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U. S. Nuclear Regulatory Commission
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Vogtle Electric Generating Plant
Response to Request for Additional Information on License Amendment Request
to Permit the use of Risk Informed Completion Times

Ladies and Gentlemen:

By letter dated September 13, 2012, Southern Nuclear Operating Company (SNC) submitted a license amendment request to permit the use of Risk Informed Technical Specification (TS) Completion Times in accordance with Nuclear Energy Institute (NEI) Report 06-09, Revision 0, *Risk Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines,* at the Vogtle Electric Generating Station. The SNC submittal was supplemented by letters dated August 2, 2013, July 17, 2014, November 11, 2014, December 12, 2014, March 16, 2015, and May 5, 2015. By letter dated December 17, 2015, the Nuclear Regulatory Commission (NRC) issued a request for additional information (RAI) regarding the SNC Technical Specifications amendment request.

The Enclosure to this letter contains the SNC responses to NRC RAI questions #1 and #2 from the December 17, RAI. However, SNC has requested clarifying information from NRC on question #3; consequently, the SNC response will be submitted in the near future.

This letter contains no NRC commitments.

If you have any questions, please contact Ken McElroy at (205) 992-7369.

Mr. C.R. Pierce states he is Regulatory Affairs Director of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and, to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

C. R. Pierce

C. R. Pierce
Regulatory Affairs Director

CRP/OCV/

Sworn to and subscribed before me this 17 *day of* February, *2016.*

Laura L. Crump
Notary Public

My commission expires: 10-8-2017

Enclosure: Response to Request for Additional Information

cc: Southern Nuclear Operating Company
Mr. S. E. Kuczynski, Chairman, President & CEO
Mr. D. G. Bost, Executive Vice President & Chief Nuclear Officer
Mr. D. R. Madison, Vice President – Fleet Operations
Mr. M. D. Meier, Vice President – Regulatory Affairs
Mr. B. K. Taber, Vice President – Vogtle 1 & 2
Mr. B. J. Adams, Vice President – Engineering
Mr. G. W. Gunn, Regulatory Affairs Manager – Vogtle 1 & 2
RType: CVC7000

U. S. Nuclear Regulatory Commission
Mr. L. D. Wert, Regional Administrator
Mr. R. E. Martin, NRR Senior Project Manager – Vogtle 1 & 2
Mr. L. M. Cain, Senior Resident Inspector – Vogtle 1 & 2
Mr. G.E. Miller, Project Manager

State of Georgia
Mr. J. H. Turner, Director- Environmental Protection Division

Vogtle Electric Generating Plant
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to Permit the use of Risk Informed Completion Times

Enclosure

Responses to Request for Additional Information

NRC RAI Regarding PRA Functionality

Model Application to TSTF-505, Revision 1, "Proposed Revision to the Model Application for TSTF-505, Revision 1, 'Provide Risk-Informed Completion Times – RITSTF Initiative 4b'," Enclosure 1 (ADAMS Accession No. ML12032A065) states:

> *This enclosure should provide a description of PRA functionality for each associated specified safety function that corresponds to each proposed Required Action that is applicable when all trains of equipment are inoperable as discussed in Section 2.3.1.10 of NEI 06-09.*

The Vogtle license amendment report (ADAMS Accession No. ML12258A055) requesting Implementation of NEI 06-09, "Risk-Informed Technical Specifications Initiative 4b, Risk Managed Technical Specifications Guidelines," was not submitted as a TSTF-505 submittal but the proposed program also utilizes probabilistic risk assessment (PRA) Functional when all trains of equipment are inoperable. The TSTF-505 enclosure guidance is included as part of the model application because the NRC staff seeks clarity in how PRA Functional will be used during full power operation following "loss of a specified safety function or inoperability of all required trains or divisions of a system." In lieu of requesting additional justification for PRA functionality for each associated specified safety function consistent with TSTF-505, the NRC requests the following information.

NRC RAI #1

To provide confidence that the defense-in-depth philosophy is maintained as the completion times are extended, the NRC staff requests the following information for three of the defense-in-depth "circumstances" described in RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decision Making: Technical Specifications", Revision 1, May 2011.

a. *System redundancy, independence, and diversity are maintained commensurate with the expected frequency and consequences of challenges to the system (e.g., there are no risk outliers). The licensee should consider ... whether there are appropriate restrictions in place to preclude simultaneous equipment outages that would erode the principles of redundancy and diversity.*

Beyond prohibiting voluntary entry, the guidance on PRA Functionality in NEI 06-09 does not address how PRA Functionality should be defined when the systems, structures, and components (SSCs) normally relied on to perform a specified safety function are unavailable. Specifically, the PRA often includes alternative SSCs that could be used to fulfill a specified safety function when the SSCs referenced in the TSs are unavailable. Crediting alternative SSCs when the SSCs normally relied on are unavailable would represent a loss of redundancy or diversity. Please confirm that SSCs credited in a PRA Functional determination are the same SSCs relied upon to perform the specified safety function. If a PRA Functional determination for a loss of specified safety function or inoperability of all required trains or divisions of a system credits SSCs

other than the SSCs covered by the TSs (e.g., crediting the Fire Protection system as an alternative water source), please summarize each such TS and justify how appropriate redundancy and diversity is maintained if alternative SSCs are credited.

