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June 30, 2010
NND-10-0254

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

ATTN: Document Control Desk

Subject: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 Combined License Application (COLA) - Docket Numbers 52-027 and 52-028 Responses to NRC Request for Additional Information (RAI) Letter No. 081 Related to SRP Section 9.2.2 and Letter No. 079 Related to SRP Section 6.2.1

References:
1. Letter from Tanya Simms (NRC) to Alfred M. Paglia (SCE&G), Request for Additional Information Letter No. 081 Related to SRP Section 9.2.2 for the Virgil C. Summer Nuclear Station Units 2 and 3 Combined License Application, dated April 20, 2010.

2. Letter from Joseph M. Sebrosky (NRC) to Alfred M. Paglia (SCE&G), Request for Additional Information Letter No. 079 Related to SRP Section 6.2.1 for the Virgil C. Summer Nuclear Station Units 2 and 3 Combined License Application, dated March 30, 2010.

The enclosures to this letter provide the South Carolina Electric & Gas Company (SCE&G) response to the RAI items included in the above referenced letters. Enclosure 4 also identifies associated changes that will be incorporated in Revision 3 of the VCSNS Units 2 and 3 COLA.

Should you have any questions, please contact Mr. Alfred M. Paglia by telephone at (803) 345-4191, or by email at apaglia@scana.com.

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NRO

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

Executed on this 30th day of June, 2010.

Sincerely,

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Vice President
New Nuclear Deployment

AMM/RBC/am

Enclosures

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NRC RAI Letter No. 079 Dated March 30, 2010

SRP Section: 6.2.1 – Containment Functional Design

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

NRC RAI Number: 06.02.01-1

VCS DEP 2.0-2 increases the maximum noncoincident wet bulb temperature from 86.1°F to 87.3°F. The departure justification states that this increase does not change the maximum containment pressure value reported in the DCD. Please describe the analyses supporting this statement, including initial conditions, break locations, resulting peak pressure and pressure at 24 hours.

VCSNS RESPONSE:

The peak containment pressure wet bulb temperature sensitivity analysis (TPG-GW-GSC-001, Revision 0) was performed with the WGOTHIC AP1000 containment model, which had been updated from the DCD modeling to include significant design changes, particularly to the shield building (APP-GW-GSC-040, Revision 0). It was shown in APP-GW-GSC-040, Revision 0, that the design changes did not have a significant impact on the peak pressure over the DCD analysis.

The analysis was performed on the limiting peak pressure case, the cold leg LOCA, using the initial containment conditions assumed in the DCD containment peak pressure analysis. The containment pressure was initially +2 psig, the containment initial temperature was 120°F and the containment initial relative humidity was 0%. The ambient wet bulb temperature was varied from 80.0°F (in DCD, Revision 15) up to 89.0°F for the sensitivity analysis as shown in Table 1.

Table 1
Dry-bulb/Wet-bulb Temperature Combinations, Relative Humidity and Pressure Ratio

Case Name	T_{db} °F	T_{wb} °F	Rel. Hum. %	P_{sat} @ T_{db} psia	PR_{st} -
ap1kloca	115	80.0	22.02	1.47	0.0220
ap1k_dcp	115	86.1	31.71	1.47	0.0317
wb87	115	87.4	33.95	1.47	0.0340
wb89	115	89.0	36.79	1.47	0.0368

