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A SCANA COMPANY

RC-16-0036
March 7, 2016

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1
DOCKET NO. 50-395
OPERATING LICENSE NO. NPF-12
LICENSE AMENDMENT REQUEST – LAR-15-01424
IMPLEMENTATION OF WCAP-15376-P-A, REVISION 1
RESPONSE TO REQUEST FOR SUPPLEMENTAL INFORMATION

Reference: 1. T. D. Gatlin, SCE&G, letter to Document Control Desk, NRC, "License Amendment Request – LAR-15-01424 Implementation of WCAP-15376-P-A, Revision 1 – 'Risk-Informed Assessment of the RTS and ESFAS Surveillance Test Intervals and Reactor Trip Breaker Test and Completion Times'," dated December 16, 2015 [ML15356A048]

2. S. A. Williams, NRC, letter to G. A. Lippard, SCE&G, "Virgil C. Summer Nuclear Station, Unit 1 – Supplemental Information Needed for Acceptance of License Amendment Request for Implementation of WCAP-15376-P-A, Rev. 1 (CAC NO. MF7196)," dated February 22, 2016 [ML16032A170]

South Carolina Electric & Gas Company (SCE&G), acting for itself and as agent for South Carolina Public Service Authority pursuant to 10 CFR 50.90, submitted License Amendment Request per Reference 1 concerning the implementation of WCAP-15376-P-A, Revision 1. The Nuclear Regulatory Commission (NRC) staff's acceptance review of the amendment request determined that supplemental information is required. This submittal's attachment contains SCE&G's response to Reference 2 dated February 22, 2016.

There are no regulatory commitments associated with this response.

If you have any questions regarding this submittal, please contact Mr. Bruce L. Thompson at (803) 931-5042.

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NRR

I certify under penalty that the foregoing is correct and true.

3/7/16
Executed on

George A. Lippard

TS/GAL/wm

Attachment: VCSNS Response to Request for Supplemental Information

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VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNIT 1
DOCKET NO. 50-395
OPERATING LICENSE NO. NPF-12

ATTACHMENT

VCSNS RESPONSE TO REQUEST FOR SUPPLEMENTAL INFORMATION

By letter dated December 16, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15356A048), the South Carolina Electric & Gas Company (SCE&G, the licensee) submitted a license amendment request to revise Virgil C. Summer Nuclear Station, Unit 1 (VCSNS). The proposed amendment would revise technical specification (TS) 3/4.3.1, Reactor Trip System Instrumentation (RTS), and Engineered Safety Feature Actuation System Instrumentation (ESFAS) to implement the allowed outage time, bypass time, and surveillance frequency changes approved by the Nuclear Regulatory Commission (NRC) in Westinghouse WCAP-15376-P-A, Rev. 1, "Risk-Informed Assessment of the RTS and ESFAS Surveillance Test Intervals and Reactor Trip Breaker Test and Completion Times," dated March 2003. The licensee stated that the proposed changes in this license amendment request are consistent with the NRC approved Technical Specification Task Force (TSTF) -411, Rev.1.

The NRC staff has reviewed the application and concluded that the information delineated below is necessary to enable the staff to make an independent assessment regarding the acceptability of the proposed amendment.

Supplement Request No. 1

TSTF-411, Revision 1, requires plant specific evaluations for certain ESFAS functions. In the ESFAS instrumentation bases of the technical specifications (TS), the TSTF-411 traveler includes a reviewer's note ("INSERT 7"):

> "In Table 3.3.2-1, Functions 7.b and 7.c were not included in the generic evaluations approved in either WCAP-10271, as supplemented, or WCAP-15376. In order to apply the WCAP-10271, as supplemented, and WCAP-15376 TS relaxations to plant specific Functions not evaluated generically, licensees must submit plant specific evaluations for NRC review and approval."

A review of the proposed changes in the license amendment request (LAR), indicates that the Westinghouse Standard Technical Specifications Functions 7.b and 7.c appear to correspond to the V.C. Summer TS Function 8.a in the LAR Table 4.3.2, which is proposing to change the analog channel operational test frequency from quarterly to semi-annually.

A previous VCSNS license amendment No. 101 (ADAMS No. ML012250025), regarding the reactor trip system instrumentation and the ESFAS to include surveillance test intervals (STIs) under topical report WCAP-10271 was issued on June 18, 1991. The NRC safety evaluation for license amendment No. 101 indicates that two ESFAS functions, 8.a and 6.h, had required a plant specific analyses.

