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

Vogtle Electric Generating Plant Units 1 and 2
Docket Nos. 50-424 & 50-425

Subject: Response to Request for Additional Information Regarding License Amendment Request to Revise Technical Specification 3.7.2 Limiting Condition for Operation to Remove One Main Steam Isolation Valve System

By letter dated September 30, 2021, Southern Nuclear Operating Company (SNC) submitted an application to revise the Vogtle Electric Generating Plant (VEGP), Units 1 and 2, Technical Specification (TS) 3.7.2, "Main Steam Isolation Valves (MSIVs)." By email dated November 15, 2021, the Nuclear Regulatory Commission (NRC) staff issued a request for additional information (RAI). By email dated December 16, 2021, the NRC staff issued additional RAIs. The Enclosure to this letter provides the SNC response to the NRC staff's RAIs.

The conclusions of the No Significant Hazards Consideration and Environmental Consideration contained in the original application have been reviewed and are unaffected by this response.

If you have any questions, please contact Ryan Joyce at 205.992.6468.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 13 day of January 2022.

Respectfully submitted,

C. A. Gayheart
Director, Regulatory Affairs
Southern Nuclear Operating Company

CAG/kgl/cg

Enclosure: SNC Response to NRC RAIs

cc: Regional Administrator, Region ll
NRR Project Manager – Vogtle 1 & 2
Senior Resident Inspector – Vogtle 1 & 2
State of Georgia Environmental Protection Division
RType: CVC7000

Vogtle Electric Generating Plant – Units 1 and 2
Response to Request for Additional Information Regarding License Amendment Request to Revise Technical Specification 3.7.2 Limiting Condition for Operation to Remove One Main Steam Isolation Valve System

Enclosure

SNC Response to NRC RAIs

NRC SNSB RAI 1:

In Section 3.3 of the LAR, under the title “Safety Analyses”, the licensee has identified main steam line break (MSLB) containment pressure and temperature response analysis is potentially impacted by the proposed change. In the same section, under the title “MSLB Containment Pressure and Temperature Response”, the licensee states that there is an adverse impact on the containment pressure and temperature response due to the reverse flow from the steam header into the containment. In the current configuration, this did not need to be considered as there was no credible single failure that cause the reverse flow to occur.

Based on the proposed TS change, the licensee has revised the MSLB containment pressure and temperature response analysis, which shows the containment peak pressure increased from its current value of 36.5 pounds per square inch gauge (psig) to 39 psig, and the peak vapor temperature increased from its current value of 303°F to 309°F.

For the revised MSLB analysis, provide **changes** in the following items with justification if conservatism is reduced, or state if there is no change in these items from the current analysis:

(a) Methodology, computer codes used for mass and energy (M&E) release and containment response.

(b) Assumptions listed in Final Safety Analysis Report (FSAR) Tables 6.2.1-2 and 6.2.2-3

(c) Containment structural heat sinks listed in FSAR Table 6.2.1-4

(d) Thermophysical properties of containment heat sinks in FSAR Table 6.2.1-5

(e) Design inputs in FSAR Table 6.2.1-64

(f) Sequence of events listed in FSAR tables 6.2.1-66 and 6.2.1-67 for the most limiting cases for peak pressure (FSAR Table 6.2.1-65 case 16) and peak temperature (FSAR Table 6.2.1-65 case 13).

(g) Sub-compartment steam line break M&E release (FSAR Section 6.2.1.4) and differential pressure response.

SNC Response to NRC SNSB RAI 1:

(a) There is no change to the methodology, or computer codes used for the main steamline break (MSLB) mass and energy (M&E), and containment response analysis.

The analysis performed to quantify the impact of the subject LAR on containment response utilized the LOFTRAN (FSAR Section 6.2.1.7 Reference 7) and COCO (Westinghouse containment pressure and temperature analysis software approved for VEGP 1&2) (FSAR Section 6.2.1.7 Reference 8) codes for M&E release and

containment response analyses respectively.

The methodologies employed in the analysis are the current approved methodologies WCAP-8822 (FSAR Section 6.2.1.7 Reference 6) for M&Es, and WCAP-8326 (FSAR Section 6.2.1.7 Reference 8) for containment response.

