None

South Carolina Electric & Gas Co.

NND-16-0468

Enclosure 2

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

Exemption Request for Tier 1 Changes Related to ADS and IRWST Injection Block (LAR 16-15)

(This Enclosure contains 7 pages, including this cover)

1.0 Purpose

South Carolina Electric & Gas Co. (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 plant-specific 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 the Appendix, including certified information in DCD Tier 1. Tier 1 includes inspections tests, analyses, and acceptance criteria (ITAAC) that must be satisfactorily performed prior to fuel load. The design details to be verified by these ITAAC are specified in the text, tables, and figures that are referenced in each individual ITAAC. The Tier 1 information for which a departure and permanent exemption is being requested is related to the addition of Tier 2 design detail to the Automatic Depressurization System (ADS) blocking device and adding the blocking device to the design of the In-Containment Refueling Water Storage Tank (IRWST) injection squib valves actuation logic.

This request for permanent exemption applies the requirements of 10 CFR 52, Appendix D, Section VIII.A.4 to allow departures from plant-specific DCD Tier 1 information due to the following proposed changes to the following ITAAC tables (specific details are provided in Enclosure 1 of the accompanying license amendment request).

- Tier 1 Table 2.5.2-5, "Minimum Inventory of Displays, Alerts, and Fixed Position Controls in the MCR"
    - Add a new row for the manual ADS and IRWST injection unblock control feature. The Control column is marked with a "Yes." The Display and Alert columns are blank.
- Tier 1 Table 2.5.2-6, "PMS Blocks"
    - Add "ADS and IRWST Injection Actuation" under Engineered Safety Features.

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

2.0 Background

The Licensee is the holder of Combined License (COL) 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.

During the detailed design finalization of the systems, departures from the details identified in Tier 1 information were determined necessary to facilitate consistency with the actual design

functions of the systems described in the plant-specific DCD Tier 2 information. This activity requests exemption from the Generic DCD Tier 1 tables which support the associated COL Appendix C ITAAC.

A permanent exemption from elements of the AP1000 certified design information is requested to allow the Licensee to depart from the design details contained in these Tier 1 tables.

3.0 Technical Justification of Acceptability

An exemption is requested to depart from AP1000 generic Design Control Document (DCD) Tier 1 material in regard to the ADS and IRWST injection blocking device. The proposed exemption would allow a change to the plant-specific DCD Tier 1 ITAAC information.

The proposed changes to the information presented in plant-specific DCD Tier 1 tables are at a level of detail that is consistent with the information currently provided therein. The proposed changes neither adversely impact the ability to meet the design functions of the structures, systems, or components (SSCs) nor involve a significant decrease in the level of safety provided by the SSCs. The proposed changes to information in plant-specific DCD Tier 1 continue to provide the detail necessary to implement the corresponding ITAAC. Further, application of the current generic 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, would not serve the underlying purpose of the rule since it could be read to be inconsistent with the existing design information provided in Tier 2 of the plant-specific DCD.

Additional detail for supporting the Technical Justification of this exemption is provided in Enclosure 1 of the accompanying license amendment request.

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. The Licensee has identified necessary changes to plant-specific Tier 1 information related to the ADS and IRWST injection valve blocking devices as a result of further design review activities. As a result, the Licensee requests a permanent exemption from the certified design information in plant-specific Tier 1, pursuant to the above regulations, to allow the implementation of a departure.

10 CFR Part 52, Appendix D; 10 CFR 50.12; 10 CFR 52.7; and 10 CFR 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.1].

The requested exemption to allow the licensee to change the design descriptions of the structures, systems, and components satisfies the six criteria for granting specific exemptions, as described below.

1. This exemption is authorized by law

The NRC has authority under 10 CFR §§ 50.12, 52.7, and 52.63 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 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 the Licensee to depart from elements of the plant-specific DCD Tier 1 design information. The plant-specific Tier 1 material will continue to reflect the approved licensing basis, and will maintain a consistent level of detail with that which is currently provided elsewhere in Tier 1 of the plant-specific DCD. Therefore, no adverse safety impact which would present any additional risk to the health and safety of the public is present. The affected design description in the plant-specific Tier 1 material will also continue to provide the detail necessary to support the performance of the associated ITAAC.

This proposed change will not impact the ability of the SSCs to perform their design functions. Because the changes will not alter the intended operation of any plant equipment or systems, they do not present any undue risk from existing equipment or systems. The proposed changes do not introduce any new industrial, chemical, or radiological hazards that would represent a public health or safety risk, nor do they remove any design or operational controls or safeguards that are 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 new equipment or systems.

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

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

The requested exemption from the requirements of 10 CFR 52, Appendix D, Section III.B would allow the Licensee to depart from elements of the plant-specific DCD Tier 1 design information. The proposed exemption does not alter the design, function, or operation of any structures or plant equipment that are necessary to maintain a safe and secure status of the plant. The proposed exemption has no impact on the facility's physical or cyber security.

