Eugene S. Grecheck
Vice President
Nuclear Development

Dominion Energy, Inc. • Dominion Generation
Innsbrook Technical Center
5000 Dominion Boulevard, Glen Allen, VA 23060
Phone: 804-273-2442, Fax: 804-273-3903
E-mail: Eugene.Grecheck@dom.com

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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

Serial No. NA3-12-008R
Docket No. 52-017
COL/BCB

DOMINION VIRGINIA POWER
NORTH ANNA UNIT 3 COMBINED LICENSE APPLICATION
SRP 09.02.05: RESPONSE TO RAI LETTER 96

On February 28, 2012, the NRC requested additional information to support the review of certain portions of the North Anna Unit 3 Combined License Application (COLA), which consisted of one question. The response to the following Request for Additional Information (RAI) Question is provided in Enclosure 1:

- RAI 6198, Question 09.02.05-2 UHS Design Wet-Bulb Temperatures

Please contact Regina Borsh at (804) 273-2247 (regina.borsh@dom.com) if you have questions.

Very truly yours,

Eugene S. Grecheck

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NRO

Enclosure:

1. Response to NRC RAI Letter No. 96, RAI 6198, Question 09.02.05-2.

Commitments made by this letter:

None.

COMMONWEALTH OF VIRGINIA

COUNTY OF HENRICO

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Eugene S. Grecheck, who is Vice President-Nuclear Development of Virginia Electric and Power Company (Dominion Virginia Power). He has affirmed before me that he is duly authorized to execute and file the foregoing document on behalf of the Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 13th day of April, 2012
My registration number is 7173057 and my
Commission expires: August 31, 2012

Wanda K. Marshall
Notary Public

WANDA K. MARSHALL
Notary Public
Commonwealth of Virginia
7173057
My Commission Expires Aug 31, 2012

cc: U. S. Nuclear Regulatory Commission, Region II
C. P. Patel, NRC
T. S. Dozier, NRC
G. J. Kolcum, NRC

ENCLOSURE 1

Response to NRC RAI Letter No. 96

RAI No. 6198, Question 09.02.05-2

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

North Anna Unit 3

Dominion

Docket No. 52-017

RAI NO.: 6198 (RAI LETTER NO. 96)

SRP SECTION: 09.02.05 – ULTIMATE HEAT SINK

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

DATE OF RAI ISSUE: 02/28/2012

QUESTION NO.: 09.02.05-2

10 CFR 50.36(c)(2)(ii) states that a technical specification (TS) limiting condition for operation (LCO) of a nuclear reactor must be established for each item meeting one or more of four listed criteria. The third criterion provides that a TS LCO is required for "[a] structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier." The UHS is the sink for heat removed from the reactor core following all accidents and anticipated operational occurrences in which the unit is cooled down and placed on residual heat removal (RHR) operation. The operating limits are based on conservative heat transfer analyses for the worst case Loss-of-Coolant-Accident (LOCA). The UHS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

The North Anna 3 uses mechanical draft cooling towers (MDCT) for its ultimate heat sink (UHS). Regulatory Position 4 from Regulatory Guide (RG) 1.27 (1976), "Ultimate Heat Sink for Nuclear Power Plants," states, in part, that the technical specifications for the plant should include provisions for actions to be taken in the event that conditions threaten partial loss of the capability of the UHS. There are already surveillance requirements in TS 3.7.9 for the UHS cooling tower basin water temperature (SR 3.7.9.2) and level (SR 3.7.9.1). For a MDCT, wet bulb (WB) temperature dictates the cooling tower's heat removal capacity. The higher the ambient WB temperature the worse the cooling performance of the tower. A higher WB temperature than previously analyzed would threaten the cooling capability of the MDCT UHS. Thus, if RG 1.27 is followed, plants that use MDCTs for their UHS should incorporate an ambient WB temperature surveillance requirement in their TS.

Section 2.3.1.3.8, "Meteorological Data for Evaluating the Ultimate Heat Sink," in the North Anna Early Site Permit (ESP) Site Safety Analysis Report (SSAR), which is incorporated by reference into Section 2.3.1 of the North Anna Final Safety Analysis Report (FSAR), establishes the design basis wet bulb temperature as 78.3° F.