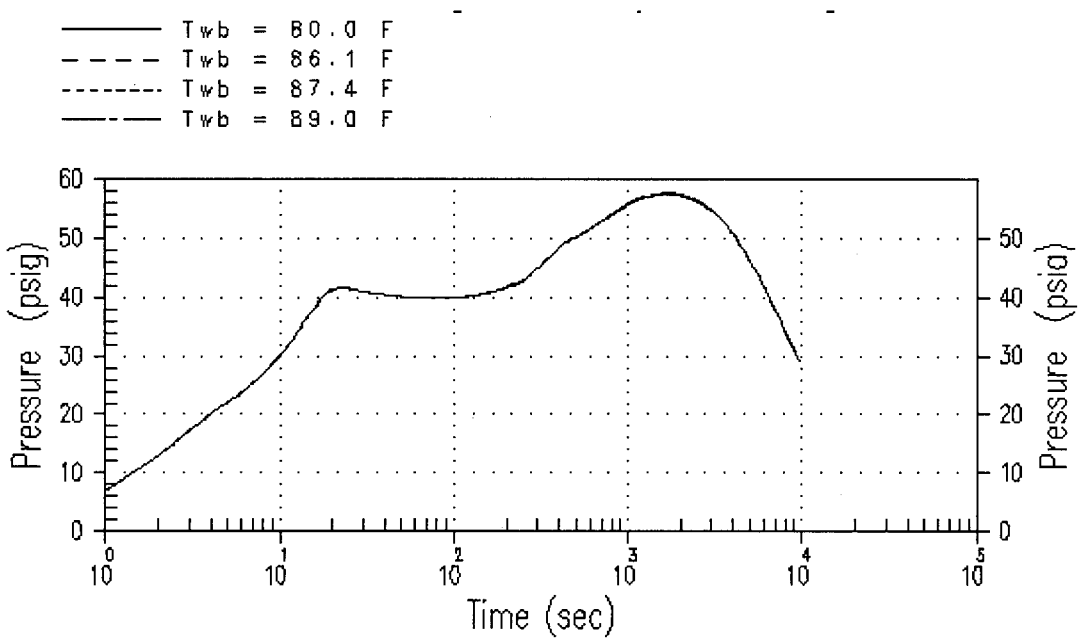
** from Psychrometric Chart

The resulting peak pressures are shown in Table 2 and Figure 1. The analyses were not run to 24 hours. However, from Figure 1 it can be determined that the ambient wet bulb temperature does not impact the long term containment pressure.

Table 2
Peak Pressure Sensitivity to the Dry and Wet-bulb Temperatures

Case Name	T_{db} °F	T_{wb} °F	Peak P psig
ap1kloca	115	80.0	57.8
ap1k_dcp	115	86.1	57.88
wb87	115	87.4	57.88
wb89	115	89.0	57.90

Figure 1
Containment Peak Pressure Sensitivity to Wet Bulb Temperature Double-Ended Cold Leg Break, Dry Bulb Temp = 115°F



In addition, please refer to Westinghouse document VSP-VSG-000706 which was prepared to provide amplifying information to support VCS DEP 2.0-2 and is included as Enclosure 3 to this submittal.

This response is PLANT SPECIFIC.

ASSOCIATED VCSNS COLA REVISIONS:

VCSNS COLA Part 2 will be revised in Revision 3 as indicated in Enclosure 4.

ASSOCIATED ATTACHMENTS:

None

NRC RAI Letter No. 081 Dated April 20, 2010

SRP Section 9.2.2 - Reactor Auxiliary Cooling Water Systems

QUESTION from Balance of Plant Branch 1 (SBPA)

NRC RAI Number: 09.02.02-1

The V.C. Summer COL Application, Part 7, Departure and Exemptions, provides justification to the maximum safety wet bulb (noncoincident) air temperature of 87.3 °F. This corresponding site characteristic value exceeds the AP1000 DCD site parameter by 1.2 °F. Analysis of the maximum safety wet bulb (noncoincident) air temperature at a bounding value of 87.4 °F has been performed by the COL applicant. The detailed justification was performed on the following components/systems.

- Containment pressure design limits
- IRWST temperature control with normal residual heat removal system
- Component cooling water system
- Nuclear Island nonradioactive ventilation system capability

This departure/exemption was evaluated by the staff against the AP1000 DCD submittal, APP-GW-GLE-036, "Impact of a revision to the current Wet Bulb Temperature indentified in Table 5.0-1 (Tier 1) and Tier 2 Table 2-1 (Sheet 1 of 3) of the DCD (Revision 16)" to support Levy and Turkey Point 6 and 7. The staff concludes that the applicant should describe in their applicant in a similar manner the change justification at VC Summer to the extent of the AP1000 justification and evaluation. Specifically, the departure/exemption justification should include;

- The performance of passive containment cooling system
- Passive heat sinks associated with the main control room habitability system
- Normal, decay, and spent fuel pool heat removal
- HVAC design
- Chiller water system design
- Component cooling and service water system design
- Steam and power conversion
- Circulating water system and turbine building closed cooling water system design

In addition, specific to Section 5.4.7, "Normal Residual Heat Removal System," in the VC Summer's COL Revision 2 submittal, the applicant incorporated by reference DCD Section 5.4.7 with the exception of the following departure in Subsection 5.4.7.1.2.3:

VCS DEP 2.0-2 The component cooling water system supply temperature to the normal residual heat removal system heat exchangers is based on an ambient design wet bulb temperature of no greater than 87.3°F (100 year return estimate of 2-hour

duration). The 87.3°F value is assumed for normal conditions and transients that start at normal conditions.