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 & 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 change maintains the design functions of these systems. This change does not impact the ability of any SSCs to perform their functions or negatively impact safety.

Accordingly, this exemption from the certification information will allow the Licensee to safely construct and operate the AP1000 facility consistent with the design certified by the NRC in 10 CFR 52, Appendix D.

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

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

Based on the nature of the proposed departure from the plant-specific DCD Tier 1 information and the understanding that these changes support the actual system functions,

it is likely that other AP1000 licensees will request this exemption. However, if this is not the case, the special circumstances continue to outweigh any decrease in safety from the reduction in standardization because the design functions of the systems associated with this request will continue to be maintained. This exemption request and the associated mark-ups to tables demonstrate that there is a minimal change from the generic AP1000 DCD, minimizing the reduction in standardization and consequently the safety impact from the reduction.

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.

This exemption request proposes to allow the Licensee to revise the plant-specific DCD Tier 1 information by adding the manual ADS and IRWST injection unblock control switch to Table 2.5.2-5 and adding the ADS and IRWST injection actuation PMS Block to Table 2.5.2-6. The updates will not impact the functional capabilities of these SSCs. Because the changes associated with this exemption request will continue to meet existing Codes and Standards and methodologies described in the UFSAR, there are no new failure modes introduced by these changes and the level of safety provided by the current SSCs remains unchanged.

Because the proposed changes to the SSCs will not affect the ability of the SSCs to perform their design functions and the level of safety provided is unchanged, it is concluded that the changes 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

None identified.

7.0 Environmental Consideration

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20, or would change an inspection or surveillance requirement. However, the proposed exemption 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. Specific justification is provided in Enclosure 1, Section 5 of the accompanying license amendment request. Accordingly, the proposed exemption meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the proposed exemption.

8.0 Conclusion

The proposed changes to DCD Tier 1 are necessary to update information in plant-specific DCD Tier 1. The exemption request meets the requirements of 10 CFR 52.63, "*Finality of Design Certifications,*" 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, as well as providing the special circumstances criteria of 10 CFR 50.12(a)(2)(ii). Furthermore, approval of this request does not result in a decrease in the level of safety, does not present a significant decrease in safety as a result of a reduction in standardization, and meets the eligibility requirements for categorical exclusion.

9.0 References

None.

South Carolina Electric & Gas Co.

NND-16-0468

Enclosure 3

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

Proposed Changes to Licensing Basis Documents

(Publicly Available Information)

(LAR 16-15)

Note: Added text is Denoted by Underlined Blue Text
Deleted text is shown as ~~Red Strikethrough~~
Proposed changes to figures are shown in Red Clouded areas
Information to be withheld is annotated by enclosing within "[…]" and with superscripted "a,c" after the close-bracket
Omitted text is shown as three asterisks (* * *)

(This Enclosure consists of 20 pages, including this cover page.)

COL Appendix C Table 2.5.2-5 and corresponding Plant-Specific DCD Tier 1 Table 2.5.2-5

Table 2.5.2-5 (cont.) Minimum Inventory of Displays, Alerts, and Fixed Position Controls in the MCR			
Description	**Control**	**Display**	**Alert(1)**
...	...	...	...
Manual Containment Vacuum Relief	Yes		
Manual ADS and IRWST Injection Unblock	Yes	-	-

COL Appendix C Table 2.5.2-6 and corresponding Plant-Specific DCD Tier 1 Table 2.5.2-6

Table 2.5.2-6 PMS Blocks
... Engineered Safety Features: ADS and IRWST Injection Actuation Automatic Safeguards ...

UFSAR Section 1.6, Table 1.6-1, "Material Referenced"

- **Revise Tier 2 text applicable to DCD Section 7.1 in UFSAR Table 1.6-1 to reflect changes to referenced WCAPs.**

DCD Section Number	Westinghouse Topical Report Number	Title
* * *		
7.1	* * *	
	WCAP-16674-P WCAP-16674-NP	AP1000 I&C Data Communication and Manual Control of Safety Systems and Components, Revision 4 (as modified by changes provided in Appendix 7A)
	WCAP-16675-P WCAP-16675-NP	AP1000 Protection and Safety Monitoring System Architecture Technical Report, Revision 5 (as modified by changes provided in Appendix 7A)
	* * *	

UFSAR Section 6.3, Subsection 6.3.2.2.8.9, "Explosively Opening (Squib) Valves"

- **Revise Tier 2 text, as follows:**

  * * *

  In the incontainment refueling water storage tank injection lines, the squib valves are in series with normally closed check valves. Inadvertent opening of the injection squib valves is considered beyond design basis. However, the consequence of this inadvertent opening could lead to a loss of reactor coolant. Therefore, a blocking device, as described in Subsection 7.3.1.2.4.1, is utilized to preclude the inadvertent opening of the injection squib valves. In the containment recirculation lines, the squib valves are in series with normally closed check valves in two lines and with normally open motor operated valves in the other two lines. As a result, inadvertent opening of these squib valves will not result in loss of reactor coolant or in draining of the incontainment refueling water storage tank.

