

## PMNorthAnna3COLPEmails Resource

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**Sent:** Monday, September 22, 2008 5:19 PM  
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**Subject:** Response to Request for Additional Information Letter No. 024 (FSAR Chapter 2, 12 and 14) - Part 1 of 2  
**Attachments:** 091908 NA3-08-095R Response to Request for Additional Information Letter No. 024-Letter.pdf  
**Importance:** High

cc list:

**This document will be sent in two parts. Part 1 is the letter and Part 2 will be the attachment to RAI 02.04.12-1.**

**Attached please find Part 1.**

**Wanda K. Marshall**  
Administrative Assistant III  
Dominion Resources Services  
COL Project Team  
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<b>Recipients Received:</b>	

Eugene S. Grecheck  
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September 19, 2008

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

Serial No. NA3-08-095R  
Docket No. 52-017  
COL/MJL

**DOMINION VIRGINIA POWER**  
**NORTH ANNA UNIT 3 COMBINED LICENSE APPLICATION**  
**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION LETTER No. 024**  
**(FSAR CHAPTER 2, 12, and 14)**

On August 8, 2008, the NRC requested additional information to support the review of certain portions of the North Anna Unit 3 Combined License Application (COLA). The responses are provided in Enclosures 1 through 16:

- RAI Question 02.04.12-1      Technical Basis for Assumptions
- RAI Question 12.02-4      STD SUP 12.2-4-A Not Included
- RAI Question 12.02-5      FSAR Section 12.5 Clarification
- RAI Question 12.02-6      Additional Contained Source Uses
- RAI Question 12.02-7      Source Shielding Requirements
- RAI Question 12.02-8      Check Sources Integral to Monitors
- RAI Question 12.02-9      Cf-252 Source Placement and Duration
- RAI Question 12.03-12.04-1      Placement and Number of Portable RAMs
- RAI Question 12.03-12.04-2      Very High Radiation Area Drawings
- RAI Question 12.03-12.04-3      Zinc Injection System Justification
- RAI Question 12.03-12.04-4      DCD and FSAR Chapter 12 Consistency
- RAI Question 12.05-1      Airborne Iodine Concentration Instruments
- RAI Question 12.05-2      Site-Specific Alterations to NEI 07-03
- RAI Question 12.05-3      Radiation Protection Program Milestones
- RAI Question 14.02-8      FSAR Section 14.2.9.1.3 Clarification
- RAI Question 14.03.03-1      Plant Service Water Storage ITAAC

This information will be incorporated into a future submission of the North Anna Unit 3 COLA, as described in the Enclosures.

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

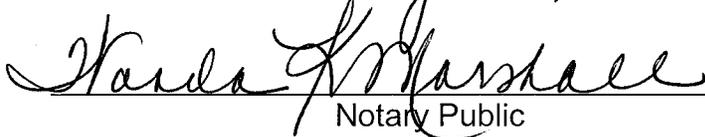
COUNTY OF HENRICO

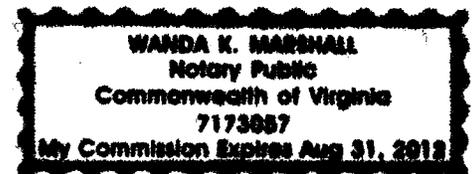
The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Eugene S. Grecheck, who is Vice President-Nuclear Development of Virginia Electric and Power Company (Dominion Virginia Power). He has affirmed before me that he is duly authorized to execute 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 19<sup>th</sup> day of September, 2008

My registration number is 7173057 and my

Commission expires: August 31, 2012

  
Notary Public



Enclosures:

1. Response to RAI Letter 024, RAI Question 02.04.12-1
2. Response to RAI Letter 024, RAI Question 12.02-4
3. Response to RAI Letter 024, RAI Question 12.02-5
4. Response to RAI Letter 024, RAI Question 12.02-6
5. Response to RAI Letter 024, RAI Question 12.02-7
6. Response to RAI Letter 024, RAI Question 12.02-8
7. Response to RAI Letter 024, RAI Question 12.02-9
8. Response to RAI Letter 024, RAI Question 12.03-12.04-1
9. Response to RAI Letter 024, RAI Question 12.03-12.04-2
10. Response to RAI Letter 024, RAI Question 12.03-12.04-3
11. Response to RAI Letter 024, RAI Question 12.03-12.04-4
12. Response to RAI Letter 024, RAI Question 12.05-1
13. Response to RAI Letter 024, RAI Question 12.05-2
14. Response to RAI Letter 024, RAI Question 12.05-3
15. Response to RAI Letter 024, RAI Question 14.02-8
16. Response to RAI Letter 024, RAI Question 14.03.03-1

Commitments made by this letter:

1. The information provided in the RAI responses will be incorporated into a future submission of the North Anna Unit 3 COLA, as described in the Enclosures.

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  
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K. Ainger, Exelon  
P. W. Smith, DTE Energy

**ENCLOSURE 1**

**Response to NRC RAI Letter 024**

**RAI Question Number 02.04.12-1**

### **NRC RAI 02.04.12.1**

*Staff has reviewed the groundwater analysis results described in FSAR Section 2.4.12. In accordance with 10 CFR 100.20(c)(3) and 10 CFR 52.79(a)(1)(iii) NRC staff requests that the applicant: (a) provide the technical bases for the assumptions, parameter values, and boundary conditions of the MODFLOW model(s) used to evaluate post-construction groundwater heads, (b) provide a discussion of the alternative explanations considered to explain the head at well OW-901 and the discrepancy between the observed head at this well and the model results, and (c) provide the technical basis for the confidence in model predictions of post-construction groundwater heads given this discrepancy.*

### **Dominion Response**

#### **Technical Bases for MODFLOW Model**

The assumptions, parameter values and boundary conditions of the MODFLOW model used to evaluate post-construction groundwater heads are described in detail in the attached report titled "North Anna Groundwater Model." Section 3.3 of this report discusses the assumptions made for the development of the model and the rationale behind them. Section 2 discusses the available data for the selection of the key parameter values. Boundary conditions are discussed in Sections 3.2.5 and 3.3.2.