The staff reviewed the applicable RNS design basis subsections and determined that additional information is required by the applicant in order for the staff to complete the evaluation.

With plant operation at the design limit and the ambient design wet bulb temperature at the proposed 87.3°F, describe if the CCW have sufficient heat removal capacity such that the RNS remains within the design basis as described in DCD Subsection 5.4.7.1 and provide a discussion of the evaluation performed that confirms the following subsections:

A. Subsection 5.4.7.1.2.1 that the normal residual heat removal system reduces the temperature of the reactor coolant system from 350° to 125°F within 96 hours after shutdown and the RNS system maintains the reactor coolant temperature at or below 125°F for the plant shutdown;

B. Subsection 5.4.7.1.2.3 that the RNS system limits the in-containment refueling water storage tank water temperature to less than boiling temperature during extended operation of the passive residual heat removal system and not greater than 120°F during normal operation.

VCSNS RESPONSE:

To provide amplifying information and additional support for the VCSNS departure (VCS DEP 2.0-2), Westinghouse prepared document VSP-VSG-000706 which is included as Enclosure 3 to this submittal. This supporting document contains the complete response to this NRC RAI.

This response is PLANT SPECIFIC.

ASSOCIATED VCSNS COLA REVISIONS:

VCSNS COLA Part 2 will be revised in Revision 3 as indicated in Enclosure 4.

ASSOCIATED ATTACHMENTS:

None

ASSOCIATED VCSNS COLA REVISIONS

VCSNS COLA Part 2 will be revised in Revision 3 as indicated below. Each entry will be annotated with a left margin annotation (LMA) of VCS DEP 2.0-2. Insertions are shown in green-underlined text, and deletions are shown in red strike-through text.

1. Revise note (k) in Table 2.0-201 to read as follows:

   (k) ~~See COLA Part 7~~ Justification for the exemption and departure ~~justification~~ for Maximum Safety Wet Bulb Temperature (Noncoincident) can be located in the following FSAR Subsections: 2.3.1.5, 5.4.7.1.2.3, 6.2.1.1.3, 6.2.2.3, 6.4, 9.1.3.1.3.1, 9.2.2.1.2.1, and 9.2.7.2.4.

2. Revise VCSNS FSAR Subsection 5.4.7 to add the following information:

   Add the following information at the end of the second bullet in DCD Subsection 5.4.7.1.2.3.

   The steaming prevention function is evaluated assuming the ambient wet bulb temperature is at the maximum safety value for the site. During plant operation, maximum IRWST temperature is reduced below 120 °F whenever necessary by circulating IRWST water through one of the RNS heat exchangers, and removing the heat through the CCS and SWS. Since the RNS heat exchangers are not being used to remove decay heat with the plant at power, at least one is available for IRWST heat removal. Only one train of CCS (pump and heat exchanger) and one train of SWS (pump, strainer, and cooling tower cell) are normally in operation with the plant at power. There is sufficient margin in CCS pump flow capacity and motor size, and in CCS heat exchanger UA, to valve in one of the RNS heat exchangers and remove IRWST heat by directing CCS flow through the heat exchanger and transferring the excess heat to the SWS cooling tower. CCS temperature rises slightly above the normal full power CCS temperature during this evolution, but does not approach the maximum allowable value of 100 °F.

   Prevention of IRWST steaming following high pressure heat removal operations with the Passive Residual Heat Removal (PRHR) heat exchanger is accomplished in the same manner, by lining up both RNS heat exchangers to the CCS and the IRWST. CCS is delivered to the RNS heat exchangers at a temperature consistent with the maximum safety ambient wet bulb temperature and the CCS and SWS heat duty and flow rates. Cooling is assumed to begin two hours after reactor trip, with decay heat appropriate for that time after the event. Calculations performed to determine the maximum IRWST temperature achieved following a high pressure heat removal event using the PRHR heat exchanger assumed CCS temperature is determined by use of a maximum safety ambient wet bulb temperature value of 87.4 °F. The maximum predicted IRWST liquid temperature is 201 °F. Therefore, it can be concluded that IRWST cooling performance (prevention of steaming) is acceptable.