  * * *

UFSAR Section 7.1, Subsection 7.1.7, "References"

- **Revise Tier 2 references, as follows:**

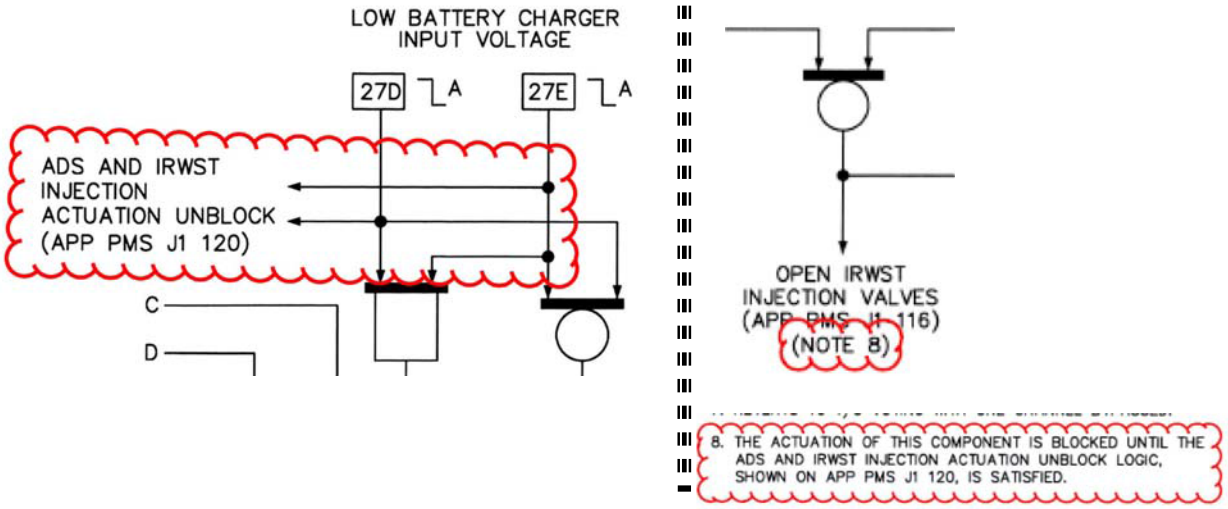
* * *

19. WCAP-16675-P (Proprietary) and WCAP-16675-NP (Non-Proprietary), "AP1000 Protection and Safety Monitoring System Architecture Technical Report," Revision 5 (as modified by changes provided in Appendix 7A).

* * *

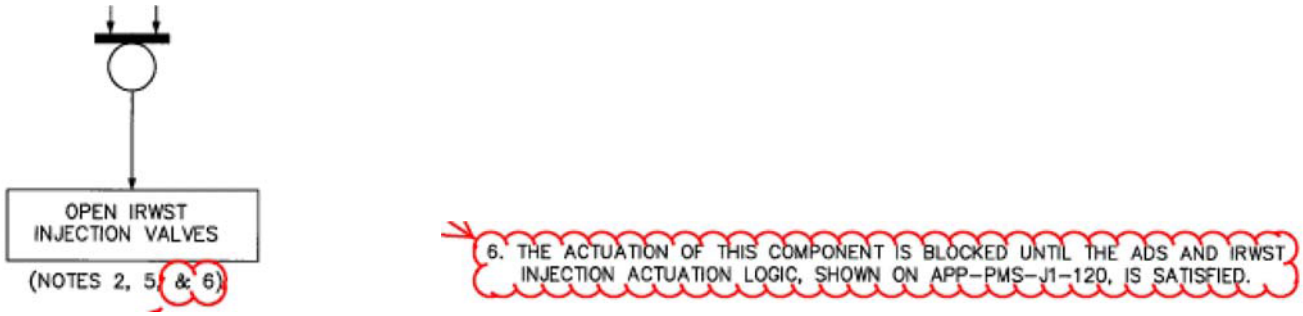
25. WCAP-16674-P (Proprietary) and WCAP-16674-NP (Non-Proprietary), "AP1000 I&C Data Communication and Manual Control of Safety Systems and Components," Revision 4 (as modified by changes provided in Appendix 7A).

