David A. Christian
Senior Vice President
Nuclear Operations and Chief Nuclear Officer

Dominion Nuclear North Anna, LLC
5000 Dominion Boulevard, Glen Allen, VA 23060

Dominion

September 25, 2003

10 CFR Part 52, Subpart A

James E. Dyer, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Serial No. 03-457
NRC Project No. 719
ESP/JDH

Dear Mr. Dyer:

**NORTH ANNA EARLY SITE PERMIT APPLICATION**

Pursuant to Part 52, Subpart A of Title 10 of the Code of Federal Regulations, Dominion Nuclear North Anna, LLC ("Dominion") applies to the U.S. Nuclear Regulatory Commission (NRC) for an Early Site Permit (ESP) for a location in central Virginia identified as the North Anna ESP site. The location is described and characterized in the enclosed application. Dominion requests that the NRC issue an ESP with a duration of twenty years.

Pursuant to 10 CFR 52.15(b), 50.30(a)(6), and 50.4(b)(3), Dominion hereby submits this application for acceptance review and determination of sufficiency for docketing.

The North Anna ESP application is submitted in the form of a CD-ROM, consistent with NRC Regulatory Issues Summary 2001-05, *Guidance on Submitting Documents to the NRC by Electronic Information Exchange or on CD-ROM*. The enclosed CD-ROM contains the North Anna ESP application organized as follows:

- **Transmittal Letter.** This transmittal letter replicated on the CD-ROM.

- **Part 1—Administrative Information**. This part contains general corporate information about Dominion and an overview of the application format and content.

- **Part 2—Site Safety Analysis Report**. This part contains information about site safety, emergency preparedness, and quality assurance. The site safety analysis information includes a description of the site and proposed facilities, an assessment of the site features affecting the facility design, and the meteorological, hydrologic, geologic, and seismic characteristics of the ESP site.

- **Part 3—Environmental Report**. This part contains information about site environmental issues sufficient to support a NRC evaluation culminating in the issuance of an Environmental Impact Statement.

- **Part 4—Programs and Plans**. This part contains information about site redress.

Service upon the applicants of comments, hearing requests, intervention petitions or other pleadings related to this application should be made to counsel for Dominion as follows: Lillian M. Cuoco, Senior Counsel, Dominion Resources Services, Inc., Rope Ferry Road, Waterford, CT 06385 (phone: 860-444-5316; e-mail: lillian_cuoco@dom.com; fax: 860-444-4278) and David R. Lewis at Shaw Pittman, 300 N. Street, N.W., Washington D.C. 20037 (phone: 202-663-8474; e-mail: david.lewis@shawpittman.com; fax: 202-663-8007).

Any written correspondence to Dominion regarding this application should be sent to me at the address shown above. If any additional information concerning this application is needed, please contact Mr. Joseph D. Hegner (phone: 804-273-2770 or e-mail: joseph_hegner@dom.com).

Very truly yours,

David A. Christian

Enclosures: 1. Affirmation Statement
2. CD-ROM containing North Anna ESP Application

C w/encls: Mr. L. Reyes, NRC Region II Administrator
Mr. M. Morgan, NRC North Anna Senior Resident Inspector
Mr. M. Scott, NRC North Anna ESP Project Manager
Dr. R. Simard, Nuclear Energy Institute
Ms. M. Parkhurst, Battelle, DOE

I, David A. Christian, being duly sworn according to law, state that I am Senior Vice President-Nuclear Operations and Chief Nuclear Officer of Dominion Nuclear North Anna, LLC, that I am authorized to sign and file this application on behalf of Dominion Nuclear North Anna, LLC, and that the application is true and correct to the best of my knowledge, information and belief.

Dominion Nuclear North Anna, LLC

David A. Christian
Senior Vice President-Nuclear Operations and
Chief Nuclear Officer

STATE OF Virginia

COUNTY OF Henrico

Subscribed and sworn to before me, a Notary Public, in and for the County and State above named, this 18th day of September, 2003.

Maggie McClure

My commission expires 3-31-04

Eugene S. Grecheck
Vice President-Nuclear Support Services

Dominion Nuclear North Anna, LLC
5000 Dominion Boulevard, Glen Allen, VA 23060

Dominion

October 2, 2003

10 CFR Part 52, Subpart A

James E. Dyer, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Serial No. 03-457A
NRC Project No. 719
ESP/JDH

Dear Mr. Dyer:

**NORTH ANNA EARLY SITE PERMIT APPLICATION—REVISION 1**

On September 25, 2003, Dominion Nuclear North Anna, LLC (Dominion) submitted its North Anna Early Site Permit application, Revision 0, to the NRC pursuant to 10 CFR 52, Subpart A. As a result of subsequent discussions between M. L. Scott, North Anna ESP Project Manager, and J. D. Hegner of my staff, it was determined that unnecessary detail had been included in Revision 0 of the application. That information has since been removed and Revision 1 of the North Anna Early Site Permit application in CD-ROM format is enclosed. A set of affected pages is also enclosed for convenience.

If you have any questions or require additional information, please contact Mr. Hegner at 804-273-2770 or joseph_hegner@dom.com.

Very truly yours,

Eugene S. Grecheck

Enclosures:
1. Affirmation Statement
2. CD-ROM containing North Anna ESP Application, Revision 1
3. Revision 1 Affected Pages

C w/encls 1&2:
Mr. L. Reyes, NRC Region II Administrator
Mr. M. Morgan, NRC North Anna Senior Resident Inspector
Mr. M. Scott, NRC North Anna ESP Project Manager
Dr. R. Simard, Nuclear Energy Institute
Ms. M. Parkhurst, Battelle, DOE

I, Eugene S. Grecheck, being duly sworn according to law, state that I am Vice President-Nuclear Support Services of Dominion Nuclear North Anna, LLC, that I am authorized to sign and file this document on behalf of Dominion Nuclear North Anna, LLC, and that the information is true and correct to the best of my knowledge, information and belief.

Dominion Nuclear North Anna, LLC

Eugene S. Grecheck
Vice President – Nuclear Support Services

STATE OF Virginia
COUNTY OF Henrico

Subscribed and sworn to before me, a Notary Public, in and for the County and State above named, this 2nd day of October, 2003.

Maggie McClure

My commission expires 3-31-04

Dominion Nuclear North Anna, LLC
5000 Dominion Boulevard, Glen Allen, VA 23060

Dominion

July 15, 2004

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

Serial No. 04-434
ESP/JDH
Docket No. 52-008

**DOMINION NUCLEAR NORTH ANNA, LLC**
**NORTH ANNA EARLY SITE PERMIT APPLICATION**
**REVISION 2**

Enclosed is Revision 2 to the North Anna Early Site Permit application. The application consists of four parts: Part 1, Administrative Information, Part 2, Site Safety Analysis Report, Part 3, Environmental Report, and Part 4, Programs and Plans. Revision 2 primarily updates the Environmental Report to support the NRC staff's ongoing environmental review and planned issuance of a draft environmental impact statement. Revision 2 incorporates Dominion's responses to NRC requests for additional environmental information, Dominion's letter to the NRC responding to Virginia Department of Environmental Quality comments, and other information discussed with the NRC.

Certain information in the North Anna ESP application is common to both the Environmental Report and the Site Safety Analysis Report. Because only information in the Environmental Report is being changed by Revision 2, the corresponding common information in the Site Safety Analysis Report will require separate revision. That revision will occur in the next update, Revision 3, of the ESP application. Revision 3 is intended to be a comprehensive update.

A summary of the changes is provided in Enclosure 1. A CD containing Revision 2 of the ESP application is provided in Enclosure 2.

If you have any questions or require additional information, please contact us.

Very truly yours,

Eugene S. Grecheck
Vice President-Nuclear Support Services

Enclosures: 1. Description of Changes in Revision 2.
2. One CD-ROM labeled "North Anna Early Site Permit Application, Docket No. 52-008, September 2003; Revision 2, July 2004, NRC ADAMS Edition," containing the following 9 files:

001 North Anna ESP Application R2 (1 of 9).pdf; 2,989 KB; publicly available
002 North Anna ESP Application R2 (2 of 9).pdf;19,202,736 bytes, publicly available
003 North Anna ESP Application R2 (3 of 9).pdf; 49,572,480 bytes, publicly available
004 North Anna ESP Application R2 (4 of 9).pdf; 40,897,951 bytes, publicly available
005 North Anna ESP Application R2 (5 of 9.pdf; 37,328,818 bytes, publicly available
006 North Anna ESP Application R2 (6 of 9).pdf; 26,629,982 bytes, publicly available
007 North Anna ESP Application R2 (7 of 9).pdf; 1,153,004 bytes, publicly available
008 North Anna ESP Application R2 (8 of 9).pdf; 44,908,018 bytes, publicly available
009 North Anna ESP Application R2 (9 of 9).pdf; 24,746,868 bytes, publicly available

Commitments made in this letter: None.

cc: U.S. Nuclear Regulatory Commission, Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Suite 23T85
Atlanta, Georgia 30303

Mr. Andy Kugler
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. Michael Scott
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. M. T. Widmann
NRC Senior Resident Inspector
North Anna Power Station

Ms. Ellie L. Irons, Program Manager
Office of Environmental Impact Review
Virginia Department of Environmental Quality

Mr. Adrian Heymer
Nuclear Energy Institute
1776 I Street, N.W.
Washington, D.C. 20013

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 Support Services, of Dominion Nuclear North Anna, LLC. He has affirmed before me that he is duly authorized to execute and file the foregoing document on behalf of Dominion Nuclear North Anna, LLC, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 15th day of July, 2004.

My Commission expires: 3/31/08

Maggie McClure

Notary Public

(SEAL)

# Enclosure 1

## Description of Changes in Revision 2
## North Anna Early Site Permit Application

| **North Anna Early Site Permit Application<br>Description of Changes in Revision 2** | |
|---|---|
| Affected Section, Table, or Figure | Reason for Change |
| **Acronyms/Abbreviations/Initialisms** | |
| ▪ New entries | Added new entries for changes made in Revision 2 |
| **Part 1, Administrative Information** | |
| ▪ Section 1.2.2.5 | Added section describing notation of changes. |
| **Part 3, Environmental Report (ER) Chapter 1** | |
| ▪ Section 1.1.4 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. |
| **Part 3, ER Chapter 2** | |
| ▪ Sections 2.3.1.1, 2.3.3.1 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. |
| ▪ Sections 2.5.1.2, 2.5.1.3.1<br>▪ Tables 2.5-5, 2.5-8, 2.5-10, 2.5-13, 2.5-15, 2.5-16<br>▪ Figures 2.5-3, 2.5-4, 2.5-5, 2.5-6, 2.5-7, 2.5-9, 2.5-10, 2.5-11, 2.5-12 | Corrected and updated population figures. Reference May 13, 2004 telecon advising NRC of population figure errors and of intent to correct with next revision. |
| ▪ Section 2.7.5.2<br>▪ Tables 2.7-9, 2.7-10, 2.7-11, 2.7-12 | Response to RAI 2.3.4-1; Reference Dominion's 7/12/04 Letter to NRC, Serial No. 04-170A. |
| **Part 3, ER Chapter 3** | |
| ▪ Sections 3.1.2.2, 3.1.5 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. |
| ▪ Table 3.1-1, Section 9.1 | Response to RAI E3.1-1; Reference Dominion's 5/17/04 Letter to NRC, Serial No. 04-170. |
| ▪ Sections 3.2.3, 3.3, 3.3.1<br>▪ Table 3.3-2<br>▪ Figure 3.3-2<br>▪ Sections 3.4.1.1, 3.4.1.3.1, 3.4.1.3.3, 3.4.1.3.4, 3.4.2.1, 3.4.2.2, 3.4.2.3<br>▪ Figures 3.4-3, 3.4-4 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. |
| ▪ Section 3.8.2.3 | Response to Follow-up Environmental RAI |

| North Anna Early Site Permit Application<br>Description of Changes in Revision 2 | |
|---|---|
| Affected Section, Table, or Figure | Reason for Change |
| | 2 and revised response to RAI E3.8-7; Reference Dominion's 7/12/04 Letter to NRC, Serial No. 04-170A. |
| ▪ Section 3.8.2.5<br>▪ Table 3.8-2 | Response to Follow-up Environmental RAI 2; Reference Dominion's 7/12/04 Letter to NRC, Serial No. 04-170A. |
| **Part 3, ER Chapter 4** | |
| ▪ Section 4.2.1.1 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. |
| ▪ Section 4.2.3<br>▪ Section 4.2 References | Response to RAI E4.2.2-2; Reference Dominion's 5/17/04 Letter to NRC, Serial No. 04-170. |
| ▪ Section 4.3.2 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. |
| ▪ Section 4.5.3.1 | Response to RAI E4.5-4; Reference Dominion's 5/17/04 Letter to NRC, Serial No. 04-170. |
| ▪ Section 4.5.3.2 | Response to RAI E4.5-7; Reference Dominion's 5/17/04 Letter to NRC, Serial No. 04-170. |
| ▪ Section 4.5.4.1 | Response to RAI E4.5-4; Reference Dominion's 5/17/04 Letter to NRC, Serial No. 04-170. |
| ▪ Section 4.5.4.2 | Response to RAI E4.5-7; Reference Dominion's 5/17/04 Letter to NRC, Serial No. 04-170. |
| ▪ Section 4.5.4.4 | Response to RAI E4.5-4; Reference Dominion's 5/17/04 Letter to NRC, Serial No. 04-170. |
| ▪ Table 4.5-1 | Response to RAI E4.5-3; Reference Dominion's 5/17/04 Letter to NRC, Serial No. 04-170. |
| ▪ Tables 4.5-2, 4.5-3, 4.5-4 | Response to RAI E4.5-4; Reference Dominion's 5/17/04 Letter to NRC, Serial No. 04-170. |
| ▪ Table 4.5-5 | Response to RAI E4.5-7; Reference Dominion's 5/17/04 Letter to NRC, Serial No. 04-170. |

| **North Anna Early Site Permit Application<br>Description of Changes in Revision 2** | |
|---|---|
| Affected Section, Table, or Figure | Reason for Change |
| **Part 3, ER Chapter 5** | |
| ▪ Sections 5.1.1, 5.1.1.2, 5.2.1, 5.2.1.1, 5.2.1.2, 5.2.1.3, 5.2.1.4<br>▪ Table 5.2-1<br>▪ Sections 5.2.1.5, 5.2.2, 5.2.2.1.2, 5.2.2.1.3 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. |
| ▪ Section 5.2.2.2 | Response to VDEQ Comment AA1; Reference Dominion's 6/28/04 Letter to NRC, Serial No. 04-364. |
| ▪ Sections 5.2.2.3, 5.2.2.4 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. |
| ▪ Section 5.2 References<br>▪ Tables 5.2-5, 5.2-6, 5.2-7, and 5.2-8 | Response to VDEQ Comment AA1; Reference Dominion's 6/28/04 Letter to NRC, Serial No. 04-364. |
| ▪ Sections 5.3, 5.3.1, 5.3.1.1, 5.3.1.1.2, 5.3.1.2.1.b<br>▪ Table 5.3-4 (Deleted)<br>▪ Sections 5.3.1.2.2, 5.3.1.2.3.a, 5.3.1.2.3.b<br>▪ Table 5.3-8 (Deleted)<br>▪ Sections 5.3.1.2.4, 5.3.2.1, 5.3.2.1.2, 5.3.2.1.3, 5.3.2.2.3, 5.3.3, 5.3.3.1, 5.3.3.2, 5.3.3.2.1, 5.3.3.2.2, 5.3.3.2.3, 5.3.3.2.4, 5.3.4, 5.3.4.1,<br>▪ Section 5.3 References<br>▪ Tables 5.3-14, 5.3-15, 5.3-16<br>▪ Figure 5.3-4 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. |
| ▪ Section 5.4.2 | Response to RAI E5.4.2-1; Reference Dominion's 5/17/04 Letter to NRC, Serial No. 04-170. |
| ▪ Section 5.4.4.2 | Response to RAI E5.4.4-1; Reference Dominion's 5/17/04 Letter to NRC, Serial No. 04-170. |
| ▪ Section 5.4 References<br>▪ Table 5.4-12 | Response to Follow-up Environmental RAI 6; Reference Dominion's 7/12/04 Letter to NRC, Serial No. 04-170A. |
| ▪ Section 5.5.13, 5.8.1.2, 5.8.1.3, 5.8.1.4, 5.8.1.5, 5.8.1.6, 5.8.2.3 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. |
| ▪ Table 5.10-1 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference |

| North Anna Early Site Permit Application<br>Description of Changes in Revision 2 | |
|---|---|
| Affected Section, Table, or Figure | Reason for Change |
| | Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. |
| **Part 3, ER Chapter 7** | |
| ▪ Section 7.1.4<br>▪ Tables 7.1-1, 7.1-2, 7.1-4, 7.1-6, 7.1-8, 7.1-10, 7.1-11, 7.1-13, 7.1-15, 7.1-17, 7.1-19, 7.1-20, 7.1-22, 7.1-24, 7.1-26, 7.1-28 | Response to RAI E7.1-1; Reference Dominion's 7/12/04 Letter to NRC, Serial No. 04-170A. |
| ▪ Section 7.2.2.1 | Response to RAI E7.2-1; Reference Dominion's 7/12/04 Letter to NRC, Serial No. 04-170A. |
| **Part 3, ER Chapter 9** | |
| ▪ Section 9.1 | Added description of "No-Action Alternative" in response to June 21-22, 2004 ASLB pre-hearing conference. |
| ▪ Sections 9.4.1, 9.4.1.1, 9.4.1.1.1, 9.4.1.1.2, 9.4.1.2, 9.4.1.2.1, 9.4.1.2.2, 9.4.2, 9.4.2.1, 9.4.2.3, 9.4.2.4, 9.4.2.5<br>▪ Section 9.4 References<br>▪ Tables 9.4-1, 9.4-2, 9.4-3, 9.4-4, 9.4-5, 9.4-6 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. |
| **Part 3, ER Chapter 10** | |
| ▪ Section 10.1.3<br>▪ Table 10.1-2<br>▪ Sections 10.2.1.2, 10.2.1.6, 10.3.2 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. |

Dominion Nuclear North Anna, LLC
5000 Dominion Boulevard, Glen Allen, VA 23060

Dominion®

September 7, 2004

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

Serial No. 04-537
ESP/JDH
Docket No. 52-008

**DOMINION NUCLEAR NORTH ANNA, LLC**
**NORTH ANNA EARLY SITE PERMIT APPLICATION**
**REVISION 3**

Enclosed is Revision 3 to the North Anna Early Site Permit (ESP) application. Revision 3 updates the application to incorporate Dominion's responses to NRC's requests for additional information and other information discussed with the NRC staff.

Note that Revision 2, submitted July 15, 2004 (Serial No. 04-434) only updated information in the Environmental Report. Revision 3 updates the corresponding common information in the Site Safety Analysis Report.

A summary of the Revision 3 changes is provided in Enclosure 1. A CD containing the North Anna ESP application, Revision 3, is provided in Enclosure 2.

If you have any questions or require additional information, please contact Mr. Joseph D. Hegner at 804-273-2770.

Very truly yours,

Eugene S. Grecheck
Vice President-Nuclear Support Services

Enclosures:

1. Description of Changes in Revision 3.

2. One CD-ROM labeled "North Anna Early Site Permit Application, Docket No. 52-008, September 2003; Revision 3, September 2004, NRC ADAMS Edition," containing the following files:

001 North Anna ESP Application R3 (1 of 9).pdf; 2,989 KB; publicly available
002 North Anna ESP Application R3 (2 of 9).pdf;19,202,736 bytes, publicly available
003 North Anna ESP Application R3 (3 of 9).pdf; 49,572,480 bytes, publicly available
004 North Anna ESP Application R3 (4 of 9).pdf; 40,897,951 bytes, publicly available
005 North Anna ESP Application R3 (5 of 9.pdf; 37,328,818 bytes, publicly available
006 North Anna ESP Application R3 (6 of 9).pdf; 26,629,982 bytes, publicly available
007 North Anna ESP Application R3 (7 of 9).pdf; 1,153,004 bytes, publicly available
008 North Anna ESP Application R3 (8 of 9).pdf; 44,908,018 bytes, publicly available
009 North Anna ESP Application R3 (9 of 9).pdf; 24,746,868 bytes, publicly available

Commitments made in this letter: None

cc: U.S. Nuclear Regulatory Commission, Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Suite 23T85
Atlanta, Georgia 30303

Administrative Judge
Alex S. Karlin, Chair
Atomic Safety and Licensing Board
Mail Stop T-3 F23
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Administrative Judge
Dr. Thomas S. Elleman
Atomic Safety and Licensing Board
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Administrative Judge
Dr. Richard F. Cole
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Mr. Michael Scott
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. M. T. Widmann
NRC Senior Resident Inspector
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Virginia Department of Environmental Quality
P.O. Box 10009
Richmond, Virginia 23240

Mr. Adrian Heymer
Nuclear Energy Institute
1776 I Street, N.W.
Suite 400
Washington, D.C. 20006-3708

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 Support Services, of Dominion Nuclear North Anna, LLC. He has affirmed before me that he is duly authorized to execute and file the foregoing document on behalf of Dominion Nuclear North Anna, LLC, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 7TH day of September 2004.

