From: Wanda.K.Marshall@dom.com
Sent: Thursday, August 28, 2008 5:05 PM
Cc: Thomas Kevern; Thomas Kevern; NRC.North.Anna@dom.com; JDebiec@odec.com; gzinke@entergy.com; twilli2@entergy.com; rick.kingston@ge.com; kenneth.ainger@exeloncorp.com; smithpw@dteenergy.com; Andrea Johnson; Chandu Patel; Bruce Bavol; Tom Tai; Dennis Galvin; Michael Eudy; Rocky Foster; Leslie Perkins; Mark Tonacci; Jerry Hale
Subject: Response to Request for Additional Information Letter No. 017
Attachments: 082808 D ltr. Response to Request for Additional Information Letter No. 017.pdf

Importance: High

cc list:

Please see attached.

Wanda K. Marshall
Administrative Assistant III
Dominion Resources Services
COL Project Team
wanda.k.marshall@dom.com

Hearing Identifier: NorthAnna3_Public_EX
Email Number: 306

Mail Envelope Properties (OF4C978A7A.EE81EF69-ON852574B3.006A324F-852574B3.0073DB2D)

Subject: Response to Request for Additional Information Letter No. 017
Sent Date: 8/28/2008 5:05:20 PM
Received Date: 8/28/2008 5:09:41 PM
From: Wanda.K.Marshall@dom.com

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Dominion®

August 28, 2008

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

Serial No. NA3-08-086R
Docket No. 52-017
COL/GY

DOMINION VIRGINIA POWER
NORTH ANNA UNIT 3 COMBINED LICENSE APPLICATION
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION LETTER 017

On July 15, 2008, the NRC requested additional information to support the review of certain portions of the North Anna Unit 3 Combined License Application (COLA). The letter contained fifteen RAIs. The responses to the following fourteen RAIs are provided in Enclosures 1 through 14:

- RAI Question 02.01.02-1 Control of WHTF
- RAI Question 02.03.01-1 Wind Speed Values
- RAI Question 02.03.01-2 10 CFR 52.79(a)(1)(iii) Dry / Wet Bulb Temperatures
- RAI Question 02.03.01-3 Clarification of Ambient Temperatures
- RAI Question 02.03.02-2 Cooling Towers Salt Deposition Rates
- RAI Question 09.02.01-1 Cooling Tower Performance Capability
- RAI Question 09.02.01-2 Fiberglass Reinforced Polyester Pipe for PSWS
- RAI Question 09.02.01-3 PSWS Material Selections Based on Water Quality
- RAI Question 09.02.01-4 FSAR Section 9.2.1.2 Additional Information
- RAI Question 09.02.01-5 Plant Specific Information versus Standard Design
- RAI Question 09.02.01-6 Cooling Tower Performance – RTNSS Functions
- RAI Question 09.02.01-7 PSWS Design Capability
- RAI Question 14.02-5 Personnel Monitors and Radiation Survey Instruments
- RAI Question 14.02-6 Site-Specific Preoperational Test

This information will be incorporated into a future submission of the North Anna Unit 3 COLA, as described in the enclosures. The response to the fifteenth RAI, Question 02.03.05-1, "X/Q and D/Q Values," will be provided separately.

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

Very truly yours,

Eugene S. Grecheck

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 28th day of August, 2008

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

Enclosures:

1. Response to RAI Letter 017, RAI Question 02.01.02-1
2. Response to RAI Letter 017, RAI Question 02.03.01-1
3. Response to RAI Letter 017, RAI Question 02.03.01-2
4. Response to RAI Letter 017, RAI Question 02.03.01-3
5. Response to RAI Letter 017, RAI Question 02.03.02-2
6. Response to RAI Letter 017, RAI Question 09.02.01-1
7. Response to RAI Letter 017, RAI Question 09.02.01-2
8. Response to RAI Letter 017, RAI Question 09.02.01-3
9. Response to RAI Letter 017, RAI Question 09.02.01-4
10. Response to RAI Letter 017, RAI Question 09.02.01-5
11. Response to RAI Letter 017, RAI Question 09.02.01-6
12. Response to RAI Letter 017, RAI Question 09.02.01-7
13. Response to RAI Letter 017, RAI Question 14.02-5
14. Response to RAI Letter 017, RAI Question 14.02-6

Commitments made by this letter:

1. Incorporate proposed changes in a future COLA submission.

cc: U. S. Nuclear Regulatory Commission, Region II
T. A. Kevern, NRC
J. T. Reece, NRC
J. J. Debiec, ODEC
G. A. Zinke, NuStart/Entergy
T. L. Williamson, Entergy
R. Kingston, GEH
K. Ainger, Exelon
P. W. Smith, DTE Energy

ENCLOSURE 1

Response to NRC RAI Letter 017

RAI Question 02.01.02-1

NRC RAI 02.01.02-1

The North Anna Early Site Permit identifies COL Item 2.1-2 "A COL or CP applicant should arrange with the appropriate local, State, Federal, or other public agencies to provide for control of the portions of Lake Anna and the waste heat treatment facility (WHTF) that are within the exclusion area." Staff review of FSAR Section 2.1.2, Exclusion Area Authority and Control, indicates the supplemental information provided in this Section does not address the arrangements at the WHTF. Please address the arrangements for control of the WHTF area.

Dominion Response

Dominion's arrangements with responsible state agencies regarding control of the WHTF area are discussed in FSAR Section 2.1.2.2. In that section it describes that, under the Commonwealth of Virginia's Radiological Emergency Response Plan (COVRERP), the Virginia Department of Game and Inland Fisheries (VDGIF) is responsible for warning people in boats, assisting in traffic control of boats, and notifying persons participating in swimming, fishing, and boating on Lake Anna in the vicinity of NAPS in the event of a radiological emergency.

As defined in both the North Anna ESP and COL applications, the 13,000 acre Lake Anna consists of the 3400 acre Waste Heat Treatment Facility (WHTF) and the 9600 acre North Anna Reservoir. Thus, the reference to control of Lake Anna includes the portions of both the WHTF and the North Anna Reservoir that lie within the NAPS exclusion area.

Proposed COLA Revision

None.

ENCLOSURE 2

Response to NRC RAI Letter 017

RAI Question 02.03.01-1

NRC RAI 02.03.01-1

ESBWR DCD COL Item 2.0-7-A states, in part, that the COL applicant is to determine the basic speed of extreme wind for use in the design of nonsafety-related structures that are not included as part of the ESBWR standard plant design. FSAR Section 2.3.1, Regional Climatology, NAPS COL 2.0-7-A, states that the information to address the DCD COL Item 2.0-7-A is included in SSAR Section 2.3.1. However, staff review identified that SSAR Section 2.3.1 does not provide the basis for this wind speed value. Please revise FSAR Section 2.3.1 to provide the basis for the FSAR Table 2.0-2R wind speed value of 90 mi/hr which is to be used in the design of nonsafety-related structures that are not included as part of the ESBWR standard plant design.

Dominion Response

Nonsafety-related structures that are not included as part of the ESBWR standard plant design are designed in accordance with the Virginia Construction Code (VCC), Part I of the Virginia Uniform Statewide Building Code, which is identified in FSAR Table 1.9-204. The applicable VCC edition of record is the 2003 edition for North Anna Unit 3. This edition incorporates by reference the International Building Code (IBC), 2003 Edition, which specifies use of Section 6 of American Society of Civil Engineers (ASCE), Standard No. 7 (ASCE 7-02).

Figure 6.1 in Section 6.5.4 of ASCE 7-02 provides the design wind speed for these nonsafety-related Unit 3 structures. The design wind speed is defined as a 3-second gust wind speed at 10 m (33 ft) above the ground that has a 2% annual probability of being exceeded, (i.e., the 50 year mean recurrence interval). This definition is applicable because there are no special notes indicating otherwise and the North Anna Power Station does not fall within a Special Wind Region. Therefore, the design wind speed is 40 m/s (90 mph) for the area in which North Anna Power Station is located.

Proposed COLA Revision

FSAR Table 1.9-204, Section 2.3.1, and Section 2.3 References will be revised as shown in the attached markups to incorporate the above response.

Markup of North Anna COLA

The attached markup represents Dominion's good faith effort to show how the COLA will be revised in a future COLA submittal in response to the subject RAI. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be somewhat different than as presented herein.