With regard to the function 6.h, the LAR Table 4.3.2 is also proposing to change the analog channel operational test frequency from quarterly to semi-annually. WCAP-15376-P-A, Section 11, indicates that the WCAP-15376-P-A results are applicable to signals not evaluated under WCAP-10271 but shown to be applicable through subsequent evaluations. The NRC staff notes that the licensee evaluated Functions 6.h and 8.a to implement allowed outage time and bypass test time changes for license amendment No. 177 dated October 24, 2006 (ADAMS No. ML062430684). However, this

evaluation is not applicable to the STI extensions proposed in the LAR. The LAR and the previous evaluations do not provide information on subsequent STI evaluations performed for functions 8.a. and 6.h to support their proposed STI extension.

Based on the review of the information in TSTF-411 traveler, the LAR, and the previous license amendments No. 101 and No. 177, and associated documentation, a plant-specific risk evaluation for functions 8.a and 6.h appear to be required, as well as information discussed in the TSTF-411 traveler for plant specific analyses. Please provide the required plant-specific risk evaluation results and technical justification, as well as the TSTF-411 traveler plant-specific analyses information for these two functions. In addition, please confirm that there are no other proposed functions in the LAR which have not been generically evaluated by the topical report WCAP-15376 and require a plant-specific analysis.

SCE&G Response

TSTF-411 Traveler Plant-specific Analysis for ESFAS Functions 8.a and 6.h

Per TSTF-411 Revision 1, utilities are required to provide plant specific evaluations (for NRC review and approval) to apply Technical Specifications relaxations to functions not evaluated generically in either WCAP-10271 or WCAP-15376. Inserts 5 and 7 of TSTF-411 specifically note that Westinghouse Standard Technical Specification Functions 11.a, 11.b, 7.b, and 7.c. were not evaluated generically and require plant specific evaluations. (These correspond to Table 4.3-1 Functions 19.c, 19.b, and Table 4.3-2 Function 8.a, respectively, in the VCSNS Technical Specifications.) VCSNS is not proposing changes to Functions 19.c or 19.b; therefore, no evaluations are needed for these functions. VCSNS is, however, proposing a change to Refueling Water Storage Tank (RWST) Switchover Surveillance Test Interval (STI) for Function 8.a. Additionally, VCSNS is proposing a change to the STI for VCSNS Table 4.3-2 Function 6.h (Emergency Feedwater Suction transfer on low pressure, also known as Condensate Storage Tank (CST) Switchover), which was also not evaluated generically in WCAP-10271 or WCAP-15376. Since Functions 8.a and 6.h were not evaluated generically, site specific evaluations were performed to show applicability of these functions to the changes in the Westinghouse Technical Specifications Optimization Program (TOP).

In WCAP-10271 (and its supplements), the Westinghouse Owners Group (WOG) TOP evaluated the impact of increasing the STIs and Allowed Outage Times (AOTs) for Reactor Trip and Engineered Safety Feature Actuation System (ESFAS) on signal unavailability and plant safety. Plant Safety was measured by core damage frequency. In particular, changes associated with the analog channels, process instrumentation, logic cabinets, master relays and slave relays were evaluated. Since this was an Owners Group program, only the ESFAS functions which were applicable to a majority of the plants were included in the study. The RWST and CST switchovers were not included since implementation of these functions is, for the most part, plant specific. When VCSNS implemented WCAP-10271, site specific evaluations were completed for these two functions to maintain consistency in ESFAS STIs and AOTs. Without this consistency (because a logic cabinet is considered inoperable when it is being tested regardless of which ESFAS function is tested) the functions with the shortest AOTs would dictate the AOTs for all the ESFAS functions during testing. This would have negated the benefit of extending the AOTs for the functions that were evaluated generically. It should be

noted that VCSNS ESFAS Functions 2.c and 3b.2 (Reactor Building Pressure High-3: Reactor Building Spray/Containment Isolation) was generically evaluated in the TOP Program.