My Commission expires: May 31, 2006

Vicki L. Hull
Notary Public

(SEAL)

**Enclosure 1**

**Description of Changes in Revision 3
North Anna Early Site Permit Application**

| North Anna Early Site Permit Application<br>Description of Changes in Revision 3 | |
|---|---|
| **Affected Section, Table, or Figure** | **Reason for Change** |
| **Acronyms/Abbreviations/Initialisms** | |
| ▪ New entries | Added new entries for changes made in Revision 3. |
| **Part 2 Chapter 1** | |
| ▪ Table 1.3-1 | Response to RAI E3.1-1; Reference Dominion's 5/17/04 Letter, Serial No. 04-170. |
| ▪ Table 1.3-1 | Response to RAI 1.3-2; Reference Dominion's 8/10/04 Letter, Serial No. 04-348. |
| ▪ Section 1.8 | Response to RAI 1.8-1; Reference Dominion's 8/20/04 Letter, Serial No. 04-354. |
| ▪ Sections 1.8.1, 1.8.2, 1.8.3 | Response to RAI 2.3.5-2; Reference Dominion's 8/20/04 Letter, Serial No. 04-354. |
| ▪ Section 1.8.2 | Response to RAI 2.5.2-9 and July 9, 2004 RAI; Reference Dominion's 8/19/04 Letter, Serial No. 04-438. |
| ▪ Section 1.9 (new)<br>▪ Section 1.9 References<br>▪ Tables 1.3-1, 1.9-1(new) | Response to RAI 1.3-1; Reference Dominion's 8/19/04 Letter, Serial No. 04-318A. |
| **Part 2 Chapter 2** | |
| ▪ Sections 2.1.3.1, 2.1.3.2, 2.1.3.3.1, 2.1.3.3.2, 2.1.3.4, 2.1.3.5, 2.1.3.6<br>▪ Section 2.1 References<br>▪ Figures 2.1-4, 2.1-5, 2.1-6, 2.1-7, 2.1-8, 2.1-8A (new), 2.1-10, 2.1-11, 2.1-12, 2.1-13, 2.1-13A (new), 2.1-14 | Response to RAI 2.1.3-1; Reference Dominion's 8/10/04 Letter, Serial No. 04-348. |
| ▪ Section 2.1 References | Response to RAI 1.8-1; Reference Dominion's 8/20/04 Letter, Serial No. 04-354. |
| ▪ Section 2.2.3.1.2 | Response to RAI 2.2.2-3; Reference Dominion's 8/2/04 Letter, Serial No. 04-318. |
| ▪ Sections 2.3.1.1, 2.3.1.2, 2.3.1.3.1, 2.3.1.3.2, 2.3.1.3.3, 2.3.1.3.4, 2.3.1.3.5, 2.3.1.3.6, 2.3.1.3.8, 2.3.2.1, 2.3.2.2.1, 2.3.2.3, 2.3.2.4, 2.3.2.5<br>▪ Section 2.3 References<br>▪ Tables 2.3-1, 2.3-2, 2.3-4, 2.3-5, 2.3-6, 2.3-7, 2.3-18 (new)<br>▪ Figure 2.3-24 | Response to RAIs 2.3.1-1 (revised), 2.3.1-2, 2.3.1-3, 2.3.1-4, 2.3.1-5, 2.3.1-6, 2.3.2-1, 2.3.2-2; Reference Dominion's 8/2/04 Letter, Serial No. 04-318. |
| ▪ Section 2.3.4.2<br>▪ Tables 2.3-3, 2.3-13, 2.3-14 | Response to RAI 2.3.4-1; Reference Dominion's 7/12/04 Letter, Serial No. 04-170A. |

| North Anna Early Site Permit Application<br>Description of Changes in Revision 3 | |
|---|---|
| **Affected Section, Table, or Figure** | **Reason for Change** |
| ▪ Section 2.3 References | Response to RAI 1.8-1; Reference Dominion's 8/20/04 Letter, Serial No. 04-354. |
| ▪ Section 2.4.1.1<br>▪ Sections 2.4.7.2, 2.4.7.4<br>▪ Section 2.4.8<br>▪ Sections 2.4.11.3, 2.4.11.4<br>▪ Table 2.4-6 | Change in Unit 4 cooling approach from wet towers to dry towers; Reference Dominion's 3/31/04 Letter to NRC, Serial No. 04-194. Response to RAIs 2.4.1-2, 2.4.1-4; Reference Dominion's 8/2/04 Letter, Serial No. 04-318. |
| ▪ Section 2.4.7.6 | Response to RAI 2.4.7-5; Reference Dominion's 8/2/04 Letter, Serial No. 04-318. |
| ▪ Section 2.4.9 | Response to RAI 2.4.9-1; Reference Dominion's 8/2/04 Letter, Serial No. 04-318. |
| ▪ Sections 2.4.12.1.2, 2.4.12.3, 2.4.12.4<br>▪ Table 2.4-15<br>▪ Figure 2.4-15 | Response to RAI 2.4.12-1; Reference Dominion's 8/2/04 Letter, Serial No. 04-318. |
| ▪ Section 2.4.12.2<br>▪ Section 2.4 References<br>▪ Table 2.4-19 | Follow-up response to RAI 17.1-1; Reference Dominion's 8/20/04 Letter, Serial No. 04-354. |
| ▪ Section 2.5.1.1.4, 2.5.2.2.8 | Response to RAI 2.5.1-1; Reference Dominion's 7/8/04 Letter, Serial No. 04-270. |
| ▪ Section 2.5.1.1.4 | Response to RAI 2.5.1-2; Reference Dominion's 7/8/04 Letter, Serial No. 04-270. |
| ▪ Section 2.5.1.1.4 | Response to RAI 2.5.1-3; Reference Dominion's 7/8/04 Letter, Serial No. 04-270. |
| ▪ Section 2.5.1.1.4 | Response to RAI 2.5.1-4; Reference Dominion's 7/8/04 Letter, Serial No. 04-270. |
| ▪ Section 2.5.1.2.6 | Response to RAI 2.5.4-7; Reference Dominion's 8/5/04 Letter, Serial No. 04-347. |
| ▪ Section 2.5.2.6.2<br>▪ Section 2.5 References | Response to RAI 2.5.2-4; Reference Dominion's 7/8/04 Letter, Serial No. 04-270. |
| ▪ Sections 2.5.2, 2.5.2.6.5, 2.5.2.6.6, 2.5.2.6.7, 2.5.2.6.8, 2.5.2.6.9, 2.5.2.6.10, 2.5.2.7<br>▪ Section 2.5 References<br>▪ Tables 2.5-24, 25, 26, 27, 28<br>▪ Figures 2.5-44A, 44B, 46, 48, 49, 50, 51, 52, 53, 54A, 54B, 54C, 55 | Response to RAI 2.5.2-9 and July 9, 2004 RAI; Reference Dominion's 8/19/04 Letter, Serial No. 04-438. |
| ▪ Sections 2.5.4.7.3, 2.5.4.7.4<br>▪ Table 2.5-46 | Response to RAI 2.5.4-9; Reference Dominion's 8/19/04 Letter, Serial No. 04-347A. |
| ▪ Sections 2.5.4.8, 2.5.4.8.2, 2.5.4.8.4, 2.5.4.8.5 | Response to RAI 2.5.4-10; Reference Dominion's 8/19/04 Letter, Serial No. 04-347A. |
| ▪ Sections 2.5.5.1.2, 2.5.5.2.3, 2.5.5.5, 2.5.5.6 | Response to RAI 2.5.5-1; Reference Dominion's 8/19/04 Letter, Serial No. 04-347A. |

| North Anna Early Site Permit Application<br>Description of Changes in Revision 3 | |
|---|---|
| **Affected Section, Table, or Figure** | **Reason for Change** |
| ▪ Tables 2.5-20, 2.5-23 | Correction of controlling earthquake calculation; Reference Dominion's 8/19/04 Letter, Serial No. 04-347A. |
| ▪ Table 2.5-45 | Response to RAI 2.5.4-5; Reference Dominion's 8/5/04 Letter, Serial No. 04-347. |
| ▪ Table 2.5-47 | Response to RAI 2.5.4-11; Reference Dominion's 8/5/04 Letter, Serial No. 04-347. |
| **Part 2 Chapter 15** | |
| ▪ Section 15.2<br>▪ Section 15.4<br>▪ Tables 15.4-1, 15.4-3, 15.4-5, 15.4-7, 15.4-9, 15.4-10, 15.4-12, 15.4-14, 15.4-16, 15.4-18, 15.4-19, 15.4-21, 15.4-23, 15.4-25, 15.4-27 | Response to RAIs 15.4-2, 15.4-3, 15.4-5, 15.4-6; Reference Dominion's 8/10/04 Letter, Serial No. 04-348. |
| ▪ Section 15.2 References | Response to RAI 1.8-1; Reference Dominion's 8/20/04 Letter, Serial No. 04-354. |
| ▪ Section 15.3 References | Response to RAI 1.8-1; Reference Dominion's 8/20/04 Letter, Serial No. 04-354. |
| **Part 3 Chapter 2** | |
| ▪ Section 2.3.2.2.1<br>▪ Table 2.3-11<br>▪ Section 2.3 References | Follow-up response to RAI 17.1-1; Reference Dominion's 8/20/04 Letter, Serial No. 04-354. |
| ▪ Section 2.5.1, 2.5.1.1, 2.5.1.2, 2.5.1.3.1, 2.5.1.3.2, 2.5.1.5<br>▪ Section 2.5 References<br>▪ Table 2.5-12<br>▪ Table 2.5-15<br>▪ Figures 2.5-7A (new), 2.5.12A (new)<br>▪ Figure 2.5-10<br>▪ Figure 2.5-13 | Response to RAI 2.1.3-1; Reference Dominion's 8/10/04 Letter, Serial No. 04-348. |
| ▪ Section 2.5.2 | Response to RAI 1.3-1; Reference Dominion's 8/19/04 Letter, Serial No. 04-318A. |
| ▪ Sections 2.7.1, 2.7.1.1, 2.7.1.2, 2.7.1.3, 2.7.1.4, 2.7.1.5, 2.7.2.1, 2.7.3.1, 2.7.3.2, 2.7.3.3, 2.7.3.4, 2.7.4, 2.7.4.1.1, 2.7.4.1.2, 2.7.4.1.3, 2.7.4.1.4, 2.7.4.1.5, 2.7.4.1.7<br>▪ Section 2.7 References<br>▪ Tables 2.7-1, 2.7-2, 2.7-3<br>▪ Figure 2.7-2 | Response to RAIs 2.3.1-1 (revised), 2.3.1-2, 2.3.1-3, 2.3.1-4, 2.3.1-5, 2.3.1-6, 2.3.2-1, 2.3.2-2; Reference Dominion's 8/2/04 Letter, Serial No. 04-318. |

| North Anna Early Site Permit Application<br>Description of Changes in Revision 3 | |
|---|---|
| **Affected Section, Table, or Figure** | **Reason for Change** |
| **Part 3 Chapter 3** | |
| ▪ Section 3.1.6 (new)<br>▪ Section 3.1 References<br>▪ Tables 3.1-1, 3.1-9 (new) | Response to RAI 1.3-1; Reference Dominion's 8/19/04 Letter, Serial No. 04-318A. |
| ▪ Sections 3.2.1, 3.8.1, 3.8.2.2 | Response to RAI 1.3-1; Reference Dominion's 8/19/04 Letter, Serial No. 04-318A. |
| • Table 3.1-1 | Response to RAI 1.3-2; Reference Dominion's 8/10/04 Letter, Serial No. 04-348. |
| **Part 3 Chapter 5** | |
| ▪ Sections 5.4.3, 5.8.2.1.2 | Response to RAI 1.3-1; Reference Dominion's 8/19/04 Letter, Serial No. 04-318A. |
| **Part 3 Chapter 6** | |
| ▪ Section 6.4.1 | Response to RAIs 2.3.1-1 (revised), 2.3.1-2, 2.3.1-3, 2.3.1-4, 2.3.1-5, 2.3.1-6, 2.3.2-1, 2.3.2-2; Reference Dominion's 8/2/04 Letter, Serial No. 04-318. |
| **Part 3 Chapter 7** | |
| ▪ Section 7.1 References | Response to RAI 1.8-1; Reference Dominion's 8/20/04 Letter, Serial No. 04-354. |

Dominion Nuclear North Anna, LLC
5000 Dominion Boulevard, Glen Allen, VA 23060

Dominion®

May 12, 2005

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

Serial No. 05-305
ESP/JDH
Docket No. 52-008

**DOMINION NUCLEAR NORTH ANNA, LLC**
**NORTH ANNA EARLY SITE PERMIT APPLICATION**
**REVISION 4**

Enclosed is Revision 4 to the North Anna Early Site Permit (ESP) application. Revision 4 updates the application to incorporate Dominion's responses to NRC's requests for additional information, our responses to the open items in the December 2004 draft Safety Evaluation Report, and other information discussed with the NRC staff.

A summary of the Revision 4 changes is provided in Enclosure 1. A CD containing the North Anna ESP application, Revision 4, is provided in Enclosure 2.

If you have any questions or require additional information, please contact Mr. Joseph D. Hegner at 804-273-2770.

Very truly yours,

Eugene S. Grecheck
Vice President-Nuclear Support Services

Enclosures:

1. Description of Changes in Revision 4.

2. One CD-ROM labeled "North Anna Early Site Permit Application, Docket No. 52-008, September 2003; Revision 4, May 2005, NRC ADAMS Edition," containing the following files:

1. North Anna ESP Application R4 (1 of 8).pdf; 4664 KB; publicly available
2. North Anna ESP Application R4 (2 of 8).pdf; 28,064,970 bytes, publicly available
3. North Anna ESP Application R4 (3 of 8).pdf; 49,772,368 bytes, publicly available
4. North Anna ESP Application R4 (4 of 8).pdf; 47,298,189 bytes, publicly available
5. North Anna ESP Application R4 (5 of 8).pdf; 43,676,749 bytes, publicly available
6. North Anna ESP Application R4 (6 of 8).pdf; 34,149,855 bytes, publicly available
7. North Anna ESP Application R4 (7 of 8).pdf; 51,103,672 bytes, publicly available
8. North Anna ESP Application R4 (8 of 8).pdf; 31,311,890 bytes, publicly available

Commitments made in this letter: None

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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 Support Services, of Dominion Nuclear North Anna, LLC. He has affirmed before me that he is duly authorized to execute and file the foregoing document on behalf of Dominion Nuclear North Anna, LLC, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 12th day of May, 2005.

My Commission expires: My Commission Expires July 31, 2007

Vera F. Thoms
Notary Public

(SEAL)

**Enclosure 1**

**Description of Changes in Revision 4**
**North Anna Early Site Permit Application**

| North Anna Early Site Permit Application<br>Description of Changes in Revision 4 | |
|---|---|
| **Affected Section, Table, or Figure** | **Reason for Change** |
| **Part 2 Chapter 1** | |
| ▪ Section 1.8.1 | Editorial change to clarify conformance with requirements of 10 CFR 100.21(c)(1). |
| ▪ Section 1.8.2 | Revision 3 format error. Added electronic link to RG 1.76 and DG 1105. |
| ▪ Table 1.9-1 | Response to DSER Open Items 2.3-1, 2.3-2, 2.3-3, 2.4-5, 2.4-8, 2.4-10, 2.4-11; Reference Dominion's March 3, 2005 Letter, Serial No. 05-785B. |
| **Part 2 Chapter 2** | |
| ▪ Section 2.1.2.1 | Response to DSER Open Item 2.1-1; Reference Dominion's May 2, 2005 Letter, Serial No. 05-194A. |
| ▪ Section 2.3.1.3.1<br>▪ Table 2.3-4 (deleted) | Response to DSER Open Item 2.3-1; Reference Dominion's March 3, 2005 Letter, Serial No. 05-785B. |
| ▪ Section 2.3.1.3.8 | Response to DSER Open Item 2.3-3; Reference Dominion's March 3, 2005 Letter, Serial No. 05-785B. |
| ▪ Section 2.3.2.3 | Response to DSER Open Item 2.3-4; Reference Dominion's March 3, 2005 Letter, Serial No. 05-785B. |
| ▪ Section 2.3.5.1 | Editorial change to clarify conformance with requirements of 10 CFR 100.21(c)(1). |
| ▪ Section 2.4.7.5<br>▪ Section 2.4 References<br>▪ Table 2.4-13 (deleted) | Response to DSER Open Item 2.3-3; Reference Dominion's March 3, 2005 Letter, Serial No. 05-785B. |
| ▪ Sections 2.4.11.1, 2.4.11.4<br>▪ Section 2.4 References | Response to DSER Open Item 2.4-3; Reference Dominion's March 3, 2005 Letter, Serial No. 05-785B. |
| ▪ Section 2.4.13<br>▪ Section 2.4 References<br>▪ Table 2.4-20 (new) | Response to DSER Open Item 2.4-11; Reference Dominion's March 3, 2005 Letter, Serial No. 05-785B. |
| ▪ Sections 2.4.12.1.2, 2.4.12.3, 2.4.12.4<br>▪ Table 2.4-15<br>▪ Figure 2.4-15 | Response to DSER Open Item 2.4-7; Reference Dominion's March 3, 2005 Letter, Serial No. 05-785B. |
| ▪ Sections 2.5.2.5, 2.5.2.6.7, 2.5.2.6.7.c, 2.5.2.6.7.d, 2.5.2.7, 2.5.4.7.1, 2.5.4.7.3, 2.5.4.7.4, 2.5.4.8.2, 2.5.4.8.4.a, 2.5.4.8.4.b, 2.5.4.8.4.c, 2.5.4.8.5, 2.5.5.2.3.a, 2.5.5.2.3.b<br>▪ Section 2.5 References<br>▪ Tables 2.5-27A (new), 2.5-45, 2.5-46 | Response to DSER Open Item 2.5-2; Reference Dominion's March 30, 2005 Letter, Serial No. 05-194. |

| North Anna Early Site Permit Application<br>Description of Changes in Revision 4 | |
|---|---|
| **Affected Section, Table, or Figure** | **Reason for Change** |
| ▪ Figures 2.5-48, 2.5-48A (new) 2.5-51, 2.5-53, 2.5-54A, 2.5-54B, 2.5-54B(1) (new), 2.5-54B(2) (new), 2.5-54B(3) (new), 2.5-55A (new) | |
| **Part 2 Chapter 13** | |
| ▪ Section 13.3.2.2.2.h | Response to DSER Open Item 13.3-3; Reference Dominion's March 3, 2005 Letter, Serial No. 05-785B. |
| **Part 2 Chapter 15** | |
| ▪ Table 15.4-26 | Revision 3 typographical errors. Corrected isotope designations. |
| **Part 3 Chapter 2** | |
| ▪ Table 3.1-1<br>▪ Table 3.1-9 | Response to Supplemental RAIs 1.a and 1.c; Reference Dominion's April13, 2005 Letter, Serial No. 05-209A. |
| ▪ Table 3.1-9<br>▪ Table 3.3-1<br>▪ Figure 3.3-1 | Response to Supplemental RAI 1.b; Reference Dominion's April13, 2005 Letter, Serial No. 05-209A. |
| **Part 3 Chapter 3** | |
| ▪ Section 3.4.1.3.3 | Response to DSER Open Item 2.4-3; Reference Dominion's March 3, 2005 Letter, Serial No. 05-785B. |
| ▪ Section 3.8 | Revision 3 typographical error. CFR citation should be 10 CFR 51.52. |
| ▪ Section 4.2 References | Revision 3 format error. Reference 13 text should be black versus blue. |
| **Part 3 Chapter 5** | |
| ▪ Sections 5.2.2.1.3, 5.2.2.2<br>▪ Section 5.2 References | Response to DSER Open Item 2.4-3; Reference Dominion's March 3, 2005 Letter, Serial No. 05-785B. |
| ▪ Section 5.7.1 | Response to October 29, 2004 RAI on Uranium Fuel Cycle Impacts; Reference Dominion's November 18, 2004 Letter, Serial No. 04-705. |
| **Part 3 Chapter 7** | |
| ▪ Section 7.1.2<br>▪ Table 7.1-27 | Revision 3 typographical errors. Corrected EAB and LPZ $\chi/Q$ values (Section 7.1.2) and isotope designations (Table 7.1-27). |

Dominion Nuclear North Anna, LLC
5000 Dominion Boulevard, Glen Allen, VA 23060

Dominion®

July 25, 2005

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
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Serial No. 05-457
ESP/JDH
Docket No. 52-008

**DOMINION NUCLEAR NORTH ANNA, LLC**
**NORTH ANNA EARLY SITE PERMIT APPLICATION**
**FINAL SAFETY EVALUATION REPORT REVIEW ITEMS AND REVISION 5 TO THE NORTH ANNA ESP APPLICATION**

On June 16, 2005, the NRC issued its Final Safety Evaluation Report (FSER) for the North Anna Early Site Permit Application. As part of our review of the FSER, we identified several corrections that must be made to documents Dominion previously submitted to the NRC. Enclosure 1 to this letter describes those corrections.

The North Anna ESP Application has been updated to reflect the corrections. A summary of the changes in Revision 5 of the ESP Application is provided in Enclosure 2. A CD containing Revision 5 of the ESP Application is provided as Enclosure 3.

If you have any questions or require additional information, please contact Mr. Joseph Hegner at 804-273-2770.