(b) There are no changes in analysis assumptions documented in FSAR Table 6.2.1-2. There are no changes in the containment cooling system failure mode and effects analysis documented in FSAR Table 6.2.2-3.

(c) No changes were made to the modeling of containment heat sinks documented in FSAR Table 6.2.1-4 for the COCO containment evaluation model.

(d) No changes were made to the modeling of thermophysical properties of containment heat sinks in FSAR Table 6.2.1-5 for the COCO containment evaluation model.

(e) The information in Table 6.2.1-64 was updated to reflect the results of the re-analysis. Though all cases were re-analyzed and updated, only changes to Cases 13-16 are provided below as Case 13 and Case 16 are the limiting cases for temperature and pressure respectively. For ease of comparison, the current FSAR Table 6.2.1-64 (Cases 13-16) is provided along with the updated table.

VEGP-FSAR-6

TABLE 6.2.1-64 (SHEET 3 OF 3)

Case		13	14	15	16
Initial steam generator inventory (lbm)	Faulted Intact	116,000 107,700	130,100 123,500	155,900 142,800	186,300 186,300
Initial steam pressure (psia)		1008	1051	1112	1102
Mass added by feedwater pumping (lbm)		25,100	17,600	10,700	4800
Mass added by feedwater flashing (lbm)		20,800	21,500	22,600	0
Unisolatable steam line volume (ft^3)		470	470	470	470
Auxiliary feedwater addition rate (lbm/h)		5.41E+05	5.41E+05	5.41E+05	5.47E+05
Main steam line isolation time (s)		50.1	48.0	46.5	114.0
Main feedwater line isolation time (s)		17.1	15.5	14.3	23.8
Termination of auxiliary feedwater addition (s)		1800	1800	1800	1800

Current FSAR Table 6.2.1-64

Revised Values for UFSAR Table 6.2.1-64					
	Case:	13	14	15	16
Initial steam generator inventory (lbm)	Faulted	143483	157174	180380	210679
	Intact	120044	133024	155205	186019
Initial steam pressure (psia)		1044	1072	1112	1092
Mass added by feedwater pumping (lbm)	Faulted	22218	17229	11450	4600
Mass added by feedwater flashing (lbm)	Faulted	20600	21400	22400	100
Unisolatable steam line volume (ft^3)		9961	9961	9961	9961
Auxiliary feedwater addition rate (lbm/h) (to faulted steam generator)		5.48E+05	5.48E+05	5.48E+05	5.48E+05
Main steam line isolation time (s)		35.8	37.4	38.6	126.5
Main feedwater line isolation time (s)		12.8	12.8	12.8	23.8
Termination of auxiliary feedwater addition (s)		1800	1800	1800	1800

Draft Updated FSAR Table 6.2.1-64

(f) The following changes were made to the sequence of events for Case 13 (FSAR Table 6.2.1-67) and Case 16 (FSAR Table 6.2.1-66). Draft markups of the FSAR tables are shown below.

VEGP-FSAR-6

TABLE 6.2.1-66

SEQUENCE OF EVENTS FOR CASE 16 -
PEAK CALCULATED CONTAINMENT PRESSURE FOR MSLB

Time (s)	Event
0.0	Break occurs, blowdown from all steam generators.
16.8	Containment pressure setpoint for isolation of main feedwater lines reached (6.29 psig).
23.8	Main feedwater line isolation valves closed.
64.8	Air coolers start.
116.5 → ~~103.8~~	Containment pressure setpoint for isolation of main steam lines reached (17.19 psig).
126.5 → ~~114~~	Main steam line isolation valves closed, blowdown from broken loop steam generator and unisolated steam piping only.
~~116.8~~	~~Air coolers start.~~
~~117.0~~	~~Peak containment vapor temperature of 260°F is reached.~~
524.3 → ~~484.6~~	Containment pressure setpoint for actuation of containment sprays reached (25.79 psig).
624.3 → ~~584.6~~	Containment sprays start.
1322.9	Peak containment vapor temperature of 254.2 °F is reached.
1323.9 → ~~897.6~~	Peak containment pressure of ~~36.5~~ psig is reached.
38.9	
1800.0	Auxiliary feedwater addition is terminated.
1844.0 → ~~1842~~	Dryout occurs, steam generator dry following auxiliary feedwater termination.