NAPS SUP 1.9-1

Table 1.9-204 Industrial Codes and Standards

Code or Standard Number	Year	Title
	American Society of Civil Engineers (ASCE)	
ASCE 7-02	2002	Minimum Design Loads for Buildings and Other Structures
	American Society of Mechanical Engineers (ASME)	
A 17.1	2007	Safety Code for Elevators and Escalators
B31.1	2007	Power Piping
NQA-1	2004	Quality Assurance Programs Requirements for Nuclear Facilities
Boiler and Pressure Vessel Code, Section IX	2007	Qualification Standard for Welding and Brazing Procedures, Welder, Brazers and Welding and Brazing Operators
	American Society for Testing and Materials (ASTM)	
ASTM E-84	2007	Method of Test of Surface Burning Characteristics of Building Materials
ASTM E-119	2007	Fire Test of Building Construction Materials
ASTM E-814	2006	Standard Test Method for Fire Tests for Through-Penetration Fire Stops
	Applicable Building Codes	
International Building Code	As defined in the Virginia Uniform Statewide Building Code edition of record	International Building Code
International Fire Code	As defined in the Virginia Uniform Statewide Building Code edition of record	International Fire Code
28 CFR 36		American Disability Act (ADA) Accessibility Guidelines
	2003	Virginia Uniform Statewide Building Code, Part I (Virginia Construction Code)

2.3 Meteorology

NAPS COL 2.0-7-A

2.3.1 Regional Climatology

The information needed to address the DCD COL Item 2.0-7-A is included in SSAR Section 2.3.1, which is incorporated by reference with the following supplement.

2.3.1.3.1 Extreme Winds

This SSAR section is supplemented with information to address wind speeds used for part of the Unit 3 design as follows.

NAPS COL 2.0-7-A

Nonsafety-related structures, not included as part of the certified design, are designed in accordance with Part I of the Virginia Uniform Statewide Building Code (Reference 2.3-204), which incorporates by reference the International Building Code (IBC) (Reference 2.3-205). The applicable edition of the IBC invokes Section 6 of American Society of Civil Engineers (ASCE) Standard No. 7 (Reference 2.3-206). ASCE 7, Section 6.5.4, Figure 6.1, defines the basic wind speed for such structures. Unit 3 is not in a Special Wind Region.

The basic wind speed for Unit 3 nonsafety-related structures, not included in the certified design, is 40 m/s (90 mph). This design value is defined in Reference 2.3-206 as a 3-second gust at 10 m (33 ft) above the ground that has a 2 percent annual probability of being exceeded (i.e., the 50-year mean recurrence interval).

2.3.1.3.4 Precipitation Extremes

The last paragraph in this SSAR section is supplemented as follows with information to address ice and winter precipitation for Unit 3 safety-related structures.

As Section 2.4.7.6 indicates, the design features that demonstrate acceptable roof structure performance are described in DCD Appendix 3G, e.g., for the reactor building, see DCD Section 3G.1.5.

NAPS COL 2.0-8-A

2.3.2 Local Meteorology

The information needed to address the DCD COL Item 2.0-8-A is included in SSAR Section 2.3.2, which is incorporated by reference with the following supplements.

The maximum annual χ/Q (no decay) at the EAB is 3.70×10^{-6} sec/m^3; at a distance of 1.42 km (0.88 mile) to the ESE of the plant facility boundary (Figure 2.0-205). The results are summarized in Table 2.3-16R and Table 2.3-17R. These tables present the maximum calculated χ/Qs and D/Qs at receptors and at various distances from the site.

Section 2.3 References

2.3-201 Dominion North Anna Power Station 2006 Annual Radiological Environmental Operating Report, prepared by Dominion North Anna Power Station, January 2006-December 2006.

2.3-202 SACTI User's Manual: Cooling-Tower-Plume Prediction Code, EPRI CS-3403-CCM, April 1984.

2.3-203 Institute of Electrical and Electronics Engineers, Std C57.19.100-1995 (R2003), "IEEE Guide for Application of Power Apparatus Bushings," April 26, 2004.

2.3-204 Virginia Uniform Statewide Building Code, Part I (Virginia Construction Code), Virginia Board of Housing and Community Development.

2.3-205 International Building Code, International Code Council, Inc.

2.3-206 Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers Standard No. 7 (ASCE 7).

ENCLOSURE 3

Response to NRC RAI Letter 017

RAI Question 02.03.01-2

NRC RAI 02.03.01-2

10 CFR 52.79(a)(1)(iii) states in part that COL applications must identify the meteorological characteristics of the proposed site with appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area and with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated. In order to be compliant with 10 CFR 52.79(a)(1)(iii), please provide the following information: 1) the highest of either the 100-year return period or historic maximum dry-bulb temperature, coincident wet bulb temperature, and non-coincident wet bulb temperature values should be compared to the corresponding ESBWR 0% exceedance maximum ambient design temperature site parameters shown on FSAR Table 2.0-201 (FSAR page 2-20); and 2) the lowest of either the 100-year return period or historic minimum dry-bulb temperatures should be compared to the ESBWR 0% exceedance minimum values ambient design temperature site parameter shown on FSAR Table 2.0-201 (FSAR page 2-21). Use of the 100-year return period temperatures are intended to cover situations where the historical data used to characterize a site may not extend over a significant time interval to capture cyclical events.

Dominion Response

Maximum Dry-Bulb Temperature Comparison

Based on 30 years (1973-2002) of Richmond, VA, hourly data, the 100-year return period maximum dry-bulb temperature (109°F) was estimated using a linear regression method (least squares). This 100-year return period value as presented in SSAR Table 2.3-18 is higher than the historical maximum dry-bulb temperature of 104.9°F as presented in the same table. It is also higher than the extreme maximum temperature in the region (107°F) as presented in SSAR Table 2.3-5 for a nearby station (Charlottesville in 1954). Therefore, the highest of these values is the 100-year return period value (109°F). This temperature will be presented as the Unit 3 site characteristic value for maximum dry-bulb temperature.

Using the International Station Meteorological Climate Summary for Richmond, dry-bulb temperatures ranging from -25°F to 101°F were plotted in 2°F intervals with their maximum observed coincident wet-bulb temperatures to obtain a corresponding curve. Extrapolating the curve to 109°F (the 100-year return period maximum dry-bulb temperature), the 100-year return coincident wet-bulb temperature was determined to be 76°F. This coincident wet-bulb temperature (76°F) will be presented as the Unit 3 site characteristic value that corresponds to the 100-year return period value for maximum dry-bulb temperature.

Similarly, using 30 years of the Richmond data, the 100-year return period value for maximum wet-bulb temperature (non-coincident) was estimated to be 88°F. This value will be used as the Unit 3 site characteristic value for maximum non-coincident wet-bulb temperature.

Minimum Dry-Bulb Temperature Comparison

The lowest dry-bulb temperature ever observed in Richmond is -12°F (2003 Local Climatological Data, Annual Summary with Comparative Data, NCDC). The 100-year return period value for the minimum dry-bulb temperature at Richmond was estimated to be -19°F as presented in SSAR Table 2.3-18. However, as presented in SSAR Table 2.3-5, the extreme minimum temperature in the region was -21°F as reported at a nearby station (Louisa in 1996). This historic minimum dry-bulb temperature will be used as the Unit 3 site characteristic value.

Proposed COLA Revision

FSAR Table 2.0-201 Part 1, Section 2.3.1, and Section 2.3 References will be revised as shown in the attached markups.

Markup of North Anna COLA

The attached markup represents Dominion's good faith effort to show how the COLA will be revised in a future COLA submittal in response to the subject RAI. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be somewhat different than as presented herein.

NAPS COL 2.0-1-A

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

Subject[16]	DCD Site Parameter Value[1][16]	Site Characteristic	Evaluation
Ambient Design Temperature (continued)			
0% Exceedance Values			
Maximum	47.2°C (117°F) dry bulb 26.7°C (80°F) wet bulb (coincident)	**ESP** No value provided	
		Unit 3 40.5°C 42.8°C (104.9°F 109°F) dry-bulb with 26.1°C 24.4°C (79°F 76°F) wet bulb coincident (0% exceedance 100-year return values)	The Unit 3 site characteristic values for maximum dry bulb with coincident wet bulb temperatures are the maximum dry bulb and wet bulb, coincident temperatures for 0% annual exceedance temperature for a 100-year return period as provided in SSAR Table Tables 2.3-18 and SSAR Table 1.9-1, and its corresponding wet bulb temperature (using a correlation between dry bulb and wet bulb temperatures). These As shown in Section 2.3.1.2, these values are 40.5°C 42.8°C (104.9°F 109°F) dry-bulb with 26.1°C 24.4°C (79°F 76°F) wet bulb coincident and fall within (are less than) the DCD site parameter values for 0% exceedance. The Unit 3 site characteristic 0% exceedance values (historic maxiumum values) for dry bulb with coincident wet bulb temperatures are provided in SSAR Tables 2.3-18 and 1.9-1, and also fall within (are less than) the DCD site parameter values for 0% exceedence.

NAPS COL 2.0-1-A

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

Subject[16]	DCD Site Parameter Value[1][16]	Site Characteristic	Evaluation
Ambient Design Temperature (continued)			
0% Exceedance Values			
Maximum (continued)	31.1°C (88°F) wet bulb (non-coincident)	**ESP** No value provided.	
		Unit 3 ~~29.4°C~~ 31.1°C (~~84.9°F~~ 88°F) wet-bulb (non-coincident) (~~0% exceedance~~ 100-year return value)	The Unit 3 site characteristic value for maximum wet bulb temperture (non-coincident) is the ~~maximum wet bulb temperature (non-coincident) for 0% annual exceedance~~ 100-year return period temperature as provided in SSAR ~~Table~~ Tables 2.3-18 and ~~SSAR Table~~ 1.9-1. This value is ~~29.4°C~~ 31.1°C (~~84.9°F~~ 88°F) wet bulb non-coincident and falls within (is ~~less than~~ equal to) the DCD site parameter value for 0% exceedance. The Unit 3 site characteristic 0% exceedance value (historic maximum value) for wet bulb temperature (non-coincident) is provided in SSAR Tables 2.3-18 and 1.9-1, and also falls within (is less than) the DCD site parameter value for 0% exceedance.