UFSAR Section 7.2, Figure 7.2-1, Sheet 15 of 21 (changes reflected in clouded areas)

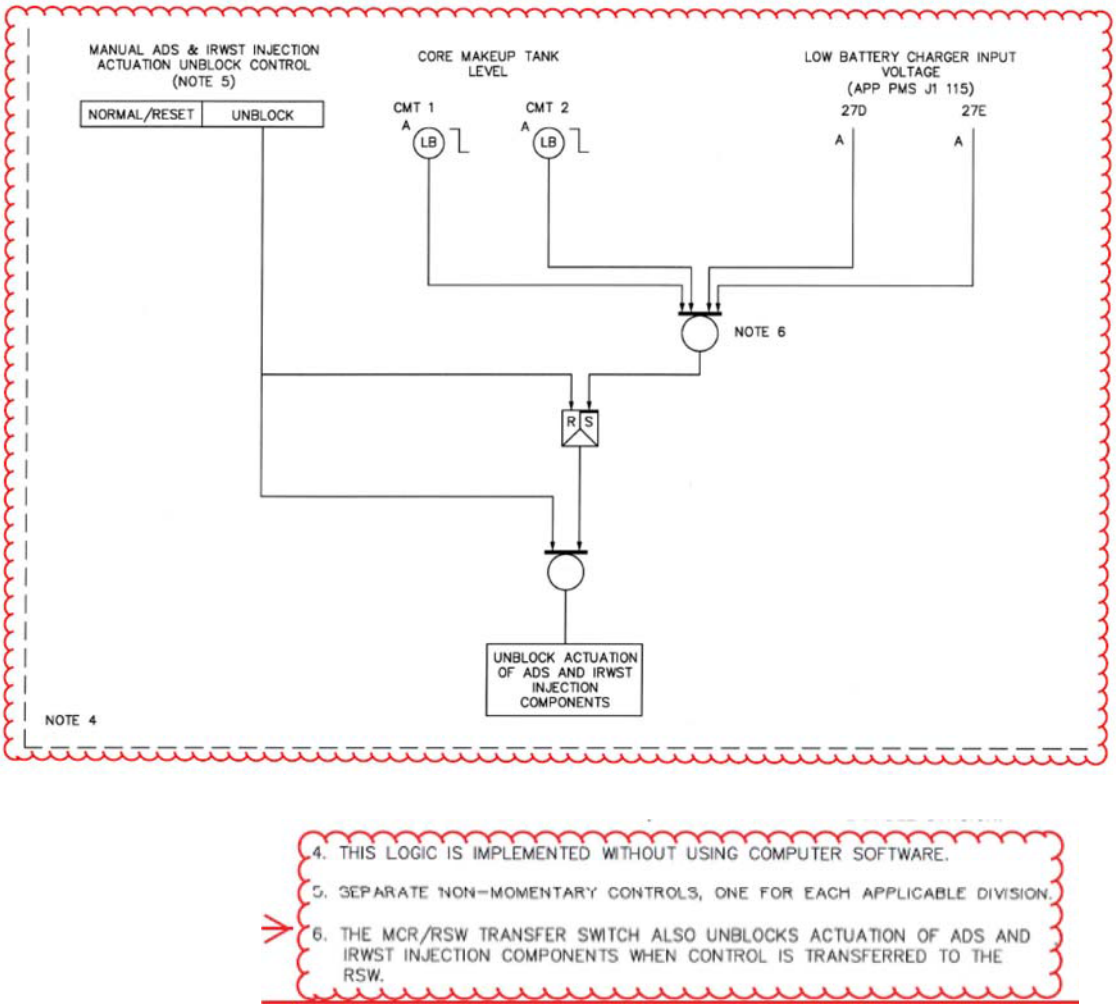


(Existing Note 8 is replaced with the above Note 8)

UFSAR Section 7.2, Figure 7.2-1, Sheet 16 of 21 (changes reflected in clouded areas)



UFSAR Section 7.2, Figure 7.2-1, Sheet 19 of 21 (changes reflected in clouded areas)



UFSAR Section 7.3, Subsection 7.3.1.2.2, "In-Containment Refueling Water Storage Tank Injection"

- **Revise Tier 2 text, as follows:**

Signals to align the in-containment refueling water storage tank for injection are generated from the following conditions:

1. Actuation of the fourth stage of the automatic depressurization system (Subsection 7.3.1.2.4)

2. Coincidence loop 1 and loop 2 hot leg levels below Low-2 setpoint for a duration exceeding an adjustable time delay

3. Manual initiation

Each of the above conditions opens the in-containment refueling water storage tank injection valves, thereby providing a flow path to the reactor coolant system. As described in subsection 7.3.1.2.4.1, a blocking device prevents ADS spurious actuation as well as in-containment refueling water storage tank injection.