Very truly yours,

Eugene S. Grecheck
Vice President-Nuclear Support Services

Enclosures:

1. Final Safety Evaluation Report Review Items
2. Description of Changes in Revision 5
3. One CD-ROM labeled "North Anna Early Site Permit Application, Docket No. 52-008, September 2003; Revision 5, July 2005, NRC ADAMS Edition," containing the following files:

- North Anna ESP Application R5 (1 of 8).pdf; 9355 KB; publicly available
- North Anna ESP Application R5 (2 of 8).pdf; 28,064,970 bytes, publicly available
- North Anna ESP Application R5 (3 of 8).pdf; 49,772,302 bytes, publicly available
- North Anna ESP Application R5 (4 of 8).pdf; 47,578,761 bytes, publicly available
- North Anna ESP Application R5 (5 of 8).pdf; 43,787,240 bytes, publicly available
- North Anna ESP Application R5 (6 of 8).pdf; 34,327,107 bytes, publicly available
- North Anna ESP Application R5 (7 of 8).pdf; 51,600,526 bytes, publicly available
- North Anna ESP Application R5 (8 of 8).pdf; 32,215,787 bytes, publicly available

Commitments made in this letter: None

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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 Support Services, of Dominion Nuclear North Anna, LLC. He has affirmed before me that he is duly authorized to execute and file the foregoing document on behalf of Dominion Nuclear North Anna, LLC, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 25TH day of July, 2005

My Commission expires: May 31, 2006

Vicki L. Hull
Notary Public

(SEAL)

**Enclosure 1**

**Final Safety Evaluation Report Review Items**

**Correction of Coordinates for ESP Site Footprint**

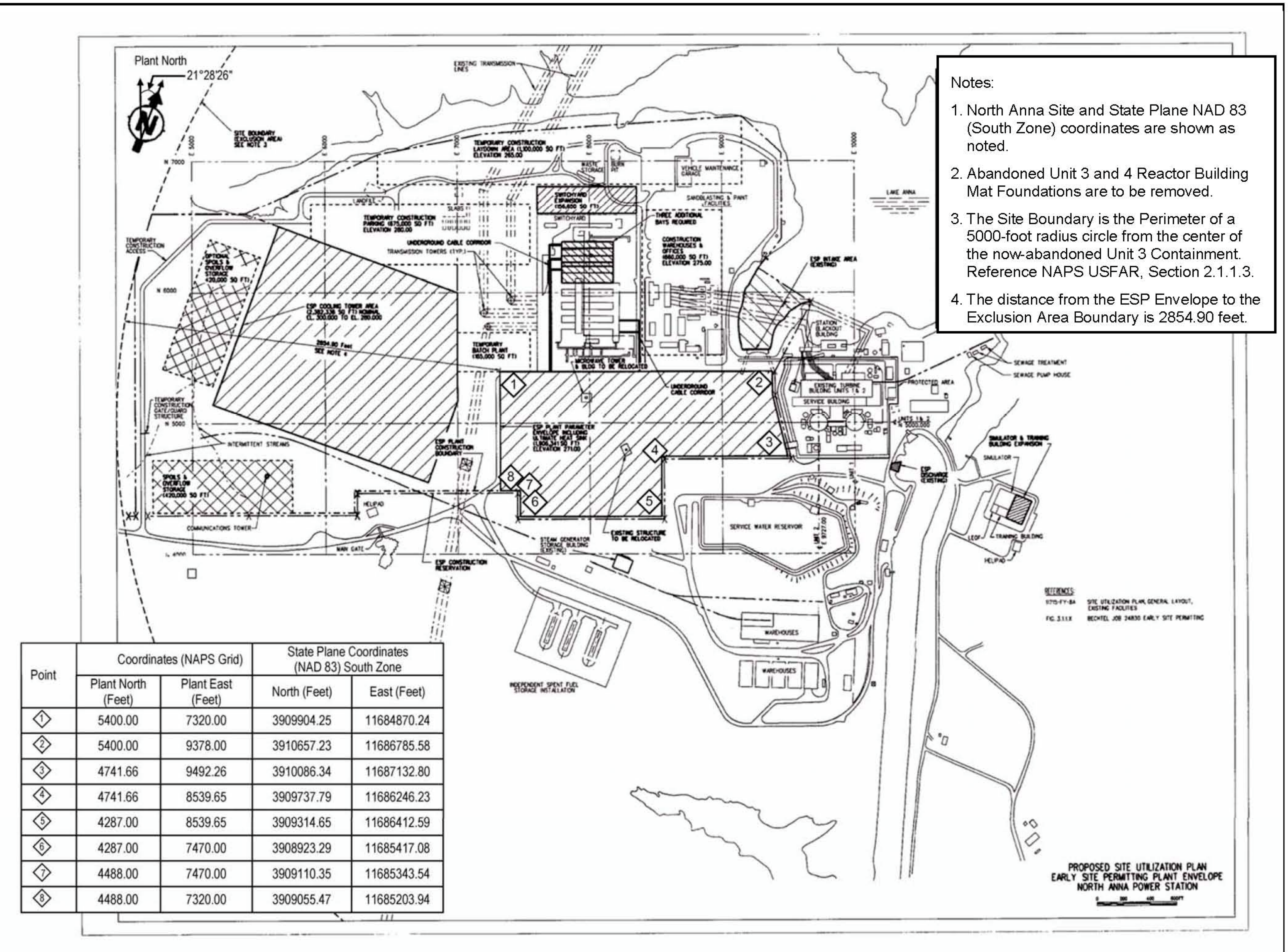
Coordinates for the ESP site footprint were submitted to the NRC in response to Draft Safety Evaluation Report (DSER) Open Item 2.4-1 (Dominion Letter 05-785B dated March 3, 2005).

As discussed in a July 5, 2005 conference call with NRC Staff, upon further review, it has been determined that the coordinates identified in Figure 1 of the DSER Open Item 2.4-1 response contained errors.

A corrected version of Figure 1 is provided on the next page.

**Application Revision**

None. Figure 1 on the next page is not included in the North Anna ESP Application.




Notes:

1. North Anna Site and State Plane NAD 83 (South Zone) coordinates are shown as noted.
2. Abandoned Unit 3 and 4 Reactor Building Mat Foundations are to be removed.
3. The Site Boundary is the Perimeter of a 5000-foot radius circle from the center of the now-abandoned Unit 3 Containment. Reference NAPS USFAR, Section 2.1.1.3.
4. The distance from the ESP Envelope to the Exclusion Area Boundary is 2854.90 feet.

| Point | Coordinates (NAPS Grid) | | State Plane Coordinates (NAD 83) South Zone | |
|---|---|---|---|---|
| | Plant North (Feet) | Plant East (Feet) | North (Feet) | East (Feet) |
| 1 | 5400.00 | 7320.00 | 3909904.25 | 11684870.24 |
| 2 | 5400.00 | 9378.00 | 3910657.23 | 11686785.58 |
| 3 | 4741.66 | 9492.26 | 3910086.34 | 11687132.80 |
| 4 | 4741.66 | 8539.65 | 3909737.79 | 11686246.23 |
| 5 | 4287.00 | 8539.65 | 3909314.65 | 11686412.59 |
| 6 | 4287.00 | 7470.00 | 3908923.29 | 11685417.08 |
| 7 | 4488.00 | 7470.00 | 3909110.35 | 11685343.54 |
| 8 | 4488.00 | 7320.00 | 3909055.47 | 11685203.94 |

**Incorrect Version of SSAR Figure 2.5-55A**

In Dominion's response to DSER Open Item 2.5-2 (Dominion Letter 05-194 dated March 30, 2005), a new SSAR figure, Figure 2.5-55A, was included titled:

Figure 2.5-55A Selected Horizontal and Vertical OBE and SSE Spectra for the Hypothetical Rock Outcrop Control Point at the Top of Zone III-IV Material (Representative Elevation 250 ft, 3300 ft/sec Shear Wave Velocity)

Revision 4 of the North Anna ESP Application included an incorrect version of SSAR Figure 2.5-55A. (A duplicate copy of SSAR Figure 2.5-55 was inadvertently included as SSAR Figure 2.5-55A.)

The correct version of SSAR Figure 2.5-55A has been incorporated in Revision 5 of the ESP Application.

**Application Revision**

In Revision 5 of the ESP Application, SSAR Figure 2.5-55A has been replaced with the correct version shown on the next page.

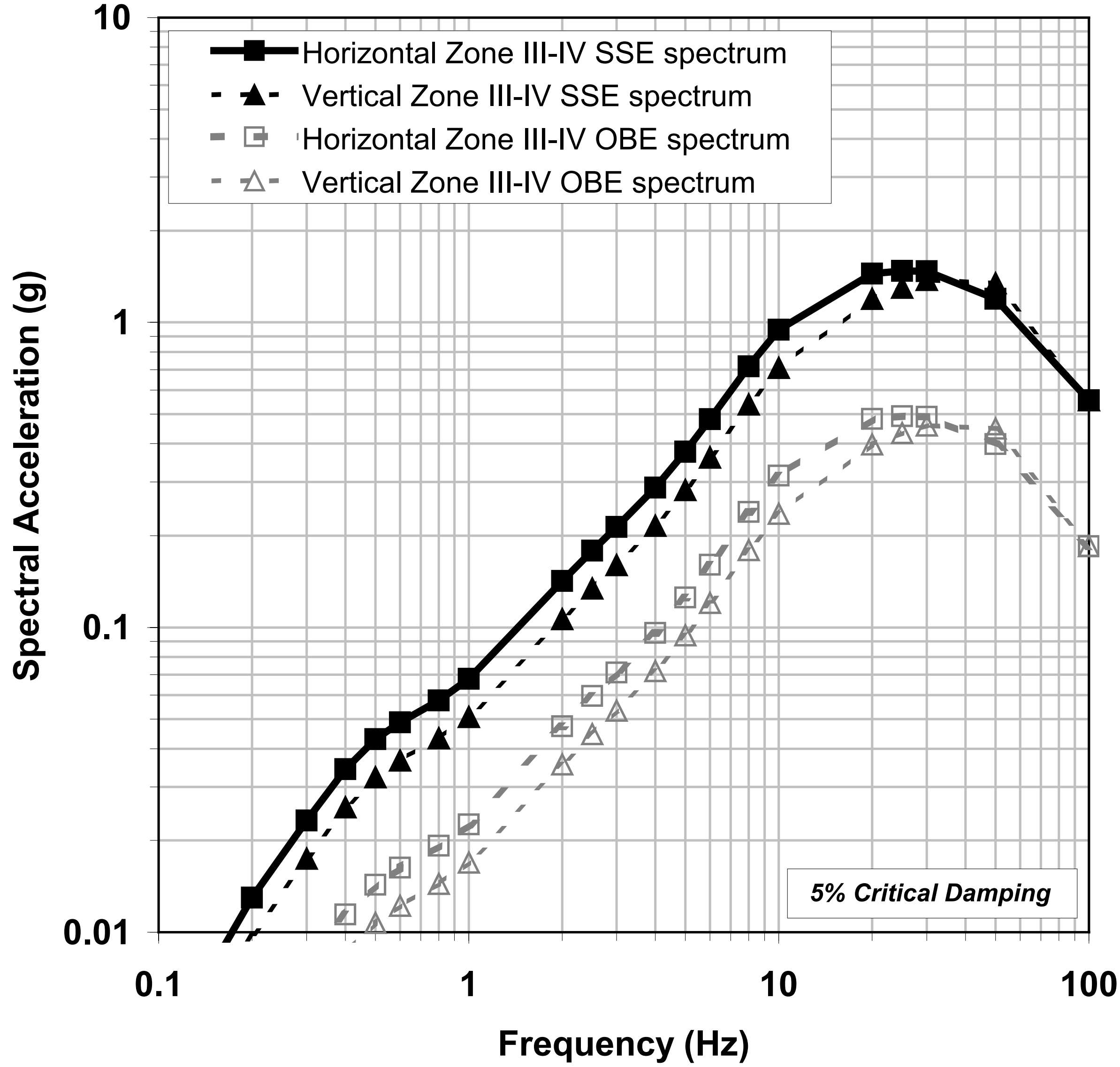



**Figure 2.5-55A** **Selected Horizontal and Vertical OBE and SSE Spectra for the Hypothetical Rock Outcrop Control Point at the Top of Zone III-IV Material (Representative Elevation 250 ft, 3300 ft/sec Shear Wave Velocity)**

**Confirmatory Analysis of V/H Ratios for Zone III-IV Hypothetical Rock Outcrop Control Point SSE Spectrum**

In Revision 4 of the North Anna ESP Site Safety Analysis Report (SSAR), the site horizontal and vertical safe shutdown earthquake (SSE) spectra were estimated at a control point at the top of a hypothetical outcrop of Zone III-IV material having a best estimate shear wave velocity of 3,300 ft/sec. The vertical SSE was determined using V/H ratios from NUREG/CR-6728 (Reference 171 of SSAR Section 2.5) and are listed in SSAR Table 2.5-27A. These V/H ratios are identical to those used for hard rock conditions (see SSAR Table 2.5-27).

As discussed in a July 14, 2005 conference call with NRC Staff, upon further evaluation, it has been determined that the NUREG/CR-6728 V/H ratios apply explicitly to hard rock conditions with a shear wave velocity of 9,200 ft/sec. The NUREG/CR-6728 V/H ratios are not explicitly appropriate for the site-specific shear wave velocity profile and controlling earthquake magnitude and distance for the North Anna ESP site.

A site-specific analysis has been performed to investigate the appropriateness of the V/H ratios listed in SSAR Table 2.5-27A for the characteristics of the North Anna ESP site. A description of the site-specific analysis is provided in the following section.

**Site-Specific Analysis of V/H Ratios**

1. Description of Site-Specific Analysis

A site-specific vertical to horizontal (V/H) spectral ratios analysis has been performed following a methodology similar to that used in NUREG/CR-6728 (Reference 171 of SSAR Section 2.5), which is the source of the V/H spectral ratios in SSAR Table 2.5-27A. For the analysis, site-specific shear and compressional wave (S- and P-wave) profile data were used along with the high frequency deaggregation results from the PSHA. The stochastic point source ground motion model was used with an implementation of random vibration theory to generate the horizontal and vertical ground motions and subsequent V/H spectral ratios.

To maintain a consistency between the S- and P-wave profiles, the P-wave profile was developed from a model of Poisson's ratio with depth rather than the P-wave velocity data for the site. This application of the Poisson's ratio model to the previously developed S-wave profile maintains the consistency between the S- and P-wave profiles developed for the site. The Poisson's ratio values were derived from the site S- and P-wave data. Based on the distribution of observed Poisson's ratio data, two models were developed which, when applied to the single S-wave profile, resulted in

two P-wave profiles for the analysis. The first model was based on the older subsurface data from the Units 1 and 2 investigation, using the profiles from borings B-20 and B-104, and Well #1. The more recent ESP investigation data from boring B-802 were used to develop the second model. Preferred relative weights of 0.25 and 0.75 were used in the analysis for the P-wave Models 1 and 2, respectively; these weights were assigned based on the quality of the recently recorded ESP site investigation data compared to the older North Anna site data. The two Poisson's ratio models used in the analysis are shown in Figure 1 along with the site-specific data. The corresponding two P-wave velocity profiles are listed in Table 1 along with the S-wave and two Poisson's ratio models.

Four pairs of magnitude and distance values (weighted average magnitudes for given distance bins of the high-frequency PSHA deaggregation, shown in SSAR Figure 2.5-50) were used in the analysis. These same magnitude and distance pairs were used for both the horizontal and vertical ground motions. Associated deaggregation weights for these paired values, below, were used to combine the results.

| Magnitude (M) | Distance (km)[1] | Weight[2] |
|---|---|---|
| 5.1 | 7.5 | 0.34 |
| 5.3 | 22.5 | 0.33 |
| 5.7 | 37.5 | 0.25 |
| 6.1 | 75.0 | 0.08 |

[1] value used for the given distance bin
[2] contribution of the hazard for the given distance bin

Horizontal and vertical ground motions spectra, based on the magnitude-distance values and corresponding profiles listed in Table 1, were computed using a stochastic point source model and an implementation of random vibration theory. For each case, a total of 100 realizations were performed to provide a stable statistical estimate of the ground motions and corresponding V/H spectral ratios. Ground motions were computed based on a linear response at low strain material damping levels of 0.5, 1.0, 2.0, and 5.0%. The 2.0% damping level was chosen as the base case level and the additional three damping levels were used for a sensitivity analysis of the site-specific V/H ratios.

Statistical $16^{th}$, $50^{th}$, mean, and $84^{th}$ percentile V/H spectral ratio values as a function of frequency were developed based on the relative weighting between the two P-wave profiles and four magnitude-distance cases from the high-frequency deaggregation results. These results were computed for the four damping levels.

2. Results

The statistical results of the V/H spectral ratios for the 0.5% damping level are shown in Figure 2. For comparison purposes, the V/H ratio for the 0.2g<PGA<0.5g bin from NUREG/CR-6728, which was used in SSAR Table 2.5-27A, is shown in Figure 2.

Similar plots for the additional damping levels of 1.0, 2.0, and 5.0% are shown in Figures 3, 4, and 5. The results for the base case damping level of 2.0% are tabulated in Table 2 for the 21 frequencies used in SSAR Table 2.5-27A.

3. Summary and Conclusions

A site-specific analysis of vertical to horizontal (V/H) spectral ratios for the North Anna ESP site was performed. Two P-wave profiles were developed which are consistent with the base case S-wave profile used in the PSHA. The results from these two models were assigned relative weights of 0.25 and 0.75 for P-wave Model 1 and 2, respectively. The higher weight of 0.75 was based on P-wave Model 2 being developed from the more recently recorded ESP site investigation data. Horizontal and vertical ground motion spectra were computed for four magnitude and distance values based on the 5-10 Hz PSHA deaggregation. The associated weights from the PSHA deaggregation for these four magnitude-distance values were combined with the assigned weights for the two P-wave models. The base case was run for a damping level of 2.0%. In addition, damping levels of 0.5, 1.0, and 5.0% were analyzed. These other damping values did not produce significantly different results (i.e., comparison of the results presented in Figures 2 through 5).

The 16th, 50th, and 84th percentiles and mean V/H ratios are shown in Figure 4 for the 2.0% damping case and listed in Table 2. For comparison, the V/H ratios from NUREG/CR-6728 for the 0.2g<PGA<0.5g case, which was used for SSAR Table 2.5-27A, are also shown in Figure 4 and listed in Table 2. On average, the mean V/H ratios from the site-specific analysis are approximately 30% lower (ranging from 18-35% lower) over the complete frequency range of 100 Hz to 0.1 Hz than the V/H ratios used in SSAR Table 2.5-27A. At the 84th percentile, the site-specific V/H ratio values are on average 8% lower (ranging from 19% lower to 5% higher) over the entire frequency range than the SSAR Table 2.5-27A V/H ratio values.

The comparison results provide justification that the V/H ratios given in NUREG/CR-6728 and used in SSAR Table 2.5-27A are appropriate for the North Anna ESP site. To maintain a hazard-consistent level in scaling the horizontal ground motions, the fractile level needed for the V/H ratio is between the 50th and 84th percentile. The exact percentile level would depend on frequency, site, design considerations, and judgment.

The site-specific analysis included the deaggregation information from the high frequency (i.e., 5-10 Hz) controlling earthquake only. If a more detailed analysis were performed, the deaggregation events from the low-frequency (i.e., 1-2.5 Hz) deaggregation would be included. In addition, the 5-10 Hz deaggregation events for distances greater than 75 km were included in the 75 km case. These factors would lead to a more conservative V/H ratio (shown in Figure 4) for the lower frequency range than for the higher frequency range.

**Table 1. S-wave profile, Poisson's ratio models, and corresponding P-wave profiles.**

| Thickness (m) | Base Case Vs (m/sec) | Model 1 Poisson's Ratio | Model 2 Poisson's Ratio | Model 1 P wave (m/sec) | Model 2 P wave (m/sec) |
|---|---|---|---|---|---|
| 2.286 | 1102 | 0.3340 | 0.4267 | 2207.4 | 3082.2 |
| 2.286 | 1199 | 0.3326 | 0.4253 | 2394.3 | 3326.5 |
| 2.286 | 1295 | 0.3313 | 0.4240 | 2578.1 | 3564.5 |
| 2.286 | 1391 | 0.3299 | 0.4226 | 2760.9 | 3799.2 |
| 2.286 | 1488 | 0.3285 | 0.4212 | 2944.6 | 4033.4 |
| 2.286 | 1584 | 0.3272 | 0.4199 | 3125.3 | 4261.8 |
| 2.286 | 1680 | 0.3258 | 0.4161 | 3305.0 | 4431.2 |
| 2.286 | 1777 | 0.3244 | 0.4062 | 3485.6 | 4471.7 |
| 2.286 | 1873 | 0.3230 | 0.3964 | 3663.4 | 4521.1 |
| 2.286 | 1969 | 0.3217 | 0.3866 | 3840.2 | 4579.0 |
| 2.286 | 2066 | 0.3203 | 0.3767 | 4018.0 | 4645.8 |
| 2.286 | 2162 | 0.3189 | 0.3669 | 4193.0 | 4715.5 |
| 2.286 | 2258 | 0.3176 | 0.3571 | 4367.1 | 4789.2 |
| 2.286 | 2355 | 0.3162 | 0.3473 | 4542.2 | 4868.4 |
| 2.286 | 2451 | 0.3108 | 0.3341 | 4678.2 | 4911.0 |
| 2.286 | 2547 | 0.2930 | 0.3097 | 4707.1 | 4850.8 |
| 2.286 | 2644 | 0.2752 | 0.2852 | 4747.4 | 4823.4 |
| 2.286 | 2740 | 0.2573 | 0.2608 | 4793.4 | 4816.5 |
| 2.286 | 2830 | 0.2500 | 0.2500 | 4901.7 | 4901.7 |

**Table 2. V/H Spectral Ratios**[1]

| Frequency (Hz) | 16th Percentile | 50th Percentile | Mean | 84th Percentile | SSAR Table 2.5-27A |
|---|---|---|---|---|---|
| .1000 | .4066 | .5161 | .5315 | .6552 | 0.75 |
| .2000 | .4164 | .5129 | .5245 | .6317 | 0.75 |
| .3000 | .4081 | .5005 | .5113 | .6138 | 0.75 |
| .4000 | .3936 | .4906 | .5030 | .6114 | 0.75 |
| .5000 | .3881 | .4965 | .5125 | .6350 | 0.75 |
| .6000 | .3926 | .5170 | .5381 | .6808 | 0.75 |
| .8000 | .4162 | .5654 | .5935 | .7682 | 0.75 |
| 1.0000 | .4325 | .5848 | .6119 | .7907 | 0.75 |
| 2.0000 | .3850 | .5281 | .5533 | .7246 | 0.75 |
| 2.5000 | .3787 | .5300 | .5583 | .7418 | 0.75 |
| 3.0000 | .3772 | .5268 | .5545 | .7359 | 0.75 |
| 4.0000 | .3838 | .5013 | .5192 | .6547 | 0.75 |
| 5.0000 | .3808 | .4887 | .5045 | .6273 | 0.75 |
| 6.0000 | .3748 | .4912 | .5094 | .6439 | 0.75 |
| 8.0000 | .3346 | .4712 | .4969 | .6635 | 0.75 |
| 10.0000 | .3046 | .4569 | .4913 | .6855 | 0.75 |
| 20.0000 | .3393 | .5263 | .5726 | .8162 | 0.83 |
| 25.0000 | .3593 | .5475 | .5919 | .8343 | 0.88 |
| 30.0000 | .3777 | .5727 | .6185 | .8682 | 0.94 |
| 50.0000 | .4176 | .6693 | .7380 | 1.0725 | 1.12 |
| 100.0000 | .4276 | .6329 | .6788 | .9366 | 1.00 |

[1] V/H spectral ratios for the 16th, 50th, and 84th percentiles, and mean from the site specific analysis and the V/H ratio values used in SSAR Table 2.5-27A at the 21 frequency points used in SSAR Table 2.5-27A. The site-specific results are based on the relative weights from the PSHA deaggregation and a weighting of 0.25 for P-wave Model 1 and 0.75 for P-wave Model 2.