#### **Additional Discussion Related to Well OW-901**

The difference between the head at well OW-901 and the model results is likely due to local heterogeneities in the distribution and characteristics of fractures in the bedrock which cannot be accounted for in the MODFLOW model.

An example of this is the head difference between observation wells OW-901 and OW-845. Observation well OW-901 is about 200 ft from, and about 14 ft upslope of, observation well OW-845. The top of the well screen in OW-901 is at elevation 214.6 ft, which is 28.7 ft below the bottom of the well screen in OW-845 at elevation 243.3 ft. The measured heads in these two wells in May 2007 (288.46 and 276.86 ft, respectively) differ by 11.6 ft. Head differences for five quarterly measurements range from 8.6 to 11.6 ft, with an average difference of 9.9 ft. Data from the well pairs, however, suggest that vertical gradients are small. For example, the nearest well pair to OW-901 is OW-845 and OW-846. The top of the screened intervals in these two wells are at elevations 253 ft and 273.5 ft, respectively. The measured heads at the two wells differ by 0.3 ft, with the deeper well (OW-845) having a higher head.

Given the difference in the measured heads between wells OW-845 and OW-901, the calibration of the model aimed at producing model heads in the area of the two wells that are between the measured values. The model predicts a higher than observed head at well OW-845, where the residual is +3.75 ft, and a lower than observed head at well OW-901, where the residual is -7.09 ft. To assess the significance of the fact that the simulated heads at well OW-901, located at the proposed Unit 3 reactor building, are lower than observed, a sensitivity analysis was performed. In this sensitivity analysis an alternative calibration of the model is presented where the heads at OW-901 are

matched. The details of the sensitivity analysis are provided in Section 5.2 of the attached report titled "North Anna Groundwater Model."

Confidence in Model Predictions

The technical basis for the confidence in model predictions of post-construction groundwater heads given this discrepancy in the computed and observed heads at well OW-901 is given in Section 4 of the attached report titled "North Anna Groundwater Model," which discusses in detail the calibration process and criteria.

Proposed COLA Revision

None.

Attachment

Dominion North Anna Unit 3 Combined License Application, "North Anna Groundwater Model," Bechtel Power, September 2008.

**Attachment to RAI 02.04.12-1**

**Dominion North Anna Unit 3 Combined License Application, "North Anna  
Groundwater Model," Bechtel Power, September 2008.**

**ENCLOSURE 2**

**Response to NRC RAI Letter 024**

**RAI Question 12.02-4**

**NRC RAI 12.02-4**

*In Tier 2, Section 12.2.4 of the ESBWR DCD, GEH includes reference to COL information item 12.2-4-A, Other Contained Sources. Section 12.2 of the North Anna FSAR does include "STD SUP 12.2-1" which provides a supplemental section (Section 12.2.1.5, Other Contained Sources) to the FSAR which appears to address the proposed resolution of COL information item 12.2-4-A. However, neither Table 1.10-201 (Summary of FSAR Sections Where DCD COL Items Are Addressed), or Section 12.2 of the FSAR, address the COL Item 12.2-4-A. Please correct this apparent discrepancy to the FSAR by modifying both Table 1.10-201 and Section 12.2 of the North Anna FSAR (and any other applicable sections of the FSAR) to address COL information item 12.2-4-A.*

**Dominion Response**

Dominion agrees with the staff on the recommended resolution.

Dominion did not refer to COL Information Item 12.2-4-A in Revision 0 of the North Anna Unit 3 FSAR because it did not exist in ESBWR DCD Revision 4. Subsequent to Revision 0 of the FSAR in November 2007, GEH issued ESBWR DCD Revision 5 in June 2008 which contained COL Information Item 12.2-4-A.

The discrepancy will be addressed by revising FSAR Table 1.10-201 and Section 12.2 to address COL item 12.2-4-A.

**Proposed COLA Revision**

Revise FSAR Table 1.10-201 and Section 12.2 to address COL Information Item 12.2-4-A 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.

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**NAPS SUP 1.10-1 Table 1.10-201 Summary of FSAR Sections Where DCD COL Items Are Addressed**

<b>Item No.</b>	<b>Subject/Description of Item</b>	<b>FSAR Section</b>
11.5-2-A	Offsite Dose Calculation Manual	11.5.4.4, 11.5.4.5, and 11.5.5.8
11.5-3-A	Process and Effluent Monitoring Program	11.5, 11.5.4.6, and Table 11.5-201
11.5-4-A	Site Specific Offsite Dose Calculation	11.5.4.8
11.5-5-A	Instrument Sensitivities	11.5.4.9
12.1-1-A	Regulatory Guide 8.10	12BB
12.1-2-A	Regulatory Guide 1.8	12BB
12.1-3-A	Operational Considerations	12BB
12.1-4-A	Regulatory Guide 8.8	12BB
12.2-2-A	Airborne Effluents and Doses	12.2.2.1, 12.2.2.2, and Table 2.0-201
12.2-3-A	Liquid Effluents and Doses	12.2.2.4
<u>12.2-4-A</u>	<u>Other Contained Sources</u>	<u>12.2.1.5</u>
12.3-2-A	Operational Considerations	12.3.4
12.3-3-A	Controlled Access	12.3.1.3
12.5-1-A	Equipment, Instrumentation, and Facilities	12BB
12.5-2-A	Compliance with 10 CFR Part 50.34(f)(2)(xxvii) and NUREG-0737 Item III.D.3.3	12BB
12.5-3-A	Radiation Protection Program	12BB
13.1-1-A	Organizational Structure	9.5.1.15.3, 13.1.1 through 13.1.3, and Appendix 13AA
13.2-1-A	Reactor Operator Training	13.2.1 and 13BB
13.2-2-A	Training for Non-Licensed Plant Staff	13.2.2 and 13BB
13.3-1-A	Identification of OSC and Communication Interfaces with Control Room and TSC	13.3 and COLA Part 5, Sections II.F and II.H
13.3-2-A	Identification of EOF and Communication Interfaces With Control Room and TSC	13.3 and COLA Part 5, Sections II.F and II.H
13.3-3-A	Decontamination Facilities	13.3 and COLA Part 5, Section II.J
13.4-1-A	Operation Programs	13.4