UFSAR Section 7.3, Subsection 7.3.1.2.4.1, "Block to Prevent ADS Spurious Actuation"

- **Revise Tier 2 text, as follows:**

7.3.1.2.4.1 Block to Prevent ADS and IRWST Injection Spurious Actuation

A number of measures have been taken to reduce the likelihood of spurious actuation of ESF functions in the AP1000 Protection and Safety Monitoring System (PMS) design. Special attention has been given to prevention of spurious Automatic Depressurization System (ADS) and In-containment Refueling Water Storage Tank (IRWST) Injection valve action, since a spurious actuation could result in a release of reactor coolant to containment. In order to prevent such spurious actuations, an ADS and IRWST Injection blocking device is provided that is independent of PMS processor hardware and software ~~failure modes~~. Each division of the PMS contains an independent blocking device that prevents the following ADS Stage 1-4 valves and IRWST Injection valves from actuating unless there is a confirmatory process condition separate from the PMS ADS and IRWST Injection actuation logic:

ADS Stage 1: Depressurization Valve for Stage 1A Valve Set and Depressurization Valve for Stage 1B Valve Set

ADS Stage 2: Depressurization Valve for Stage 2A Valve Set and Depressurization Valve for Stage 2B Valve Set

ADS Stage 3: Depressurization Valve for Stage 3A Valve Set and Depressurization Valve for Stage 3B Valve Set

ADS Stage 4: Block "ARM" ~~or "FIRE"~~ signal for all squib valves

IRWST Injection Isolation Valves: Block "ARM" signal for all squib valves

Independence

The ADS and IRWST Injection blocking device is a Class 1E module physically located within each of the PMS divisions. The blocking device is diverse from the PMS processor hardware and software that is used to create the automatic ADS and IRWST Injection actuation signal, which provides the input to the component interface modules for the ADS and IRWST Injection valves. There are no inter-divisional connections between the blocking devices nor will there be any coincidence voting among the blocking devices.

~~**Clearing of the ADS Block**~~

~~The ADS block device uses Core Makeup Tank (CMT) level to automatically clear this block. The ADS block in each division uses a level signal input from a level sensor on each CMT that clears the block if either signal indicates a CMT is draining. The use of two CMT level sensors in each ADS block device provides for a device that does not adversely affect the reliability of ADS to actuate when it is required. Switches, one for each division, are provided in the Main Control Room (MCR) to allow the operators to manually clear the ADS blocks.~~

Removing the ADS and IRWST Injection Block

The ADS and IRWST injection blocking device uses Core Makeup Tank (CMT) level and Class 1E Battery Charger (IDS) input voltage to automatically remove this block. The ADS and IRWST injection block in each division receives an input from a level sensor on each CMT that removes the block if the water level in either CMT is below a predetermined setpoint. CMT level is also used to actuate the ADS, therefore the unblock CMT level setpoint is set at a level with enough margin, including instrument uncertainty, to ensure the unblock function occurs prior the need for ADS actuation. Similarly, the block is removed if either of the two undervoltage relay inputs indicates that the voltage has dropped below a predetermined setpoint. The use of two CMT level sensors and two IDS undervoltage inputs in each ADS and IRWST injection blocking device ensures that the blocking device does not significantly affect the reliability of ADS and IRWST injection to actuate when required. In addition, the main control room (MCR)/remote shutdown workstation (RSW) switch unblocks actuation of the ADS and IRWST injection signal when control is transferred to the remote shutdown room (RSR) by the main control room (MCR)/remote shutdown workstation (RSW) switch. The MCR also contains one switch for each division that allows operators to manually remove the ADS and IRWST injection blocks. The logic for the ADS blocking device is shown on Figure 7.2-1 (Sheet 19). The ADS and IRWST injection block must be manually removed if less than two CMTs are allowed to be operable.

UFSAR Table 7.3-1, "Engineered Safety Features Actuation Signals"

- **Revise Tier 2 table as follows:**

Table 7.3-1 (Sheet 2 of 9)
Engineered Safety Features Actuation Signals

Actuation Signal	No. of Divisions/ Controls	Actuation Logic	Permissives and Interlocks
3. Automatic Depressurization ~~System~~ System[(9)] (Figure 7.2-1, Sheets 15 and 19) **(Initiate Stages 1, 2, and 3)**			
a. Core makeup tank injection coincident with	(See items 6a through 6e)		
* * *	* * *	* * *	* * *

Table 7.3-1 (Sheet 8 of 9)
Engineered Safety Features Actuation Signals

* * *	* * *	* * *	* * *
21. Open In-Containment Refueling Water Storage Tank (IRWST) Injection Line ~~Valves~~ Valves[(9)] (Figure 7.2-1, Sheets ~~12 and 16~~12, 16, and 19)			
* * *	* * *		

Table 7.3-1 (Sheet 9 of 9)
Engineered Safety Features Actuation Signals

* * *

Notes:

* * *

9. Spurious ADS and IRWST injection actuations, both automatic and manual, are blocked as described in subsection 7.3.1.2.4.1.