SNC Response

SSCs credited in the PRA Functionality determination are the same SSCs relied on to perform the specified safety function when a RICT for a Technical Specification (TS) total loss of function (LOF Condition) is calculated.

If SNC desires to credit specific alternative SSCs in the future, i.e., SSCs other than those covered by the TS, a separate license amendment request will be required.

NRC RAI #1 (Cont.)

b. *Over-reliance on programmatic activities as compensatory measures associated with the change on the licensing basis is avoided (e.g., the change does not use high reliability estimates that are primarily based on optimistic program assumptions).*

It appears that, some CT length calculations rely on high reliability assumptions (i.e., low human error probabilities) for human actions required to achieve the specified safety function without evaluating the likelihood of these actions and the context within which they are needed well enough to model them in the PRA.

i) Please confirm that all human actions (other than the room cooling actions addressed in 1.b.ii) required to achieve PRA functional upon loss of specified safety function are modeled in the PRA (i.e., are proceduralized and trained on or are so simple so as to be skill of the craft). If any actions other than the room cooling actions were evaluated, but not modeled, please summarize the actions and the evaluation.

SNC Response

Human actions (other than the room cooling actions addressed in 1.b.ii) required to achieve PRA Functionality during a TS LOF Condition are modeled in the PRA and are proceduralized and trained on unless they are simple enough to be skill of the craft.

NRC RAI #1 (Cont.)

ii) In response to NRC PRA RAI 1 (ADAMS Accession No. ML13217A072, page E-20) VEGP stated that human actions to open the doors to five rooms to prevent excessive heat up was required on loss of room cooling but the actions are not included in the PRA logic model. The response stated that the human error

probability for failing to open the doors is extremely small and implies that VEGP procedures include guidance on opening the doors. Please confirm that these actions are explicitly proceduralized and trained on and summarize the evaluation concluding the HEPs are extremely small. Note that when room cooling is unavailable during a 30-day CT, these actions would be required if room cooling is required. Please clarify why these actions have a "negligible" impact on core damage frequency and large early release frequency and the associated CT that will be used when room cooling is unavailable.

SNC Response

Room cooling human actions required to achieve PRA Functionality upon loss of room cooling are proceduralized and trained on; however, these procedures will be reviewed and revised as necessary to ensure robust guidance is available to operators responsible for the actions to identify loss of room cooling and open doors.

The following summary justifies the basis for not including human actions to open doors in the PRA following loss of room cooling.

The PRA logic for the equipment in five rooms where the room temperature is expected to exceed the functional temperature limit within 24 hours is modified for the purpose of this evaluation to reflect the impact of hardware and human action failure. When room cooling is lost, two independent human actions are possible; one based on control room alarms indicating a room temperature increase, and the other based on monitoring during operator rounds. The available time to open doors following loss of room cooling is in excess of 8 hours for the five rooms. A HEP of 1E-03 for each action is chosen as a highly conservative screening value. For comparison purposes, the Vogtle PRA model provides a HEP of 5.27E-05 for "Operator Fails to Manually Start ESF Equipment" where the available time is significantly less than 8 hours. In a TS LOF case, if one train is established as PRA functional, modeling the two HEPs in the PRA will result in a delta CDF/LERF of about 1E-08 /1E-09. This translates to a delta CDP/LERP of about 8.22E-10/8.22E-11 for a 30 day OOS condition. This change is <0.02% of the allowable limits of 1E-05 / 1E-06 for CDP/ LERP. This change in CDP/LERP is considered an extremely small contribution.

NRC RAI #1 (Cont)

iii) If any other human actions are directly or indirectly credited in the CT length calculations, please provide the same information requested in 1.b.ii about each action.

SNC Response

No other human actions that are not modeled in the PRA are directly or indirectly credited in the CT length calculations other than those that are discussed in response to NRC questions 1.b.ii. All other human actions

credited in the CT length calculations are modeled in the PRA as indicated in response to NRC question 1.b.i.

NRC RAI #1 (Cont)

c. The intent of the plant's design criteria is maintained.

The intent of the design basis criteria is that all design basis accident scenarios could be mitigated, i.e., the minimum specified safety function capability is available. To maintain this intent, PRA Functionality should not include any scenarios that allow any design basis accident initiator to proceed directly to core damage (e.g., no initiating events that model design basis accident initiators in the PRA models should have a conditional core damage probability (CCDP) of 1.0). Please confirm that PRA Functionality does not include any scenarios that allow any design basis accident to proceed directly to core damage or containment failure, or identify the scenarios and justify that the intent of the design criteria is maintained and describe how the PRA Functionality determination will verify these requirements are met.