NAPS COL 2.0-1-A

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

Subject[16]	DCD Site Parameter Value[1][16]	Site Characteristic	Evaluation
Ambient Design Temperature (continued)			
0% Exceedance Values (continued)			
Minimum	-40°C (-40°F)	**ESP** No value provided	
		Unit 3 ~~-28.3°C~~ -29.4°C (~~-19°F~~ -21°F) (~~100 year return period~~ 0% exceedance value).	The Unit 3 site characteristic value for minimum 0% exceedance value temperature is the ~~ESP site characteristic value for~~ historic minimum dry bulb temperature ~~for the 100-year return period~~ as provided in SSAR Table 2.3-5. ~~This value is defined as the ambient dry-bulb temperature for which a 1 percent annual probability of a lower dry-bulb temperature exists (100-year mean recurrence interval).~~ This value is ~~-28.3°C~~ -29.4°C (~~-19°F~~ -21°F) and falls within (is higher than) the DCD site parameter value for 0% exceedance.~~Because the minimum temperature site characteristic value for 0% annual exceedance is even higher than the site characteristic value for the 100-year return period, the site characteristic value for 0% also falls within (is higher than) the DCD site parameter value for 0% exceedance. SSAR Table 2.3-18 and SSAR Table 1.9-1 provide the same 100-year return period value as FSER Supplement 1, Appendix A.~~

NAPS COL 2.0-1-A

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

Subject (16)	DCD Site Parameter Value (1)(16)	Site Characteristic	Evaluation
Site Characteristic (continued)			
Minimum Dry-Bulb Temperature 99.6% annual exceedance	No value provided	**ESP and Unit 3** -10°C (14°F)	The ESP site characteristic value is defined as the ambient dry-bulb temperature below which dry-bulb temperature will fall 0.4% of the time annually. The Unit 3 site characteristic value is provided as the 0.4% annual exceedance value for minimum dry bulb temperature in SSAR Table 2.3-18 and SSAR Table 1.9-1; and falls within (is the same as) the ESP site characteristic value.
100-year return period	No value provided	**ESP and Unit 3** –28.3°C (–19°F)	The ESP site characteristic value is defined as the ambient dry-bulb temperature for which a 1% annual probability of a lower dry-bulb temperature exists (100-year mean recurrence interval). The Unit 3 site characteristic value is provided in SSAR Tables 2.3-18 and 1.9-1, and falls within (is the same as) the ESP site characteristic value.
Maximum Wet-Bulb Temperature 100-year return period	No value provided	**ESP and Unit 3** 31.1°C (88°F)	The ESP site characteristic value is defined as the ambient wet-bulb temperature that has a 1 percent annual probability of being exceeded (100-year mean recurrence interval). The Unit 3 site characteristic value is provided in SSAR Table 2.3-18 and SSAR Table 1.9-1; and falls within (is the same as) the ESP site characteristic value.
Ultimate Heat Sink Ambient Air Temperature and Humidity			Although the Unit 3 site characteristic value is presented for comparison with the ESP site characteristic value, the ultimate heat sink (UHS) for the passive Unit 3 ESBWR design does not use safety-related engineered underground reservoirs or storage basins. Comparisons of meteorological conditions are provided as information required per 10 CFR 52.79(b)(1).

2.3 Meteorology

NAPS COL 2.0-7-A

2.3.1 Regional Climatology

The information needed to address the DCD COL Item 2.0-7-A is included in SSAR Section 2.3.1, which is incorporated by reference with the following supplement.

2.3.1.2 General Climate

This SSAR section is supplemented by inserting, as the third paragraph, the following information about temperature extremes.

NAPS COL 2.0-7-A

Using the International Station Meteorological Climate Summary for Richmond (Reference 2.3-207), dry-bulb temperatures ranging from -31.6°C (-25°F) to 38.3°C (101°F), were plotted in 1.1°C (2°F) intervals with their maximum observed coincident wet-bulb temperatures to obtain a corresponding curve. Extrapolating the curve to 42.8°C (109°F), which is the 100-year return value for maximum dry-bulb temperature, the 100-year return value for coincident wet-bulb temperature was determined to be 24.4°C (76°F). That is, 24.4°C (76°F) is the coincident wet-bulb temperature corresponding to the 100-year return period value for maximum dry-bulb temperature.

2.3.1.3.1 Extreme Winds

This SSAR section is supplemented with information to address wind speeds used for part of the Unit 3 design as follows.

NAPS COL 2.0-7-A

Nonsafety-related structures, not included as part of the certified design, are designed in accordance with Part I of the Virginia Uniform Statewide Building Code (Reference 2.3-204), which incorporates by reference the International Building Code (IBC) (Reference 2.3-205). The applicable edition of the IBC invokes Section 6 of American Society of Civil Engineers (ASCE) Standard No. 7 (Reference 2.3-206). ASCE 7, Section 6.5.4, Figure 6.1, defines the basic wind speed for such structures. Unit 3 is not in a Special Wind Region.

The basic wind speed for Unit 3 nonsafety-related structures, not included in the certified design, is 40 m/s (90 mph). This design value is defined in Reference 2.3-206 as a 3-second gust at 10 m (33 ft) above the ground that has a 2 percent annual probability of being exceeded (i.e., the 50-year mean recurrence interval).

Section 2.3 References

2.3-201 Dominion North Anna Power Station 2006 Annual Radiological Environmental Operating Report, prepared by Dominion North Anna Power Station, January 2006-December 2006.

2.3-202 SACTI User's Manual: Cooling-Tower-Plume Prediction Code, EPRI CS-3403-CCM, April 1984.

2.3-203 Institute of Electrical and Electronics Engineers, Std C57.19.100-1995 (R2003), "IEEE Guide for Application of Power Apparatus Bushings," April 26, 2004.

2.3-204 Virginia Uniform Statewide Building Code, Part I (Virginia Construction Code), Virginia Board of Housing and Community Development.

2.3-205 International Building Code, International Code Council, Inc.

2.3-206 Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers Standard No. 7 (ASCE 7).

2.3-207 International Station Meteorological Climate Summary, Fleet Numerical Meteorology and Oceanography Detachment, National Climatic Data Center, and USAFETAC OL-A, Version 4.0, September 1996.

ENCLOSURE 4

Response to NRC RAI Letter 017

NRC RAI Question 02.03.01-3

NRC RAI 02.03.01-3

In FSAR Table 2.0-201, please clarify whether the "7.8 °C (18 °F)" value listed as the Unit 3 minimum ambient design temperature 2% exceedance value (FSAR page 2-17) and 1% exceedance value (FSAR page 2-19) [should] be corrected to read "-7.8 °C (18 °F)."

Dominion Response

The Unit 3 minimum ambient design temperature 2% exceedance value and 1% exceedance value will be corrected to read "-7.8 °C (18 °F)."

Proposed COLA Revision

FSAR Table 2.0-201 will be revised as shown in the attached markup.

Markup of North Anna COLA

The attached markup represents Dominion's good faith effort to show how the COLA will be revised in a future COLA submittal in response to the subject RAI. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be somewhat different than as presented herein.

NAPS COL 2.0-1-A

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

Subject[16]	DCD Site Parameter Value[1][16]	Site Characteristic	Evaluation
Ambient Design Temperature (continued)			
2% Exceedance Values (continued)			
Minimum	-23.3°C (-10°F)	**ESP** No value provided	
		Unit 3 -7.8°C (18°F) (99% exceedance value)	The Unit 3 site characteristic value is the ESP site characteristic value for the minimum dry bulb temperature for 99% annual exceedance. This value is defined as the ambient dry-bulb temperature below which dry-bulb temperatures will fall 1% of the time annually. This value is -7.8°C (18°F) and falls within (is higher than) the DCD site parameter value for 2% exceedance (i.e., the ambient dry-bulb temperature below which dry-bulb temperatures will fall 2% of the time annually). Because the minimum temperature site characteristic value for 2% is even higher than the 1% value, the site's 2% value also falls within (is higher than) the DCD site parameter value for 1% annual exceedance. SSAR Table 2.3-18 and SSAR Table 1.9-1 provide the same 1% value as FSER Supplement 1, Appendix A.