To assess the impact of increasing the AOTs and STIs associated with the RWST and CST Switchover functions for WCAP-10271 implementation, VCSNS examined the ESFAS configuration for the two functions (analog channel logic and process circuitry, logic cabinet circuitry, master and slave relay configurations, switchover procedures and analog channel test configurations) and compared them to functions that were specifically analyzed in WCAP-10271 to show that the results of WCAP-10271 are applicable. Specifically, the RWST Switchover design and function was compared to an auxiliary feedwater pump start on low steam generator level, and the CST Switchover design and function was compared to the ESFAS pressurizer pressure channel and the auxiliary feedwater pump start on low steam generator level. The results of this review showed that the impact of implementing the TOP AOT and STI requirements on RWST and CST Switchover were conservative when compared to the impact of the functions that were specifically analyzed in the WCAP-10271 analyses. Contributors to this result included the following: First, the analog channel operability tests for these two functions were conducted with the channels in the tripped condition instead of bypassed as modeled in WCAP-10271 (both of these functions use 2 of 4 actuation logic circuitry which the TOP analyses noted as resulting in a minor contribution to signal unavailability). Secondly, the procedural direction includes operator action to back-up both automatic functions (and the RWST switchover requires an operator action to complete the swap). Based on these factors, a 12 percent increase in signal unavailability was assigned to the RWST and CST Switchover functions based on the value derived for representative signals in the TOP. A 12 percent increase is on the low end of the change in signal unavailability calculated for the functions evaluated in the TOP Program (12 percent to 35 percent). The NRC evaluated the site specific evaluation for the two switchover signals and found them acceptable in the Safety Evaluation Report for VCSNS Amendment No. 101.

The WOG approach for evaluating WCAP-15376 signal availability and risk impact differed from the WCAP-10271 approach in that instead of re-evaluating the impact on all the Reactor Trip and ESFAS functions typically found in Westinghouse plant design, only a few representative signals were specifically evaluated. The chosen representative signals were: safety injection from pressurizer pressure low interlocked with P-11, auxiliary feedwater pump start signal from steam generator level low-low in one loop, reactor trip single source from pressurizer pressure high, reactor trip diverse source from pressurizer pressure high or overtemperature delta-T. Note that among these representative signals are the signals chosen to perform the site specific WCAP-10271 evaluation for VCSNS, as stated above. The major contributors to the site specific analysis conducted for WCAP-10271 implementation of these two functions (ESFAS design/configuration and procedure actions to complete and back-up the automatic functions) with regard to configuration and unavailability are still applicable. One notable difference is that VCSNS now tests these signals in a bypassed (rather than tripped) condition. Because the TOP Program evaluated the signals as being tested in a bypassed state, this does not affect applicability of the signals to the TOP Program.

The above information provides the TSTF-411 traveler plant specific information for these two functions. Section 11.0 of WCAP-15376 provides implementation guidance and states that the results of WCAP-15376 "are applicable to any signals utilities have independently shown to be encompassed by the WOG TOP evaluation during plant specific implementation of the

WCAP-10271 and WCAP-14333 Technical Specification changes. Section 11.0 of WCAP-15376-P-A, Rev. 1, also specifically lists these two signals in the category of WCAP applicability, provided the signals have been shown to be applicable through subsequent evaluations. The approach utilized above (documenting NRC approval of site specific evaluations from WCAP-10271 implementation to show applicability of the signals for WCAP-15376 implementation) was approved by the NRC for the Beaver Valley Nuclear Power Station in TAC NOS. MD7531 and MD7532 [ML083380061], "Beaver Valley Power Station, Unit Nos. 1 and 2- Issuance of Amendments RE: Technical Specification Task Force 411 and 418." The safety evaluation report states, "Both WCAP-14333 and WCAP-15376 state that the CTs, STIs and bypass test time evaluation performed under these topical reports are applicable to the signals previously evaluated under WCAP-10271 and its supplements. Therefore, signals not specifically addressed under WCAP-10271 but found to be applicable through plant-specific WCAP-10271 evaluations, are also applicable to WCAP-14333 and WCAP-15376."

SCE&G discusses other deviations from WCAP-15376 in Sections 4.4 and 4.5 of the LAR dated December 16, 2015. There are no other proposed functions in the LAR that have not been generically evaluated by the topical report and require a plant-specific analysis.

Plant-specific Risk Evaluation and Technical Justification

During implementation of WCAP-14333-P-A, Rev. 1, VCSNS conducted an additional risk evaluation on the three energize to actuate functions because these channels utilize different instrumentation power supplies than similar functions evaluated in the WCAP. These functions are: Reactor Building Pressure High 3 (ESFAS Functions 2.c and 3.b.2), Emergency Feedwater Suction Transfer on Low Pressure (ESFAS Function 6.h), and RWST Level Low-Low (ESFAS Function 8.a). For implementation of WCAP-15376, Revision 1, VCSNS performed a risk-informed analysis in accordance with Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Current Licensing Basis," and RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decision-making: Technical Specifications," using the VCSNS PRA model to assess the impact of revising the analog channel operational test interval from quarterly to semi-annually. The results of the risk analysis are provided below:

Function	Δ Core Damage Frequency (**CDF**)	Δ Large Early Release Frequency (**LERF**)
Emergency Feedwater Suction Transfer on Low Pressure (ESFAS Function 6.h)	8.70E-09/yr	-8.90E-11/yr
Reactor Building Pressure High 3 (ESFAS Function 2.c)	8.70E-09/yr	-8.90E-11/yr
RWST Level Low-Low (ESFAS Function 8.a)	2.42E-08/yr	9.00E-11/yr
Combined Impact	2.42E-08/yr	9.00E-11/yr

The changes in LERF for Functions 6.h and 2.c are reported as negative numbers. This is due to post-processing treatment by the PRA software tool in very low level cutsets, and has no real impact on the calculation. These results should be interpreted as having a negligible change in risk.