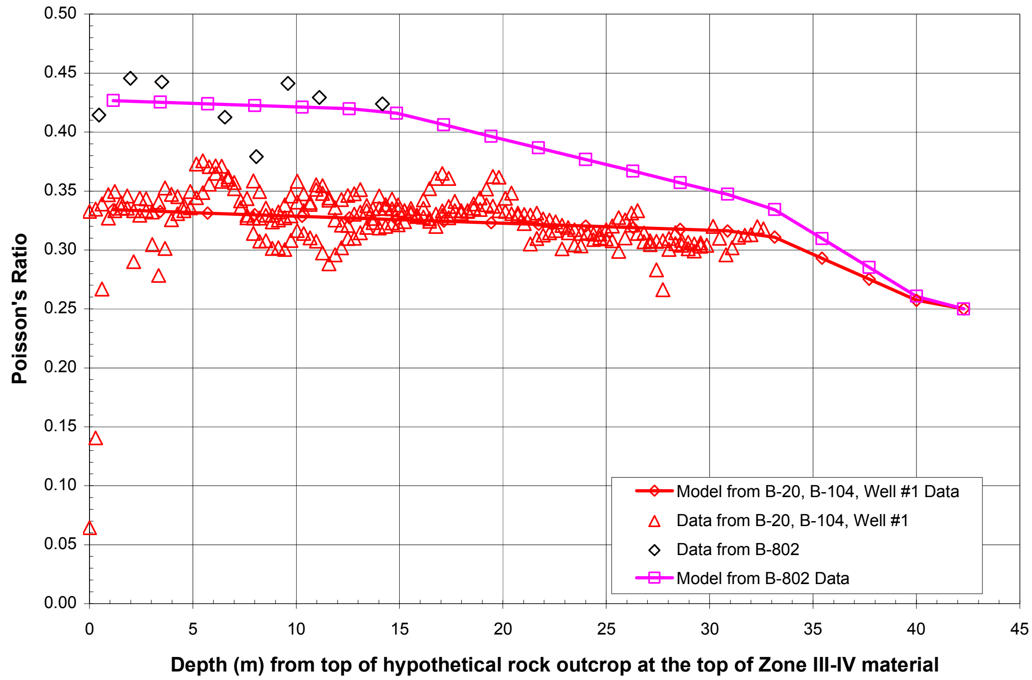



**Figure 1. Poisson's ratio data and fitting models, used to develop P-wave velocity models.**

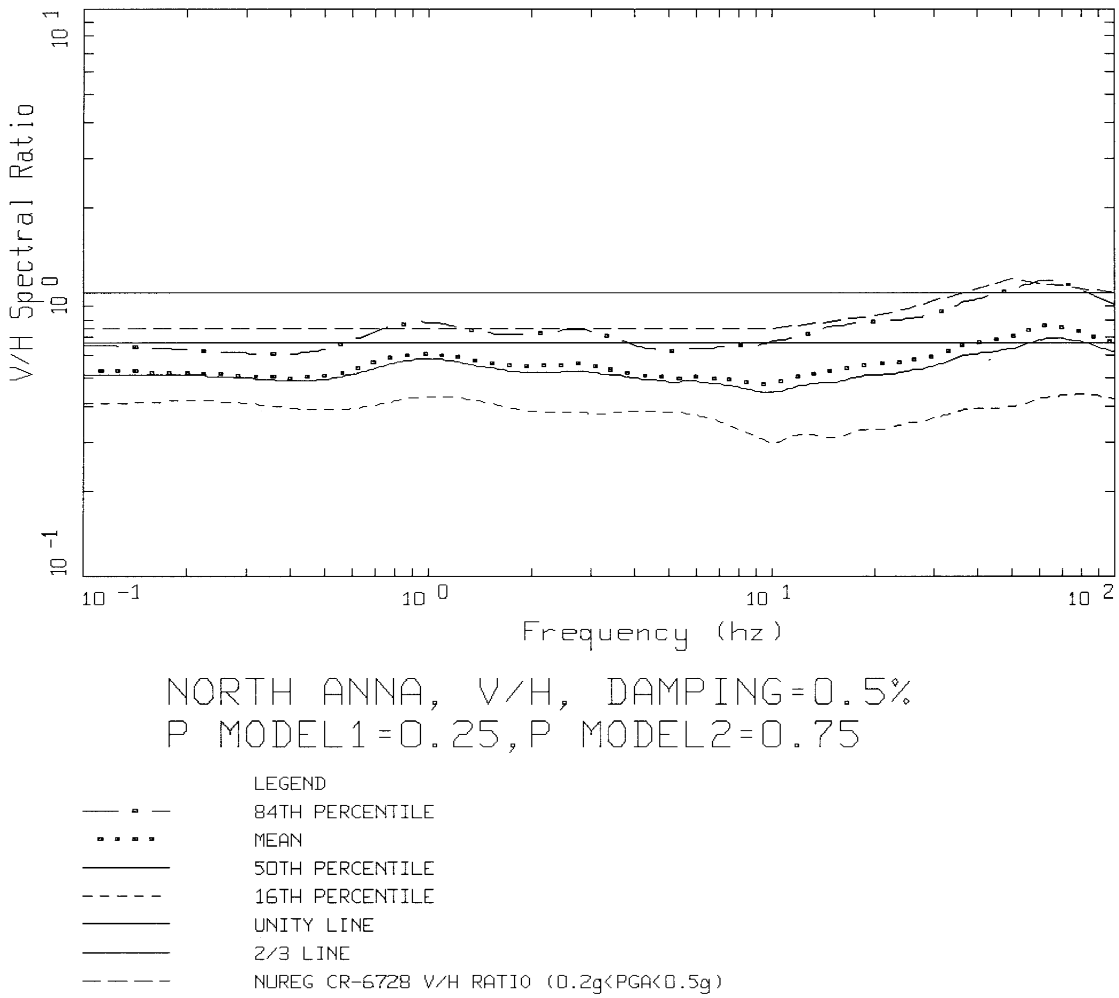



**Figure 2.** **V/H spectral ratios for the base damping level of 0.5% with a combined weighting of 0.25 and 0.75 for the P-wave Model 1 and 2, respectively. Median, mean, and plus and minus one-sigma (84th and 16th percentile) curves are shown. The NUREG/CR-6728 V/H ratio used in SSAR Table 2.5-27A is shown as a long dashed line for comparison.**

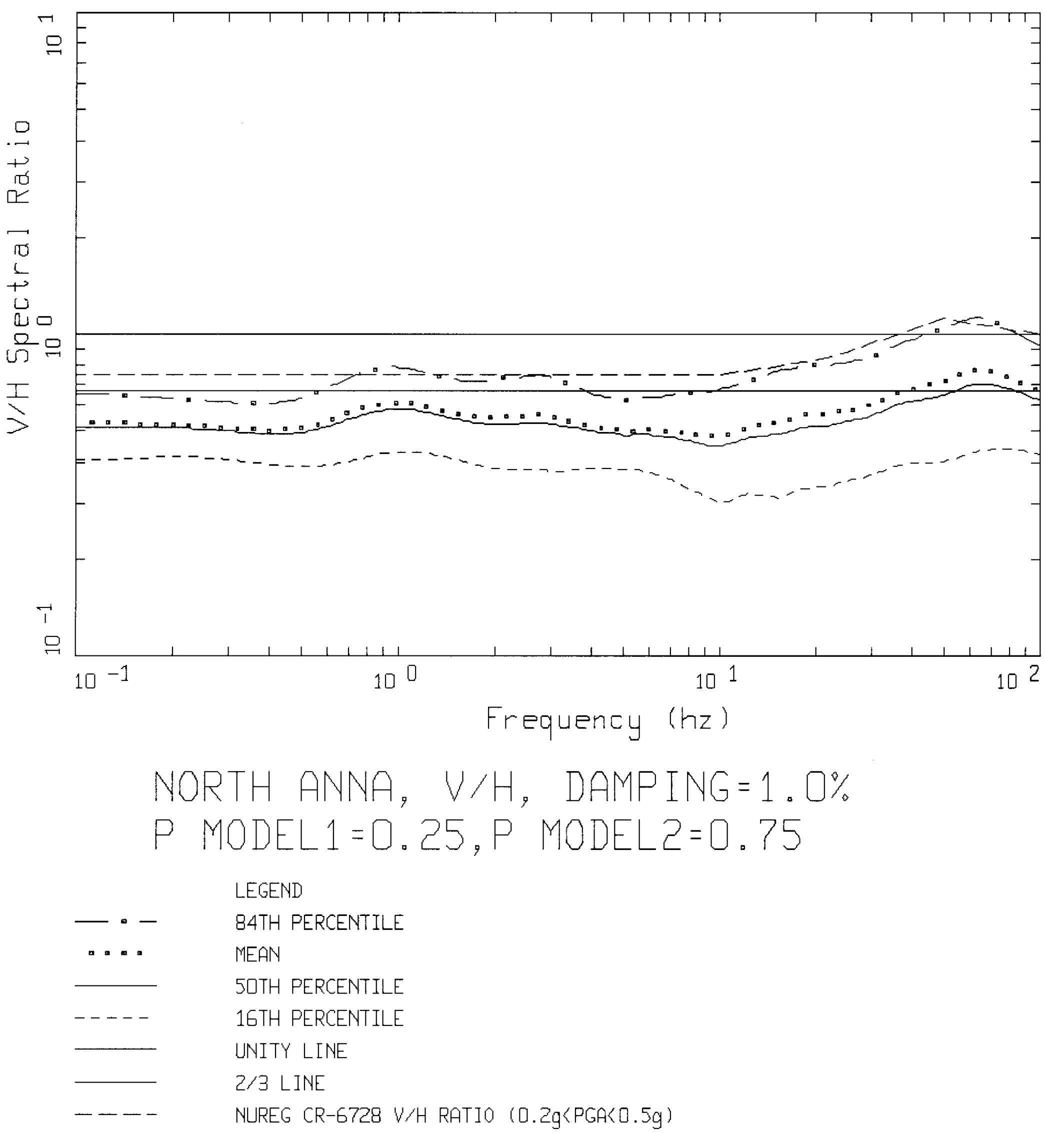



**Figure 3.** **V/H spectral ratios for the base damping level of 1.0% with a combined weighting of 0.25 and 0.75 for the P-wave Model 1 and 2, respectively. Median, mean, and plus and minus one-sigma (84$^{th}$ and 16$^{th}$ percentile) curves are shown. The NUREG/CR-6728 V/H ratio used in SSAR Table 2.5-27A is shown as a long dashed line for comparison.**

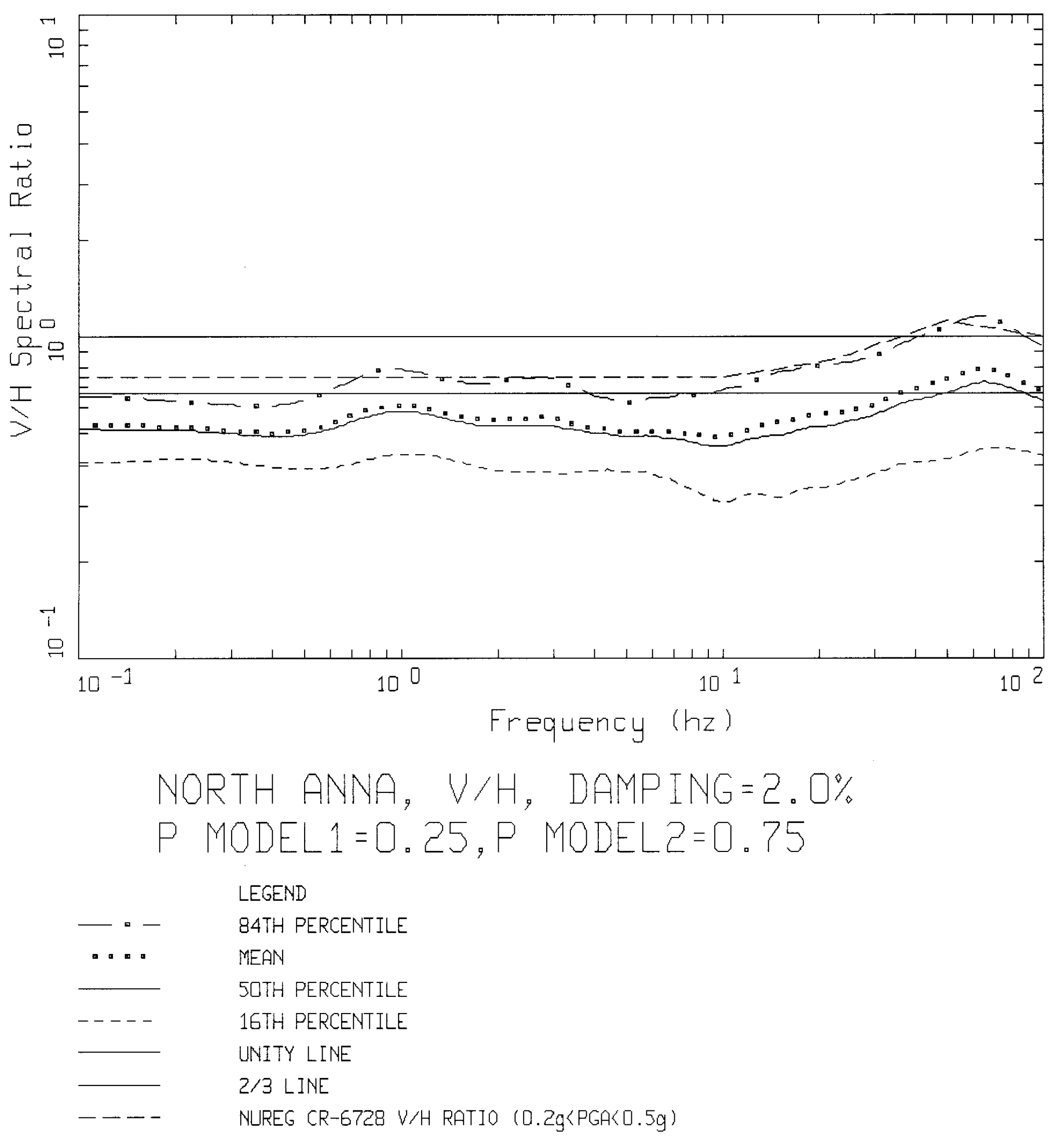



**Figure 4.** **V/H spectral ratios for the base damping level of 2.0% with a combined weighting of 0.25 and 0.75 for the P-wave Model 1 and 2, respectively. Median, mean, and plus and minus one-sigma (84$^{th}$ and 16$^{th}$ percentile) curves are shown. The NUREG/CR-6728 V/H ratio used in SSAR Table 2.5-27A is shown as a long dashed line for comparison.**

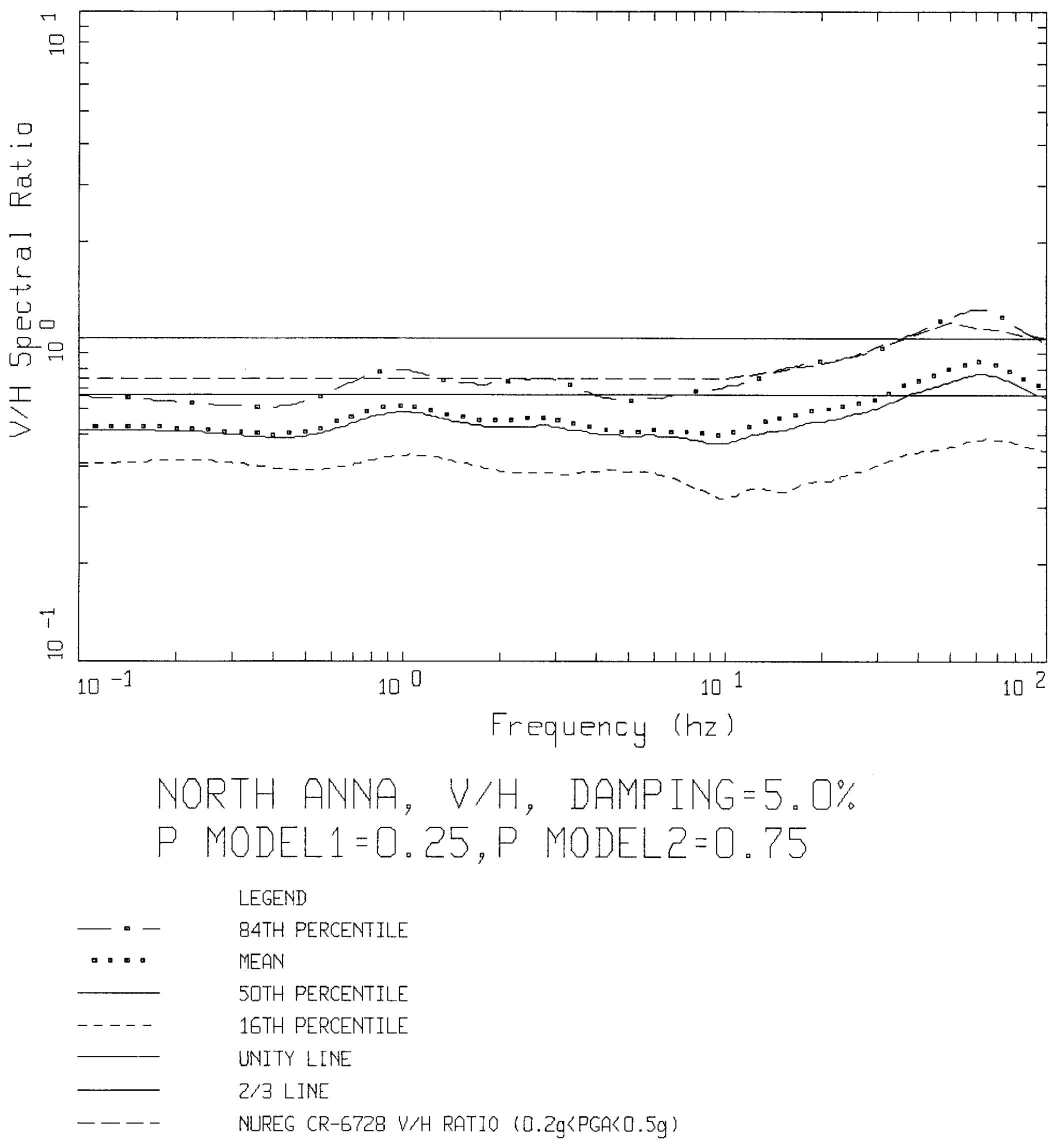



**Figure 5. V/H spectral ratios for the base damping level of 5.0% with a combined weighting of 0.25 and 0.75 for the P-wave Model 1 and 2, respectively. Median, mean, and plus and minus one-sigma (84th and 16th percentile) curves are shown. The NUREG/CR-6728 V/H ratio used in SSAR Table 2.5-27A is shown as a long dashed line for comparison.**

**Application Revision**

In Revision 5 of the ESP Application, SSAR Section 2.5.2.6.7.d has been revised to read as follows:

**d. Development of Vertical SSE Spectra**

Hard Rock SSE Spectrum

The applicable V/H ratios used to develop the selected vertical hard rock SSE spectrum (5 percent of critical damping) are listed in Table 2.5-27. The vertical SSE spectrum is calculated by multiplying the selected horizontal SSE spectral amplitude at each frequency by the applicable V/H ratio for that frequency. The selected horizontal and vertical spectra are plotted in Figure 2.5-48 for the hard rock SSE.

Zone III-IV Hypothetical Rock Outcrop Control Point SSE Spectrum

The horizontal SSE spectral accelerations, V/H ratios, and vertical SSE spectral accelerations for the Zone III-IV hypothetical rock outcrop control point are listed in Table 2.5-27A. The vertical SSE spectrum is calculated by multiplying the selected horizontal SSE spectral amplitude at each frequency by the applicable V/H ratio for that frequency. The selected horizontal and vertical spectra are plotted in Figure 2.5-48A.

To confirm the appropriateness of the V/H ratios listed in Table 2.5-27A, a site-specific analysis was performed. For the site-specific analysis, the stochastic point source model was used with an implementation of random vibration theory to model both horizontal and vertical spectra. The vertical ground motion was extended to consider P-SV waves. This approach has been used to develop the recommended V/H ratios in Reference 171 and has been shown to predict general trends in V/H ratios for earthquakes recorded in the Western United States. The model has been validated against empirical V/H ratio data from the 1989 Loma Prieta earthquake for rock site conditions.

Two site-specific P-wave profiles were developed that are consistent with the base shear wave profile used in the site analysis. These two P-wave profiles were developed by applying two Poisson's ratio models as a function of depth to the base shear wave profile. These two Poisson's ratio models are based on measured shear and compression wave data for the North Anna site, with the more recent data from the ESP investigation being assigned a larger weight of 0.75 and the older data from the investigation for Units 1 and 2 having a weight of 0.25 in the analysis. Both the horizontal and vertical ground motions were

computed assuming a linear response. Four magnitude-distance values and associated weights based on the 5-10 Hz PSHA deaggregation were used in the analysis to develop the horizontal and vertical ground motions. Relative weights for each of the four cases were used in combining the spectral ratios. A constant damping level of 2.0% was used. For each case, a total of 100 realizations were performed for both the horizontal and vertical ground motions. Statistics were computed for the suite of V/H spectral ratios. Additional damping levels of 0.5%, 1.0, and 5.0% were computed in a sensitivity study.

The results of the site-specific analysis confirm the appropriateness of the V/H ratios listed in Table 2.5-27A. Compared with the Table 2.5-27A values, the mean V/H ratios from the site-specific analysis are, on average, approximately 30% lower (ranging from 18-35% lower) over the complete frequency range of 100 Hz to 0.1 Hz. At the $84^{th}$ percentile, the site-specific V/H ratio values are on average 8% lower (ranging from 19% lower to 5% higher) over the entire frequency range than the Table 2.5-27A V/H ratio values.