UFSAR Appendix 7A, "INSTRUMENTATION AND CONTROLS LICENSING BASIS DOCUMENT CHANGES":
[Note: For clarity, entirely new text that is being added to UFSAR Appendix 7A is depicted in blue font in these markups; new markups to add or delete text to the existing Appendix 7A text are identified with blue underlined font or red strike-out font, respectively; and existing markups in Appendix 7A that are unchanged by this LAR are depicted with black font (underlined or strike-out) as per the current UFSAR Appendix 7A.]

- **Revise Tier 2* Section 7A.2, "[*WCAP-17179-P and WCAP-17179-NP, AP1000™ Component Interface Module Technical Report*]" as follows:**

  * * *

  - *Revise the REFERENCES as follows:*

    13. *WCAP-15775, Revision ~~-~~4 (as modified by changes provided in Appendix 7A), "AP1000 Instrumentation and Control Defense-In-Depth and Diversity Report," Westinghouse Electric Company LLC.*

    15. *WCAP-16438-P (Proprietary), Rev. ~~2~~ 3, "FMEA of AP1000 Protection and Safety Monitoring System," Westinghouse Electric Company LLC. (as modified by changes provided in UFSAR Appendix 7A)*

22. *WCAP-17184-P (Proprietary), Revision ~~1~~ 2 (as modified by changes provided in Appendix 7A), "AP1000 Diverse Actuation System Planning and Functional Design Summary Technical Report," Westinghouse Electric Company LLC.*

- *Revise Section 2.1, "CIM System Overview" as follows:*

  * * *

  The CIM has two Z port inputs that can be used for connection with a high priority system. ~~These inputs are not used.~~ A subset of CIMs receives a Z port input from the PMS in the AP1000 application ~~(subsection 2.3.1.1.4)~~.

- *Revise Section 2.3.1.1.4 "Z Port Input Circuits" as follows:*

  * * *

  ~~The Z port inputs are not used in the AP1000 application.~~ [

  ]^{a,c}

- *Revise Section 2.3.1.2.4 "Priority Logic" as follows:*

  * * *

  The priority logic function takes inputs from the X port, Y port, Z port and local control port. [

  ]^{a,c}

- *Revise Section 2.9.4, Human Diversity, as follows:*

  * * *

- **Revise Tier 2 Section 7A.4, "WCAP-16438-P and WCAP-16438-NP, FMEA of AP1000™ Protection and Safety Monitoring System," as follows:**

  * * *

  - Revise Section 2.15, "ADS and IRWST Blocking Device," as follows:

    A number of measures have been taken to reduce the likelihood of spurious actuation of ESF functions in the **AP1000** Protection and Safety Monitoring System (PMS) design. Special attention has been given to prevention of spurious Automatic Depressurization System (ADS) and In-containment Refueling Water Storage Tank (IRWST) valve action, since a spurious actuation could result in a release of reactor coolant to containment. In order to prevent such spurious actuations, an ADS and

IRWST blocking device is provided that is independent of PMS software failure modes. Each division of the PMS contains an independent blocking device that prevents the following ADS Stage 1 - 4 and IRWST valves from actuating unless there is a confirmatory process condition separate from the PMS ADS and IRWST actuation logic:

ADS Stage 1: Depressurization Valve for Stage 1A Valve Set and Depressurization Valve for Stage 1B Valve Set

ADS Stage 2: Depressurization Valve for Stage 2A Valve Set and Depressurization Valve for Stage 2B Valve Set

ADS Stage 3: Depressurization Valve for Stage 3A Valve Set and Depressurization Valve for Stage 3B Valve Set

ADS Stage 4: Block "ARM" ~~or "FIRE"~~ signal for all squib valves

IRWST Injection Isolation Valves: Block "ARM" signal for all squib valves

~~Independence:~~ The ADS and IRWST blocking device is a Class 1E module physically located within each of the PMS divisions. The blocking device is diverse from the PMS hardware and software that is used to create the automatic ADS and IRWST actuation signal, which provides the input to the component interface modules for the ADS and IRWST valves. There are no inter-divisional connections between the blocking devices nor will there be any coincidence voting.

~~Clearing of the ADS Block:~~ The ADS and IRWST block device uses Core Makeup Tank (CMT) level to automatically clear this block. The ADS and IRWST block in each division uses a level signal input from a level sensor on each CMT that clears the block if either signal indicates that a CMT is draining. The use of two CMT level sensors in each ADS and IRWST block device provides for a device that does not adversely affect the reliability of ADS or IRWST to actuate when it is required. The ADS and IRWST block can also be removed when battery charger input voltage is low. Each division receives two battery charger input voltage low contact inputs; the block is removed if either contact input opens (indicating low battery charger voltage). ~~Switches, one for each division, are~~ Additionally, one switch for each division is provided in the Main Control Room (MCR) to allow the operators to manually clear the ADS and IRWST blocks. Additionally, changing control from the MCR to the RSR using the MCR/RSR transfer switch clears the ADS and IRWST block.