NAPS COL 2.0-1-A

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

Subject [16]	DCD Site Parameter Value [1][16]	Site Characteristic	Evaluation
Ambient Design Temperature (continued)			
1% Exceedance Values (continued)			
Maximum	27.8°C (82°F) wet bulb (non-coincident)	**ESP** No value provided	
		Unit 3 26.1°C (79°F) wet-bulb (non-coincident) (0.4% exceedance value)	The Unit 3 site characteristic value is the ESP site characteristic value for the maximum wet bulb temperature (non-coincident) for 0.4% annual exceedance. This value is defined as the ambient wet-bulb temperature that will be exceeded 0.4% of the time annually. This value is 26.1°C (79°F) wet bulb (non-coincident) and falls within (is less than) the DCD site parameter value for 1% exceedance. Because the 1% site characteristic value is even lower than the 0.4% value, the site's 1% value also falls within (is lower than) the DCD site parameter value for 1% annual exceedance. SSAR Table 2.3-18 and SSAR Table 1.9-1 provide the same 0.4% value as FSER Supplement 1, Appendix A.
Minimum	-23.3°C (-10°F)	**ESP and Unit 3** -7.8°C (18°F) (1% exceedance value)	The ESP site characteristic value for minimum dry-bulb temperature 1% annual exceedance is defined as the ambient dry-bulb temperature below which dry-bulb temperatures will fall 1% of the time annually. The ESP site characteristic value falls within (is higher than) the DCD site parameter value. SSAR Table 2.3-18 and SSAR Table 1.9-1 provide the same value as FSER Supplement 1, Appendix A. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.

ENCLOSURE 5

Response to NRC RAI Letter 017

RAI Question 02.03.02-2

NRC RAI 02.03.02-2

FSAR Section 2.3.2.3, Potential Influence of the Plant and the Facilities on Local Meteorology, includes discussion of salt deposition. Please explain why the service water cooling tower produces higher salt deposition rates than the CIRC hybrid cooling tower even though the CIRC hybrid cooling tower is modeled with a higher drift rate.

Dominion Response

When calculating salt deposition rates, there were several design features that were significantly different between the two types of cooling towers (for example, dimensions, flow rate, water temperature, and mass distribution of drift particle size). The main difference contributing to the higher salt deposition rates for the service water cooling tower is mass distribution. Based on information obtained from manufacturers of towers typical of those to be used for North Anna Unit 3, the particle sizes emitted by the service water towers are larger than those from the CIRC cooling tower. This results in higher salt deposition rate when modeled with the Seasonal Annual Cooling Tower Impact (SACTI) model.

Mass distribution for the service water tower is shown below:

Mass (%)	**Drift Particle Size (micron)**
6.6	Above 615
0.8	600 – 615
0.4	590 – 600
0.7	575 – 590
0.5	565 – 575
0.6	550 – 565
0.4	540 – 550
1.0	525 – 540
0.5	515 – 525
1.0	500 – 515
3.5	450 – 500
4.0	400 – 450
5.0	350 – 400
8.0	300 – 350
6.0	250 – 300
5.0	200 – 250
3.5	150 – 200
2.5	100 – 150
12.0	50 – 100
13.0	25 – 50
15.0	10 - 25
10.0	Below 10

Mass distribution for the CIRC cooling tower is shown in the following table:

Mass (%)	**Drift Particle Size (micron)**
1.0	Above 275
4.0	230 – 275
5.0	170 – 230
10.0	115 – 170
20.0	65 – 115
20.0	35 – 65
20.0	15 – 35
20.0	Below 15

As shown by these tables, the service water cooling tower emits 39% of particles (by mass) above 250 microns. The CIRC cooling tower emits only 5% above 230 microns. This difference in particle size directly results in higher deposition rates for the service water cooling tower.

<u>Proposed COLA Revision</u>

None

ENCLOSURE 6

Response to NRC RAI Letter 017

RAI Question 09.02.01-1

NRC RAI 09.02.01-1

Tier 1 of the ESBWR DCD, Section 4.1, specifies as a COL interface requirement that the plant-specific PSWS be capable of removing 2.02x10^7 MJ (1.92x 10^{10} BTU) over a period of seven days without active makeup. The proposed plant-specific ITAAC (Part 10: ITAAC, Table 2.4.2-1) specifies a cooling tower basin water inventory requirement as a way of demonstrating that the heat removal capability specified by the DCD has been satisfied. While water inventory is an important factor that must be addressed by the ITAAC, it does not demonstrate that the cooling towers are capable of dissipating the specified heat load. The capability of cooling towers to dissipate heat is dependent on a number of other factors that should be taken into consideration, such as cooling tower design attributes; the capability to satisfy the PSWS pump minimum net positive suction head (NPSH) requirements for the most limiting cooling tower basin water level, temperature, and flow conditions; the maximum allowed PSWS water supply temperature; and the most limiting meteorological assumptions that pertain to the site for determining: (a) heat dissipation capability, and (b) water inventory requirements. Transient analyses that take these factors into consideration (including margin for expected degradation and operating flexibility) and confirmatory testing are usually necessary in order to adequately demonstrate that cooling tower performance satisfies the specified heat removal requirement. Also, the basis and justification for using the combined cooling tower basin inventory for Trains and B were not explained and justified. Please revise the proposed ITAAC to include consideration of these factors such that the specified cooling tower performance capability is adequately demonstrated for both defense-in-depth and RTNSS functions, and revise the FSAR accordingly to fully describe the plant licensing basis in this regard.

Dominion Response

The capability of the PSWS cooling towers is based on the typical design attributes associated with the design of nonsafety-related cooling systems utilizing cooling towers. The minimum heat duty for each tower is 2.98 x 10^8 BTU/hr and the design uses ambient wet bulb temperature (79 °F), approach temperature (9 °F), and cold water (supply) temperature of 88 °F. The system's normal loads are from the RCCWS and TCCWS and the system is designed as a nonsafety-related system to perform a cooldown assuming a LOPP and single train operation. Initial testing of the system includes performance testing of the cooling towers for conformance with design heat loads and water flows. This information is incorporated by reference from the DCD in FSAR Section 9.2.1, with necessary supplements.

During a postulated event where PSWS functions as a RTNSS Criterion C (Low Regulatory Oversight) System, the normal makeup water to the cooling towers is not qualified as a RTNSS function and is considered to be unavailable. The cooling tower basin must have a sufficient volume of water to allow the tower to perform its cooling function without active makeup. The DCD Tier 1 Interface Requirement and ITAAC specify the heat to be removed over seven days to allow a calculation of the amount of water that is needed to support this cooling function without active makeup. The heat load from the components and systems requiring cooling during the seven days indicated by the interface requirement is much less than the design minimum heat duty of each cooling tower. This reduced load is used to analyze the water loss from the system due to evaporation and drift. The ITAAC in COLA Part 10, Table 2.4.2-1, assesses the volume above minimum pump submergence and below the minimum normal operating level, ensuring adequate NPSHA for the vertical pumps and sufficient inventory to support PSWS cooling of RCCWS.

Therefore, the ITAAC in COLA Part 10, Table 2.4.2-1 meets the intent of the PSWS interface requirement stated in DCD Tier 1, Section 4.1. This ITAAC, in combination with the design and testing requirements described in the FSAR, adequately demonstrates PSWS performance for both defense-in-depth and RTNSS functions as a Criterion C, Low Regulatory Oversight, Maintenance Rule support system.

Regarding the use of the combined cooling tower basin inventory from Trains A and B, the stop gate in the cooling tower basin is normally open, allowing the PSW pumps to draw water from the entire basin inventory. Figure 9.2-201 will be revised to indicate that the stop gate in the PSWS cooling tower basin is normally open to assure that the entire basin water inventory is available to meet the specified $2.6x10^6$ gallon requirement.