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### 12.1-4-A **Regulatory Guide 8.8**

**STD COL 12.1-4-A**

This COL item is addressed in Section 12.1.1.3.1 and Appendix 12BB.

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## **12.2 Plant Sources**

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

~~STD SUP 12.2-4~~  
STD COL 12.2-4-A

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### 12.2.1.5 **Other Contained Sources**

In addition to the contained sources identified above, additional contained sources which contain by-product, source, or special nuclear materials may be maintained on site. These contained sources are typically used as calibration or radiography sources. These sources are not part of the permanent plant design, and their control and use are governed by plant procedures. The procedures consider the guidance provided in RG 8.8 to ensure that occupational doses from the control and use of the sources are as low as is reasonably achievable (ALARA).

Various types and quantities of radioactive sources are employed to calibrate the process and effluent radiation monitors, the area radiation monitors, and portable and laboratory radiation detectors. Check sources that are integral to the area, process, and effluent monitors consist of small quantities of by-product material and do not require special handling, storage, or use procedures for radiation protection purposes. The same consideration applies to solid and liquid radionuclide sources of exempt quantities or concentrations which are used to calibrate or check the portable and laboratory radiation measurement instruments.

Instrument calibrators are normally used for calibrating gamma dose rate instrumentation. These may be self-contained, heavily shielded, multiple source calibrators. Beta and alpha radiation sources are also available for instrument calibration. Calibration sources are traceable to the National Institute of Standards and Technology, or equivalent.

Radiography sources are surveyed upon entry to the site. Radiation protection personnel maintain copies of the most recent leak test records for owner-controlled sources. Contractor radiography personnel provide copies of the most recent leak test records upon radiation protection personnel request. Radiography is conducted in accordance with approved procedures.

Although not every radionuclide is bounded, the total liquid effluent release activity of Unit 3 is less than the total composite release activity presented in the ESP-ER.

Table 12.2-19bR shows the total activity concentrations at the site release point for the nuclides in radioactive liquid effluent for Units 1, 2, and 3. For every nuclide, the maximum activity concentration is equal to or less than the corresponding value in ESP-ER Table 5.4-6.

#### 12.2.2.4.7 Comparison of ESPA to Unit 3 Liquid Effluent Doses

As described in Section 12.2.2.4, the calculated radioactive liquid effluent doses for Unit 3 are provided in Table 12.2-20bR.

The radioactive liquid effluent doses for the ESPA are included in ESP-ER Table 5.4-8. The results from that table are reproduced in Table 12.2-20bR. The dose for each liquid radioactive effluent pathway for Unit 3 is less than the corresponding estimate in the ESP-ER. Table 12.2-202 summarizes the annual total body and bone doses to the MEI and shows that the Unit 3 doses are lower than those calculated and presented in ESP-ER Table 5.4-10.

As indicated in Tables 12.2-203 and 12.2-204, the annual total site doses to the MEI and the population within 50 miles of Unit 3 are lower than those calculated and presented in ESP-ER.

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### 12.2.4 COL Information

#### 12.2-2-A Airborne Effluents and Doses

NAPS COL 12.2-2-A

This COL item is addressed in Sections 12.2.2.1, 12.2.2.2, and Table 2.0-201.

#### 12.2-3-A Liquid Effluents and Doses

NAPS COL 12.2-3-A

This COL item is addressed in Section 12.2.2.4.

#### 12.2-4-A Other Contained Sources

STD COL 12.2-4-A

This COL item is addressed in Section 12.2.1.5.

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### 12.2.5 References

12.2-201 USNRC, "Safety Evaluation Report for an Early Site Permit (ESP) at the North Anna ESP Site, NUREG-1835 Supplement 1, November 2006

**ENCLOSURE 3**

**Response to NRC RAI Letter 024**

**RAI Question 12.02-5**

### **NRC RAI 12.02-5**

*FSAR Section 12.2.1.5, "Other Contained Sources," (STD SUP 12.2-1) states that the control and use of the additional contained by-product, source, or special nuclear material sources which are not part of the permanent plant design and which are not listed in the ESBWR DCD will be governed by plant procedures.*

*a) State whether these procedures will be part of the Radiation Protection Program, as described in Section 12.5 of the North Anna COL. Additionally, state whether these materials will be controlled under the procedures described in Section 12.5.4.10 (Radioactive Material Control) of NEI 07-03.*

*b) 10 CFR 20.1801 requires licensees to secure from unauthorized removal or access licensed materials that are stored in controlled or unrestricted areas. Describe how the additional contained sources described in STD SUP 12.2-1 (response to COL Information Item 12.2-4-A) will be secured in accordance with 10 CFR 20.1801. Describe how the materials will be tracked.*

*c) STD SUP 12.2-1 (response to COL Information Item 12.2-4-A) of the COL application states that "Radiography is conducted in accordance with approved procedures". Describe what is meant by approved procedures.*

### **Dominion Response**

#### **Radiation Protection Program Procedures**

North Anna Unit 3 FSAR Section 12.5, "Operational Radiation Protection Program," incorporates by reference the DCD Section 12.5. Each of the three COL Information Items in that section is addressed by Appendix 12BB of the FSAR. FSAR Appendix 12BB, "Radiation Protection," incorporates by reference NEI 07-03, "Generic FSAR Guidance for Radiation Protection Program Description." Therefore, NEI 07-03 is the Radiation Protection Plan for North Anna Unit 3. NEI 07-03, Section 12.5, states, "(a) radiation protection program is developed, documented and implemented through plant procedures...."