- Revise Section 4.12, “ADS Blocking Device,” as follows:

  4.12 ADS AND IRWST BLOCKING DEVICE

a,c

- **Revise Section 7A.5, "WCAP-15776, Safety Criteria for the AP1000 Instrumentation and Control Systems, April 2002," as follows:**

  * * *

  - Revise Table 2-3, "Minimum Inventory of Fixed Position Controls, Displays, and Alerts" as follows:

Description	Control	Display	Alert
* * *			
Manual feedwater isolation	x		
Manual ADS and IRWST injection unblock(5)	x		
Notes: * * * 5. These controls are not required at the remote shutdown workstation			

**** REVIEWERS NOTE: Section 7A.6 is reserved for use by another LAR.**

- **Add new Section 7A.7, " WCAP-16674-P and WCAP-16674-NP, AP1000 I&C Data Communication and Manual Control of Safety Systems and Components," as follows:**

7A.7 WCAP-16674-P and WCAP-16674-NP, AP1000 I&C Data Communication and Manual Control of Safety Systems and Components

The UFSAR incorporates by reference Tier 2 documents WCAP-16674-P and WCAP-16674-NP, "AP1000 I&C Data Communication and Manual Control of Safety Systems and Components." See Table 1.6-1. WCAP-16674, Revision 4, includes the following revisions and additions as indicated by strikethroughs and underlines.

- Revise the Reference section, as follows:

7. WCAP-16675-P, Rev. 5 (Proprietary), "AP1000 Protection and Safety Monitoring System Architecture Technical Report," Westinghouse Electric Company LLC. (as modified by changes provided in UFSAR Appendix 7A)

- Revise Section 6, "Component Interface Module" as follows:
  * * *

  To support this functionality, the CIM retains the current demanded state of the component.

  [

  ]a,c The block is removed when there is a drop in Core Makeup Tank levels, low battery charger input voltage upon loss of AC power, MCR/RSR transfer, or operator action. The ADS and IRWST Injection Blocking Device consists only of hardware not subject to software failure modes. [

  ]a,c

- **Add new Section 7A.8, "WCAP-16675-P and WCAP-16675-NP, AP1000 Protection and Safety Monitoring System Architecture Technical Report," as follows:**

  7A.8 WCAP-16675-P and WCAP-16675-NP, AP1000 Protection and Safety Monitoring System Architecture Technical Report

  The UFSAR incorporates by reference Tier 2 documents WCAP-16675-P and WCAP-16675-NP, AP1000 Protection and Safety Monitoring System Architecture Technical Report. See Table 1.6-1. WCAP-16675, Revision 5, includes the following revisions and additions as indicated by strikethroughs and underlines.

- Revise the Reference section, as follows:

30. WCAP-16674-P (Proprietary), Rev. ~~3~~ 4, "AP1000 I&C Data Communication and Manual Control of Safety Systems and Components," Westinghouse Electric Company LLC. (as modified by changes provided in UFSAR Appendix 7A)

- Add Section 2.2.9, “Block to Prevent ADS and IRWST Injection Spurious Actuation” as follows:

2.2.9 Block to Prevent ADS and IRWST Injection Spurious Actuation

A number of measures have been taken to reduce the likelihood of spurious actuation of ESF functions in the AP1000 PMS design. Special attention has been given to prevention of spurious Automatic Depressurization System (ADS) and In-Containment Refueling Water Storage Tank (IRWST) Injection valve action, since a spurious actuation could result in a release of reactor coolant to containment. In order to prevent such spurious actuations, an ADS and IRWST Injection Blocking Device is provided that is independent of PMS failure modes. Each division of the PMS contains an independent block that prevents the ADS Stage 1-3 depressurization valves and the arm signal to the ADS Stage 4 depressurization and IRWST Injection valves from being actuated unless there is a confirmatory process condition separate from the PMS ADS and IRWST Injection actuation logic.

2.2.9.1 Independence

The ADS and IRWST Injection Blocking Device is a Class 1E module physically located within each of the PMS divisions. The blocking device is diverse from the PMS AC160 hardware and software that is used to create the automatic ADS and IRWST Injection actuation signal, which provides the input to the component interface modules for the ADS and IRWST Injection valves. There are no inter-divisional connections between the blocking devices nor will there be any coincidence voting.