Note that the risk metrics above meet the acceptance criteria provided in RG 1.174 and RG 1.177: delta CDF less than 1E-06/yr and delta LERF less than 1E-07/yr.

Reactor Building Pressure High 3 (ESFAS Function 3.b.2) was not evaluated quantitatively since it is not explicitly modeled in the VCSNS PRA model. The Phase B containment isolation signal (Reactor Building Pressure High 3 [ESFAS Function 3.b.2]) is used to isolate Component Cooling Water (CCW) to the Reactor Building, CCW to the Thermal Barrier Heat Exchangers, and Chemical Feed from the Feedwater system to the Steam Generators. Each of these systems is a closed system inside containment, that is, it is closed to the containment atmosphere with piping, or a similar component, forming the barrier. With such systems, a pathway from the containment atmosphere to the outside environment requires a pipe break inside containment in addition to a failure of the Containment Isolation Valve (CIV) outside the containment to close and/or remain closed. Typically, such penetrations are screened out of the containment isolation analyses due to the very low probability of the required pipe break. Given this, CIVs associated with these penetrations are not included in the PRA model. Since this type of penetration is screened from the analysis, i.e., it is considered to contribute negligibly to releases, the Phase B containment isolation signal will also be unimportant to containment isolation success. Therefore, the changes for the Phase B containment isolation signal will have a negligible impact on the LERF.

Supplement Request No. 2

Since the VCSNS Technical Specifications have not been converted to the Standard Technical Specifications, the NRC staff requests the license to identify the plant-specific systems, functions, and nomenclature for the proposed changes and identify the corresponding systems, functions, and nomenclature used in TSTF-411.

SCE&G Response

Listed below are comparison tables of VCSNS Technical Specifications and Westinghouse Standard Technical Specifications for both Reactor Trip System Instrumentation and Engineered Safety Feature Actuation System Instrumentation.

Function Comparison of VCSNS Technical Specifications and Westinghouse Standard Technical Specifications	
VCSNS Technical Specifications Reactor Trip System Instrumentation Table 4.3-1	**Westinghouse Standard Technical Specifications Reactor Trip System Instrumentation Table 3.3.1-1**
2. Power Range, Neutron Flux High Setpoint Low Setpoint	2. Power Range Neutron Flux a. High b. Low
3. Power Range, Neutron Flux High Positive Rate	3. Power Range Neutron Flux Rate a. High Positive Rate
5. Intermediate Range, Neutron Flux	4. Intermediate Range Neutron Flux
6. Source Range, Neutron Flux	5. Source Range Neutron Flux
7. Overtemperature ΔT	6. Overtemperature ΔT
8. Overpower ΔT	7. Overpower ΔT
9. Pressurizer Pressure--Low	8. Pressurizer Pressure a. Low
10. Pressurizer Pressure--High	8. Pressurizer Pressure b. High
11. Pressurizer Water Level--High	9. Pressurizer Water Level - High
12. Loss of Flow	10. Reactor Coolant Flow - Low
13. Steam Generator Water Level-- Low-Low	14. Steam Generator (SG) Water Level - Low Low
14. Steam Generator Water Level - Low Coincident with Steam/Feedwater Flow Mismatch	15. SG Water Level - Coincident with Steam Flow/Feedwater Flow Mismatch
15. Undervoltage - Reactor Coolant Pumps	12. Undervoltage RCPs
16. Underfrequency - Reactor Coolant Pumps	13. Underfrequency RCPs
20. Reactor Trip Breaker	19. Reactor Trip Breakers(i)
21. Automatic Trip Logic	21. Automatic Trip Logic
22. Reactor Trip Bypass Breaker	19. Reactor Trip Breakers(i)

(i) Including any reactor trip bypass breakers that are racked in and closed for bypassing an RTB.