Proposed COLA Revision

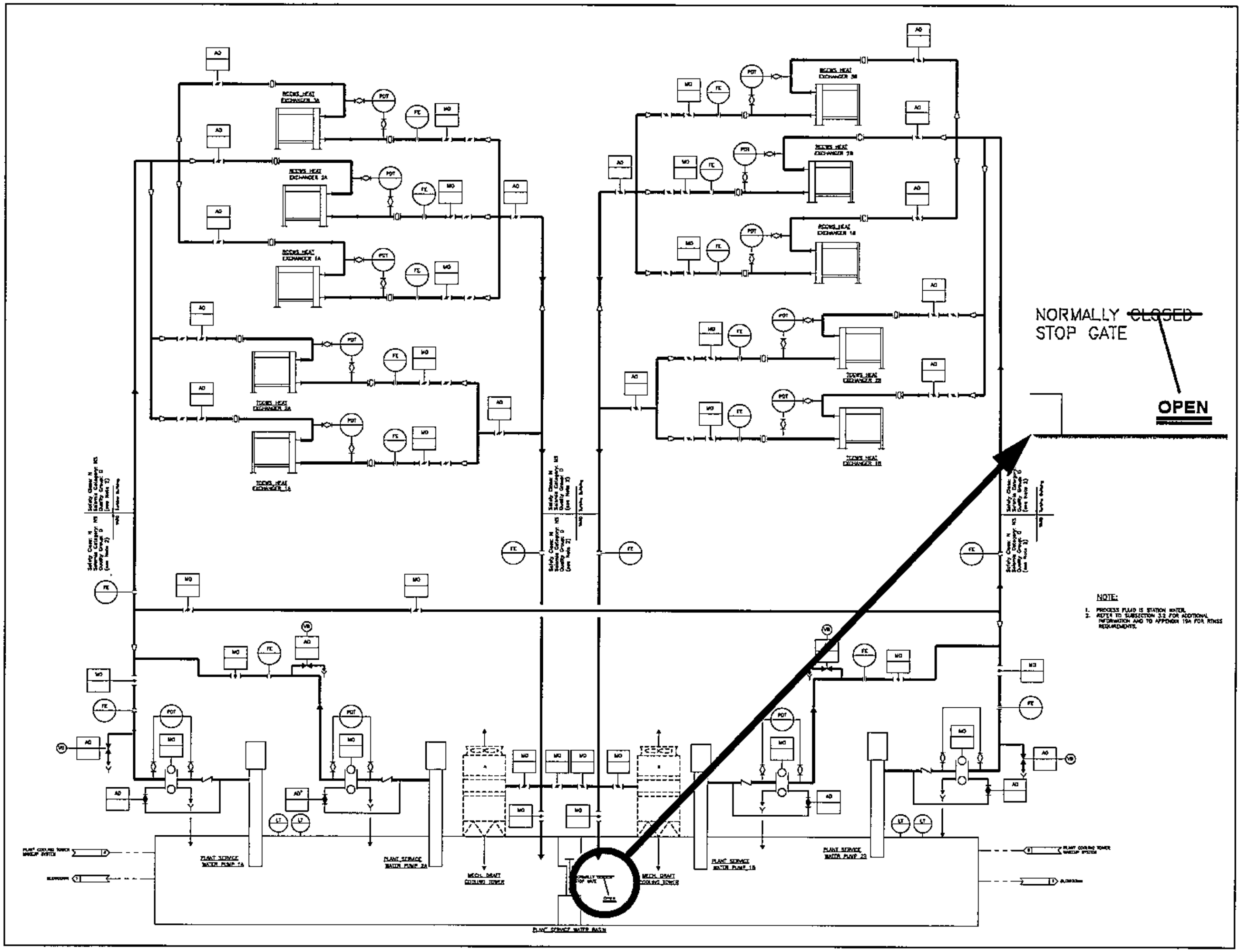
FSAR Figure 9.2-201 will be revised as indicated in the attached markup.

Markup of North Anna COLA

The attached markup represents Dominion's good faith effort to show how the COLA will be revised in a future COLA submittal in response to the subject RAI. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be somewhat different than as presented herein.

NAPS CDI

Figure 9.2-201 Plant Service Water System Simplified Diagram



ENCLOSURE 7

Response to NRC RAI Letter 017

NRC RAI Question 09.02.01-2

NRC RAI 09.02.01-2

In response to COL Item 9.2.1-1-A, "Material Selection," the applicant proposes to use fiberglass reinforced polyester pipe (FRPP) in locations where the plant service water system (PSWS) piping is buried to preclude long-term corrosion. The review criteria specified by the SRP 3.6.1 relative to pipe failure is based on the use of metal pipe. In order to assure that the use of nonmetallic pipe will not adversely impact safety-related SSCs or those that are subjected to the RTNSS long-term safety criteria, the following additional information needs to be reflected in the applicable sections of the FSAR and plant-specific ITAAC as appropriate: a) the criteria and limitations of using FRPP; b) an evaluation of the impact of using FRPP on SWS reliability and availability assumptions, especially during seismic events; and c) a revised evaluation of the consequences (including flood effects) of pipe failure during seismic events. Please note that, unless otherwise justified, the evaluation should assume the failure of all FRPP in addition to the failures that are postulated for metallic pipe and the other considerations that are specified by the SRP.

Dominion Response

(a) Criteria and Limitations for Use of FRPP

Criteria and limitations for using FRPP are specified in the FSAR by incorporation of DCD Chapter 3, Sections 9.2.1.1 and 19A, and Table 19A-4. Specifically:

- DCD Chapter 3, "Design of Structures, Components, Equipment, and Systems," and DCD Section 9.2.1.1, "Plant Service Water System Design Bases," specify the criteria and limitations that the PSWS must meet to satisfy ESBWR standard plant design requirements.

- DCD Section 9.2.1.1 also defines the PSWS as a nonsafety-related system that does not interface with any safety-related systems. Rather, it is a Regulatory Treatment of Non-Safety Related Systems (RTNSS) Criterion C, Low Regulatory Oversight, Maintenance Rule, system that supports the RCCWS.

- Section 19A.8.3 and Table 19A-4 of DCD Revision 5 specify design criteria pertaining to flood protection, wind speed, wind-generated missiles, and seismic requirements for RTNSS Criterion C systems.

PSWS components, including FRPP, are designed and fabricated to meet the general design requirements for the system and the special requirements prescribed for RTNSS Criterion C systems that have been specified in the FSAR by incorporation of the DCD. Also, as a Maintenance Rule system, the PSWS will be monitored under the Maintenance Rule Program and any degradation addressed.

(b) Impacts of Using FRPP on PSWS Reliability and Availability Assumptions

FRPP meets the design requirements specified for the PSWS, as described in the response to Item (a) above. These requirements include design for a safe shutdown earthquake (SSE) to International Building Code (IBC) requirements. As stated in DCD Revision 5, Section 19A.8.3, "RTNSS C systems and components are designed to the seismic requirements of IBC-2003 consistent with the above SSE ground motion" with "the above SSE ground motion" defined earlier in Section 19A.8.3 as "seismically designed using dynamic analysis method with the SSE ground input motion equal to two-thirds of the Certified Seismic Design Spectra taken from Figures 2.0-1 and 2.0-2 adjusted as required to their bases." Consequently, the use of FRPP will not have a negative impact on PSWS reliability or availability assumptions. Rather, the choice of FRPP is expected to enhance the reliability and availability of the PSWS due to its long-term corrosion resistance and extended design life.

(c) Consequences of PSWS Pipe Failure During Seismic Events

As stated in Section 9.2.1.3 of DCD Revision 5: "Failure of the system does not compromise any safety-related system or component, nor does it prevent safe shutdown of the plant." That is, failure of all or any portion of the PSWS, including FRPP, does not impact any plant safety function.

Also, as stated above, PSWS FRPP is designed and fabricated to meet the seismic requirements prescribed for RTNSS Criterion C systems. Section 9.2.1.5 of DCD Revision 5 specifies that flow elements and transmitters in the PSWS provide monitoring of system flow in the Main Control Room and can be used to assist in leak detection. These flow elements and transmitters are located at the beginning of the system to monitor the flow leaving the pumps as well as at the end of the system to monitor the flow entering the cooling towers. By using these flow elements and transmitters, any unexpected flow differential (for example, due to gross system leakage) are identified and the effects of flooding minimized by shutting down PSWS pumps to reduce system pressure and isolate the leak. The system configuration incorporates isolation valves and cross-ties to allow continuation of the cooling function when the leak is isolated, enhancing the system's reliability and availability. Table 19A-4 of the DCD describes the external flood protection design requirements for all RTNSS systems. DCD Section 3.4 addresses flood protection for plant safety systems. No PSWS FRPP is located within any safety-related SSC. And since the ground level where PSWS is located slopes away from all safety-related SSCs, a leak or break in the FRPP portion of the PSWS is not a flooding challenge to any safety-related SSC.

Proposed COLA Revision

None

ENCLOSURE 8

Response to NRC RAI Letter 017

RAI Question 09.02.01-3

NRC RAI 09.02.01-3

COL Item 9.2.1-1-A, "Material Selection," indicates that the applicant is to specify plant specific plant service water system (PSWS) material selections based on water quality analysis in order to preclude long-term corrosion and fouling. The response to this COL item (NAPS COL 9.2.1-1-A) only addressed material selection for buried piping but did not provide material specifications for any other parts of the PSWS, including those for the cooling towers and related components. Please provide additional information to specify and explain the material selections that pertain to the remainder of the PSWS.

Dominion Response

The response to COL Item 9.2.1-1-A in FSAR Section 9.2.1.2 states that appropriate chemical treatment is added to the PSWS basin to preclude long-term corrosion and fouling of the PSWS based on site water quality analysis. This statement applies to all PSWS components, not just buried piping. Material selection for PSWS components will take into consideration PSWS water quality, a viable water treatment option to meet nutrient discharge limits for Lake Anna, economic considerations, and DCD-related RTNSS criteria.

Proposed COLA Revision

FSAR Section 9.2.1.2 will be revised as shown in the attached markup to include a statement that materials are selected based on PSWS water treatment regime.

Markup of North Anna COLA

The attached markup represents Dominion's good faith effort to show how the COLA will be revised in a future COLA submittal in response to the subject RAI. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be somewhat different than as presented herein.

Quality Assurance

Procedures for control of heavy loads are developed in accordance with Section 13.5. In accordance with Section 17.5, other specific quality program controls are applied to the heavy loads handling program, targeted at those characteristics or critical attributes that render the equipment a significant contributor to plant safety.

9.1.5.9 Safety Evaluations

Add the following at the end of this section.

STD COL 9.1-5-A

No heavy loads are identified that are outside the scope of the certified design. In addition, there is no heavy load handling equipment, nor interlocks associated with heavy load handling equipment, outside the scope of the certified design.