The comparison results provide justification that the V/H ratios given in Reference 171 and used in Table 2.5-27A are appropriate for the North Anna ESP site. To maintain a hazard-consistent level in scaling the horizontal ground motions, the fractile level needed for the V/H ratio is between the $50^{th}$ and $84^{th}$ percentile. The exact percentile level would depend on frequency, site, design considerations, and judgment.

**Enclosure 2**

**Description of Changes in Revision 5
North Anna Early Site Permit Application**

| North Anna Early Site Permit Application<br>Description of Changes in Revision 5 | |
|---|---|
| **Affected Section, Table, or Figure** | **Reason for Change** |
| **Part 2 Chapter 2** | |
| • Section 2.5.2.6.7.d | Confirmatory analysis for V/H ratios; Reference Dominion's 7/20/05 Letter; Serial No. 05-457. |
| • Figure 2.5-55A | Replaced incorrect figure; Reference Dominion's 7/20/05 Letter; Serial No. 05-457. |

Dominion Nuclear North Anna, LLC
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Dominion®

April 13, 2006

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

Serial No. 06-273
ESP/JDH
Docket No. 52-008

**DOMINION NUCLEAR NORTH ANNA, LLC**
**NORTH ANNA EARLY SITE PERMIT APPLICATION**
**RESPONSE TO NRC QUESTIONS AND REVISION 6 TO THE NORTH ANNA ESP APPLICATION**

On February 10, 2006, NRC informed Dominion that it was conducting a review of the North Anna ESP Application Supplement submitted January 13, 2006. In its letter, the NRC noted that several key areas had been identified for which additional information was needed. On March 2, 2006, NRC documented the results of that review and identified specific information needs. Separately, on March 13, 2006, NRC requested information related to possible bald eagle nests reportedly in the vicinity of North Anna and requested that Dominion investigate the matter and provide the results when it submitted the next revision of the North Anna ESP application.

Dominion's response to the March 2, 2006 NRC questions and the separate March 13, 2006 request are provided in Enclosure 1. As described in Enclosure 1 the North Anna ESP Application has been revised, where appropriate, to incorporate changes resulting from both the January 13, 2006 supplement and subsequent NRC questions. A summary of the changes is provided as Enclosure 2. A CD containing Revision 6 of the application is provided as Enclosure 3. A CD containing MACCS2 computer code files (in response to NRC Question 14b) is provided as Enclosure 4.

If you have any questions or require additional information, please contact Tony Banks at 804-273-2170 or Joe Hegner at 804-273-2770.

Very truly yours,

Eugene S. Grecheck
Vice President-Nuclear Support Services

Enclosures:

1. Response to March 2 and March 13, 2006 NRC questions.
2. Summary of North Anna ESP Application Revision 6 changes.
3. One CD-ROM labeled, “North Anna Early Site Permit Application, Docket No. 52-008, September 2003; Revision 6, April 2006, NRC ADAMS Edition,” containing the following files:

001 North Anna ESP Application R6 (1 of 9).pdf; 8,450,087 bytes; publicly available
002 North Anna ESP Application R6 (2 of 9).pdf; 29,537,825 bytes; publicly available
003 North Anna ESP Application R6 (3 of 9).pdf; 49,775,907 bytes; publicly available
004 North Anna ESP Application R6 (4 of 9).pdf; 49,721,570 bytes; publicly available
005 North Anna ESP Application R6 (5 of 9).pdf; 46,242,534 bytes; publicly available
006 North Anna ESP Application R6 (6 of 9).pdf; 36,568,346 bytes; publicly available
007 North Anna ESP Application R6 (7 of 9).pdf; 41,520,610 bytes; publicly available
008 North Anna ESP Application R6 (8 of 9).pdf; 39,890,330 bytes; publicly available
009 North Anna ESP Application R6 (9 of 9).pdf; 33,186,644 bytes; publicly available

4. One CD-ROM labeled, “Title of Record: SM-1526 Rev 0, Add. N/A, dated 4-12-06,” containing multiple MACCS2 code input and output files.

Commitments made in this letter:

1. Provide NRC with a copy of information prepared by the U.S. Army Corps of Engineers (Question 4 response).
2. Inform NRC of stakeholder meeting results (Question 6a response).

Cc: (with Enclosures 1-3 except as noted)

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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 Support Services, of Dominion Nuclear North Anna, LLC. He has affirmed before me that he is duly authorized to execute and file the foregoing document on behalf of Dominion Nuclear North Anna, LLC, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 13TH day of April, 2006.

My Commission expires: May 31, 2006

Vicki L. Hull
Notary Public

(SEAL)

**Enclosure 1**
**Dominion Response to March 2 and March 13, 2006 NRC Questions**

**1. Drift (NRC 3/2/06 Letter)**

- **a. ER Table 3.1-9 — Include a plant parameter envelope (PPE) value related to cooling tower drift for the Unit 3 wet cooling tower.**
- **b. ER Table 3.3-1 — Include drift estimates for the cooling towers.**
- **c. ER Sections 3.4.1.1, 3.6.1 — Drift needs to be discussed in these sections.**
- **d. ER Section 5.1.1 — Drift should be included in the bullet list.**
- **e. ER Section 5.3.3.2.1 — Provide an evaluation of cooling tower drift and visible plumes.**

**1a Response**

A drift rate, based on a percent of cooling water flow has been added to the Design Parameters portion of ER Table 3.1-9

Application Revision

ER Table 3.1-9 is revised to reflect the above response

**1b Response**

Drift estimates, based on a percent of cooling water flow, have been added, as appropriate, to the tabulation of water use in ER Tables 3.3-1 and 3.3-2 for Units 3 and 4, respectively.

Application Revision

ER Tables 3.3-1 and 3.3-2 are revised to reflect the above response.

**1c Response**

For ER Section 3.4.1.1, the discussion has been revised to include the description that the make-up water is required in order to compensate for water lost from the closed-cycle cooling system due to evaporation, blowdown, and drift. In the energy conservation (EC) mode[1], these losses would be no greater than 1.67 E4 gpm for evaporation, 5.57 E3 gpm for blowdown, and 8 gpm for drift. In the maximum water conservation (MWC)

[1] EC and MWC modes are described in response to Question 3.

mode, these losses would be no greater than 1.15 E4 gpm for evaporation, 3.84 E3 gpm for blowdown, and 8 gpm for drift.

ER Section 3.6.1 discusses liquid plant effluents. The section indicates that discharges would occur due to the cooling tower treatment. In that context, the existing discussion is appropriate to describe the discharge from the cooling tower. Since the small drift loss is not a liquid effluent per se, it is more appropriately addressed in the air quality section of the ER (Section 5.3.3) and no changes to ER Section 3.6.1 are necessary. The response to Question 13 addresses the impact of drift loss.

Application Revision

ER Section 3.4.1.1 is revised to reflect the above response.

**1d Response**

The bulleted list in ER Section 5.1.1 has been updated to include both salt deposition and an explicit description of moisture dissipation (indicating that this is from evaporation and drift). In addition, the description of moisture dissipation in ER Section 5.1.1.2 has been modified to indicate that this is from evaporation and drift. ER Section 5.1.1.2 provides a reference to a more detailed description of the effects of the cooling towers in ER Section 5.3.3.

Application Revision

ER Sections 5.1.1 and 5.1.1.2 are revised to reflect the above response.

**1e Response**

An evaluation has been performed to quantify the fogging, icing, moisture and salt deposition, and visible plume which could be present as a result of the operation of the wet cooling towers. This evaluation was performed using the SACTI computer program, a tool first developed at Argonne National Laboratories to predict cooling tower plume behavior and effects. The evaluation, including methodology, significant assumptions, and results, is discussed in ER Section 5.3.3.2.1.

Application Revision

ER Section 5.3.3.2.1 is revised to include the description of the cooling tower impact evaluation. ER Tables 5.3-22 through 5.3-41 have been added to provide the results of the evaluation.

**2. Noise (NRC 3/2/06 Letter)**

**ER Section 5.8.1.2**

**This section concluded that the noise associated with the new cooling design would not cause adverse offsite impacts and that a noise study would be described in a future COL application. Make reasonable assumptions about the design and analyze the environmental impact, if the final design of the cooling system and the associated noise level is not known at ESP stage.**

**a. ER Section 3.1.5 states that operation of the cooling fans would produce noise below 60–65 dbA at the exclusion area boundary (EAB). Table 3.1-9 lists this noise level for the Unit 4 dry towers, but does not provide values for the Unit 3 or the Ultimate Heat Sink (UHS) towers. If all of the towers are running (Unit 3 dry and wet, Unit 4 dry, and the UHS towers), would the total noise level still be below 65 dbA at the EAB?**

**b. Provide the calculations and assumptions used to estimate noise levels at the EAB and the closest residence. Include initial sound levels (background and cooling towers), the number of sources, distances, and attenuation factors considered in reaching a conclusion but not included in the calculations.**

**<u>2a Response</u>**

ER Table 3.1-9 has been revised to reflect noise information for the Unit 3 wet and dry cooling towers. The values presented in this table for both Units 3 and 4 are not sound levels for an individual source. Rather, the values reflect the results of the evaluation which shows that the sound level at the nearest point on the EAB would be less than 65 dBA, which the NRC has defined as the significance level. The evaluation (which is described in ER Section 5.8.1.2) shows that the total sound level from the cooling towers is less than or equal to 65 dBA at the EAB with the Unit 4 dry cooling towers operating and either the Unit 3 dry and wet cooling towers operating (in the case of the MWC mode of operation) or the Unit 3 wet cooling towers operating (in the case of the EC mode of operation). The UHS (or service water) towers are considered operating in all conditions.

<u>Application Revision</u>

ER Table 3.1-9 and ER Section 5.8.1.2 are revised to reflect noise information for the Unit 3 wet and dry cooling towers.

**2b Response**

ER Section 5.8.1.2 has been revised to include the description of the methodology, the significant inputs and assumptions, and the results of the evaluation. The description includes the sound levels at the source due to cascading water, fans and fan motors. Since the sound levels at the EAB at the closest point to the cooling tower area will be dominated by the sound from the cooling towers, there is no background noise included in the evaluation. Also, no credit has been taken for attenuation (other than due to distance) from structures, vegetation, or the slight changes in terrain between the cooling towers and the EAB. Sound levels beyond the EAB were not evaluated since the evaluation showed that at the EAB the sound level was below the level characterized by the NRC as significant (65 dBA).

Application Revision

ER Section 5.8.1.2 is revised to include the description of the methodology, the significant inputs and assumptions, and the results of the evaluation. In addition, ER Section 5.3.4.2 is revised to provide details of the analysis program used for the noise impact evaluation.

**3. ER Section 3.4.1.1 (NRC 3/2/06 Letter)**

**Explain the statement: "The wet towers would incorporate water savings features to reduce evaporative water losses." Describe the associated design features and how they affect the amount of water used by the cooling towers.**

**3 Response**

The normal plant cooling system is a closed cycle system combining dry and wet cooling towers to provide the capability to reduce water consumption during drought conditions. The process flow diagram for the system is shown in the attached Figure. In the Maximum Water Conservation (MWC) mode of operation, heated cooling water leaving the plant main condenser would be cooled in a dry cooling tower section where a minimum of one-third of the heat would be rejected. The cooling water passes through the tubes of the dry cooler while fans move air across the outside of the tubes to transfer the heat to the air. After passing though the dry coolers, the water then passes through a wet cooling tower section, where the remaining heat is dissipated by spraying the water into an air stream, achieving the majority of the heat transfer by evaporation of a portion of the water. The cooled water then returns to the plant condenser to condense the steam leaving the turbines. When the system is in the Energy Conservation (EC) mode of operation, the dry tower fans are turned off with 100% of the cooling then provided using the wet tower section.

Several features are available for conserving water in wet cooling towers. A hybrid tower can be used that incorporates a dry cooling section into the top of the wet cooling tower. A portion of the water entering the tower passes through the tube side of a heat exchanger while air is drawn or forced over the tubes before mixing with the air that has passed through the wet section. This configuration increases the heat transfer due to convection and conduction and reduces the amount of evaporation required to achieve the desired return temperature to the condenser.

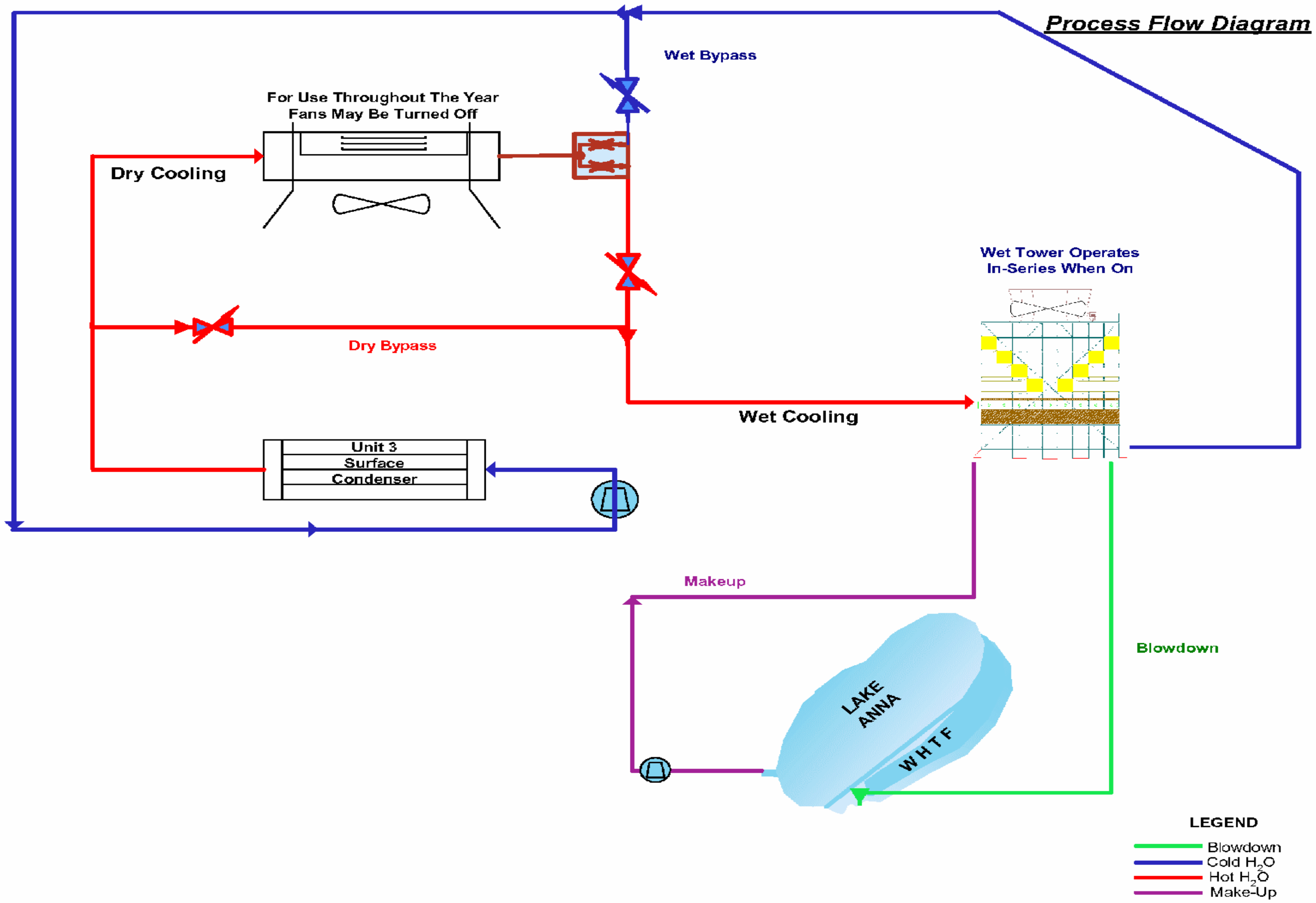
A variation of the hybrid tower uses a dry section above the wet tower section where cooler outside air is drawn in through ducts while the warm moist air from the wet section exhaust passes over the outside of the ducts. Water from the wet section exhaust condenses on the cooler dry section duct surfaces and falls back into the process stream before leaving the cooling tower, thereby reducing the water loss due to evaporation.

Additional means for saving water include using variable speed fans and pumps and adjustable louver settings to more accurately control air and water flow. These methods provide for controlling the heat rejection capacity of the tower and matching the load and ambient conditions without over-cooling at the expense of higher than required evaporation rates.

The performance characteristics of the cooling towers analyzed for Unit 3 are based on consideration of a model that incorporates such features.

Application Revision

ER Section 3.4.1.1 is revised to include the diagram of the cooling system shown in the attached Figure and to describe examples of the water saving features that could be used in the wet towers. The figure in the ER Section also includes a plant service water system described in the section.




**NORTH ANNA UNIT 3 CLOSED CYCLE CIRCULATING WATER SYSTEM DIAGRAM**

**4. Terrestrial Ecosystems (NRC 3/2/06 Letter)**

**ER Section 2.4.1.8, Wetlands**

**Are there any areas identified by Army Corp of Engineers (ACE) as jurisdictional wetlands under the Clean Water Act? If so, what protection or mitigation measures have been proposed or agreed to?**

**4 Response**

Wetlands delineation for the potentially affected areas was obtained by Dominion in November 2005. This information was presented to ACE [Army Corp of Engineers], and additional information was requested. Dominion is currently in the process of finalizing the survey information requested, and expects to present this to ACE by the end of April 2006 with a subsequent request for ACE confirmation. Following that, mitigation measures would be addressed as necessary. Dominion will provide a copy of the required delineation and survey documentation to NRC.

Application Revision

ER Section 2.4.1.8 is revised to reflect the above response.

**5. Aesthetic (NRC 3/2/06 Letter)**

**ER Section 5.8.1.5**

**Provide an evaluation of the aesthetic impacts of the moisture plumes from the cooling towers. Estimate by season (summer, fall, winter, spring) the approximate percentage of the time that the plume would be visible above the containment building and would extend more than 0.5 miles. Provide this information for two cases: 1) with the wet cooling towers operating 100% of the time in energy conservation (EC) mode and 2) with the wet cooling towers operating 100% of the time in maximum water conservation (MWC) mode.**

**5 Response**

The visible plume from the wet cooling towers has been evaluated for the Energy Conservation (EC) mode (i.e., only wet cooling towers operating) using the SACTI suite of computer programs. A description of the SACTI evaluation is provided in ER Section 5.3.3.2.1. In that section, frequency tables are provided of the predicted height and length of the visible plume as functions of wind direction and season of the year. Only the EC mode was evaluated because it represents the bounding case for the plume evaluation and, as long as there is adequate water supply to Lake Anna, it is the mode in which the plant would commonly be operated. Further, the visible plume is most probable and would be most pronounced in the late autumn through early spring; times when the plant is more likely to be operated in the EC mode.

A description of visual intrusion due to visible plume from the wet cooling towers has been included in ER Section 5.8.1.5 and a reference made to the evaluation description in ER Section 5.3.3.2.1.

Application Revision

ER Section 5.8.1.5 is revised to include the visual impact of the cooling tower plumes and to refer to the evaluation description in ER Section 5.3.3.2.1.

**6. Human Health (NRC 3/2/06 Letter)**

**ER Section 5.3.4.1**

**Recent correspondence with Virginia Department of Health (VDH, September 2005) addressed the health risks associated with exposure to Naegleria fowleri. Dominion stated in its supplement that it is working with State agencies to communicate the information related to risk that was provided in the VDH correspondence to residents around the waste heat treatment facility (WHTF).**

**a. Provide the details of the plan for communication regarding the risk from thermophilic organisms to the residents around the WHTF.**

**b. Provide an evaluation of the thermophilic micro-organisms in the basins below the wet cooling towers.**

**c. In view of the fact that the WHTF, although regulated as a private pond with a point of compliance at Dike 3, is also used for water-based recreation (especially swimming), specifically include an analysis of any health impacts of swimming in the WHTF. Include in your analysis the impacts related to the cooling water blowdown from the wet cooling towers that will be regulated as an internal source in accordance with 40 CFR 423.10.**

**<u>6a Response</u>**

With the changed cooling system, Unit 3 does not contribute to the risk of exposure to thermophilic organisms. Dominion, in concert with VDEQ and VDH, is exploring options to communicate to local residents information related to existing risks. The option(s) will be discussed at a stakeholder meeting to be scheduled in mid-2006. Dominion will inform NRC of the results of the meeting.

<u>Application Revision</u>

ER Section 5.3.4.1 is revised to reflect the above response.

**<u>6b Response</u>**

The makeup water to the plant cooling towers would be treated with a biocide (such as sodium hypochlorite). With this treatment, there would be no potential for growth of thermophilic micro-organisms in the plant cooling towers or water collection basin.

Application Revision

ER Section 5.3.4.1 is revised to reflect the above response.

**6c Response**

The chemistry of the circulating water in wet cooling towers is typically controlled through the use of additives. For example, typical treatment includes biocides to prevent fouling of heat exchanger surfaces by algae and other macroscopic organisms. Cooling tower water pH is adjusted with acid to discourage corrosion and the formation of scale. Other organic and inorganic corrosion inhibitors may be used in combination with an acid for pH control. Dispersants are commonly used to prevent the formation of deposits on the heat exchange surfaces.

Dominion would use treatment chemicals that have been tested for toxicity and determined to be protective of the environment and human health. The chemicals are added to the cooling tower water circulation system in concentrations in accordance with manufacturer's recommendations to ensure that they are below toxicity thresholds as defined by each chemical's Material Safety Data Sheet. Discharge limits are administratively controlled through the National Pollutant Discharge Elimination System (NPDES) permitting process which prescribes the concentrations that can be released to surface waters.

