



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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November 8, 2016

Mr. George A. Lippard, III
Vice President, Nuclear Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
Post Office Box 88, Mail Code 800
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1 – REQUEST FOR
ADDITIONAL INFORMATION RE: LICENSE AMENDMENT REQUEST FOR
IMPLEMENTATION OF TSTF-411 (WCAP-15376-P-A), REVISION 1
(CAC NO. MF7196)

Dear Mr. Lippard:

By letter dated December 16, 2015, as supplemented by letter dated March 7, 2016, South Carolina Electric & Gas Company (SCE&G, the licensee) requested changes to the Technical Specifications for the Virgil C. Summer Nuclear Station, Unit No. 1. The proposed license amendment changes are based on Technical Specification Task Force (TSTF) Traveler TSTF-411, Revision 1, "Surveillance Test Interval Extensions for Components of the Reactor Protection System (WCAP-15376-P)."

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's submittal and determined that additional information is needed to continue its review. During a clarification call on November 7, 2016, Mr. Thompson of SCE&G requested 90 days of the date of this letter to respond to the NRC request for additional information. The NRC staff agreed to this request but notes that the NRC staff's review is continuing, and further requests for information may be developed.

If you have any questions, please contact me at 301-415-1009 or Shawn.Williams@nrc.gov.

Sincerely,

A handwritten signature in cursive script that reads "Shawn Williams".

Shawn A. Williams, Senior Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-395

Enclosure:
Request for Additional Information

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REQUEST FOR ADDITIONAL INFORMATION
LICENSE AMENDMENT REQUEST FOR IMPLEMENTATION OF
WCAP-15376-P-A, REVISION 1
SOUTH CAROLINA ELECTRIC & GAS COMPANY
VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1
DOCKET NO. 50-395

By letter dated December 16, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15356A048), as supplemented by letter dated March 7, 2016 (ADAMS Accession No. ML16069A021), South Carolina Electric & Gas Company (SCE&G, the licensee), submitted a license amendment request (LAR) for the Virgil C. Summer Nuclear Station, Unit No. 1 (VCSNS). The licensee proposes to revise Technical Specification (TS) 3/4.3.1, "Reactor Trip System Instrumentation," and TS 3/4.3.2, "Engineered Safety Feature Actuation System Instrumentation," to implement the allowed outage time, bypass test time, and surveillance frequency changes approved by the U.S. Nuclear Regulatory Commission (NRC) in Technical Specification Task Force (TSTF) Traveler TSTF-411, Revision 1, "Surveillance Test Interval Extension for Components of the Reactor Protection System (WCAP-15376-P)" (ADAMS Accession No. ML022470164).

The NRC staff has determined that the following requests for additional information (RAI) are required to complete its review.

RAI 1:

Provide internal events probabilistic risk assessment (PRA) facts and observations (F&Os) from the following:

- i. 2002 peer review
- ii. 2007 focused review
- iii. 2011 gap assessment

that are (1) open or (2) closed by self-assessment for supporting requirements that the review or gap assessment found to be not-met or met at Capability Category I. In addition, evaluate and provide the resolution of these F&Os to determine whether these F&Os are adequately resolved to support this application.

RAI 2:

LAR Section 4.6 states that the PRA model is maintained and updated in accordance with VCSNS procedures and has been updated to meet the American Society of Mechanical Engineers (ASME) PRA standard and Regulatory Guide (RG) 1.200, Revision 2, "An Approach

Enclosure

for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities” (ADAMS Accession No. ML090410014). Address the following:

- i. Describe the applicable VCSNS PRA maintenance procedures, including configuration control.
- ii. Clarify the version of the ASME PRA standard and RG 1.200 used.

RAI 3:

The LAR includes extending the surveillance frequency for TS 3/4.3.1, Table 4.3-1, “Reactor Trip System Instrumentation Surveillance Requirements,” reactor trip system (RTS) function 15, reactor trip on reactor coolant pump undervoltage, and TS 3/4.3.1, Table 4.3-1, RTS function 16, reactor trip on reactor coolant pump underfrequency. The LAR also states that these two functions were not included in the TSTF-411 program.

The NRC staff’s safety evaluation report (SER) on WCAP-10271-P-A, dated February 21, 1985 (ADAMS Legacy Library Accession No. 8503010427), states that these reactor coolant pump undervoltage and underfrequency functional units were included in the unavailability models of the WCAP and that the approvals made by the staff in the SER for analogue channels also apply to these functional units. According to the LAR, Topical Report (TR) WCAP-15376-P-A, Revision 1, Section 11, states, in part, that, “These recommendations are applicable to all the signals evaluated in WOG TOP [Westinghouse Owners Group Technical Specification Optimization Program] for both solid state and relay protection systems.”