9.1.6 COL Information

9.1.6-4-A Fuel Handling Operations

STD COL 9.1.6-4-A

This COL item is addressed in Section 9.1.4.13 and Section 9.1.4.19.

9.1-5-A Handling of Heavy Loads

STD COL 9.1-5-A

This COL item is addressed in Section 9.1.5.6, Section 9.1.5.8, and Section 9.1.5.9.

9.2 Water Systems

9.2.1 Plant Service Water System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.2.1.2 System Description

Replace the Summary Description, Detailed System Description, and Operation portions of this section with the following.

NAPS CDI

Summary Description

The PSWS rejects heat from nonsafety-related RCCWS and Turbine Component Cooling Water System (TCCWS) heat exchangers to the environment. The source of cooling water to the PSWS is from the auxiliary heat sink (AHS), while the heat removed is rejected to the AHS. Unit 3 utilizes mechanical draft plume abated cooling towers for the AHS.

A simplified diagram of the PSWS is shown in Figure 9.2-201.

Detailed System Description

The PSWS consists of two independent and 100 percent redundant trains that continuously circulate water through the RCCWS and TCCWS heat exchangers.

Each PSWS train consists of two 50 percent capacity vertical pumps taking suction in parallel from the plant service water basin. Discharge is through a check valve, a self-cleaning duplex strainer, and a motor-operated discharge valve at each pump to a common header. Each common header supplies plant service water to each RCCWS and TCCWS heat exchanger train arranged in parallel. The plant service water is returned via a common header to the mechanical draft plume abated cooling tower (AHS) in each train. Remotely-operated isolation valves and a cross-tie line permit routing of the plant service water to either cooling tower. The RCCWS and TCCWS heat exchangers are provided with remote-operated isolation valves. Manual balancing valves are provided at each heat exchanger outlet.

The PSWS pumps are located at the plant service water basin. Each pump is sized for 50 percent of the train flow requirement for normal operation. The pumps are low speed, vertical wet–pit designs with allowance for increase in system friction loss and impeller wear. Basin water level is monitored to ensure sufficient NPSH at design flow is provided to the PSWS pumps.

The pumps in each train are powered from redundant electrical buses. During a LOPP, the pumps are powered from the two nonsafety-related standby diesel-generators.

Where needed, valves are provided with hard seats to withstand erosion. The valves are arranged for ease of maintenance, repair, and in-service inspection. During a LOPP, the motor-operated valves are powered from the two nonsafety-related standby diesel-generators.

The AHS provided for each PSWS train is a separate, multi-celled, 100 percent capacity mechanical draft plume abated cooling tower, with the fans in the tower from each train supplied by one of the two redundant electrical buses. During a LOPP, the fans are powered from the two nonsafety-related standby diesel-generators. Each tower cell has an adjustable-speed, reversible motor fan unit that can be controlled for cold weather conditions to prevent freezing in the basin. A full flow bypass is provided to return water directly to the PSWS basin to allow ease of cold weather startup. Mechanical and electrical isolation allows maintenance on one tower, including complete disassembly, during full power operation. The Station Water System (SWS) provides makeup for blowdown, drift, and evaporation losses from the basin. Refer to Section 9.2.10 for the SWS discussion. Fiberglass reinforced polyester pipe is used for buried PSWS piping to preclude long-term corrosion.

Replace the eighth sentence in the sixth paragraph with the following.

NAPS COL 9.2.1-1-A

Fiberglass reinforced polyester pipe is used for buried PSWS piping to preclude long-term corrosion. Appropriate chemical treatment is added to the PSWS basin to preclude long-term corrosion and fouling of the PSWS components based on site water quality analysis. PSWS materials are compatible with the PSWS water treatment regime.

In the event of a LOPP, the PSWS supports the RCCWS in bringing the plant to cold shutdown condition in 36 hours assuming the most limiting single active or passive component failure.

Unit 3 PSWS heat loads are shown in DCD Table 9.2-1. The PSWS component design characteristics are shown in Table 9.2-201.

The PSWS design detects and alarms in the MCR any potential gross leakage and permits the isolation of any such leak in a sufficiently short period of time to preclude extensive plant damage.

Analysis of routine PSWS basin grab samples will detect RCCWS leakage, which may contain low levels of radioactivity, into the PSWS. This provides the action required by NRC Inspection and Enforcement Bulletin No. 80-10.

The potential for water hammer is mitigated through the use of various system design and layout features, such as automatic air release/vacuum valves installed at high points in system piping and at the pump discharge, proper valve actuation times to minimize water hammer, limiting fluid velocities in piping, procedural requirements ensuring proper line filling prior to system operation and after maintenance operations, and the use of check valves at pump discharges to prevent backflow into the pumps.

ENCLOSURE 9

Response to NRC RAI Letter 017

RAI Question 09.02.01-4

NRC RAI 09.02.01-4

Tier 2 of the ESBWR DCD, Section 9.2.1.6, "COL Information," specifies in part that the COL applicant needs to establish provisions to preclude long-term corrosion and fouling based on site water quality analysis. The FSAR does not explain what specific vulnerabilities are considered to be pertinent based upon operational experience that applies and why chemical treatment alone is sufficient for addressing these vulnerabilities. Chemical treatment is a common practice and suitable for addressing service water system corrosion and fouling problems to some extent, but it is usually implemented as part of a more comprehensive program (or collection of programs) to address service water system vulnerabilities. For example, considerations for precluding long-term corrosion and fouling of service water systems typically include: (i) establishing a program of surveillance and control techniques (such as chemical treatment) to prevent flow blockage problems due to biofouling; (ii) establishing a routine inspection and maintenance program to assure that corrosion, erosion, protective coating failure, silting, biofouling and others that are applicable cannot degrade defense-in-depth and RTNSS cooling functions that are credited; and (iii) establishing a test program to verify (initially and periodically) the heat transfer capability of heat exchangers that are important to safety has not degraded over time. Please provide additional information in FSAR Section 9.2.1.2, System Description, to describe: a) the corrosion and fouling mechanisms and vulnerabilities that are anticipated based on industry operating experience and the plant-specific location, and b) programmatic controls that will be implemented to address these considerations and to assure that PSWS performance (including cooling towers) will not degrade over time.

Dominion Response

The plant service water system (PSWS) is a closed system with makeup water treated to preclude long-term corrosion and fouling, based on the site water quality analysis. Generic Letter 89-13 and its supplements are not applicable because the ESBWR has no safety-related service water (reference DCD Table 1C-1). The approach to maintaining the PSWS against its site-specific vulnerabilities reflects North Anna's experience with its service water system (SW) system. The PSWS is a nonsafety-related system that is designated as RTNSS, Criterion C, Low Regulatory Oversight, Maintenance Rule support system. As a Maintenance Rule system, system operation will be monitored for degradation and deficiencies addressed.

Based on the operation of the existing nuclear units at North Anna, Dominion has developed significant knowledge of the operating environment and the degradation mechanisms of the SW system. The water chemistry, inspections, trending and maintenance activities address potential problems with algae, mollusks, bacteria, and general steel corrosion. The specific water treatment is strongly influenced by design characteristics of the SW Reservoir that are not directly applicable to the Unit 3 PSWS. For Unit 3, use of cooling towers, water treatment, and material selection mitigate these site-specific mechanisms. Under the plant chemistry program, periodic analysis assures that the desired chemical balance is maintained in the PSWS. Additionally, monitoring and trending of system operating parameters of PSWS as a Maintenance Rule system will assess the ongoing effectiveness of the water treatment program.

Proposed COLA Revision

None

ENCLOSURE 10

Response to NRC RAI Letter 017

RAI Question 09.02.01-5

NRC RAI 09.02.01-5

Tier 2 of the ESBWR DCD, Section 9.2.1.2, indicates that the heat rejection facilities are dependent upon actual site conditions and provides CDI for the standard plant design. FSAR Section 9.2.1.2 replaces the CDI with plant-specific information, but does not indicate what part is plant-specific information and what is standard design information. In order to avoid possible confusion relative to the North Anna 3 design basis and the change process that applies, please indicate what part of the information in the FSAR is NAPS-CDI (such as with double brackets).

Dominion Response

FSAR Table 1.1-201 "Left Margin Annotations" provides guidance on the definition and use of the left margin annotations or LMAs used throughout the FSAR, including Section 9.2.1.2.

As described in Table 1.1-201, plant-specific conceptual design information is identified by the left margin annotation "(Plant) CDI" which, in the case of North Anna, becomes NAPS CDI. Standard conceptual design information is identified by the left margin annotation "STD CDI." Thus, the information presented in FSAR 9.2.1.2 that replaced the CDI information in DCD Section 9.2.1.2 is labeled NAPS CDI, which means it is plant-specific to North Anna.

Regarding possible confusion relative to the North Anna 3 design basis and the applicable change process, it is important to note that the CDI presented in the DCD is not reviewed and approved by the NRC staff as part of the design certification process. The actual design information (labeled either NAPS CDI or STD CDI) presented in the FSAR is reviewed by the NRC staff. Thus, once the COL is issued, the NAPS CDI and STD CDI information in the FSAR will be controlled by Dominion using the appropriate change process.