The ambient WB temperature greatly influences the heat removal capacity and efficiency of the MDCT and may simultaneously affect all four trains of the UHS, which is used to protect fission product barriers. Thus, the staff needs assurance that the assumptions used to calculate the UHS cooling capability bound actual conditions.

a. Describe how the 1-day and 5-day worst time periods discussed in SSAR Section 2.3.1.3.8 were used in the design of the UHS.

b. Describe in the North Anna 3 FSAR the condition of the UHS that would exist if the ambient WB temperature exceeds the UHS design basis 78.3° F.

c. Describe in the North Anna 3 TS bases the UHS WB temperature margins.

d. Provide justification for why the TS surveillance requirements for UHS water temperature and level provide assurance, in accordance with RG 1.27, that if the ambient WB is exceeded, the UHS is still able to perform its intended heat removal function. If the UHS is determined to be unable to perform its intended heat removal function if the ambient WB is exceeded, then create a North Anna 3 TS surveillance (and associated TS Bases) for ambient WB temperature as it relates to cooling tower performance. Also, describe in the North Anna 3 TS Bases how ambient WB is to be measured and on what frequency.

Dominion Response

a. The worst 1-day and 5-day wet-bulb temperatures were not used in the design of the ultimate heat sink (UHS). Rather, the UHS design is based on the worst 30-day average combination of controlling atmospheric conditions resulting in maximum evaporation and drift losses during the assumed 30-day period following an accident. To ensure an adequate water supply in accordance with RG 1.27, the worst 30-day period daily average wet-bulb temperature of 76.3°F, plus a recirculation penalty of 2°F (i.e., 76.3°F + 2°F = 78.3°F), is used as the design basis for the UHS mechanical draft cooling tower (MDCT) and basin sizing.

   The maximum 0% exceedance ambient wet-bulb temperature of 84.9°F (SSAR Table 2.3-18) was used to evaluate the heat removal capability of the UHS during an accident. This wet-bulb temperature conservatively envelopes the worst 1-day (78.9°F) and 5-day (77.6°F) daily average wet-bulb temperatures described in SSAR Section 2.3.1.3.8. An analysis shows that the UHS is capable of removing Essential Service Water System heat loads during all plant operating and accident conditions at a wet-bulb temperature of 84.9°F. So, while the worst 1-day and 5-day wet-bulb temperatures were not used in the design of the UHS, the analysis at the

the higher 84.9°F demonstrates that the UHS will perform its cooling function at the worst 1-day and 5-day daily average wet-bulb temperatures.

b. The cooling performance of the MDCT for accident conditions is analyzed for a 0% exceedance ambient wet-bulb temperature of 84.9°F, as compared to the condition identified in SSAR Table 1.9-1 that results in minimum water cooling during any one day (i.e., worst 1-day daily average wet-bulb temperature of 78.9°F). At an ambient wet-bulb temperature of 84.9°F, calculations confirm that the UHS is capable of removing the Essential Service Water System heat loads during all plant operating conditions, including normal power operation and plant accident conditions, without exceeding the basin water temperature design basis limit of 95°F.

c. The UHS cooling tower basin water temperature surveillance requirement (SR 3.7.9.2) verifies that the UHS water temperature is ≤93°F once per 24-hour period. This operability limit for the UHS is confirmed by analyses using the 0% exceedance ambient wet-bulb temperature of 84.9°F (SSAR Table 2.3-18). This is a more conservative temperature than the design wet-bulb temperature of 78.3°F (FSAR Subsection 9.2.5.2.3) and provides additional margin. As discussed in Part b of this response, the heat removal capacity of the UHS MDCT at an ambient wet-bulb temperature of 84.9°F is confirmed.

   TS B3.7.9 states that the MDCT design and minimum basin water inventory are based on the safe shutdown analysis and refers to FSAR Section 9.2.5 for details regarding the assumptions used in the analysis, including the worst expected meteorological conditions. FSAR Section 9.2.5 describes the basis for the UHS design wet-bulb temperature (78.3°F) and the margin provided by using the maximum 0% exceedance ambient wet-bulb temperature of 84.9°F in the analysis of MDCT cooling performance. Because this information is in the FSAR and is referenced by TS B3.7.9, no additional detail is needed in the TS Bases.

d. RG 1.27 specifies that sufficient conservatism be provided in the design so that the design basis temperatures of safety-related equipment are not exceeded. As noted above, and in FSAR Section 9.2.5, adequate conservatism is provided in the design and performance of the UHS. UHS cooling tower heat removal performance and the ambient wet-bulb temperature determines the UHS basin water temperature. The UHS cooling tower basin water temperature surveillance requirement (SR 3.7.9.2) confirms that the UHS water temperature is ≤93°F and provides margin for the plant operating staff to monitor UHS operation. As noted in Part b of this response, the UHS is capable of handling accident condition heat loads without exceeding the basin water temperature design basis limit of 95°F.

Proposed COLA Revision

None.