VEGP-FSAR-6

TABLE 6.2.1-67

SEQUENCE OF EVENTS FOR CASE 13 -
PEAK CALCULATED CONTAINMENT TEMPERATURE FOR MSLB

Time (s)	Event
0.0	Break occurs, blowdown from all four steam generators.
5.8 → ~~10.1~~	Containment pressure setpoint for isolation of main feedwater lines reached (6.29 psig).
12.8 → ~~22.0~~	Main feedwater line isolation valves closed.
~~110.2~~	~~Air coolers start.~~
25.8 → ~~40.4~~	Containment pressure setpoint for isolation of main steam lines reached (17.19 psig).
35.8 → ~~50.1~~	Main steam line isolation valves closed, blowdown from broken loop steam generator and unisolated steam piping only.
51.0 → ~~89.7~~	Containment pressure setpoint for actuation of containment sprays reached (25.79 psig).
	53.8 Air coolers start.
54.0 → ~~109.0~~	Peak containment vapor temperature of ~~(303.1°F)~~ is reached. 308.5
151.0 → ~~190.3~~	Containment sprays start.
206.8 → ~~190.4~~	Peak containment pressure of ~~31.9~~ psig is reached.
1800.0	Auxiliary feedwater addition is terminated. 35.5
1811.0 → ~~1832.0~~	Dryout occurs, steam generator dry following auxiliary feedwater termination.

(g) A summary discussion of changes to FSAR Section 6.2.1.4 and corresponding subsections is provided below. Several changes are related to improving clarity in the wording of the FSAR section respective of going to a single MSIV per loop configuration.

Changes to FSAR Section 6.2.1.4.1.3, Item B.1 clarify that the reverse flow from the faulted loop is characterized by the flow through the faulted MSIV instead of the SG flow restrictors.

Changes to Section 6.2.1.4.1.5 include specifying a 100 second and 48 second delay for the start of containment sprays and fan coolers respectively. The fan cooler and containment spray delay times are assumed to be that associated with no offsite power available (delay includes diesel generator start time) and specified in FSAR Table 7.3.1-6.

Changes to Section 6.2.1.4.1.6 include adding a third bullet for the single active failure to be that of a MSIV. This single failure is assumed simultaneously in the updated analyses along with the loss of one emergency diesel, and a failure of one feedwater isolation valve.

Changes to Section 6.2.1.4.1.6 also include the removal of the discussion of two fast acting MSIVs per loop. A statement is added that the updated analysis models only one MSIV per steam line. This discussion also includes the increase in unisolable steamline volume due to the one MSIV per loop configuration. The differences in unisolable steamline volume used in the legacy analysis as compared to the new analysis is illustrated in the response to Item “e” above.

Lastly, for completeness it is prudent to note that FSAR Figures 6.2.1-26 thru 6.2.1-29 are updated to graphically reflect the pressure and temperature time histories for the limiting cases (Case 13 and Case 16).

Discussion of Changes to Analysis Conservatisms

Based on a review of the changes to the FSAR sections, tables, and figures associated with the MSLB containment response contained in this response that generic analysis conservatisms such as MSIV stroke time, available trains of fan coolers, and containment sprays (along with the corresponding performance characteristics), and containment heat sinks have been preserved in the updated analysis.

In addition, it is pertinent to note that while there is a slight pressure and temperature increase associated with this change, there is substantial margin to the containment design atmospheric temperature and design pressure as documented in FSAR Table 6.2.1-1. The updated analysis preserves ~20% margin to the design temperature and pressure, even whilst postulating 3 simultaneous single failures. The ~20% margin retained in the VEGP Units 1 and 2 containment response analyses as a result of this change is double that recommended in NUREG-0800, Section 6.2.1.1.A, Revision 3 for plants proceeding from the design to construction permit phase of the plant lifecycle. As a result, the slight increase in containment temperature and pressure resulting from this change is determined to be acceptable.