The NRC staff stated in a letter, dated December 20, 2002 (ADAMS Accession No. ML023540534), that the TR is acceptable for referencing in licensing applications to the extent specified and under the limitations delineated in the report and in the associated NRC safety evaluation (SE). Since the LAR is proposing the TSTF-411 TS changes for these two signals, the NRC staff’s SE, dated December 20, 2002, for WCAP-15376-P-A limitations and conditions should also be applied to them.

Please provide your evaluation of these two functions (RTS functions 15 and 16) against each of the five limitations and conditions.

RAI 4:

Condition 1 in the NRC staff’s SE, dated December 20, 2002, limitations and conditions section states:

A licensee is expected to confirm the applicability of the topical report to their plant, and to perform a plant-specific assessment of containment failures and address any design or performance differences that may affect the proposed changes.”

The NRC staff's SE also discusses containment failures in terms of how the TR addressed large early release frequency (LERF):

These values are based on the assumption that the only contributions to LERF would come from containment bypass events and core damage events with the containment not isolated. The contributions from containment failure events are not considered in WCAP-15376-P, Rev. 0 based on the Vogtle PRA and the assumption that Vogtle is representative of all Westinghouse plants.

The LAR disposition for this condition is that, "The WCAP analysis and determination of LERF is based on a large dry containment. VCSNS Unit 1 is a large dry containment; therefore, the results are applicable." This statement only is related to the applicability of the TR.

Please provide a discussion on the plant-specific assessment of containment failures performed and your conclusions regarding design or performance differences that may affect the proposed changes, consistent with Condition 1.

RAI 5:

As noted in the LAR, Attachment 5, Table 1, WCAP-15376-P-A used a transient frequency of 3.6/year, and the plant-specific frequency is 0.441/year. Please provide justification for the large difference.

RAI 6:

As noted in the LAR, Attachment 5, Table 1, the VCSNS anticipated transient without scram contribution to core damage frequency (CDF) is much less than that assumed in WCAP-15376-P-A. Please explain the difference.

RAI 7:

The LAR is proposing a semi-annual surveillance test interval for two plant-specific signals: 6.h, "Suction transfer on low pressure," and 8.a, "RWST [refueling water storage tank] level low-low," as shown in the marked-up Table 4.3.2, "Engineered Safety Feature Actuation System Instrumentation Surveillance Requirements." The NRC staff requested supplemental information in a letter dated February 22, 2016 (ADAMS Accession No. ML16032A170), for its acceptance review of the LAR. The supplemental information request included the following:

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."

The response to the requested information by the licensee, dated March 7, 2016, was not provided in its entirety. Additional information on the technical justification and evaluation results are requested below.

RG 1.200, Section 3.3, "Demonstration of Technical Adequacy of the PRA," states, in part:

There are two aspects to demonstrating the technical adequacy of the pieces of the PRA to support an application. The first aspect is the assurance that the pieces of the PRA used in the application have been performed in a technically correct manner. The second aspect is the assurance that the assumptions and approximations used in developing the PRA are appropriate."

Additional discussion on PRA technical adequacy is provided in RG 1.200.

TR WCAP-15376-P-A provided the technical basis for signals analyzed, and, as stated in the associated NRC staff SE, utilized the Vogtle Electric Generating Plant's PRA model. Plant-specific signals 8.a and 6.h were not evaluated in WCAP-15376-P-A. Therefore, for signal functions 8.a and 6.h, provide the following PRA technical adequacy information, consistent with RG 1.200, and plant-specific information, consistent with the NRC staff's SE of WCAP 15376 P-A, dated December 20, 2002:

- a. Discuss whether these signals and functions are modeled in the PRA. If not, describe the method used for the risk results provided in the response to the NRC staff's supplemental information request.
- b. TSTF-411 extends the surveillance test interval (STI) for instrumentation and control (I&C) components such as analogue channel, master relay, and logic cabinet. However, slave relays are not included in the TSTF-411 STI extensions. Explain how the necessary I&C components are modeled in the PRA for the functions of these two plant-specific signals. If all necessary I&C components are not included in the PRA model, explain which ones are not included and why the PRA model is technically adequate to support the risk analysis results provided in the supplementary information. If a surrogate method is used to model these function(s), describe the surrogate and why it is technically adequate for this application, including justification for conservatism or for probabilities assigned to it. Please include in the discussion the PRA modeling of the solid state protection system.
- c. These signals would be required for certain initiating events and would perform functions for the plant response.
 - i. Explain how these signals are modeled for the necessary initiating events in the PRA model.
 - ii. Explain the expected plant response for these signals and how it is incorporated into the PRA model. Confirm that the plant response of these two signals in the PRA model reflects the as-built, as-operated plant.
 - iii. If there is any model incompleteness with respect to these signals and initiating events or plant response in the PRA model, describe the model incompleteness, which is important for the application, and how it was addressed for the risk evaluation results provided in the response to the NRC staff's request for supplementary information.

- iv. If a surrogate method is used to model the function(s) (see part b above), explain how the surrogate method ensures the initiating events and plant response (see parts c.i and c.ii above) are accounted for in the PRA model.
- d. Describe how common cause failure for these I&C components and functions is incorporated into the PRA model. Describe the method used to evaluate common cause failure for the STI extension.
- e. Explain whether the I&C data for the PRA modeling of the unavailability of these two plant-specific signals uses WCAP-15376-P-A or other data, and discuss why the data is applicable.
- f. Describe the method for calculating the unavailability from the fault exposure time associated with the proposed STI extensions for these two signals. Confirm it is consistent with that given in WCAP-15376-P-A used for calculating signal unavailabilities or identify any differences. Provide a comparison of the unavailability results for the proposed STI extension against the previous STI extension (i.e., from WCAP-10271-P-A). If the I&C components were not included in the WCAP-10271-P-A STI extensions, provide the unavailability results for the proposed STI extension.
- g. The response to the NRC staff request for supplemental information shows an increase in core damage frequency (CDF) and a decrease in LERF for function 6.h, and an increase in CDF/LERF for function 8.a.
 - i. Explain why the increase in CDF/LERF for the new signals given in the supplementary information response is low.
 - ii. If the decrease in LERF for function 6.h is a calculation-generated result due to algorithmic technique limitations, provide a LERF calculation result that removes the limitations or is a bounding/conservative estimate, and include a discussion on how the LERF was calculated. If this is not the case, explain why the results show a decrease in LERF and an increase in CDF.
 - iii. Discuss sources of uncertainty associated with these risk estimates and their importance for the application.
- h. The response to the NRC staff request for supplemental information does not discuss the risk contribution from external events for these two signals. Discuss and include the fire and external events risk analyses in your evaluation of these two functions.
- i. While the LAR shows these two signals are Engineered Safety Feature Actuation System Instrumentation Surveillance Requirements signals, confirm there is no relation to the reactor trip breaker unavailability associated with the STI extension or in performing the STI for the analogue channel operational test. If this is not the case, explain its significance for the application.

- j. If the proposed STI for other I&C components (e.g., logic cabinet) can have a contribution to the risk associated with these two plant-specific signals, explain how the PRA model is capable of evaluating the risk contribution. If such risk contributions can occur, confirm these contributions are in the risk results reported in the response to the supplemental information or update the results as appropriate.
- k. The limitations and conditions in the NRC staff's SE for the TR WCAP-15376-P-A also apply for these two signals. Provide your assessment of each of the five limitations and conditions.
 - i. With respect to Condition 1, discuss your assessment for these two signals if they have a unique impact (not covered in PRA RAI 3) on the plant-specific assessment of containment failures and discuss your conclusions regarding design or performance differences that may affect the proposed changes.
 - ii. With respect to Condition 2, LAR Section 4.2, identifies Tier 2 restrictions that will be implemented when a reactor trip breaker train becomes inoperable when operating under the proposed completion times. Since these two signals were not part of the TR evaluation in identifying Tier 2 restrictions, consider these two signals in your Tier 2 assessment and determine if any additional Tier 2 restrictions are necessary. Include in your assessment whether testing of these two Engineered Safety Feature Actuation System Instrumentation Surveillance Requirements signals should be avoided, based on Tier 2 risk significance, when a logic cabinet or a reactor trip breaker is inoperable.
 - iii. With respect to Conditions 3, 4, and 5, address whether the information provided in the LAR is sufficient for these two signals or provide additional justification for these conditions, as necessary.