2.2.9.2 Clearing of the ADS and IRWST Injection Block

The ADS and IRWST Injection Blocking Device uses the CMT level to automatically clear this block. The ADS and IRWST Injection block in each division uses a level signal input from a level sensor on each CMT that clears the block if either signal indicates a CMT is draining. The use of two CMT level sensors in each ADS and IRWST Injection block device provides for a device that does not adversely affect the reliability of the ADS to actuate when it is required. Switches, one for each division, are provided in the MCR to allow the operators to manually clear the ADS blocks. Additionally, inputs from the MCR/Remote Shutdown Workstation (RSW) transfer switch and from the battery chargers remove the ADS and IRWST Injection block upon MCR evacuation and upon loss of AC power, respectively.

2.2.9.3 System Response to ADS and IRWST Injection Block Failures

[

]a,c

a,c

•

- Add Section 5.1.8, “ADS Blocking Device” as follows

5.1.8 ADS Blocking Device

The ADS and IRWST Injection Blocking Device design uses conventional analog components that do not rely on software. Apart from its inputs and outputs and power source, the ADS and IRWST Injection Blocking Device does not share other PMS components.

The ADS and IRWST Injection Blocking Device in each division requires the following inputs:

- 4-20 mA inputs from two narrow range upper-level sensors (one on each CMT).
- Contact inputs from one MCR override switch.
- Contact inputs from one MCR/RSW transfer switch.
- Contact inputs from two undervoltage relays from battery chargers.

[

•

]a,c

[

]a,c

UFSAR Section 18.12, "Inventory"

- **Revise Tier 2 table, as follows:**

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

Description	Control	Display	Alert(2)
* * *			
Manual containment hydrogen igniter (nonsafety-related)	X		
Manual ADS and IRWST injection unblock(5)	X		

Notes:

* * *

5. These controls are not required at the remote shutdown workstation.

COL Appendix A, Technical Specifications

TABLE OF CONTENTS Page

3.3 INSTRUMENTATION (continued)

* * *

3.3.20 Automatic Depressurization System (ADS) and In-containment Refueling Water Storage Tank (IRWST) Injection Blocking Device ... 3.3.20 – 1

INSERT New Technical Specification 3.3.20

3.3 INSTRUMENTATION

3.3.20 Automatic Depressurization System (ADS) and In-containment Refueling Water Storage Tank (IRWST) Injection Blocking Device

LCO 3.3.20 Four divisions of ADS and IRWST Injection Blocking Device channels for each Function in Table 3.3.20-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.20-1.

ACTIONS

- NOTE -

Separate condition entry is allowed for each Division.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more divisions inoperable.	A.1 Unblock component interface module (CIM) in the affected division.	8 hours
B. Required Action and associated Completion Time not met.	B.1 Declare affected ADS and IRWST valves inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

- NOTE -

Refer to Table 3.3.20-1 to determine which SRs apply for each ADS and IRWST Injection Blocking Device Function.

	SURVEILLANCE	FREQUENCY
SR 3.3.20.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.20.2	Verify each ADS and IRWST Injection Block switch is in the “unblock” position.	7 days
SR 3.3.20.3	Perform CHANNEL OPERATIONAL TEST (COT) in accordance with Setpoint Program.	92 days
SR 3.3.20.4	Perform CHANNEL CALIBRATION in accordance with Setpoint Program.	24 months
SR 3.3.20.5	Perform ACTUATION LOGIC TEST of ADS and IRWST Injection Blocking Devices.	24 months
SR 3.3.20.6	**- NOTE -** Verification of setpoint not required. Perform TRIP ACTUATING DEVICE OPERATIONAL TEST (TADOT) of ADS and IRWST Injection Block manual switches.	24 months
SR 3.3.20.7	The following SRs of Specification 3.5.2, “Core Makeup Tanks (CMTs) – Operating” are applicable for each CMT: SR 3.5.2.3 SR 3.5.2.6 SR 3.5.2.7	In accordance with applicable SRs

Table 3.3.20-1 (page 1 of 1)
ADS and IRWST Injection Blocking Device

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER DIVISION	SURVEILLANCE REQUIREMENTS
1. Core Makeup Tank Level for Automatic Unblocking[a]	1,2,3,4[b]	2	SR 3.3.20.1 SR 3.3.20.3 SR 3.3.20.4 SR 3.3.20.5 SR 3.3.20.7
2. ADS and IRWST Injection Block Switches for Manual Unblocking	1,2,3,4[b]	1	SR 3.3.20.5 SR 3.3.20.6
	4[c],5,6	1	SR 3.3.20.2 SR 3.3.20.5 SR 3.3.20.6

(a) Not required to be OPERABLE with associated divisional ADS and IRWST Injection Block switch in the “unblock” position.

(b) With the Reactor Coolant System (RCS) not being cooled by the Normal Residual Heat Removal System (RNS).

(c) With the RCS being cooled by the RNS.