Radiation protection plant procedures, including those described in this RAI, are part of the North Anna Unit 3 Radiation Protection Program. NEI 07-03, Section 12.5, part 1.d., "Procedures," states that procedures will be established, implemented and maintained sufficient to maintain adequate control over the receipt, storage, and use of radioactive materials..." The procedures described in Section 12.5.4 (including 12.5.4.10) will control the use of the additional contained by-product, source, or special nuclear material sources. Specifically, NEI 07-03, Section 12.5.4 states, "(r)adiation protection procedures are established, implemented and maintained sufficient to provide adequate control over the receipt, possession, use, transfer, and disposal of byproduct, source, and special nuclear material..."

#### **Securing and Tracking Contained Sources**

NEI 07-03 has been incorporated by reference in the FSAR and thus the NEI 07-03 requirements for secure storage and tracking of contained sources are FSAR

requirements. NEI 07-03, Section 12.5.3.1, "Facilities," states that, "a radioactive materials storage area(s) is established, as needed and in accordance with 10 CFR 20.1801..." In addition, Section 12.5.4.10, "Radioactive Material Control," states that, "(p)rocedures are established, implemented and maintained that assure compliance with the requirements of 10 CFR 20.1801....to assure positive control over licensed radioactive material..."

Approved Procedure

An approved procedure is one that has been reviewed and approved by proper cognizant management personnel and issued for use in accordance with governing administrative controls.

Proposed COLA Revision

None.

**ENCLOSURE 4**

**Response to NRC RAI Letter 024**

**RAI Question 12.02-6**

**NRC RAI 12.02-6**

*FSAR Section 12.2.1.5, "Other Contained Sources," (STD SUP 12.2-1) states that additional contained sources are "typically used as calibration or radiography sources." State any uses besides calibration or radiography that these sources will be used for. If there will be no additional uses, reword the previous statement to show these additional sources will only be used for calibration and radiography sources.*

**Dominion Response**

An additional use for contained sources is as a check source. FSAR Section 12.2.1.5 states that, "(t)he same consideration applies to solid and liquid radionuclide sources of exempt quantities or concentrations which are used to calibrate or check the portable and laboratory radiation measurement instruments." Based on ANSI N323A-1997, a check source is a radiation source, not necessarily calibrated, used to confirm the continuing satisfactory operation of an instrument.

The section will be revised to specify that contained sources are used as calibration, check or radiography sources.

**Proposed COLA Revision**

FSAR Section 12.2.1.5 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.

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#### 12.1-4-A **Regulatory Guide 8.8**

**STD COL 12.1-4-A**

This COL item is addressed in Section 12.1.1.3.1 and Appendix 12BB.

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### **12.2 Plant Sources**

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

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~~STD SUP 12.2-4~~  
STD COL 12.2-4-A

#### 12.2.1.5 **Other Contained Sources**

In addition to the contained sources identified above, additional contained sources which contain by-product, source, or special nuclear materials may be maintained on site. These contained sources are ~~typically~~ used as calibration, check, or radiography sources. These sources are not part of the permanent plant design, and their control and use are governed by plant procedures. The procedures consider the guidance provided in RG 8.8 to ensure that occupational doses from the control and use of the sources are as low as is reasonably achievable (ALARA).

Various types and quantities of radioactive sources are employed to calibrate the process and effluent radiation monitors, the area radiation monitors, and portable and laboratory radiation detectors. Check sources that are integral to the area, process, and effluent monitors consist of small quantities of by-product material and do not require special handling, storage, or use procedures for radiation protection purposes. The same consideration applies to solid and liquid radionuclide sources of exempt quantities or concentrations which are used to calibrate or check the portable and laboratory radiation measurement instruments.

Instrument calibrators are normally used for calibrating gamma dose rate instrumentation. These may be self-contained, heavily shielded, multiple source calibrators. Beta and alpha radiation sources are also available for instrument calibration. Calibration sources are traceable to the National Institute of Standards and Technology, or equivalent.

Radiography sources are surveyed upon entry to the site. Radiation protection personnel maintain copies of the most recent leak test records for owner-controlled sources. Contractor radiography personnel provide copies of the most recent leak test records upon radiation protection personnel request. Radiography is conducted in accordance with approved procedures.

**ENCLOSURE 5**

**Response to NRC RAI Letter 024**

**RAI Question 12.02-7**

### **NRC RAI 12.02-7**

*Regulatory Guide 1.206 states that the applicant should describe any required radiation sources containing byproduct, source, and special nuclear material that may warrant shielding considerations, and, for any such sources, should provide a listing by isotope, quantity, form, and use for all of these sources that exceed 3.7 E+9 Bq (100 millicuries).*

*a) Describe the uses and shielding requirements of any radiation sources containing byproduct, source, and special nuclear material not described in the ESBWR DCD that may require shielding design considerations.*

*b) Provide a listing, by isotope, quantity, form, and use, of any of the sources described in your response to a) above that exceed 100 millicuries.*

### **Dominion Response**

#### **Radiation Source Uses and Shielding Requirements**

FSAR Section 12.2.1.5, "Other Contained Sources," in response to COL Information Item 12.2-4-A, identifies and describes check, calibration and radiography sources as additional radiation source uses not described in the DCD that may require shielding considerations. FSAR Appendix 12BB incorporates by reference NEI 07-03, Generic FSAR Template Guidance for Radiation Protection Program Description, which addresses in Section 12.5.4.2 the methods to maintain exposures ALARA, including shielding requirements for portable sources. Additional criteria for shielding are identified at the time of source purchase, when the specific isotope is known. NEI 07-03 Section 12.5.4 states that radiation protection procedures are established and implemented to provide adequate control over the receipt, possession, use, transfer and disposal of byproduct, source and special nuclear material and assure compliance with the requirements of 10 CFR Parts 19, 20, 50, 70 and 71.