Proposed COLA Revision

None

ENCLOSURE 11

Response to NRC RAI Letter 017

RAI Question 09.02.01-6

NRC RAI 09.02.01-6

Tier 2 of the ESBWR DCD, Section 9.2.1.2, indicates that the heat rejection facilities are dependent upon actual site conditions and provides conceptual design information (CDI) for the standard plant design. FSAR Section 9.2.1.2 replaced the CDI with plant-specific information (NAPS CDI), indicating that the heat rejection facility for North Anna 3 consists of mechanical draft plume abated cooling towers. In order for the NRC to determine if the cooling towers are capable of performing their defense-in-depth and RTNSS functions, please provide amplifying information to include cooling tower design attributes that are credited (such as minimum number of fans needed); the minimum net positive suction head (NPSH) requirement for the PSWS pumps and available margin based on the most limiting cooling tower basin water level, temperature, and flow conditions; the maximum allowed PSWS water supply temperature; and the most limiting meteorological assumptions that pertain to the site for determining: (a) heat dissipation capability, and (b) water inventory requirements. In addition, please describe plant specific vulnerabilities and degradation mechanisms that are anticipated based on operational experience and site location, potential impacts of postulated cooling tower failures and other interactions on safety-related SSCs, and how these considerations are addressed. In addition please describe programmatic controls being implemented to assure that the functional capability of the cooling towers will be maintained over the life of the plant.

Dominion Response

Design attributes, vulnerabilities, degradation mechanism and programmatic controls

The information requested by the subject RAI is the type of information normally provided for a safety-related service water system. PSWS is not a safety-related system. Failure of the system does not compromise any safety-related SSC nor prevent safe shutdown. PSWS is not credited in any safety analysis. FSAR Section 9.2.1.1 defines the PSWS as a nonsafety-related system that does not interface with any safety-related system. It is a RTNSS Criterion C, Low Regulatory Oversight, Maintenance Rule system that supports the RCCWS. As a Maintenance Rule system, PSWS performance is monitored and trended under the Maintenance Rule Program and adverse indications or trends are addressed and corrected.

Sufficient information is provided in the Detailed Design Description subsection of FSAR Section 9.2.1.2, with its referenced tables, to demonstrate that the PSWS is capable of meeting its RTNSS functions. For example, maximum allowed PSWS water supply temperature (cold leg temperature), limiting meteorological assumptions (ambient wet bulb temperature), heat dissipation capability, and water inventory requirements are listed in Table 9.2-201. The minimum net positive suction head for the PSWS pumps is ensured by maintaining the required water inventory above pump minimum submergence. The minimum water inventory requirements are met by maintaining the level at or above the minimum operating level in the cooling tower basin. Each cooling tower has a heat rejection capacity much greater than the RTNSS heat load; therefore, each tower is capable of meeting the system's RTNSS function to support cooling of RCCWS. Preoperational and startup testing is conducted to demonstrate that the PSWS can perform its intended functions. Those testing requirements are described in DCD Sections 14.2.8.1.51 and 14.2.8.2.18, respectively. Operational functionality is assured by the normal operation and monitoring of the system.

The specific vulnerabilities and degradation mechanisms that are anticipated, based on operational experience and site location, are long-term corrosion and fouling. Section 9.2.1.2 of the FSAR states that appropriate chemical treatment is added to the PSWS basin to preclude long-term corrosion and fouling of the PSWS based on site water quality analysis.

Potential impacts of postulated cooling tower failures and other interactions on safety-related SSCs.

The PSWS is a RTNSS Criterion C, Low Regulatory Oversight, Maintenance Rule system that is designed to applicable seismic requirements. Passive failure of components is not considered credible. However, the failure of cooling tower components will not cause the potential for any adverse impacts on the intended design functions of the safety-related SSCs. Water from a postulated PSWS cooling tower riser break will drain westward and northward to the storm water basin, away from any safety-related SSCs. The effect of water being released from other cooling tower components is bounded by the failure of a cooling tower riser, due to the larger size of the riser. Most of the water escaping from a failed cooling tower component would drop into and be contained in the respective basin below. The cooling tower basin for each train is located below grade. The maximum water level in the basin is also located below grade. Thus, during any failure of the cooling tower basin, the water in the basin would remain below grade and adverse impact to any safety-related SSC is precluded.

Proposed COLA Revision

None

ENCLOSURE 12

Response to NRC RAI Letter 017

RAI Question 09.02.01-7

NRC RAI 09.02.01-7

Although the initial plant test program specified by Tier 2 of the ESBWR DCD for plant service water system (PSWS) is incorporated by reference, the test program does not verify that performance of the CDI portions of PSWS (including alternate heat sink) satisfies design specifications for the various modes of operation. Please provide additional information to describe how the design capability of the PSWS will be verified by the initial plant test program.

Dominion Response

Preoperational and startup testing requirements for the PSWS, which includes the CDI portion of the PSWS (including alternate heat sink), are described in DCD Sections 9.2.1.4, 14.2.8.1.51, and 14.2.8.2.18. The DCD is incorporated by reference into the COLA FSAR.

Proposed COLA Revision

None

ENCLOSURE 13

Response to NRC RAI Letter 017

RAI Question 14.02-5

NRC RAI 14.02-5

FSAR Section 14.2.9.1.3 describes the preoperational test for personnel monitors and radiation survey instruments. Please provide amplifying information as follows:
(a) Describe the general types of personnel monitors and radiation survey instruments that are covered by this test.
(b) Under the heading "Prerequisites", the text states that "High radiation alarm setpoints have been properly established based on sensor location, background radiation level, expected radiation level and low occupational dose prior to the test." Explain how the specification "low occupational dose" is used as an input in establishing radiation alarm setpoints for the personnel monitors and radiation survey instruments covered by this preoperational test.

Dominion Response

(a) Description of Personnel Monitors and Radiation Survey Equipment in the Initial Test Program (ITP)

Site-specific personnel monitors and radiation survey instruments were originally included as part of the preoperational test program based on the guidance in Regulatory Guide (RG) 1.68, Appendix A, Section 1.k(2). However, after further evaluation, Dominion has determined that the Radiation Protection Program (RPP) adequately tests this equipment, and that the equipment does not meet the RG 1.68 criteria for plant features to be tested in the Initial Test Program (ITP), or the objectives of the ITP, which includes pre-operational testing, that are defined in DCD Section 14.2.1. Therefore, this equipment will be tested in accordance with the RPP, and is not included in the ITP.

Site specific personnel monitors and radiation survey instruments are purchased as standard commercial grade equipment and are routinely replaced over the life of the plant. Each new survey instrument or personnel monitor is tested prior to being placed in service to assure conformance with performance requirements. Testing of this equipment is governed by ANSI/IEEE N323A, "Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments," which is applicable to the ESBWR (refer to DCD Table 1.9-22) and ANSI/IEEE, N323D, "Installed Radiation Protection Instrumentation." These standards are applicable to personnel monitors and radiation survey instruments that are purchased to support the plant prior to fuel load as well as to all replacements that are purchased throughout the life of the plant. This testing is performed under the control of the RPP.

(b) Use of "Low Occupational Dose" in Establishing Setpoints

Dominion's use of the terminology "low occupational dose" was erroneous and will be removed by deletion of FSAR Section 14.2.9.1.3. Radiation alarm setpoints for personnel monitors and radiation survey instruments are established by the RPP and calibrated by the ANSI standards discussed in part (a) above.

Proposed COLA Revision

FSAR Section 14.2.9.1.3 will be deleted.

FSAR Table 1.9-201 and FSAR Table 1.9-202 will be revised to indicate exception to RG 1.68, Item 1.k(2), "personnel monitors and radiation survey instruments."

FSAR Table 1.9-204 will be revised to include ANSI/IEEE, N323D, "Installed Radiation Protection Instrumentation."

Note that FSAR Table 1.9-201 and FSAR Table 1.9-202 will be revised to indicate exception to RG 1.68, Item 1.k(3), "laboratory equipment used to analyze or measure radiation levels and radioactivity concentrations," in response to RAI 14.02-6 (Enclosure 15).

Please refer to the attached markups.

Markup of North Anna COLA

The attached markup represents Dominion's good faith effort to show how the COLA will be revised in a future COLA submittal in response to the subject RAI. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be somewhat different than as presented herein.