Although Dominion has not selected which chemicals would be added to the proposed cooling towers to control water chemistry, the following are common additives which are typically used:

Biocides-

- Sodium Hypochlorite
- Sodium Bromide (in combination with Sodium Hypochlorite)
- Bromonated Hydantoins (typically 1-bromo-3-chloro-5,5,-dimethylhydantoin, but others may be used)
- Isothiazolin (typically 5-chloro-2-methyl-4-isothiazoline, but others may also be used)

Corrosion Inhibitors-

- Organic and Inorganic Phosphates
- Tolytriazole (and potentially other azoles)
- Zinc Chloride or Zinc Sulfate

Dispersants-

- Polyelectrolytes & Organophosphates

Acid-

- Sulfuric Acid

The chemicals in these potential additives would be modeled against applicable EPA human health and aquatic life criteria to demonstrate that the concentrations of these chemicals in the WHTF would not exceed the criteria, and thus would not pose any risks to human health or the environment. None of the listed additives are identified priority pollutants defined in 40CFR423 with the exception of chlorine. The Total Residual Chlorine concentration of the cooling tower blowdown would be maintained to meet permit limits. Dominion would maintain adequate flow from the lake through the discharge canal (even if the existing units are not operating) to ensure that the water quality in the WHTF would not differ significantly from water quality of the North Anna Reservoir.

Application Revision

ER Section 5.3.4 is revised to reflect this text. ER Section 5.2.2.5 is revised to provide reference to the ER Section 5.3.4 discussion.

**7. Meteorology (NRC 3/2/06 Letter)**

**a. SSAR Section 2.3.2 and ER Section 2.7.4.1**

**Describe how potential increases in atmospheric moisture resulting from the operation of a wet cooling tower for proposed Unit 3 would impact onsite humidity data and provide a quantitative analysis for the potential for increased fog formation.**

**b. SSAR Section 2.3.2.3**

**Describe how potential increases in atmospheric temperature and moisture resulting from the operation of a closed-cycle dry and wet cooling tower system for proposed Unit 3 would impact plant design and operation.**

**c. ER Section 5.3.3.1**

**(1) What is the basis for the statement that “Salt deposition rates would be below the threshold value of 1 kg/ha/month beyond the site boundary at ground levels”?**

**(2) The supplement states: “In a COL application, when a specific reactor design is selected, a more detailed evaluation would be made of the fogging and salt deposition, and specific design consideration would be given to mitigate the effects of these phenomena or to eliminate them from occurring.” Provide the detailed evaluation of fogging and salt deposition, including any assumptions necessary to perform the analysis, so that the staff can reach its conclusion on the impacts of fogging and salt deposition. Include a discussion of mitigation if necessary.**

**(3) What are the “industry standard techniques for limiting fogging?”**

**(4) What is a “reasonable level” for fogging?**

**d. ER Section 5.3.3.2.1**

**The first sentence Section 5.3.3.2.1 states: “As concluded in Section 5.3.3.1, steam fog formation, drift and steam-fog-**

**induced icing conditions resulting from operation of the WHTF are very localized and infrequent at the NAPS site." Provide the justification for the above statement.**

**7a Response**

The normal atmospheric moisture content, as reflected by the relative humidity, is discussed in SSAR Section 2.3.2.2 and ER Section 2.7.4.1.4. The relative humidity that is reported is from the National Weather Service first order station at Richmond. The appropriateness of the use of Richmond data has been confirmed in a comparison of dewpoint temperatures from the North Anna site and Richmond. Over a 10 year period, the annual average dewpoint temperatures from the two locations were found to be very comparable, with the dry bulb and dewpoint temperatures for North Anna typically 1 – 2 degrees lower than the corresponding Richmond temperatures.

The operation of the wet cooling towers for Unit 3 may result in moisture deposition in the immediate vicinity of the towers due to drift and condensation of vapor near the discharge at the top of the towers. In addition, periodic fogging may occur around the towers when atmospheric conditions are so conducive. ER Section 5.3.3.2.1 provides a description of the environmental impact of the cooling towers. That evaluation includes a determination of the cooling tower induced fogging as a function of both distance from the towers and season of the year. The evaluation shows that the cooling tower induced fogging is predicted to occur an average of 70 hours per year (in addition to the naturally occurring atmospheric fog), with nearly all occurrences during the cooler seasons of the year, from late autumn through early spring. Therefore, the impact of the cooling tower induced fogging would be small.

Application Revision

SSAR Section 2.3.2.2.1 is revised to include a description of the normal relative humidity at the NAPS site. SSAR Section 2.3.2.3 has been revised to include a discussion of the impact of the operation of the wet cooling towers on the onsite atmospheric moisture.

**7b Response**

The warm moist air-water vapor mixture (from the wet cooling towers) and the warm dry air (from the dry towers), would tend to rise as it exits from the cooling towers. Although the prevailing winds at the site are generally not in the direction from the cooling tower area toward the plant (as contained in the ESP PPE area), there may be occasions when the wind would direct the warm air or air/vapor mixture towards the plant. Under low velocity wind conditions, the air or air/vapor mixture would tend to rise above the elevation of the plant structures as it moves

the distance from the cooling tower area to the PPE area. Under higher velocity conditions, when the air or air/vapor plume would be forced directly toward the plant, the velocity-induced turbulence would typically cause the plume to dissipate before reaching the plant. Since the specific design of the cooling towers and their exact location within the land designated for the towers has not been determined, and because the specifics of the plant design (including such details as HVAC intake locations) can not be finalized until the reactor technology has been selected and the placement and orientation of the plant(s) within the PPE has been decided, the potential impact on the design or operation of the new units will be considered as part of detailed engineering.

Application Revision

SSAR Section 2.3.2.3 is revised to clarify that the commitment to consider potential impact on the design or operation of the new units is applicable to both Unit 3 and Unit 4 cooling towers as appropriate.

**7c(1) Response**

The statement concerning the salt deposition rates is based on an analysis of the wet cooling towers using parameters that are bounding and fairly representative of the performance of types of tower that could be used for the new Unit 3. A full description of the analysis is provided in ER Section 5.3.3.2.1. Since the results of the analysis are more appropriately included with the discussion of the bases and methodology of the analysis, the above referenced statement concerning salt deposition rates has been deleted from Section 5.3.3.1.

Application Revision

ER Section 5.3.3.1 is revised to reflect the above response.

**7c(2) Response**

A full description of the analysis is provided in ER Section 5.3.3.2.1. A statement has been added to ER Section 5.3.3.1 to refer to ER Section 5.3.3.2.1.

Application Revision

ER Section 5.3.3.1 is revised to reflect the above response.

**7c(3) Response**

While the design of the cooling towers may include features that will limit drift and plume, specific cooling tower design selection has not yet been made. The analysis of fogging, icing, salt deposition, and plume formation, as described in

ER Section 5.3.3.2.1 is based on a bounding set of parameters. The sentence in ER Section 5.3.3.1 which says: "Industry standard techniques would be employed during final design to limit fogging to be within reasonable limits" has been deleted.

Application Revision

ER Section 5.3.3.1 is revised to reflect the above response.

**7c(4) Response**

See response to 7c(3).

Application Revision

ER Section 5.3.3.1 is revised to reflect the above response.

**7d Response**

The statement concerning steam fog formation, drift, and steam-fog-induced icing is based on general observations by plant personnel at the North Anna site under current conditions (with Units 1 and 2 operating). The above referenced statement in ER Section 5.3.3.2.1 has been retained. The statement in ER Section 5.3.3.1 has been revised to clarify that:

1. the conclusions of the infrequent and localized nature of the conditions are based on general observations, and
2. the additional heat to the WHTF from the blowdown from the Unit 3 cooling towers is negligible compared to the heat dissipation from the existing units and, therefore, would not contribute to fogging, drift, or icing conditions on and around the WHTF.

Application Revision

ER Section 5.3.3.1 is revised to reflect the above response.

**8. Land Use (NRC 3/2/06 Letter)**

**a. SSAR Section 2.3.2.4 and ER Section 2.7.4.1.7**

**A sentence in the last paragraph of SSAR Section 2.3.2.4 and ER Section 2.7.4.1.7 states: "No large-scale cut and fill activities would be needed to accommodate the new units since a large portion of the area to be developed is already relatively level." Given the additional land area that the wet and dry towers for Unit 3 will use in comparison to a once through cooling system, confirm or revise the above statement.**

**b. ER Section 4.1**

**Given the change in cooling system for Unit 3, is the total land area to be used shown in Section 4.1.1.4 and Table 4.1-2 of the ESP environmental report still the same? Will the overall footprint of the cooling towers, including areas that will be cleared to support construction and laydown areas, etc., fit within the 55 acres previously identified as the cooling tower area. If not then, provide updated land use figures.**

**c. ER Section 5.3.3.2.2**

**What is the expected atmospheric temperature rise at the vegetation level at the NAPS site boundary?**

**8a Response**

The defined ESP Plant Parameter Envelope area is relatively level and undulating surfaces in the area of the planned cooling towers would be leveled to accommodate the towers.

Application Revision

SSAR Section 2.3.2.4 and ER Section 2.7.4.1.7 are revised to better define the topography in these two areas and the necessary cut and fill activities in the cooling tower area.

**8b Response**

The ESP Cooling Tower area as depicted in SSAR Figure 1.2-4 and ER Figure 3.1-3 in Revision 5 of the ESP has not changed as a result of the changes described in the Supplement.

The depicted Cooling Tower area is highly dependent on the selected cooling tower design, e.g., conventional tower rows vs. a round arrangement, and each unit's cooling tower duty. For purposes of evaluating the potential environmental impacts from Unit 3 cooling, Dominion has used an upper bound estimate of land-use assuming the bounding PPE condenser duty and a conservative design consisting of single row wet type towers with full capacity cooling and horizontal, flat panel dry fin-fan towers with 1/3 capacity cooling (both towers were sized for design summer conditions). The depicted cooling tower area accommodates the bounding land use estimate. Utilization of taller alternate tower designs would allow more cooling capacity within a smaller area of the defined cooling tower area and would be considered during development of the site plan at the time of the COL application. In evaluating the environmental impacts that are affected by tower height, Dominion has used the height of the taller alternatives to ensure that the impacts are bounded.

Application Revision

None.

**8c Response**

The statement previously made concerning the small temperature increase around the tower was based on engineering judgment and general industry experience (as relayed by various cooling tower vendors). The statement in Section 5.3.3.2.2 has been revised to clarify that the conclusion of small and localized temperature increase is based on industry experience. In addition, the statement concerning the potential beneficial effect on vegetation in the immediate vicinity of the towers has been deleted.

Application Revision

ER Section 5.3.3.2.2 is revised to reflect the above response.

**9. Construction (NRC 3/2/06 Letter)**

**ER Table 3.1-1 and Table 3.1-9**

**Confirm that the number of construction personnel (combined maximum of 5000 for two units) is the same as originally stated, the number of operating personnel is still 720 for the two new units, and that the number of additional outage personnel is still 700-1000. If these numbers have changed, provide the new values, and make adjustments to the corresponding values in all of the sections of the ER that depend on these values.**

**9 Response**

The original estimates as reflected in ER Tables 3.1-1 and 3.1-9 have been based on a conservative set of assumptions for construction and operation of the new units (e.g., simultaneous construction activity on Units 3 and 4, no credit for offsite modular construction, full operating staffs for each of the new units in independent and simultaneous operation). The potential change in the size and complexity of the plant (at a higher power level and with cooling towers instead of once-through cooling) does not cause a change in the construction and operation personnel estimates. No changes are required to the tables in the Application.

Application Revision

None.

**10. Hydrology/Water Use and Quality (NRC 3/2/06 Letter)**

a. **PPE Table 3.1-1 includes cooling water temperature rise. Explain why this value is relevant as a PPE value for a cooling tower design.**

b. **In Site Characteristics and Design Parameters Table 3.1-9, a 96 percent plant capacity factor was used to define the average evaporation rate. Explain how the average was estimated. What would be the average at 100% load factor? Justify why a load factor of 96% (and 93% for existing units) would be appropriate during critical periods (e.g. dry summers, droughts).**

c. **Provide a copy of Dominion's response to the questions regarding water use and quality and aquatic impacts in the Commonwealth of Virginia's January 31, 2006, letter.**

d. **Provide a water quality analysis in sufficient detail for the staff to establish the magnitude of potential water quality impacts and weigh the environmental effects of degradation, if any, in water quality as a result of the new cooling systems.**

e. **Dominion established 250 mean sea level (MSL) as the lake level setpoint for shifting between energy conservation and water conservation modes. Provide documentation of the basis for selecting this setpoint and the 7 day lag before the shift in modes is implemented. If any studies were conducted to assess the impact of increasing or decreasing this setpoint, provide a description of the studies.**

f. **The volume of water in Lake Anna could be reduced due to evaporation from Unit 3's wet tower. This reduction in lake volume could result in less water volume in the lake to disperse the heat from Units 1 and 2 and therefore some increase in lake temperature. This indirect increase in lake temperature would cause some increased evaporation from the lake. Provide documentation demonstrating that this indirect increase in lake temperature and evaporation is insignificant or quantify the increase in temperature and evaporation.**

g. **Provide an electronic copy of the analysis spreadsheet used to estimate the lake level and downstream flow impacts.**

**h. Quantitatively define the relationship between meteorological conditions and the percent of heat load being dissipated via dry towers in the water conservation mode.**

**i. SSAR Section 2.4.11.3 discusses consumption of additional water and outflow from the dam. Provide an analysis of the number of additional days of reduced downstream flow that might result from operation of Unit 3.**

**j. Define when the cooling system would be placed into the MWC mode (an example of the time period, "e.g., 7 days," is not sufficient).**

**k. Provide the maximum amount of water Unit 3 would consume when operating at the following lake levels: above 250 MSL, between 248 and 250 MSL, and below 248 MSL. Based on the above water use, evaluate the impact on lake level and downstream users.**

**l. Provide further analysis on Unit 3 alternative 6 (dry cooling) in light of the proposed wet and dry hybrid cooling system. Include in your analysis the environmental impacts of the efficiency penalty of dry cooling (increased fuel consumption) versus the base case of combination wet and dry cooling towers.**

**m. With respect to SSAR Section 2.4, the ESP application supplement changed the normal plant cooling system for proposed Unit 3 from a once-through system to a wet and dry hybrid cooling tower system.**

**(1) Provide a conceptual description of the hybrid cooling tower system, its interaction with safety-related components, and an assessment of the reliability of this system.**

**(2) Describe how the hybrid cooling towers function for the normal cooling system (NCS) for the plant, and whether or not the NCS draws water from the ultimate heat sink (UHS) underground reservoir. If so, show how the remaining volume of water in the UHS reservoir will be adequate for a 30 day cooling water supply for safety system cooling.**

**(3) In order to show that there is no abrupt or frequent reliance on the UHS, provide an estimate of the frequency of reliance on the UHS due to various failure modes of the hybrid NCS.**

**(4) Any increase of the required lake water surface elevation above 250 ft MSL would necessitate staff re-evaluation of the probable maximum flood elevation at the proposed ESP site. If the lake water surface elevation is increased above 250 ft MSL, identify the increase and provide an analysis of the probable maximum flood (PMF) for the new and increased lake level.**

**10a Response**

The referenced PPE item, “Cooling Water Temperature Rise,” is a vendor-supplied PPE value defined in the Once-Through Cooling section of PPE Table 3.3-1. It is not relevant to a plant with a cooling tower design. This section in the ESP Supplement was revised only to remove the once-through cooling operational clarification previously added (when once-through cooling was the planned method of cooling for Unit 3) and to return the description to its original PPE Table wording.

Application Revision

None.

**10b Response**

The average evaporation rate from the wet towers is based on the long term average water consumption for the described cooling tower operating plan and a bounding 96% plant capacity factor from the reactor vendors’ input to the PPE Table. The average evaporation rate at a 100% capacity factor would be the 96% value divided by 0.96.

The average evaporation rate reflecting the bounding PPE capacity factor is the appropriate value to use in the water budget model to evaluate the long term water use impact of Unit 3. While the plant capacity factor is indicative of long term average operation, the plant would likely operate at 100% capacity on any given day when it is in operation.

Apart from the above response, it should be noted that, in order to reflect the evaporation rate contribution of 404 gpm from the Service Water System cooling tower, the average evaporation rate from all normal plant cooling wet towers is

revised from 8303 gpm to 8707 gpm. The 100% value discussed above would be 9070 gpm.

Application Revision

"Evaporation Rate" average value in "Normal Plant Heat Sink" section of ER Table 3.1-9 is revised.

**10c Response**

A response to the Commonwealth of Virginia's January 31, 2006 letter was provided to VDEQ on March 31, 2006. A copy of the information submitted to VDEQ was sent to the NRC on April 3, 2006.

Application Revision

None.

**10d Response**

Refer to Question 6c response. As noted in response to Question 6c, chemicals would be applied in small amounts to ensure that they are below toxicity thresholds as they enter the discharge canal. Further, as noted in the response provided for RAI 6c, Dominion would maintain adequate flow from the lake through the discharge canal (even if the existing units are not operating) to ensure the water quality in the WHTF would not differ significantly from water quality of the North Anna Reservoir.

Application Revision

None.

**10e Response**

The basis for selection of a lake level of 250 ft. MSL as the setpoint for shifting between Energy Conservation (EC) and Maximum Water Conservation (MWC) modes is that this level is the normal lake level. The normal lake level of 250 ft. MSL has been in place since Lake Anna was originally formed more than two decades ago and has been the basis for innumerable lake-related decisions (e.g., home and dock locations, as well as other improvements).

If the level of the lake can be maintained at the normal 250 ft. MSL with the higher evaporative loss from using 100% wet towers and no dry cooling, while maintaining at least 40 cfs downstream flow, then water is available to operate in the EC mode. When the level of the lake decreases below 250 ft. MSL, the

downstream discharge flow from the dam is reduced to a minimum of 40 cfs. The decrease in lake level below the 250 ft. elevation indicates that water needs to be conserved.

The seven day waiting period before switching from EC to MWC mode is an assumption of the water budget model that allows time to restore the level of the lake to 250 ft. MSL before realigning equipment for the MWC mode. A reasonable time period is necessary to allow for short term level variations that may be corrected through an intervening event (e.g., rain) or reduction of downstream discharge to a minimum of 40 cfs. This period also minimizes changes in equipment alignments and impacts on operating staff and provides planning and coordination time for communications with the transmission entity. Although a seven day waiting period was assumed for the analysis, the actual timeframe would be established with the Virginia Department of Environmental Quality (VDEQ) at the time of permitting by the Commonwealth of Virginia.

The VDEQ requested Dominion to perform additional analyses to assess the effect of changing the normal lake level and the Contingency Plan level. The Contingency Plan is initiated if the lake level is less than 248 ft. MSL, below which the minimum flow is reduced from 40 cfs to 20 cfs in 5 cfs increments per approximately 24 hours. The objective of the VDEQ staff request was to determine what variance in normal or Contingency Plan level would fully mitigate the impact of the additional consumption from a proposed Unit 3. The impact considered was the duration of time (expressed in percent) the lake was projected to be below the Contingency Plan level, and thus the downstream flow at the minimum 20 cfs. The results indicate that the normal lake level would need to be raised approximately 7 inches or the Contingency Plan level reduced about 6.5 inches to maintain the frequency at which the 20 cfs downstream flowrate occurs no more than is currently experienced with Units 1 and 2. The results of these studies were contained in a March 31, 2006 letter to the VDEQ and were provided to the NRC at the same time.

<u>Application Revision</u>

References to a reasonable time period before the cooling system is placed in the MWC mode as "e.g., 7 days" are deleted. The text is revised to indicate that 7 days was assumed for analysis; however, the actual timeframe will be established with VDEQ at the time of permitting. ER Sections 3.4.1.1, 5.2.1.3, and 5.2.2.4 are revised to reflect the above response.

**<u>10f Response</u>**

The reduction in lake level and lake volume due to the water consumption of the wet towers of Unit 3 would have a very small impact on the lake temperature and lake evaporation. The impact has been evaluated by considering the heat

balance of incoming energy and outgoing energy in the lake. Incoming energy includes the waste heat loading from Units 1 and 2, solar shortwave and atmospheric longwave radiation. Outgoing energy is in the form of evaporative heat loss, back radiation and conductive heat loss. The average drop in lake level due to Unit 3 has been estimated to be 0.11 ft according to the water budget model, which would result in a reduction in the lake surface area of about 40 acres. For the same meteorological condition, the incoming radiation fluxes (both shortwave and longwave) per unit lake area would remain unchanged. With a lower lake level, there would be less effective lake surface area to dissipate the same heat loading from the two existing units leading to a potential increase in the water temperature. The outgoing heat fluxes would increase in response to the water temperature increase as well. From a long-term heat balance basis, the overall impact on the lake temperature and the evaporation rate is small. The average increase in water temperature of the cooling lake due to the reduced lake level from Unit 3 has been estimated to be less than 0.1 $^{o}$F. The corresponding increase in the evaporation flux from the lake has been estimated to be less than 0.2-0.4% over the effective cooling lake area. However, when considering that the effective lake area would be reduced by 40 acres, the result would be a small savings of the order of 0.1 cfs in the evaporation due to the reduction in natural evaporation loss.

Application Revision

ER Section 5.2.2.1.3 of the application is revised to state that the impact on lake temperature and evaporation due to Unit 3 would be negligible.

**10g Response**

An electronic copy of the water budget spreadsheet calculation was provided to NRC on March 8, 2006.

Application Revision

None.

**10h Response**

In the Maximum Water Conservation (MWC) mode, the dry tower would have the capacity to remove 33 percent of the design condenser heat duty at a design dry bulb temperature (DBT) of 95°F (the 0.4% exceedance DBT for the site). As the DBT decreases, the percentage of heat which can be removed by the dry tower would increase proportionately, until at some lower DBT, the dry tower will have the capability of removing the entire condenser heat duty.

Application Revision

ER Section 3.4.1.1 is revised to provide this additional detail.

**10i Response**

Table 5.2-3 of the ER reports the outflow frequency (percent of time) for the existing 2-unit operation and the future operating condition with the new Unit 3. Outflow frequency (versus additional days) is a more appropriate measure of the reduced downstream flow that might result from operation of Unit 3.

Application Revision

The last paragraph of SSAR Section 2.4.11.4 is revised to include a reference to ER Table 5.2-3.

**10j Response**

See response to question 10e.

Application Revision

References to a reasonable time period before the cooling system is placed in the MWC mode as “e.g., 7 days” are deleted. The text is revised to indicate that 7 days was assumed for analysis; however, the actual timeframe will be established with VDEQ at the time of permitting. ER Sections 3.4.1.1, 5.2.1.3, and 5.2.2.4 are revised to reflect this response.