#### **Sources that Exceed 100 Millicuries**

Dominion is aware of two standard calibration sources that exceed 100 millicuries. These standard calibration sources are a neutron (Am-Br) source and a Cs-137 source. Details of isotope type, quantity, form, shielding requirements, and use of future contained sources will be available when these required sources are purchased. These sources are controlled by the Radiation Protection Program described above.

### **Proposed COLA Revision**

None.

**ENCLOSURE 6**

**Response to NRC RAI Letter 024**

**RAI Question 12.02-8**

**NRC RAI 12.02-8**

*STD SUP 12.2-1 (Section 12.2.1.5) states that check sources that are integral to the area, process, and effluent monitors consist of small quantities of by-product material and do not require special handling, storage, or use procedures for radiation protection purposes. Specify your criteria for determining when radiation sources would not require special handling, storage, or use procedures for radiation protection purposes.*

**Dominion Response**

Check sources used in area, process and effluent monitors do not require special handling, storage, or use procedures for radiation protection purposes when the source is actually physically located in (i.e., integral to) the monitors. These check sources are part of the radiation monitors and are not easily removed. Access to these sources would require procedures and tools to disassemble components of the monitors.

**Proposed COLA Revision**

None.

**ENCLOSURE 7**

**Response to NRC RAI Letter 024**

**RAI Question 12.02-9**

**NRC RAI 12.02-9**

*Tier 2, Section 12.2.1.1.2, of the GEH ESBWR DCD states that during the first refueling outage, the Cf-252 reactor startup source and source holder will be removed from the reactor and moved to a designated location in the spent fuel pool (SFP). The DCD then states that operations and radiation protection personnel determine placement and duration of residence for the Cf-252 source and holder in the SFP. Identify in the North Anna FSAR where the issue of placement and duration of residence for the Cf-252 source and holder in the SFP is addressed.*

**Dominion Response**

FSAR Section 12.2 incorporates by reference DCD Section 12.2, which states, "(t)he source and source holder is removed from the reactor during the first refueling outage and moved to a designated location in the spent fuel pool (SFP). Operations and radiation protection personnel determine placement and duration of residence for the Cf-252 source and holder in the SFP."

Details regarding the specific placement and duration of residence will be addressed as a part of the operational Radiation Protection Program described in FSAR Section 12.5.

The Cf-252 reactor startup sources are stored in the spent fuel pool in a designated location until final disposition can be determined.

**Proposed COLA Revision**

None.

**ENCLOSURE 8**

**Response to NRC RAI Letter 024**

**RAI Question 12.03 – 12.04-1**

**NRC RAI 12.03 – 12.04-1**

*10 CFR 20.1501 requires the ability to identify potential radiological hazards. COL Information Item COL 12.3-2-A requires the COL applicant to discuss the placement of portable airborne radiation monitors as well as the operational considerations. COL Section 12.3.4 states that the placement of these monitors is located in COL Section 12.5. COL Section 12.5 references NEI template 07-03. NEI template 07-03 discusses types of radiation monitors that may be used at a plant as well as the corresponding operational considerations that will be considered for these monitors. However, this template does not discuss the criteria for placement of the airborne portable monitors.*

*a) Describe the criteria for placement and the sensitivities of portable airborne monitors that are used for normal operation, anticipated operational occurrences, and accident conditions.*

*b) Verify that North Anna, Unit 3, will have a sufficient number of portable airborne radiation monitors to sample air at all normally occupied locations where airborne radioactivity may exist.*

**Dominion Response**

**Criteria for Placement and Sensitivities of Portable Airborne Monitors**

FSAR Appendix 12BB, "Radiation Protection," incorporates NEI 07-03, "Generic FSAR Template Guidance for Radiation Protection Program Description," by reference. NEI 07-03, Section 12.5.3.2 states that, "(c)ontinuous air monitors (CAMs) provide a means to observe trends in airborne radioactivity concentrations. CAMs equipped with local alarm capability are used in occupied areas where needed to alert personnel to sudden changes in airborne radioactivity concentrations."

NEI 07-03, Section 12.5.3.2, also states that radiation monitoring instrumentation and equipment will provide the appropriate detection capabilities, ranges, sensitivities and accuracies required for the types and levels of radiation anticipated at the plant and in the environs during routine operations, major outages, abnormal occurrences, and postulated accident conditions.

**Number of Portable Airborne Radiation Monitors**

Consistent with NEI 07-03, Section 12.5, Item III, adequate equipment is available to effectively implement the Radiation Protection Program. Milestone 1.c. of NEI 07-03, Section 12.5 ensures an adequate number of instruments is available to provide for appropriate detection capabilities to conduct radiation surveys in accordance with 10 CFR 20.1501 and 20.1502, including the capability to sample air at all normally occupied locations where airborne radioactivity may exist.

**Proposed COLA Change**

None.