3. Revise VCSNS FSAR Subsection 6.2.1 to add the following information:

   Add the following information after the fourth paragraph of DCD Subsection 6.2.1.1.3.

The maximum safety non-coincident wet bulb temperature for VCSNS Units 2 and 3 is increased from 86.1 °F to 87.3 °F, however there are no impacts on the performance of the safety systems.

4. Revise VCSNS FSAR Subsection 6.2.2 to add the following information:

   Add the following information at the end of DCD Subsection 6.2.2.3.
   There are no changes to the AP1000 design required to address any safety issues associated with the VCSNS Units 2 and 3 increased maximum safety wet bulb temperature of 87.3 °F. The peak containment pressure at the maximum safety wet bulb temperature of 87.3 °F for the VCSNS Units 2 and 3 site is bounded by the results of the current AP1000 analysis.

   The pressure decay curve for the containment utilizing the standard maximum safety wet bulb value of 87.3 °F is the same as the containment response for wet bulb temperatures equal to the standard maximum safety wet bulb value.

5. Revise VCSNS FSAR Subsection 6.4 to add the following information:

   Add the following information after the second paragraph of DCD Subsection 6.4.

   Based on system design margin of the VBS, the MCR temperature and humidity at the higher VCSNS maximum safety wet bulb temperature will remain at or below the desired design points during normal operation.

6. Revise VCSNS FSAR Subsection 9.1.3 to add the following information:

   Add the following information at the end of the third bullet in DCD Subsection 9.1.3.1.3.1.

   SFS performance following restart after a normal refueling is affected by a change in maximum safety wet bulb temperature. Calculations confirm that spent fuel pool temperature remains below 115 °F with a CCS supply temperature of 97 °F at the specified pool spent fuel loading condition and decay time on the fuel fraction just replaced during the previous 17 day refueling outage.

   While the maximum CCS temperature expected for VCSNS Units 2 and 3 is 97.3 °F, an increase of 0.3 °F in CCS supply temperature will produce a similar increase in the spent fuel pool maximum temperature; therefore, the requirement to maintain spent fuel temperature below 120 °F is met with margin.

7. Revise VCSNS FSAR Subsection 9.2.2 to add the following information:

   Add the following information at the end of the first bullet in DCD Subsection 9.2.2.1.2.1.

   The most limiting component cooled by the CCS, the RCP motor cooling system, has been designed to operate for at least 6 hours continually with cooling water supplied at temperatures up to 100 °F.

The performance of the standard AP1000 CCS and SWS for single cooling water train, full power operation at a maximum safety wet bulb temperature of 87.4 °F has demonstrated the highest CCS temperature achieved at these conditions is 97.4 °F, for a period of less than 2 hours. As ambient wet bulb temperature decreases, the CCS temperature follows and will return to below 95 °F with ambient wet bulb temperature slightly lower than 84 °F, assuming nominal performance of both the CCS and SWS. Since the definition of the maximum normal wet bulb temperature value is the seasonal 1% exceedance value observed at the site, the annual total operating time for which CCS temperatures could exceed 95 °F is less than 30 hours per year, for periods of a few hours at most. The maximum CCS temperature of 97.3 °F is bounded by the maximum allowable cooling water temperature for Reactor Coolant Pumps (the most limiting component) and the increase in maximum safety wet bulb temperature is therefore acceptable on this basis.

8. Revise VCSNS FSAR Subsection 9.2.7 to add the following information:

   Add the following information at the end of the first paragraph under "Normal Operation" in DCD Subsection 9.2.7.2.4.

   The increased heat load produced by operation at the higher VCSNS maximum safety ambient wet bulb temperature of 87.3 °F can be accommodated within the available capacity margin of the chiller units, without impacting the LCCWS or supporting systems design or plant operation. Cooling coil design calculations indicate that during operation at the standard plant design temperatures (115 °F dry bulb, 86.1 °F wet bulb), the VBS air handling unit has cooling coil and system margin.

9. Add the following reference to FSAR Subsections 5.4, 6.2, 6.4, 9.1, and 9.2 with the appropriate reference numbering for each Subsection:

   2XX. Westinghouse: *Evaluation of Impacts: Change to Maximum Safety Non-Coincident Ambient Wet Bulb Temperature for the V.C. Summer Site,* VSP_VSG_000706, June 30, 2010.