NRC ELTB RAI 2:

The licensee stated the following on page E-16 of the LAR:

Environmental Qualification of Equipment
As described above, the containment pressure and temperature are changed slightly due to additional mass and energy released into the containment following a MSLB. These changes are compared to the environmental qualification bounding curves for the containment vapor region to determine the updated post-accident parameters. The updated parameters are compared to the tested values for all equipment inside containment to determine impacts to qualification. This review has determined that there are no impacts to the environmental qualification of equipment inside containment.

a. Based on the limited information provided in the LAR on the effects of the proposed changes, provide further details of your assessment on the impact the proposed changes have on the environmental qualification of electrical equipment. Specifically, in accordance with the regulatory requirements cited above [see NRC RAI email dated November 15, 2021], address the following environmental qualification (EQ) parameters: Temperature, Pressure, Radiation, Humidity, and Chemical Spray and

explain how electrical equipment will remain qualified, with margins maintained, ensuring continued compliance with 10 CFR 50.49.

b. Clarify whether any areas changed from mild to harsh, because of the proposed changes.

c. Discuss the impact of the proposed change on nonsafety-related electric equipment whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions specified in subparagraphs (b)(1) (i) (A) through (C) of paragraph (b)(1) of 10 CFR 50.49 by the safety-related equipment.

SNC Response to NRC ELTB RAI 2:

a. A total of 24 Equipment Qualification Data Packages (EQDPs) containing EQ components located inside containment were evaluated for acceptability of the new MSLB temperature and pressure accident profiles. The acceptance criterion was met, all impacted EQ components inside containment are qualified to the new MSLB accident profiles with consideration of margin. The proposed change does not impact the radiation, humidity, or chemical spray evaluations.

   - The post-accident operating time was re-calculated for all impacted EQ equipment located inside containment using the new peak temperature and pressure revised MSLB temperature profiles.

   - All impacted equipment located inside containment was reevaluated against IEE 323-1974 for impact to qualification margin (15°F for peak temperature, 10% of gauge for peak pressure, and 10% of operating time for post-accident operating time). The reevaluated margins were determined to be acceptable.

b. There were no areas of the plant which changed from a mild environment to a harsh environment as a result of the new MSLB accident profile. Changes to environmental parameters were limited to inside containment, which was already classified as a harsh environment.

c. All non-safety-related equipment whose failure under postulated conditions could prevent the performance of a safety function are included on the Vogtle EQ Master List. All EQ equipment on the EQ Master List located inside containment was evaluated for impacts from the new MSLB accident profile. This includes non-safety-related electrical equipment whose failure could impact a safety function.

NRC EEEB RAI 3:

Please clarify the impact of the MSIV actuator load change on the electrical distribution system to demonstrate the assured operation of the MSIVs and that it will not impede operation of other critical loads, in accordance with GDC 17. Please include details of new or reused/existing cabling to demonstrate adequate capacity for the additional load.

SNC Response to NRC EEEB RAI 3:

MSIV actuator replacement for Vogtle is divided into two separate design change packages for each unit. Each design change will be implemented during different refueling outages. The first design change for Unit 2 had been approved under 50.59 and implementation is pending (Spring 2022). The remaining Unit 1 design change is scheduled to be approved under 50.59 in the near future. The approved design calculations for the first Unit 2 design change have evaluated the impacts of the MSIV actuator load change on the electrical distribution system and the results indicate the load additions are within the capacities of their respective sources and as a result will not impede the operation of other critical loads.

Electrical calculations for the Vogtle Unit 1 and 2 MSIV elimination design change which address the MSIV actuator loading changes to the DC electrical system have not yet been finalized; however, preliminary results indicate the load additions are within the capacities of their respective sources and as a result will not impede the operation of other critical loads. The same results as the completed Unit 2 MSIV actuator replacement design change package are expected as discussed below. If it is found the station batteries or chargers are insufficient, a design change would be required to improve their capacities to accommodate the new load additions. The design change for upgrading any of the safety related station batteries or battery chargers, if required, would be evaluated under 50.59.

The Vogtle Unit 2 MSIV actuator replacement DC electrical load additions have been finalized. The calculations indicate available margins in the batteries and chargers during LOOP/LOCA and SBO and as a result, the load additions are acceptable and will not impede operation of other critical loads.