**ENCLOSURE 9**

**Response to NRC RAI Letter 024**

**RAI Question 12.03 – 12.04-2**

**NRC RAI 12.03 – 12.04-2**

*Per 10 CFR 20.1602, COL applicants must institute additional measures to ensure that an individual is not able to gain unauthorized or or inadvertent access to Very High Radiation Areas. Additionally, Section 12.5.4.4 of NEI 07-03 states that COL applicants should provide detailed drawings showing isometric views of each Very High Radiation Area and indicate physical access controls and radiation monitor locations for each area. Please describe the additional measures that will be used to prevent access for each Very High Radiation area and provide detailed drawings showing the isometric views and indicate physical access controls and radiation monitors for each Very High Radiation area.*

**Dominion Response**

GEH, in its April 5, 2008 response to DCD RAI 12.4-4 S02, provided detailed drawings showing isometric views of each Very High Radiation Areas (VHRA) and subsequently incorporated them into DCD Revision 5.

A description of the additional measures that are used to prevent access for each VHRA is provided in FSAR Section 12.5, "Operational Radiation Protection Program," and Appendix 12BB, "Radiation Protection," which incorporates by reference NEI template 07-03, "Generic FSAR Template Guidance for Radiation Program Protection Description."

Physical access controls for access into a VHRA are provided as part of the Radiation Protection Program. Entry into a VHRA is allowed only with a specific (Special) Radiation Worker Permit (RWP). Additional measures include provisions for postings, barricades and physical barriers for restricting access to VHRAs, including the use of locks that are keyed so only keys designated as VHRA can open the locks.

In accordance with NEI 07-03, Section 12.5.3.2, "(r)adiation monitoring instrumentation and equipment are selected, maintained and used to provide the appropriate detection capabilities, ranges, sensitivities and accuracies required for the types and levels of radiation anticipated at the plant and in the environs during routine operations, major outages, abnormal occurrences, and postulated accident conditions." Radiation monitors for each VHRA must meet this program requirement. The specific location of each radiation monitor is not yet known at this time, however, when detailed design engineering is complete, the drawings will be revised to show actual locations within the VHRA.

The above supplemental information will be added to FSAR Appendix 12BB to address the applicant site-specific information requested in NEI 07-03, Section 12.5.4.4.

**Proposed COLA Change**

FSAR Appendix 12BB 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.

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### **Appendix 12A Calculation of Airborne Radionuclides**

This section of the referenced DCD is incorporated by reference with no departures or supplements.

### **Appendix 12B Calculation of Airborne Releases**

This section of the referenced DCD is incorporated by reference with no departures or supplements.

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STD SUP 12.1-1

### **Appendix 12AA ALARA Program**

NEI 07-08, Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures Are As Low As Is Reasonably Achievable (ALARA), which is currently under review by the NRC staff, is incorporated by reference. (Reference 12AA-201)

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#### **12AA.1 References**

12AA-201 Nuclear Energy Institute (NEI), Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures Are As Low As Is Reasonably Achievable (ALARA), NEI 07-08.

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STD COL 12.1-1-A  
STD COL 12.1-2-A  
STD COL 12.1-3-A  
STD COL 12.1-4-A  
STD COL 12.5-1-A  
STD COL 12.5-2-A  
STD COL 12.5-3-A

### **Appendix 12BB Radiation Protection**

NEI 07-03, Generic FSAR Template Guidance for Radiation Protection Program Description, which is currently under review by the NRC staff, is incorporated by reference with the following supplemental information. (Reference 12BB-201)

#### **NEI 07-03 Section 12.5.2.4 Radiation Protection Technicians**

Delete the third paragraph.

#### **NEI 07-03 Section 12.5.3.1 Facilities**

Delete the first and second paragraphs.

#### **NEI 07-03 Section 12.5.3.2 Monitoring Instrumentation and Equipment**

Delete the third paragraph.

#### **NEI 07-03 Section 12.5.4.2 Methods to Maintain Exposures ALARA**

Delete the second paragraph.

#### **NEI 07-03 Section 12.5.4.4 Access Control**

Isometric drawings of the Very High Radiation Areas (VHRA) are included in DCD Section 12.3.

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Physical access controls include postings, barricades, physical barriers, and the use of locks that are keyed so only keys designated as VHRA can open the locks. Additionally, entry into a VHRA is allowed only with a specific (Special) radiation work permit.

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**12BB.1 References**

12BB-201 Nuclear Energy Institute (NEI), Generic FSAR Template Guidance for Radiation Protection Program Description, NEI 07-03.

**ENCLOSURE 10**

**Response to NRC RAI Letter 024**

**RAI Question 12.03 – 12.04-3**

**NRC RAI 12.03 – 12.04-3**

*STD CDI for North Anna FSAR Section 1.2.2.12.15, Zinc Injection System, states that a Zinc Injection System will not be utilized at North Anna, Unit 3. One of the benefits of utilizing a Zinc Injection System to inject depleted zinc (DZO) in the feedwater is to suppress cobalt plate-out on reactor building piping. Minimizing the plate-out of radioactive cobalt on reactor building piping can lead to potentially lower dose rates in the vicinity of this piping and result in correspondingly lower doses to personnel in this portion of the plant. Justify your decision to not utilize a Zinc Injection System at North Anna, Unit 3 in light of the requirement in 10 CFR 20.1101(b) which states that the licensee shall use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses that are as low as reasonably achievable (ALARA).*

**Dominion Response**

The use of zinc injection has been beneficial in plants where cobalt-containing alloys have been employed. Radioactive cobalt plates out on surfaces, especially stainless steel, subsequently leading to increased dose rates and increased personnel exposure throughout the coolant system areas. Operating experience has indicated that a reduction in the use of cobalt can decrease dose rates. An example is Japan's ABWR Kashiwazaki-Kariwa 6 and 7 units where reduced dose rates have been achieved without zinc injection but with the use of low cobalt materials.

Based on this knowledge and operating experience, GEH reduced the amount of cobalt in contaminated applications throughout the plant and reduced the use of stainless steel in the coolant system. Cobalt is not a concern for the ESBWR stainless steel control rod drive mechanisms because the water that flows past these components is filtered prior to being injected into the vessel.