NAPS COL 1.9-3-A

Table 1.9-201 Conformance with Standard Review Plan

SRP Section	Title	Rev	Date	Specific Acceptance Criteria	Evaluation
14.2	Initial Plant Test Program - Design Certification and New License Applicants	Rev. 3	Mar-07	1A, 1B, 1C, 2A, COL/OL Applicants: 3A, 3B, 3C, 3D, 3E, 3F, 3G, 3H, 4A, 4B, 5A, 5B, 5C, 5D, 6A, 6B, 6C	Conforms with the following exception: Refer to Table 1.9-202 for exceptions to RG 1.68.
				DC Applicants: 3A, 3B, 3C, 3D, 4A, 6A, 6B, 6C	Not applicable. Applies to DC applicants.
14.2.1	Generic Guidelines for Extended Power Uprate Testing Programs	Initial Issuance	Aug-06		Not applicable. Applies to power uprates.
14.3	Inspections, Tests, Analyses, and Acceptance Criteria	Initial Issuance	Mar-07	II.1, II.2	Conforms
14.3.1	[Reserved]	[Reserved]	Mar-07		Not used
14.3.2	Structural and Systems Engineering - Inspections, Tests, Analyses, and Acceptance Criteria	Initial Issuance	Mar-07	II.1, II.2, II.3, II.4, II.5, II.6, II.7, II.8, II.9, II.10, II. 11	Conforms
14.3.3	Piping Systems and Components - Inspections, Tests, Analyses, and Acceptance Criteria	Initial Issuance	Mar-07	II.1, II.2.A, II.2.B, II.2.C, II.2.D, II.2.E	Conforms
14.3.4	Reactor Systems - Inspections, Tests, Analyses, and Acceptance Criteria	Initial Issuance	Mar-07	II.1, II.2, II.3, II.4, II.5	Conforms

NAPS COL 1.9-3-A

Table 1.9-202 Conformance with Regulatory Guides

RG Number	Title	Revision	Date	RG Position	Evaluation
1.68	Initial Test Programs for Water-Cooled Nuclear Power Plants	Rev. 2	Aug-78	General	Conforms with the following exception: Equipment listed in Appendix A, Items 1.k(2) and 1.k(3) not included in the initial test program.
1.68.1	Preoperational and Initial Startup Testing of Feedwater and Condensate Systems for Boiling Water Reactor Power Plants	Rev. 1	Jan-77	General	Conforms
1.68.2	Initial Startup Test Program to Demonstrate Remote Shutdown Capability for Water-Cooled Nuclear Power Plants	Rev. 1	Jul-78	General	Conforms
1.68.3	Preoperational Testing of Instrument and Control Air Systems	Rev. 0	Apr-82	General	Conforms
1.69	Concrete Radiation Shields for Nuclear Power Plants	Rev. 0	Dec-73	General	Conforms
1.70	Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants LWR Edition	Rev. 3	Nov-78	—	Not applicable. RG 1.206 is used. Table 1.9-203.
1.71	Welder Qualification for Areas of Limited Accessibility	Rev. 1	Mar-07	General	Conforms. Operational program implementation is described in Section 13.4.

NAPS SUP 1.9-1

Table 1.9-204 Industrial Codes and Standards

Code or Standard Number	Year	Title
	American National Standards Institute	
N323D	2002	Installed Radiation Protection Instrumentation
	American Society of Civil Engineers (ASCE)	
ASCE 7-02	2002	Minimum Design Loads for Buildings and Other Structures
	American Society of Mechanical Engineers (ASME)	
A 17.1	2007	Safety Code for Elevators and Escalators
B31.1	2007	Power Piping
NQA-1	2004	Quality Assurance Programs Requirements for Nuclear Facilities
Boiler and Pressure Vessel Code, Section IX	2007	Qualification Standard for Welding and Brazing Procedures, Welder, Brazers and Welding and Brazing Operators
	American Society for Testing and Materials (ASTM)	
ASTM E-84	2007	Method of Test of Surface Burning Characteristics of Building Materials
ASTM E-119	2007	Fire Test of Building Construction Materials
ASTM E-814	2006	Standard Test Method for Fire Tests for Through-Penetration Fire Stops
	Applicable Building Codes	
International Building Code	As defined in the Virginia Uniform Statewide Building Code edition of record	International Building Code
International Fire Code	As defined in the Virginia Uniform Statewide Building Code edition of record	International Fire Code
28 CFR 36		American Disability Act (ADA) Accessibility Guidelines
	2003	Virginia Uniform Statewide Building Code, Part I (Virginia Construction Code)

14.2.9.1.3 ~~Personnel Monitors and Radiation Survey Instruments Preoperational Test~~ [Deleted]

~~**Purpose**~~

~~To verify the ability of the personnel monitors and radiation survey equipment to indicate and alarm normal and abnormal radiation levels.~~

~~**Prerequisites**~~

~~The construction tests have been successfully completed and the SCG has reviewed the test procedure and approved the initiation of testing. High radiation alarm setpoints have been properly established based on sensor location, background radiation level, expected radiation level and low occupation dose prior to the test. Indicator, power supplies, and sensor/converters have been calibrated according to vendor instructions.~~

~~**General Test Methods and Acceptance Criteria**~~

~~Operation is observed and recorded during a series of individual component and integrated subsystem tests to demonstrate the following:~~

- ~~Proper functioning of indicators, annunciators, and audible alarms~~
- ~~Proper alarm at correct prescribed setpoints in response to high radiation and downscale/inoperative conditions~~
- ~~Proper functioning and operation of the self-test feature for gross failure and loss of power detection~~

14.2.9.1.4 **[Deleted]**

14.2.9.2 **Site-Specific Startup Tests**

Replace this section with the following.

NAPS SUP 14.2-2

14.2.9.2.1 **Cooling Tower Performance Test**

Purpose

The objective of this test is to demonstrate acceptable performance of the waste heat rejection portion of the CIRC (i.e., the dry cooling array and the hybrid cooling tower and basin), particularly its ability to cool design quantities of circulating water to design temperature under expected operational load conditions.

Prerequisites

The preoperational tests are complete and plant management has reviewed the test procedure and approved the initiation of testing. The

ENCLOSURE 14

Response to NRC RAI Letter 017

RAI Question 14.02-6

NRC RAI 14.02-6

In FSAR Section 14.2.9.1, Site-specific Pre-Operational Tests, STD SUP 14.2-1 addresses pre-operational tests applicable to FSAR 14.2.9.1.3, Personnel Monitors and Radiation Survey Instruments Preoperational test. The staff notes that RG 1.68 (Appendix A, Section 1.k (Preoperational Testing-Radiation Protection Systems)) includes "laboratory equipment used to analyze or measure radiation levels and radioactivity concentrations" as one of the system types that should receive preoperational testing to demonstrate proper operation. Please include a site-specific preoperational test for laboratory equipment in FSAR Section 14.2.9.1 or justify the absence of such testing.

Dominion Response

Site specific laboratory equipment used to analyze or measure radiation levels and radioactivity concentrations is purchased as standard commercial grade equipment and is routinely replaced over the life of the plant. Dominion has determined that the Radiation Protection Program (RPP) adequately tests this equipment, and that the equipment does not meet the RG 1.68 criteria for plant features to be tested in the Initial Test Program (ITP), or the objectives of the ITP, which includes pre-operational testing, that are defined in DCD Section 14.2.1. Therefore, this equipment will be tested in accordance with the RPP, and is not included in the ITP.

Laboratory equipment is purchased as standard commercial grade equipment which is not specific to any particular reactor plant design. Manufacturer recommended testing of this equipment, performed per the quality assurance program (QAP) for RPP, is not typically once-in-a-lifetime testing that would be consistent with an ITP test.

Operation of laboratory equipment is governed by Regulatory Guide (RG) 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) -Effluent Streams and The Environment." Dominion's conformance with RG 4.15 is described in FSAR Table 1.9-202. Implementation of this RG justifies the absence of a site-specific preoperational test for laboratory equipment.

Section 6 of RG 4.15 specifies the guidelines for quality control in the laboratory, including the use of radionuclide reference standards involved in the calibration of radiation measurement systems that analyze or measure radiation levels and radioactivity concentrations. This RG also specifies the use of intralaboratory and interlaboratory analysis, as well as the use of planned and periodic audits to verify implementation of the RG 4.15 QAP.

Based on implementation of a RG 4.15 QAP for laboratory equipment, inclusion of this equipment in the ITP is not necessary.

Proposed COLA Revision

FSAR Table 1.9-201 and FSAR Table 1.9-202 will be revised to indicate exception to RG 1.68, Item 1.k(3), "laboratory equipment used to analyze or measure radiation levels and radioactivity concentrations."

Note that FSAR Table 1.9-201 and FSAR Table 1.9-202 will be revised to indicate exception to RG 1.68, Item 1.k(2), "personnel monitors and radiation survey instruments," in response to RAI 14.02-5 (Enclosure 14).

Please refer to the attached markups.

Markup of North Anna COLA

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NAPS COL 1.9-3-A

Table 1.9-201 Conformance with Standard Review Plan

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				DC Applicants: 3A, 3B, 3C, 3D, 4A, 6A, 6B, 6C	Not applicable. Applies to DC applicants.
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14.3.4	Reactor Systems - Inspections, Tests, Analyses, and Acceptance Criteria	Initial Issuance	Mar-07	II.1, II.2, II.3, II.4, II.5	Conforms

NAPS COL 1.9-3-A

Table 1.9-202 Conformance with Regulatory Guides

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1.71	Welder Qualification for Areas of Limited Accessibility	Rev. 1	Mar-07	General	Conforms. Operational program implementation is described in Section 13.4.