New and reuse of existing cabling is planned to be utilized for the implementation of the Unit 1 and 2 MSIV eliminations. Evaluations to substantiate the ampacity and voltage profiles of the new and existing cables have not yet been completed but the same results as the Unit 2 MSIV replacement design change package as discussed below are expected. If the cable ampacities or voltage profiles selected are found to be inadequate, the cable sizes will be increased. If existing cables are found not to be adequate, new cables will be installed to address the required ampacities and voltage profiles to support the connected equipment. These changes if required would be evaluated under 50.59.

Existing and new cables have been included in the design of the Unit 2 MSIV actuator replacement. The design change package for this modification includes cable ampacity and voltage profile evaluations. The evaluations concluded the cables, both new and existing, will support the required amperage of the devices they serve, and the voltage profiles also meet the required minimum equipment voltages.

NRC EEEB RAI 4:

Please provide calculation summary that clearly demonstrates impact of actuator load change on Station Blackout (SBO) coping strategy including updated battery loading and battery charger capacity, in accordance with 10 CFR 50.63.

SNC Response to NRC EEEB RAI 4:

Electrical calculations for Unit 1 and 2 MSIV elimination design change which address the MSIV actuator loading changes to the DC electrical system have not yet been finalized; however, preliminary results indicate the load additions are within the capacities of their respective batteries and battery chargers and we expect similar results as that of the completed Unit 2 MSIV actuator replacement design change as discussed below. If it is found the station batteries or chargers are insufficient, a design change would be required to improve their capacities to accommodate the new load additions. The design change for upgrading any of the safety related station batteries or battery chargers, if required, would be evaluated under 50.59.

The Vogtle Unit 2 MSIV actuator replacement DC electrical load additions have been finalized. The calculations indicate available margins in the batteries and chargers during LOOP/LOCA and SBO and as a result, the load additions are acceptable and will not impede operation of other critical loads.

NRC EEEB RAI 5:

Please clarify that any new or modified electric cable and related conduit will be appropriately protected from missiles in accordance with GDC 4. Based upon the NRC staff's review of LAR discussions regarding GDC 4, it is not clear that new or modified electrical cables and conduits are also included in protection against missiles.

SNC Response to NRC EEEB RAI 5:

All new cable and conduits will be routed in safety-related, seismic category I buildings, which are already qualified for tornado missile protection. If any areas are identified to be vulnerable to tornado missiles, new shielding will be provided. Thus, new cable and conduits will be protected from tornado missiles. Furthermore, new cable and conduits will be protected from all other types of missiles. New cable and conduit installations would be evaluated under 50.59.

NRC EEEB RAI 6:

Please clarify that the proposed MSIV actuators and any new cable and conduit are seismically qualified in accordance with GDC 2. Based upon the NRC staff's review of LAR discussions regarding GDC 2, it is not clear that the proposed MSIV actuators or any new electrical cables and conduit are seismically qualified along with other non-electrical components that are subject to this LAR.

SNC Response to NRC EEEB RAI 6:

The new cable and conduits, routed and installed per the design changes, are all classified as safety-related and seismic category I. Seismic category I conduits and their supports are evaluated for seismic, live, and dead loads in accordance with the applicable design criteria. Seismic loads are determined from OBE and SSE conditions defined in the applicable design criteria.

New, typical prequalified supports for seismic category I conduits are structurally qualified in accordance with the applicable design criteria and meet the allowable stress requirements. These requirements are stated in the design change packages.

Similarly, other non-electrical components like actuators, piping, pipe supports, panel supports, etc. are evaluated for seismic, wind, thermal, and dynamic loads to meet the applicable design criteria as stated and evaluated in various appropriate sections of the design change packages.

NRC EEEB RAI 7:

Please discuss how each MSIV actuator will meet single failure criterion in accordance GDC 17 for power supply.

SNC Response to NRC EEEB RAI 7:

Each new MSIV actuator is equipped with redundant sets of actuation components. Each set is powered from independent power trains (train A and train B). The power cable routing will maintain train separation.

The MSIVs have been designed to fail closed (fail safe) upon loss of power of either train.