Additionally, ESBWR has no reactor coolant recirculation loops which are the primary contributors to drywell dose in existing BWRs.

**Proposed COLA Change**

None

**ENCLOSURE 11**

**Response to NRC RAI Letter 024**

**RAI Question 12.03 – 12.04-4**

**NRC RAI 12.03 – 12.04-4**

*Since the North Anna FSAR for Chapter 12 is based on the format of the Tier 2 ESBWR DCD for Chapter 12, the FSAR contains Section 12.6 entitled “Minimization of Contamination and Radwaste Generation”. However, in response to a staff RAI, GEH will be revising the DCD to incorporate the material contained in Section 12.6 of the DCD into Section 12.3 of the DCD. Therefore, the applicant should revise Chapter 12 of the North Anna FSAR to be consistent with the format of Chapter 12 of the ESBWR DCD.*

**Dominion Response**

FSAR Chapter 12 will be revised to be consistent with the format of Chapter 12 of the ESBWR DCD once the revised DCD incorporating this change has been issued.

**Proposed COLA Change**

None.

**ENCLOSURE 12**

**Response to NRC RAI Letter 024**

**RAI Question 12.05-1**

**NRC RAI 12.05-1**

*Per 10 CFR 50.34 (f)(2)(xxvii) (as supplemented by the criteria in Item III.D.3.3 of NUREG-0737) the Applicant shall provide equipment and associated training and procedures for accurately monitoring inplant radiation and airborne radioactivity (iodine concentration) in areas within the facility where plant personnel may be present during an accident and for a broad range of routine conditions. NEI template 07-03, which STD COL 12.5-2-A references, does not describe the numbers of the instruments that will be available to comply with this requirement, nor does it describe the training program and procedures on the use of these instruments.*

*a) Provide the number of instruments that the licensee will have available for use to determine the airborne iodine concentration in areas within the facility where plant personnel may be present during an accident.*

*b) Verify that the Applicant will have procedures and a training program to instruct plant personnel on how to accurately determine the airborne iodine concentration in areas within the facility where plant personnel may be present during an accident and for a broad range of routine conditions.*

**Dominion Response**

FSAR Appendix 12BB, "Radiation Protection," incorporates NEI 07-03, "Generic FSAR Template Guidance for Radiation Protection Program Description," by reference.

**Instruments for Use**

Consistent with NEI 07-03, Section 12.5, Item III, adequate equipment is available to effectively implement the Radiation Protection Program. Milestone 1.c. of NEI 07-03, Section 12.5 ensures an adequate number of instruments are available to provide for appropriate detection capabilities to conduct radiation surveys in accordance with 10 CFR 20.1501 and 20.1502, including the capability to determine the airborne iodine concentration in areas within the facility where plant personnel may be present during an accident.

**Procedures and Training**

NEI 07-03 Section 12.5.2.4, paragraph 1, radiation protection technicians (RPTs) will carry out responsibilities defined in the Radiation Protection Program and procedures. Section 12.5.2.4, paragraph 2, states that RPTs will be trained and qualified under a program established in accordance with 10 CFR 50.120. These procedures and training ensure adequate determination of airborne iodine concentration in areas within the facility where plant personnel may be present during an accident and for a broad range of routine conditions.

**Proposed COLA Change**

None.

**ENCLOSURE 13**

**Response to NRC RAI Letter 024**

**RAI Question 12.05-2**

**NRC RAI 12.05-2**

*NEI template 07-03 contains several sections that allow for site-specific alterations. Provide descriptions of any design or site-specific information for these areas. Areas which may have deviations include:*

- a) Alternative staff assigned to specific Radiation Protection Responsibilities*
- b) Alternative or additional Radiation Protection Facilities. Also, list facilities listed in the template that will be located off site and functions that will be carried out at another location or through a vendor.*
- c) Modified radiation protection monitoring instrumentation or equipment.*
- d) Use of special use respirator filters and disposable supplied air suits.*
- e) Alternate or additional procedures for maintaining exposures ALARA.*

**Dominion Response**

No site-specific alterations from the generic program description of the Radiation Protection Program provided in NEI 07-03 have been identified. Therefore, the requested applicant site-specific information in NEI 07-03 is addressed by removing the bracketed sections from the template.

**Proposed COLA Change**

FSAR Appendix 12BB will be revised as shown on 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.

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### **Appendix 12A Calculation of Airborne Radionuclides**

This section of the referenced DCD is incorporated by reference with no departures or supplements.

### **Appendix 12B Calculation of Airborne Releases**

This section of the referenced DCD is incorporated by reference with no departures or supplements.

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STD SUP 12.1-1

### **Appendix 12AA ALARA Program**

NEI 07-08, Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures Are As Low As Is Reasonably Achievable (ALARA), which is currently under review by the NRC staff, is incorporated by reference. (Reference 12AA-201)

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#### **12AA.1 References**

12AA-201 Nuclear Energy Institute (NEI), Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures Are As Low As Is Reasonably Achievable (ALARA), NEI 07-08.

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STD COL 12.1-1-A  
STD COL 12.1-2-A  
STD COL 12.1-3-A  
STD COL 12.1-4-A  
STD COL 12.5-1-A  
STD COL 12.5-2-A  
STD COL 12.5-3-A

### **Appendix 12BB Radiation Protection**

NEI 07-03, Generic FSAR Template Guidance for Radiation Protection Program Description, which is currently under review by the NRC staff, is incorporated by reference with the following supplemental information. (Reference 12BB-201)

#### **NEI 07-03 Section 12.5.2.4 Radiation Protection Technicians**

Delete the third paragraph.

#### **NEI 07-03 Section 12.5.3.1 Facilities**

Delete the first and second paragraphs.

#### **NEI 07-03 Section 12.5.3.2 Monitoring Instrumentation and Equipment**

Delete the third paragraph.