**10k Response**

When the lake level is at or above 250 ft msl, Unit 3 would be operated in the Energy Conservation (EC) mode. The maximum instantaneous evaporation rate for a new unit running in EC mode would be 16,695 gpm (37.2 cfs) (ER Table 3.1-9). When lake levels fall below 250 ft msl, Unit 3 would be operated in the Maximum Water Conservation (MWC) mode. The maximum instantaneous evaporation rate for a new unit running in MWC mode would be 11,532 gpm (25.7 cfs) (ER Table 3.1-9). These maximum instantaneous evaporation rates are design values based on the maximum site ambient condition (0.4% annual exceedance). These are not appropriate values for use to represent the long-term water use in evaluating lake level and downstream flow impact as they would not be sustainable over even a short duration of time such as a day for the ESP site meteorological conditions.

Based on site meteorological data and water budget modeling, the maximum weekly evaporation rate from Unit 3 when lake level is at or above 250 ft MSL would be 34.2 cfs. When lake level is below 250 ft msl, the maximum weekly average evaporation rate from Unit 3 is estimated to be 23.4 cfs.

Application Revision

None.

**10l Response**

The analysis of cooling system alternatives has been revised to properly reflect the environmental impacts of the dry cooling tower system compared to the wet and dry cooling tower system. The evaluation considers the increased power consumption required to operate the dry towers, the reduction in plant efficiency, especially during periods of high ambient dry bulb temperatures, and the increased land requirement associated with the dry tower system. The revision to the analysis does not change the conclusions that, for Unit 3, the combination wet and dry cooling tower system is the preferred cooling alternative.

Application Revision

ER Section 9.4.1.1.2 and Tables 9.4-2, 9.4-3, and 9.4-6 are revised to reflect this response.

**10m(1) Response**

A conceptual description of the cooling system and its function as the normal cooling system is provided in the response to question 3.

The system consists of dry and wet cooling tower sections with the required piping, valves, fans, and pumps to meet the design objective of heat rejection from the station main condenser and auxiliary cooling heat exchangers. There is no interaction of the system with any safety-related system, component or structure. There are no interconnections with or reliance on any safety-related systems, including emergency cooling systems or the Ultimate Heat Sink (UHS), if a UHS is required. The cooling towers would be located such that the separation distance from safety-related structures is sufficient to preclude any physical interaction resulting from a postulated collapse of the cooling tower structure. The cooling tower system is typical for steam power plants and would be designed with sufficient margin of capacity to provide a level of reliability consistent with the requirements of power generation.

<u>Application Revision</u>

SSAR Section 2.4.1.1 is revised to reference the cooling system description in ER Section 3.4.1.1. SSAR Section 2.4.7.2 is revised to provide a clarifying statement that there is no system interconnection or reliance between normal and emergency cooling.

**10m(2) Response**

A conceptual description of the cooling system and its function as the normal cooling system is provided in the response to question 3. The source of makeup to the system is provided from Lake Anna. The system blowdown is routed to the Waste Heat Treatment Facility (WHTF) via the discharge canal. There is no reliance of the normal cooling system on the UHS, if a UHS is required, and therefore no effect on the 30 day cooling water supply for safety system cooling.

<u>Application Revision</u>

SSAR Section 2.4.1.1 is revised to reference the cooling system description in ER Section 3.4.1.1. SSAR Section 2.4.7.2 is revised to provide a clarifying statement that there is no system interconnection or reliance between normal and emergency cooling.

**10 m(3) Response**

The normal cooling system is a non-safety system for which typical failure modes for system components would include such events as fan failures and tube leaks. These types of failures affect incremental capacity of the system but would not result in a complete loss of condenser cooling or any reliance on safety systems. Additionally, adequate capacity margins in the system would ensure that these failures do not significantly affect the reliable generation of electric power. Therefore, a complete loss of normal cooling is highly unlikely, and thus there is no abrupt or frequent reliance on the UHS, if a UHS is required.

<u>Application Revision</u>

SSAR Section 2.4.1.1 is revised to reference the cooling system description in ER Section 3.4.1.1. SSAR Section 2.4.7.2 is revised to provide a clarifying statement that there is no system interconnection or reliance between normal and emergency cooling.

**10m(4) Response**

An increase of the lake water surface elevation above 250 ft. MSL is not being proposed at this time. As stated in the response to question 10e, VDEQ requested additional analyses, including raising the normal lake level to eliminate the effects of water consumption by a proposed Unit 3. Dominion does not believe that raising the normal lake level is a desirable means of fully mitigating the increase in frequency of times when the downstream flow is at a minimum of 20 cfs. The additional impacts of this solution are discussed in the response to question 16f.

Application Revision

SSAR Section 2.4.1.1 is revised to reference the cooling system description in ER Section 3.4.1.1. SSAR Section 2.4.7.2 is revised to provide a clarifying statement that there is no system interconnection or reliance between normal and emergency cooling.

**11. ER-Aquatic Impacts (NRC 3/2/06 Letter)**

a. **Section 5.2.2.2 states that the frequency of reduced flow from the dam would increase. Provide an analysis of the impact on fish and other aquatic communities in the North Anna River downstream of the dam. Specifically, address how the reduced water flow rates would affect environmental conditions at known striped bass spawning habitat areas during the striped bass spawning season.**

b. **Dominion's RAI response dated April 12, 2005, stated that Dominion planned to provide assistance to aid the Virginia Department of Game and Inland Fisheries (VDGIF) in development and stocking of a more thermally tolerate species, such as a sterile white bass/striped bass hybrid. Given the change to the cooling system, does Dominion still plan to provide this assistance?**

**11a Response**

Flow Analysis

From the perspective of potential impacts on aquatic life in the North Anna and Pamunkey rivers, the flow changes can be viewed over two time periods. The first is on an annual basis for the general aquatic communities of the rivers. The second is specifically during the period of striped bass spawning and early development, primarily in April and May, but extending through the summer for juveniles.

Dominion's flow analysis focused on two points in the river system: (1) at the dam, which is representative of the lower North Anna River, and (2) at the Hanover USGS gauging station on the Pamunkey River about 46 miles downstream from the dam and about 25 miles upstream of the Hwy 360 Bridge (which is upstream of tidal influence and representative of freshwater flows into the downstream striped bass spawning areas, although it does not include added fresh water flow from small tributaries downstream of Hanover).

The change in flow at the dam due to Unit 3 operation was calculated using the estimated weekly-average flows over the dam for two and three units for the period from October 1978 to April 2003. The period 1978-to-2003 was considered representative of flows expected in the future, including both wet and dry years. Flows in the Pamunkey River for the 3-unit operation were obtained by subtracting from the recorded flow at the Hanover gauge the estimated flow change at the dam between the existing condition and the expected future condition with Unit 3 operation. The flow values were calculated using a "running"

7-day average recorded as daily averages at the Hanover gauge, while allowing a 2 day travel time for the flow from the North Anna Dam to reach the Hanover gauge. This assumes a velocity of about 1.5 fps (feet per second) in the free-flowing North Anna River. This approach is physically reasonable and it accounts for the travel time from the dam to the gauging station, which is not accounted for by simply subtracting a daily North Anna flow change from the daily flow at the Hanover gauge.

Certain characteristics of the changes in flow at the dam between 2-unit and 3-unit operation are apparent from these calculations as illustrated in Figure 1:

- Typical reductions in North Anna River flow are in the 25 to 35 cfs (cubic feet per second) range, which is expected due to the water consumption by the wet cooling towers that reduces the amount of water being passed through the reservoir and dam;

- There are periods of zero differences between flows under two-unit and three-unit operation, which represent periods when the reservoir level is at or below elevation 250 ft, and either 20 or 40 cfs minimum-flow releases are mandated (this would have occurred approximately 35 times in the 1978-2003 period, with durations of one week to more than one year);

- There are short periods with a difference of 20 cfs, e.g., when 2-unit operation is releasing 40 cfs minimum flow, but 3-unit operation, with a lower lake level, would release 20 cfs, which would have occurred seven times in the 1978-to-2003 period, lasting one week to 3 months;

- There are periods when the 2-unit dam release is much larger (up to 550 cfs, but mostly 100 to 350 cfs) than the 3-unit release, due to the fact that runoff after a dry period fills the reservoir level to elevation 250 ft more rapidly for the 2-unit case and nearly all the river inflow is passed over the dam for a short period before the reservoir would have filled under the 3-unit scenario. Flow differences above 100 cfs would have occurred approximately 25 times in the 1978-to-2003 period, with each episode lasting a few days to two weeks.

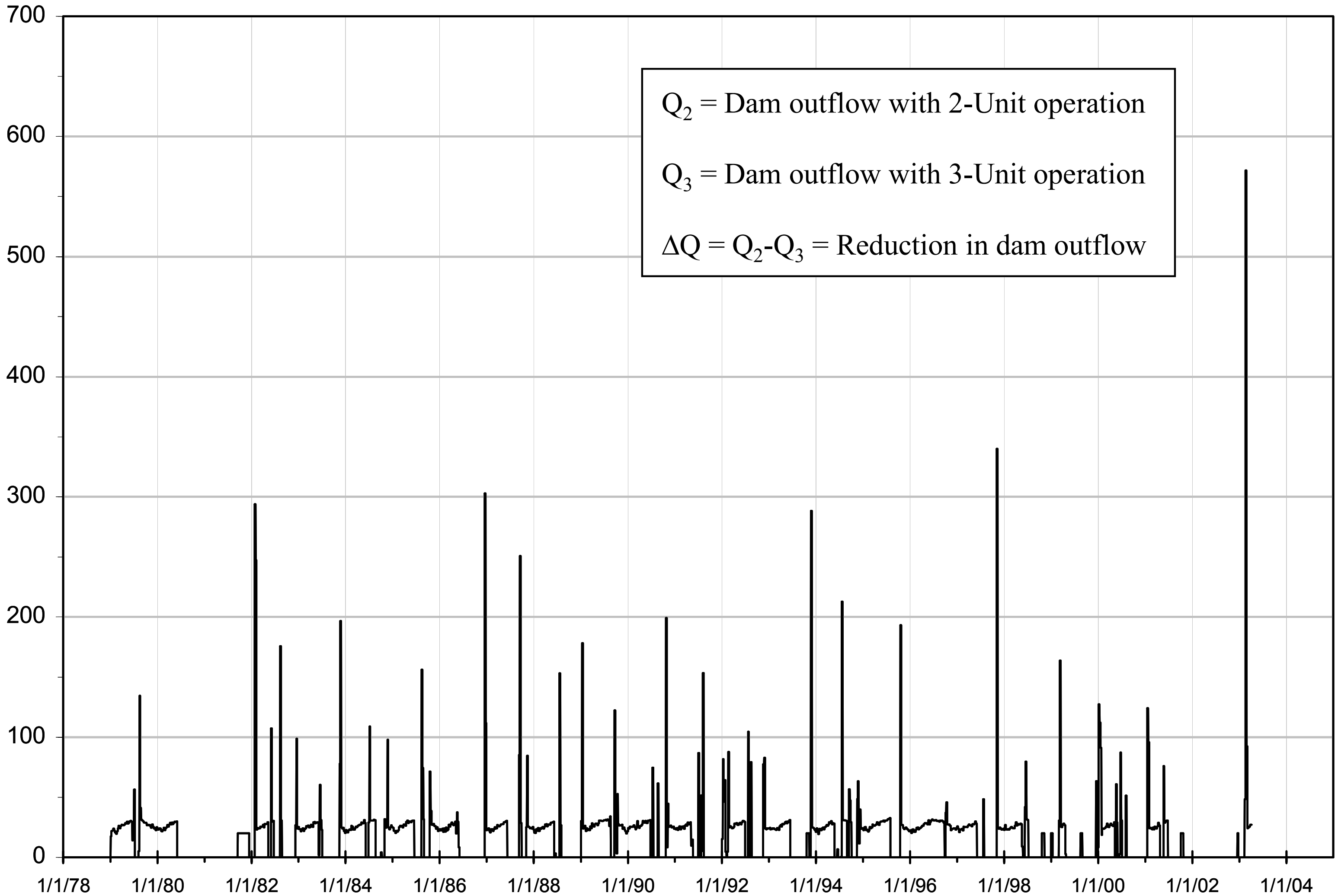



**Figure 1: Flow Reduction ($\Delta Q = Q_2 - Q_3$) over Dam (from October 1978 to April 2003)**

The number of days when these changed flows occur varies among years depending on the amount of rainfall or other runoff (e.g., snowmelt). For dry years, such as occurred in recent years, there is generally no change because the dam is passing the minimum flow of either 20 or 40 cfs most of the time under each scenario.

These changes in flow were compared to the actual flows from the dam with two units during the period 1978-to-2003. With many North Anna River flows in the 300-500 cfs range and peaks above 2,000 cfs, a lowered flow by 25 to 35 cfs is hardly noticeable under average to high flows.

Although there would be the same 25 to 35 cfs change in flow due to Unit 3 at the Hanover flow gauge on the Pamunkey River downstream of the confluence of the North Anna and South Anna rivers, this change is set against the Pamunkey's flows that are considerably higher than for the North Anna River. Many Pamunkey River flows are in the 1,000 to 3,000 cfs range, and peak flows rise over 6,000 cfs. Median flows in the Pamunkey at the Hanover gage are in the 500 cfs range, versus 130 cfs for the North Anna River at the Hart Corner gage about 30 miles below the Dam.

Dominion calculated the Pamunkey River flows at Hanover occurring at specific frequencies during the period of study (late 1978 to early 2003) with 2- and 3-unit operation. The results given in Tables 1 and 2 show that:

- The low frequency, low flows are affected very little at Hanover, e.g., the 5% flow drops from 80 cfs to 79 cfs, and the 10% flow from 104 cfs to 103 cfs. The 50% (median) flow drops from 535 cfs to 510 cfs, in line with the expected cooling tower consumption for the combined wet/dry towers. At higher flows the change is slightly higher, 30-35 cfs, roughly equivalent to the wet tower consumption.

- The occurrence (frequency) of low flows in the 50-150 cfs range (i.e., % of time the flow is below 50-150 cfs) is increased by 0.2 to 0.4%, while the frequency of flows below the moderate range of 200-500 cfs is increased by 0.4 to 1.3 %.

The number of days when flows would be set at the minimum flow release of 40 and 20 cfs at the Dam would increase with a third unit. Over the period October 1978 to March 2003, the minimum flow of 40 cfs would increase on average from 163 days per year to 181, an increase from about 45% of the year to about 50%. Minimum flow of 20 cfs would increase on average from 19 to 27 days per year, an increase from about 5% of the year to about 7%.

Because of interest in striped bass spawning and early life stage rearing, the Pamunkey River flows in April and May at the Hanover gauge were also analyzed for 2-unit and 3-unit operation. The results are given in Tables 3 and 4. The low flow (5% occurrence frequency, as 7-day running average) was diminished from 207 to 206 cfs (0.5 % difference), while the median flow was reduced from 851 cfs to 824 cfs (3% difference). Across all flows, the reduction in cfs ranged from 0.5 % to 5%. Mandated minimum flows of 40 or 20 cfs would be highly unlikely in April and May.

**Table 1**
**Flows in Pamunkey River at Hanover for "Annual" Time Period**

| Percentiles (Non Exceedance) | Flows with 2-Unit Operation (cfs) | Flows with 3-Unit Operation (cfs) |
|---|---|---|
| 5 | 80 | 79 |
| 10 | 104 | 103 |
| 15 | 131 | 129 |
| 20 | 160 | 157 |
| 25 | 196 | 192 |
| 30 | 244 | 236 |
| 40 | 353 | 337 |
| 50 | 535 | 510 |
| 60 | 729 | 705 |
| 70 | 1009 | 982 |
| 80 | 1440 | 1404 |
| 90 | 2365 | 2337 |

**Table 2**
**Percentiles of Flows in Pamunkey River at Hanover for "Annual" Time Period**

| Flow (cfs) | Percentile (Non Exceedance) with 2-Unit Operation | Percentile (Non Exceedance) with 3-Unit Operation |
|---|---|---|
| 50 | 0.6 | 0.8 |
| 75 | 3.8 | 4.1 |
| 100 | 9.0 | 9.2 |
| 150 | 18.4 | 18.8 |
| 200 | 25.5 | 25.9 |
| 300 | 35.4 | 36.5 |
| 400 | 42.9 | 44.0 |
| 500 | 48.1 | 49.4 |
| 750 | 60.8 | 61.9 |
| 1000 | 69.7 | 70.6 |
| 1500 | 81.0 | 81.4 |
| 2000 | 87.0 | 87.2 |

**Table 3**
**Flows in Pamunkey River at Hanover for "April-May" Time Period**

| Percentiles (Non Exceedance) | Flows with 2-Unit Operation (cfs) | Flows with 3-Unit Operation (cfs) |
|---|---|---|
| 5 | 207 | 206 |
| 10 | 291 | 276 |
| 15 | 355 | 339 |
| 20 | 429 | 408 |
| 25 | 493 | 471 |
| 30 | 568 | 545 |
| 40 | 699 | 673 |
| 50 | 851 | 824 |
| 60 | 1043 | 1014 |
| 70 | 1298 | 1262 |
| 80 | 1834 | 1806 |
| 90 | 2903 | 2874 |

**Table 4**
**Percentiles of Flows in Pamunkey River at Hanover for "April-May" Time Period**

| Flow (cfs) | Percentile (Non Exceedance) with 2-Unit Operation | Percentile (Non Exceedance) with 3-Unit Operation |
|---|---|---|
| 50 | | |
| 75 | <0.01 | <0.01 |
| 100 | 0.38 | 0.40 |
| 150 | 2.1 | 2.2 |
| 200 | 4.5 | 4.7 |
| 300 | 10.4 | 11.4 |
| 400 | 18.2 | 19.2 |
| 500 | 25.4 | 26.4 |
| 750 | 43.7 | 46.2 |
| 1000 | 57.7 | 59.2 |
| 1500 | 74.3 | 74.7 |
| 2000 | 82.3 | 82.7 |

**Biological Assessment**

*North Anna River*

The biological communities of the North Anna River downstream of the dam are accustomed to wide variations in flows, as the patterns of flow from 1978 to 2003 show. Typically, there are high and irregular flows in spring and early summer that spill from North Anna Dam, with summer and fall periods of lower flows often sustained by releases from the dam of 40 cfs, or during extreme drought releases of 20 cfs, by the existing mandated minimum-flow releases from the dam. The spring and early summer periods of moderate to moderately high flows are often when most important biological productivity occurs (e.g., growth of benthic algae, maturation and emergence of aquatic insects, reproduction and growth of many fishes). The reductions of 25 to 35 cfs at the dam during times when more than 40 cfs is released (mostly late winter and spring, but occasionally at other times of year when runoff is high from storms) are likely of little consequence to the aquatic life of the downstream river.

The low flows of late summer and fall are often the most critical for sustaining aquatic life, when very low flows in Piedmont and Coastal Plain rivers reduce the availability of habitat for many fish and invertebrates. The mandated minimum flows from the dam at these times would continue with Unit 3 operation although their frequency would be increased somewhat (from approximately 5% to approximately 7% of the time for the 20 cfs flow, and from approximately 45% to 50% for the 40 cfs condition). The sustained flows of 40 or 20 cfs under dry conditions should continue to benefit aquatic life under Unit 3 operation. Based on USGS data for the North Anna River at Doswell, about 15 miles downstream from the dam, flows less than the 20 cfs minimum flow occurred approximately 3% of the time before the dam was built (1929-1971). Flows as low as 1cfs were measured, whereas now flows less than 20 cfs would no longer occur. Although the VDEQ notes that a summer flow in the range of 74 to 111 cfs is needed for resource protection according to the Tennant Method (letter of February 10, 2004 from E. L. Irons of VDEQ to P. Faggert of Dominion), the pre-dam river did not always attain this ideal flow during low-flow periods.

In a river as biologically diverse as the North Anna River, it is difficult to assess the effects of relatively infrequent flow reductions, as are expected under Unit 3 operation. Dominion (2005) reported 50 species of fishes collected from the North Anna River during biological surveys conducted from 1981 to 2004. A variety of habitat use specialists were represented, some of which may be expected to temporarily benefit from reductions in flow, and some temporarily disadvantaged. The Virginia Department of Game and Inland Fisheries (VDGIF) periodically surveys the North Anna River with emphasis on recreationally important largemouth and smallmouth bass populations, which it has judged to be healthy despite limited forage (Dominion 2004). Dominion's monitoring since

1987 has also focused on documenting the largemouth and smallmouth bass populations (Dominion 2004).

Intensive studies of smallmouth bass and redbreast sunfish in the North Anna River were conducted by graduate students from Virginia Polytechnic Institute and State University (Virginia Tech) during the 1990s. Studies of habitat use by the smallmouth bass population in the North Anna River downstream of the dam indicated low-velocity microhabitats found at lower flows in summer were important to the early life stages (Sabo and Orth 1994). Larvae occupied low-velocity areas with large substrate or cover after dispersal from brood sites. During the first 4-6 weeks after dispersal, juveniles continued to use relatively deep, low-velocity microhabitats. Thereafter, juveniles occupied shallower microhabitats with greater focal-point velocities. Net rate of energy gained by juvenile smallmouth bass increased as water depths decreased and average water column velocities increased (Sabo et al. 1996). In a study of diet overlap between redbreast sunfish and smallmouth bass in the North Anna River, Pert (1997) found food acquisition was not a serious problem for either species during the summers of low, stable flow. Pert (1997) also noted that the typically relatively stable streamflow and temperatures in the North Anna River (because of the minimum flow releases) create conditions considered optimal for smallmouth bass growth. Lukas (1993) found spawning habitat for smallmouth bass in the spring was not expected to be limited by flows less than 10 $m^3$/s (353 cfs), and the temporal pattern of stream flow fluctuations was the most important abiotic factor affecting smallmouth bass reproductive success in the North Anna River. High flows occurring during spawning caused nest abandonment, whereas stable flows promoted reproductive success. The temporal pattern of spring streamflow is determined largely by seasonal runoff from the watershed.