RAI 8:

The LAR notes that the licensee has developed and implemented the guidance in the configuration risk management program (CRMP) at VCSNS; however, the LAR does not conclude that the CRMP meets the guidance in RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," August 1998 (ADAMS Accession No. ML003740176). Explain how the CRMP meets RG 1.177, Section 2.3.7.2, "Key Components of the CRMP." If there are key component areas that have not been satisfied for the CRMP, discuss them and your plans to address them.

RAI 9:

The LAR does not describe the CRMP model. Therefore:

- i. Describe your CRMP model, including its capability to evaluate internal events, fire, external events, and LERF issues. If certain events are not in the model, describe how the Tier 3 analysis will evaluate them.
- ii. Explain whether all the proposed signals and functions for the proposed TS

changes in the LAR can be evaluated with the CRMP model. If not, describe the limitations and how the limitations are addressed for the CRMP evaluation.

- iii. If surrogates are used, describe all surrogates and provide justification for their use in a CRMP evaluation.

RAI 10:

LAR Section 4.3 describes the CRMP procedural process. However, there is no discussion of the CRMP quality assurance process. Please describe how the quality of the CRMP model is assured for this application.

RAI 11:

RG 1.177 follows a four-element approach to integrated decisionmaking for TS changes. Element 3 is related to an implementation and monitoring program. RG 1.174, Revision 2, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" (ADAMS Accession No. ML100910006), states that the Maintenance Rule (MR) can be used when the monitoring performed under the MR is sufficient for the structures, systems, and components affected by the risk-informed application. Address the following regarding the implementation and monitoring program:

- i. LAR Section 4.7 of Attachment 5 does not clearly state that the MR program will be used for the proposed TS changes. Rather, it indicates that there are programs that will be reviewed and revised as necessary. Clarify whether the VCSNS MR program will be used for implementation and monitoring. If the implementation and monitoring program is other than the MR program, describe it and discuss when the program will be in place to support these proposed TS changes.
- ii. The TSTF-411 and TSTF-418, "RPS and ESFAS Test Times and Completion Times (WCAP-14333)," programs were based on versions of MR guidance in Nuclear Management and Resources Council (NUMARC) 93-01 and RG 1.182, which have been superseded by NRC-endorsed NUMARC 93-01, Revision 4, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," guidance and RG 1.160, Revision 3, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants" (ADAMS Accession No. ML113610098). Confirm that the VCSNS MR evaluations follow the current NRC-endorsed NUMARC 93-01, Revision 4, guidance and RG 1.160.

RAI 12:

LAR Table 1, "Combined Risk Metrics," provides a summary of the change in CDF (Δ CDF), incremental conditional core damage probability (ICCDP), change in LERF (Δ LERF), and incremental conditional large early release probability (ICLERP). However, it appears to provide only the change-in-risk metrics from WCAP-14333-P-A to WCAP-15376-P-A. Since risk is cumulative, provide a similar table that shows the cumulative changes of Δ CDF and Δ LERF from pre-TOP to WCAP-10271-P-A, to WCAP-14333-P-A, and through the proposed changes for WCAP-15376-P-A, which accounts for the 2/3 and 2/4 logic. Account for all proposed TS changes, including signal functions 6.h and 8.a, in the table.

RAI 13:

LAR Attachment 5, Section 3.3, states that the analysis supporting the changes in WCAP-15376-P-A, Revision 1, does not include external events. LAR Attachment 5, Section 3.3, discusses the external event risk assessments for fires and seismic events. The results are presented as a risk benefit. Table 1 in LAR Section 4.1, however, shows a risk increase in changing from WCAP-14333-P-A to WCAP-15376-P-A, which is based on internal events risk. It is not clear why the overall internal events risk is a risk increase, while the overall external events risk is a risk decrease. Explain this apparent discrepancy in the results for the application.

RAI 14:

LAR Section 4.2 identifies three Tier 2 measures that have not been identified as regulatory commitments in LAR Attachment 6. Update the list of regulatory commitments to include these three Tier 2 measures, as well as any additional Tier 2 measures identified in PRA RAI 7.I.ii.

November 8, 2016

Mr. George A. Lippard, III
Vice President, Nuclear Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
Post Office Box 88, Mail Code 800
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ADDITIONAL INFORMATION RE: LICENSE AMENDMENT REQUEST FOR
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(CAC NO. MF7196)

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/RA/

Shawn A. Williams, Senior Project Manager
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Docket No. 50-395

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Request for Additional Information

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