#### **NEI 07-03 Section 12.5.3.3 Personal Protective Clothing and Equipment**

Delete the last sentence in the first paragraph.

#### **NEI 07-03 Section 12.5.4.2 Methods to Maintain Exposures ALARA**

Delete the second paragraph.

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**NEI 07-03 Section 12.5.4.4 Access Control**

Isometric drawings of the Very High Radiation Areas (VHRA) are included in DCD Section 12.3.

Physical access controls include postings, barricades, physical barriers, and the use of locks that are keyed so only keys designated as VHRA can open the locks. Additionally, entry into a VHRA is allowed only with a specific (Special) radiation work permit.

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**12BB.1 References**

12BB-201 Nuclear Energy Institute (NEI), Generic FSAR Template Guidance for Radiation Protection Program Description, NEI 07-03.

**ENCLOSURE 14**

**Response to NRC RAI Letter 024**

**RAI Question 12.05-3**

**NRC RAI 12.05-3**

*For each of the Radiation Protection Program Milestones listed below (and shown in Table 13.4-201 of the North Anna FSAR), provide a listing of the specific operational radiation protection program elements and procedures that will be implemented consistent with each milestone.*

*a) Prior to the initial receipt of by-product, source, or special nuclear materials (excluding Exempt Quantities as described in 10 CFR 30.18), and thereafter, when such radioactive materials are possessed under this license.*

*b) Prior to receiving reactor fuel under this license, and thereafter, when reactor fuel is possessed under this license.*

*c) Prior to initial loading of fuel in the reactor.*

*d) Prior to initial transfer, transport or disposal of radioactive materials. Verify that, prior to initial loading of fuel in the reactor, the radiation protection program described in NEI template 07-03 will be fully implemented, with the exception of the organization, facilities, equipment, instrumentation, and procedures necessary for transferring, transporting or disposing of radioactive materials in accordance with 10 CFR Part 20, Subpart K, and applicable requirements in 10 CFR Part 71. In addition, verify that the position of Radiation Protection Manager will be filled and at least one radiation protection technician for each operating shift, selected, trained and qualified consistent with the guidance in RG 1.8, will be onsite and on duty when fuel is initially loaded in the reactor, and thereafter, whenever fuel is in the reactor.*

**Dominion Response**

NEI 07-03, "Generic FSAR Template Guidance for Radiation Program Protection Description," describes the specific operational radiation protection program elements including the stages in which the operational Radiation Protection Program are implemented. FSAR Appendix 12BB incorporates NEI 07-03 by reference.

Dominion will implement the Radiation Protection Program as described in NEI 07-03 in accordance with the milestones listed in FSAR Table 13.4-201.

**Proposed COLA Change**

None.

**ENCLOSURE 15**

**Response to NRC RAI Letter 024**

**RAI Question 14.02-8**

**NRC RAI 14.02-8**

*In the case of radiation monitors and/or survey instruments with range selection, the "General Test Methods and Acceptance Criteria" in FSAR Section 14.2.9.1.3, please include a clarifying bullet to the effect, "proper functioning and operation of range selection and response in each range."*

**Dominion Response**

This RAI makes reference to FSAR Section 14.2.9.1.3 and requests to include an additional clarifying statement. Dominion agrees with this assessment. However, as a result of Dominion's August 28, 2008 response to NRC Letter #17, RAI 14.02-5, this FSAR section has been deleted in its entirety.

As stated in the response to RAI 14.02-5, applicable standards for testing of radiation monitors and/or survey instruments are ANSI/IEEE N323A, "Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments," and ANSI/IEEE N323D, "Installed Radiation Protection." These standards address the aspects discussed in this RAI.

**Proposed COLA Revision**

None.

**ENCLOSURE 16**

**Response to NRC RAI Letter 024**

**RAI Question Number 14.03.03-1**

**NRC RAI 14.03.03-1**

*For ITAAC Item 1 in Table 2.4.2.1, "ITAAC For Plant Service Water Reserve Storage Capacity," the design commitment is concerned with inventory of cooling water sufficient for RCCWS to cool from hour 0 through day 7, where as the acceptance criteria is concerned with usable water volume in cooling tower basins and pump forebay above pump minimum submergence water level and below minimum normal operating level, is a minimum of 2.6 million gallons. The design commitment and acceptance criteria are not in agreement or in parallel. SRP Section 14.3, Appendix A, Section IV.4.B, 'Column 3 -Acceptance Criteria' states that acceptance criteria should be objective and unambiguous. Please revise the design commitment and acceptance criteria so that the two are in agreement or in parallel. Also, the acceptance criteria should be objective and unambiguous, as required by SRP Section 14.3, Appendix A.*

**Dominion Response**

The design commitment for the PSWS in COLA Part 10 Table 2.4.2-1 is that the system can remove  $2.02 \times 10^7$  MJ ( $1.92 \times 10^{10}$  BTU) over a period of seven days without active makeup, which is consistent with the interface requirement for the PSWS specified in DCD Tier 1, Section 4.1. Based on PSWS conformance with system design criteria as established in the DCD, this design commitment (interface requirement) is met by assuring that there is sufficient water available, without active makeup, to remove the specified amount of heat, which for North Anna Unit 3 equates to  $2.6 \times 10^6$  gallons of usable water. Therefore, the design commitment and acceptance criterion are in agreement.

The acceptance criterion of  $2.6 \times 10^6$  gallons of useable water is also an objective and unambiguously measurable parameter in that post-installation measurement (inspection) can readily confirm PSWS cooling tower basin sizing. Further, "useable water volume" is defined as the volume of water above the pump minimum submergence water level and below the minimum normal operating level, thereby assuring that there will be at least  $2.6 \times 10^6$  gallons of water available for the subject PSWS cooling function.

**Proposed COLA Revision**

None.