SNC Response

Based on how PRA functionality for the Inoperable but PRA Functional train(s) is applied (which required at least one train PRA Functional) during a TS LOF Condition, and a review of PRA results for sample RICT cases, it is concluded that when one train is determined to be PRA functional, none of the design basis accidents, as modeled in the internal events PRA, proceed directly to core damage or containment failure. As indicated in response to NRC RAI 2c, for design basis initiators modeled in the internal events PRA, PRA Functionality determination performed subsequent to a TS LOF Condition entry will ensure design basis success criteria for parameters (e.g., flow rates, temperature limits) are met.

When in a TS LOF RICT, PRA Functionality determination will include a review of dominant internal events CDF and LERF cutsets to provide high confidence that none of the design basis accidents, as modeled in the internal events PRA, proceed directly to core damage or containment failure.

NRC RAI #2

To provide confidence that sufficient safety margins are maintained, NRC Staff requests the following information for the detailed "circumstance" described in RG 1.177.

Safety analysis acceptance criteria in the final safety analysis report (FSAR) are met or proposed revisions provide sufficient margin to account for analysis and data uncertainties (e.g., the proposed TS CT or SF change does not adversely affect any assumptions or inputs to the safety analysis, or, if such inputs are affected, justification is provided to ensure sufficient safety margin will continue to exist). For TS CT changes, an

assessment should be made of the effect on the FSAR acceptance criteria assuming the plant is in the condition addressed by the proposed CT (i.e., the subject equipment is inoperable) and there are no additional failures. Such an assessment should result in the identification of all situations in which entry into the condition addressed by the proposed CT could result in failure to meet an intended safety function.

Some TS safety functions are credited in design basis accident scenarios modelled in the PRA but are also required in other design basis scenarios not modelled in the PRA because the other scenarios do not contribute to CDF and LERF or are not needed with the PRA mission time.

a. Please confirm that the acceptable PRA Functional modelled in the PRA is also available and sufficient for the remaining design basis accident scenarios that are not modelled in the PRA because other design basis accident scenario does not affect CDF or LERF (e.g., containment spray may be credited as decay heat removal in some plants which is modelled in the PRA. It may also provide an iodine removal function for the same plants, which is not modelled in the PRA) or describe how the PRA functionality determination will verify these requirements are met.

SNC Response

For design basis accident scenarios that are not modeled in the PRA because they do not affect CDF or LERF, the PRA Functionality evaluation performed following a TS LOF Condition will ensure SSCs not supporting CDF/LERF will remain available.

NRC RAI #2 (Cont.)

b. Please confirm there are no safety functions required to reach a safe and stable state but not included in the PRA because they are only required after the 24 hour mission time generally used in the PRA (e.g., some alternative primary water sources may lead to excessive boron dilution after some LOCAs but only after at least 24 hours so boron is not modelled in the PRA) or describe how the PRA functionality determination will verify these requirements are met.

SNC Response

Current VEGP PRA model success criteria are conservatively based on a 30 hour run time in the Modular Accident Analysis Program (MAAP) analysis to ensure that core damage will not occur immediately after the 24-hour mission time. If core damage has not occurred within 30 hours into the event, it is considered a confirmation that the plant was in a stable state at 24 hrs. By showing that core damage will not occur within 30 hours, the premise that plant stability is achieved within the 24 hour PRA mission time is validated.

Also, as needed, MAAP analyses are performed for an extended duration. For example, for steam generator isolation failure, a MAAP

analysis was performed for a 36-hour duration. Since the analysis results show that core damage would not occur within that time period, it is assumed that core damage would also be prevented for that scenario.

NRC RAI #2 (Cont.)

c. In Table E1.1. of its application dated September 13, 2012, the licensee noted differences between the design basis success criteria and the PRA success criteria for certain specified safety functions. In the response to PRA RAI 5, in its letter dated July 17, 2014 (ADAMS Accession No. ML14198A574), the licensee noted that the Configuration Risk Management Program (CRMP) will ensure that prior to entering a Risk-Informed CT, adequate margins of safety are maintained by ensuring that systems and subsystems redundant to the inoperable component are available, and that the PRA success criteria are met. The licensee also noted that conditions which represent a loss of function cannot be entered voluntarily. However, the response did not address how safety margin was maintained for the case of a PRA functional determination for a loss of a specified safety function or inoperability of all required trains or divisions of a system.

   For this case, please elaborate on how adequate safety margins are maintained and provide some clarifying examples of adequate safety margins for where the PRA success criteria (e.g., flow rates, temperature limits) differ from the design criteria.

SNC Response

For design basis initiators modeled in the internal events PRA, PRA Functionality determination performed subsequent to a TS LOF Condition entry will ensure design basis success criteria for parameters (e.g., flow rates, temperature limits) are met.

This constraint combined with verification that none of the design basis accidents, as modeled in the internal events PRA, are allowed to proceed directly to core damage or containment failure (NRC RAI C (part 1) response), and confirmation that SSCs credited in the PRA Functionality determination are the same SSCs relied on to perform the specified safety function (NRC RAI 1.a response), provide further assurance that safety margins at the functional level are maintained when a RICT is calculated for a TS LOF Condition.