Function Comparison of VCSNS Technical Specifications and Westinghouse Standard Technical Specifications	
VCSNS Technical Specifications Engineered Safety Feature Actuation System Instrumentation Table 4.3-2	**Westinghouse Standard Technical Specifications Engineered Safety Feature Actuation System Instrumentation Table 3.3.2-1**
1. Safety Injection, Reactor Trip, Feedwater Isolation, Control Room Isolation, Start Diesel Generators, Containment Cooling Fans and Essential Service Water b. Automatic Actuation Logic and Actuation Relays c. Reactor Building Pressure-High-1 d. Pressurizer Pressure--Low e. Differential Pressure Between Steam Lines--High f. Steam Line Pressure Low	1. Safety Injection b. Automatic Actuation Logic and Actuation Relays c. Containment Pressure - High 1 d. Pressurizer Pressure - Low e. Steam Line (2) High Differential Pressure Between Steam Lines e. Steam Line Pressure (1) Low
2. Reactor Building Spray b. Automatic Actuation Logic and Actuation Relays c. Reactor Building Pressure-High-3	2. Containment Spray b. Automatic Actuation Logic and Actuation Relays c. Containment Pressure High - 3 (High High)
3. Containment Isolation a. Phase "A" Isolation 3) Automatic Actuation Logic and Actuation Relays b. Phase "B" Isolation 1) Automatic Actuation Logic and Actuation Relays 2) Reactor Building Pressure-High-3	3. Containment Isolation a. Phase A Isolation (2) Automatic Actuation Logic and Actuation Relays b. Phase B Isolation (2) Automatic Actuation Logic and Actuation Relays (3) Containment Pressure High - 3 (High High)

Function Comparison of VCSNS Technical Specifications and Westinghouse Standard Technical Specifications	
VCSNS Technical Specifications Engineered Safety Feature Actuation System Instrumentation Table 4.3-2	**Westinghouse Standard Technical Specifications Engineered Safety Feature Actuation System Instrumentation Table 3.3.2-1**
3. Containment Isolation (continued) c. Purge and Exhaust Isolations 1) Automatic Actuation Logic and Actuation Relays	3. Containment Isolation (continued) ❖ Table 3.3.6-1 *Containment Purge and Exhaust Isolation Instrumentation* 2. Automation Actuation Logic and Actuation Relays
4. Steam Line Isolation b. Automatic Actuation Logic and Actuation Relays c. Reactor Building Pressure-High-2 d. Steam Flow in Two Steam Lines--High Coincident with T_{avg}--Low-Low e. Steam Line Pressure Low	4. Steam Line Isolation b. Automatic Actuation Logic and Actuation Relays c. Containment Pressure - High 2 e. High Steam Flow in Two Steam Lines Coincident with T_{avg} - Low Low d. Steam Line Pressure (1) Low
5. Turbine Trip and Feedwater Isolation a. Steam Generator Water Level--High-High b. Automatic Actuation Logic and Actuation Relays	5. Turbine Trip and Feedwater Isolation b. SG Water Level - High High (P-14) a. Automatic Actuation Logic and Actuation Relays
6. Emergency Feedwater b. Automatic Actuation Logic and Actuation Relays c. Steam Generator Water Level--Low-Low h. Suction Transfer on low pressure	6. Auxiliary Feedwater a. Automatic Actuation Logic and Actuation Relays (SSPS) c. SG Water Level - Low Low h. Auxiliary Feedwater Pump Suction Transfer on Suction Pressure - Low

Function Comparison of VCSNS Technical Specifications and Westinghouse Standard Technical Specifications	
VCSNS Technical Specifications Engineered Safety Feature Actuation System Instrumentation Table 4.3-2	**Westinghouse Standard Technical Specifications Engineered Safety Feature Actuation System Instrumentation Table 3.3.2-1**
8. Automatic Switchover To Containment Sump a. RWST level low-low b. Automatic Actuation Logic and Actuation Relays	7. Automatic Switchover to Containment Sump b. Refueling Water Storage Tank (RWST) Level - Low Low c. RWST Level - Low Low a. Automatic Actuation Logic and Actuation Relays
9. Engineered Safety Feature Actuation System Interlocks a. Pressurizer Pressure, P-11 b. Low, Low T_{avg}, P-12	8. ESFAS Interlocks b. Pressurizer Pressure, P-11 c. T_{avg} - Low Low, P-12

❖ Note for Westinghouse Standard Technical Specifications that Containment Purge and Exhaust Isolation Instrumentation is not included in Table 3.3.2-1 for ESFAS Instrumentation. That function is listed in Table 3.3.6-1 for Containment Purge and Exhaust Isolation Instrumentation.

Supplement Request No. 3

Please describe the extent to which this is a solid state protection system used for RTS or ESFAS, or both RTS and ESFAS.

SCE&G Response

VCSNS utilizes a solid state system for both the Reactor Trip System and the Emergency Safeguards Features Actuation System.