Given the amount of relevant, available fisheries data, the changes in hydrology expected to occur with Unit 3 operation are not expected to negatively affect the North Anna River's fish populations.

*Pamunkey River at Striped Bass Spawning Sites*

Striped bass spawn in the lower Pamunkey River generally from York/Pamunkey River Mile (RM) 27 (West Point) to about RM 53 (just downstream of a railroad crossing) (Grant and Olney 1991; Bilkovic et al. 2002). This is tidal fresh water, in which spawning and egg/larval development takes place at salinities of 1 part per thousand or less and in tidally alternating flows. This spawning area is downstream from the Hanover USGS gage by about 50 miles. Egg stage and larval development generally occur in the same area. Grant and Olney (1991) found larvae distributed a few miles upstream of the peak egg densities in only one year. All other studies show eggs and larvae being distributed similarly to spawning.

Spawning takes place between early April and mid May each year, apparently cued by water temperature of 12 to 19°C with peaks near 16 to 18°C as in other Chesapeake Bay tributaries (Setzler-Hamilton et al. 1980, 1981; Grant and Olney 1991; McGovern and Olney 1996). Spawning occurs upstream of the 1 part per thousand salinity level, even though this salinity moves upstream or downstream somewhat from year to year (McGovern and Olney 1996), probably in response to major changes in freshwater inflow. The location of peak spawning varied somewhat in studies by Grant and Olney 1991, McGovern and Olney 1996, and Bilkovic et al. 2002). Thus, the adult striped bass are adaptable in finding spawning locations within a general area that match environmental conditions. They likely would easily adapt to changes in freshwater inflow of 1-5%. Larval development is generally complete by the end of May (Grant and Olney 1991). The spawning and larval development periods are typically periods of spring freshet flows rather than drought conditions.

Flow velocities for maintaining striped bass eggs and larvae in suspension are generated primarily by tidal currents and not simply by freshwater inflow. The complex mixing dynamics of saline and fresh water in an estuary, often referred to as the “conveyor belt”, move eggs and larvae that settle toward the bottom in an upstream direction while freshwater inflows tend to move surface drifters downstream. Mixing of the upper and lower layers by tidal flow and ebb keeps eggs and larvae in suspension during the several days of development when only passive movements are possible. Tidal ebb and flow volumes are typically greater than freshwater inflow volumes at the striped bass spawning zones. The over-riding importance of tidal flows and well-known estuarine mixing patterns, coupled with the fact that the relative inflow reduction from a third unit is very small in April and May when striped bass eggs and larvae are suspended, indicate that water velocities would be maintained. Thus, a third unit should have no effect on egg and larvae suspension and development.

Juvenile striped bass generally rear in the estuary for their first two years, with gradual movement into Chesapeake Bay (Setzler-Hamilton et al. 1981). Juveniles typically disperse from the spawning areas into both freshwater and brackish tidal reaches of estuaries in the Chesapeake Bay region. There are anecdotal records of juvenile striped bass being caught by anglers occasionally in the non-tidal Pamunkey River upstream of the North Anna confluence (VDGIF, personal communication to W. Bolin of Dominion), but not in the North Anna River itself. Local biologists consider it highly unlikely that striped bass from the lower Pamunkey spawning grounds ascend the Fall Line (about 2 miles upstream of the confluence) to the rest of the North Anna River below the dam. With most juvenile striped bass spawned in the Pamunkey River occupying the freshwater tidal and brackish zones of the Pamunkey, Mattaponi, and York rivers, it is unlikely that small decreases in freshwater inflow from a third unit at the North Anna Power Station (1-5%) could alter their survival and well-being.

The timing and success of striped bass reproduction in the Pamunkey, as in other Chesapeake Bay tributaries, varies with environmental conditions. There was better year-class survival in the Pamunkey River when spawning temperatures were higher than when the year was cool; when the season was cool, most surviving juveniles were spawned late in the season when temperatures were warmer (McGovern and Olney 1996). The advantage was attributed to better food production. Investigators on the Pamunkey River have not considered freshwater inflow rates during striped bass spawning to be important enough to report for their surveys, although Bilkovic et al. (2002) noted that the Pamunkey River had an average discharge rate of 1,678 cfs during spawning periods. In the extreme, the amount of runoff can affect success of year classes of striped bass, for Uphoff (1989) found better striped bass recruitment in the Choptank River, Maryland when rainfall was high in April and May than when it was about half in the same period.

The Pamunkey River in the vicinity of striped bass spawning is also accustomed to wide variations of freshwater inflow during April and May, as shown by the Hanover gage data. The variations of freshwater inflow in the spawning areas are attenuated, however, by the tidal flows in the freshwater tidal reach. There are wide temperature variations and considerable variation in timing of spawning episodes in the Pamunkey River (Olney et al. 1991). Thus, it would seem reasonable that the spawning fish or their developing eggs, larvae and early juveniles would not detect the small changes in freshwater inflow caused by 25 to 35 cfs lowering of North Anna flows. The adjacent Mattaponi River, with a considerably lower springtime average flow of 961 cfs, also has excellent striped bass spawning and early life rearing (Bilkovic et al. 2002).

Food availability, among other environmental factors, has been linked in the scientific literature to striped bass survival through early life stages (Rothschild 1986; McGovern and Olney 1996). Starvation has long been considered a source of larval mortality in fishes (Cushing 1975). However, striped bass larvae are extremely voracious feeders on planktonic organisms like cladocerans and calanoid copepods (Setzler-Hamilton et al. 1981) and have been found to be highly resistant to food deprivation in the laboratory (Martin et al. 1985). McGovern and Olney (1996) state that “although some evidence of poor nutritional condition was determined for larvae collected by Setzler-Hamilton et al. (1987) in the Potomac and Choptank rivers, most studies [they cite ten references] indicated that starvation alone was not a significant mortality factor for striped bass.” In their own study, McGovern and Olney (1996) found abundant food for first-feeding larvae (12 invertebrate taxa) but that timing of microzooplankton abundance and striped bass hatch was not always in synchrony. This asynchrony was not linked to freshwater inflow (they did not consider it), but to temperature (in which warmer temperatures produced more food, faster growth, and more rapid growth beyond sizes preferred by predators).

It seems unlikely that the differences in freshwater inflow calculated during April and May due to a third unit would disrupt the food chain for striped bass larvae in a freshwater tidal system dominated by tidal flows.

Similarly, juvenile striped bass in the freshwater and brackish tidal estuary are unlikely to be food limited. Striped bass prey on early life stages of bay anchovy and Atlantic menhaden, which are abundant in the Pamunkey. The abundance of these species is of concern for predation on early life stages of striped bass (McGovern and Olney 1996). Their abundance in rearing areas for juvenile striped bass is unlikely to be influenced by the changes in freshwater inflow on the order of 1-5%, especially when the dynamics of the estuary are largely governed by tidal flows. This conclusion is bolstered by recognition that the adjacent Mattaponi River, with much lower freshwater flow than the Pamunkey, is also a major striped bass spawning river.

**Conclusions**

Dominion concludes that there will be indistinguishable biological impacts to the general aquatic community of the North Anna River and the striped bass spawning and early rearing areas of the Pamunkey River from changes in flows from the additional evaporative water loss from a new Unit 3 that uses evaporative wet-dry cooling towers.

**References**

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<u>Application Revision</u>

ER Section 5.2.2.2 is revised to reflect the above response.

**11b Response**

The elimination of any additional thermal impact to Lake Anna and downstream from proposed Unit 3 with a closed-cycle cooling system eliminates the need to develop and stock a more thermally tolerant species. However, Dominion remains committed to work with the state to maintain a viable and healthy habitat.

Application Revision

None.

**12. ER-State Permits (NRC 3/2/06 Letter)**

a. **Please confirm that the concerns raised by State agencies have been resolved and that permits for consumptive water use can be obtained.**

b. **What is your schedule for obtaining the Coastal Zone Management Act consistency certification?**

c. **The Virginia Pollution Discharge Elimination System (VPDES) permits for the existing Units 1 and 2 are undergoing renewal. Because the operating limits in these permits factor into the analysis for proposed Unit 3, as necessary, update the analysis to account for any changes in the permit. Provide within 30 days of issuance of the renewed VPDES permits the updated analysis to the NRC or a justification for why the analysis is not affected.**

d. **Provide Clean Water Act (CWA) Section 401 certification or documentation from the Commonwealth of Virginia that Section 401 certification is not needed because Dominion will request a permit condition that will prohibit any activities that could result in discharges to navigable waters until a Section 401 certification is obtained or waived by the Commonwealth of Virginia.**

**12a Response**

In a February 2006 conference call, VDEQ confirmed to the NRC that Dominion's cooling water approach addresses their concerns. The state's concurrence with the CZMA consistency certification would provide reasonable assurance that consumptive water use permits can be obtained. A response to the Commonwealth of Virginia's January 31, 2006 letter was provided to VDEQ on March 31, 2006. A copy of the information submitted to VDEQ was sent to the NRC on April 3, 2006.

Application Revision

None.

**12b Response**

A response to the Commonwealth of Virginia's January 31, 2006 letter was provided to VDEQ on March 31, 2006. A NOAA "stay of review" for the CZMA consistency concurrence review was removed March 31, 2006, with Dominion's submittal of additional analyses to VDEQ. A copy of the information submitted to VDEQ was sent to the NRC on April 3, 2006. In communications with VDEQ,

Dominion has been told that the CZMA consistency review would be scheduled for spring-to-summer 2006. See also NRC question number 10c.

Application Revision

None.

**12c Response**

Dominion's review of the draft renewed VPDES permit conditions for existing Units 1 & 2 has not identified any effect on the analysis for a proposed Unit 3. There are increased monitoring frequencies for some parameters at some previously included discharge points, and there are decreased monitoring frequencies for others. A copy of the final permit will be provided to the NRC when it is issued.

Application Revision

None.

**12d Response**

In a letter dated October 6, 2005 responding to an RAI, Dominion stated:

> A certification under section 401 of the Federal Water Pollution Control Act (FWPCA) is not appropriate at this time, because a specific scope and schedule for preconstruction activities and determination of specific activities that would result in a discharge have not been established. To address the timing of this certification, the ESP should include a condition prohibiting Dominion from conducting any pre-construction activity that would result in a discharge into navigable waters without first submitting to the NRC a Virginia Water Protection Permit (which under Virginia's State Water Control Law at Va. Code § 62.1-44.15:5(A) constitutes the certification required under FWPCA § 401) or a determination by the Virginia DEQ that no certification is required.

The Commonwealth of Virginia has agreed to provide a letter to the NRC within 30 days after Dominion submits its revised application concurring with this approach.

Application Revision

ER Section 1.2, Table 1.2-1 Federal, State, and Local Authorizations is revised to reflect the above response.

**13. SSAR and ER Section 7.1 (NRC 3/2/06 Letter)**

**Address the following source term related issues for the ESBWR design demonstrating the reactor accident source term PPE values specified in SSAR are still appropriate and that the radiological consequence doses at the proposed ESP site would meet the requirements of 10 CFR 50.34:**

**a. Provide ESBWR source terms for a power level at 4590 MWt (102% of requested power level to account for uncertainty). The source terms are expressed as the timing and release rate of fission products to the environment from the proposed ESP site.**

**b. Describe your analysis of selected design basis accidents based on the proposed version of the ESBWR design to demonstrate compliance of the proposed ESP site with the dose consequence evaluation factors specified in 10 CFR 50.34(a)(1).**

**c. Provide ESBWR design-specific χ/Q values used in the ESBWR design and compare them with the site-specific χ/Q values at the proposed ESP site.**

**13a Response**

SSAR Section 15 and ER Section 7.1 have been revised to show ESBWR source terms for all accidents having radiological consequences. The source terms at 4590 MWt are obtained from ESBWR DCD Revision 1 and increased by 25%. This margin is added because the DCD is still being reviewed by the NRC and source terms may change by the time the design is certified.

Application Revision

SSAR Section 15 and ER Section 7.1 are revised to show ESBWR source terms.

**13b Response**

SSAR Section 15 and ER Section 7.1 have been revised to show ESBWR doses for all accidents having radiological consequences. Reference doses are obtained from ESBWR DCD Revision 1 and adjusted to reflect site-specific χ/Q

values. Furthermore, the doses are increased by 25% as the DCD is still being reviewed by the NRC and doses may change by the time the design is certified.

Application Revision

SSAR Section 15 and ER Section 7.1 are revised to show ESBWR doses.

**13c Response**

SSAR Section 15 and ER Section 7.1 have been revised to show ESBWR design-specific χ/Q values from ESBWR DCD Revision 1. These design-specific χ/Q values are compared to site-specific χ/Q values to demonstrate that the site-specific χ/Q values are bounded by the design-specific χ/Q values.

Application Revision

SSAR Section 15 and ER Section 7.1 are revised to show ESBWR χ/Q values and ratios of site χ/Q values to ESBWR χ/Q values.

**14. ER Section 7.2 Severe Accidents (NRC 3/2/06 Letter)**

**a. Include the results of a site-specific assessment of the consequences of severe accidents for air and surface water pathways based on the results of the MACCS2 computer code.**

**b. Provide electronic copies of input and output files for the MACCS2 code for an ESBWR at 4500 MWt.**

**c. For an ESBWR, provide and justify the accident release categories and the core damage frequency for each release category.**

**14a Response**

A site-specific assessment of severe accident consequences has been calculated using the MACCS2 computer code. GE provided accident source term release fractions and their corresponding frequencies for the ESBWR. Population dose and economic cost out to a 50-mile radius from the site is provided for all severe accident categories. Analysis results for the ESBWR are included as a part of this RAI response. Analyses results for the ABWR and AP1000 were provided to NRC in Dominion letters 04-170 and 04-170A, dated May 17, 2004 and July 12, 2004, respectively.

ESBWR MACCS2 Results

The ESBWR consequences in terms of dose in sieverts and US dollars are provided below in Tables 11-1 and 11-2 for all eleven source term categories that were evaluated.

Application Revision

ER Section 7.2 is revised to reflect the above response.

| **Table 11-1: ESBWR Population Dose, Sieverts** | | | | | | **Category Frequency** |
|---|---|---|---|---|---|---|
| **STC** | **CASE1A 98MET** | **CASE2A 97MET** | **CASE3A 96MET** | **CASE4A 5500MWt** | **CASE5B Plume=1.0E 6W** | **Prob/yr** |
| **BOC** | 9.33E+04 | 8.55E+04 | 8.77E+04 | 9.79E+04 | 8.84E+04 | <1E-12 |
| **BYP** | 8.68E+04 | 7.96E+04 | 8.22E+04 | 9.11E+04 | 8.28E+04 | 4E-12 |
| **CCID** | 7.17E+04 | 6.48E+04 | 6.65E+04 | 7.16E+04 | 6.71E+04 | 2.9E-11 |
| **CCIW** | 1.24E+04 | 1.09E+04 | 1.18E+04 | 1.30E+04 | 1.20E+04 | 2.9E-10 |
| **DCH** | 6.29E+04 | 5.74E+04 | 5.73E+04 | 6.41E+04 | 5.76E+04 | <1E-12 |
| **EVE** | 7.72E+04 | 6.90E+04 | 7.18E+04 | 7.70E+04 | 7.27E+04 | 2.5E-10 |
| **FR** | 3.15E+02 | 2.64E+02 | 2.98E+02 | 3.60E+02 | 3.02E+02 | 2.3E-10 |
| **OPVB** | 3.12E+04 | 2.83E+04 | 2.91E+04 | 3.30E+04 | 2.93E+04 | <1E-12 |
| **OPW1** | 5.52E+04 | 5.13E+04 | 5.21E+04 | 5.73E+04 | 5.27E+04 | <1E-12 |
| **OPW2** | 2.87E+04 | 2.68E+04 | 2.76E+04 | 2.96E+04 | 2.78E+04 | 1.4E-11 |
| **TSL** | 2.43E+02 | 2.02E+02 | 2.29E+02 | 2.73E+02 | 2.32E+02 | 2.8E-8 |

| Table 11-2: ESBWR Offsite Cost, $ | | | | | | Category Frequency |
|---|---|---|---|---|---|---|
| **STC** | **CASE1A 98MET** | **CASE2A 97MET** | **CASE3A 96MET** | **CASE4A 5500MWt** | **CASE5B Plume=1.0E 6W** | **Prob/yr** |
| **BOC** | 1.36E+10 | 1.27E+10 | 1.41E+10 | 1.63E+10 | 1.43E+10 | <1E-12 |
| **BYP** | 1.34E+10 | 1.25E+10 | 1.38E+10 | 1.58E+10 | 1.41E+10 | 4E-12 |
| **CCID** | 1.51E+10 | 1.36E+10 | 1.42E+10 | 1.62E+10 | 1.44E+10 | 2.9E-11 |
| **CCIW** | 8.19E+08 | 6.24E+08 | 7.54E+08 | 1.06E+09 | 7.80E+08 | 2.9E-10 |
| **DCH** | 9.46E+09 | 8.50E+09 | 9.20E+09 | 1.01E+10 | 9.37E+09 | <1E-12 |
| **EVE** | 1.59E+10 | 1.44E+10 | 1.50E+10 | 1.70E+10 | 1.52E+10 | 2.5E-10 |
| **FR** | 2.48E+06 | 1.93E+06 | 2.51E+06 | 3.25E+06 | 2.47E+06 | 2.3E-10 |
| **OPVB** | 4.15E+09 | 3.45E+09 | 3.95E+09 | 4.38E+09 | 4.04E+09 | <1E-12 |
| **OPW1** | 9.13E+09 | 8.11E+09 | 8.63E+09 | 9.63E+09 | 8.74E+09 | <1E-12 |
| **OPW2** | 4.58E+09 | 3.84E+09 | 4.25E+09 | 4.93E+09 | 4.35E+09 | 1.4E-11 |
| **TSL** | 1.64E+06 | 1.47E+06 | 1.74E+06 | 2.60E+06 | 1.68E+06 | 2.8E-8 |

**14b Response**

The site specific MACCS2 input and output files using the source term inventory for a ESBWR design thermal power level of 4500 MWt, and the analysis results are provided on the enclosed CD.

Application Revision

None.

**14c Response**

A description of the ESBWR accident release categories and their corresponding release frequencies as provided to Dominion by GE is included as part of this response.

Accident Release Categories / Release Frequencies

Shown below in Table 6-1 are descriptions of the accident release categories and their corresponding frequencies.

Application Revision

None.

| Table 6-1: ESBWR Source Term Category Frequencies | | |
|---|---|---|
| **Release Category** | **Summary Description** | **Release Frequency (reactor year$^{-1}$)** |
| BYP | Containment is bypassed because of CIS failure with large (>12" diameter hole) opening in containment. Lower drywell debris bed covered. | <1E-12 |
| BOC | Break outside of containment. | 4E-12 |
| CCID | Containment fails due to core concrete interaction; lower drywell debris bed uncovered. | 2.9E-11 |
| CCIW | Containment fails due to core concrete interaction; lower drywell debris bed covered. | 2.9E-10 |
| DCH | Direct containment heating (high pressure RPV failure) event damages containment | <1E-12 |
| EVE | Ex-vessel steam explosion fails containment | 2.5E-10 |
| FR | Release through controlled (filtered) venting from suppression chamber | 2.3E-10 |
| OPVB | Containment fails due to failure of vapor suppression (vacuum breaker) function. | <1E-12 |
| OPW1 | Containment fails due to early (<24 hours) loss of containment heat removal. | <1E-12 |
| OPW2 | Containment fails due to late (>24 hours) loss of containment heat removal. | 1.4E-11 |
| TSL | Containment leakage at Technical Specification limit. | 2.8E-8 |

**15. ER-Fuel Transportation (NRC 3/2/06 Letter)**

**Provide an assessment of the impacts of the revised power levels on the numbers of shipments of unirradiated fuel, spent fuel, and radioactive waste and the radionuclide inventories of spent fuel assemblies.**

**15 Response**

There were no changes to the power levels for the majority of the reactor designs used to bound the site. The only change was to the ESBWR. The power level increase, from 4000 MWth to 4500 MWth, had a small impact on the fuel transportation assessment.

The fuel assemblies for the ESBWR are similar to the assemblies for the ABWR in construction, but slightly shorter and lighter. Truck loading for shipment is constrained by the weight of the load. With the ESBWR assemblies being lighter, this allows an additional 28% of unirradiated fuel assemblies to be added to each truckload. Since the ESBWR contains approximately 30% more assemblies compared to the ABWR, the total number of unirradiated fuel shipments would increase slightly (1-2%).

The same analysis applies to spent fuel. Although the shipping cask design for the ESBWR is not yet available, it is expected that the reduced weight of the assemblies would allow additional assemblies to be loaded in each cask. The increase in total cask shipments would be expected to increase in the same amount as for unirradiated fuel.

No change is anticipated in the volume of radioactive waste produced. The level of waste generated is largely controlled by the operational practices of the licensee. The changes in the reactor design from the ABWR to the ESBWR are not anticipated to produce additional quantities of radioactive waste. In addition, the power level increase would have little impact on the amount of waste generated.

Since there is a slight additional increase in the amount of fuel loaded into the ESBWR and based on estimated inventories and activity of the spent fuel, a change in reactor power for the ESBWR would produce only a small increase in the radionuclide inventory of the spent fuel.

Application Revision

ER Section 3.8 is revised to reflect the higher ESBWR power output, a small change in the amount of uranium loaded into the core, and the change in burnup.

**16. (NRC 3/2/06 Letter)**

**Provide justification for the sections identified as unaffected by the change to the cooling system and the increase in power level. For example, why is ER Section 7.2, Severe Accidents, not affected by the increase in power from 4300 - 4500 MWt? Examples of the sections that appear to be affected, (which are not exhaustive) are given below.**

**a. ER Section 1.2**

**ER Section 1.2 and the associated table state that a Coastal Zone Management Act (CZMA) consistency determination is not applicable. Given that Dominion has submitted its project to the Commonwealth of Virginia for a consistency determination, justify or revise the first sentence of the first paragraph, the next to last sentence of the third paragraph, and the entry in Table 1.2-1 which lists the CZMA as N/A.**

**b. ER Sections 2.7.4.1.4 and 2.7.4.1.6**

**Provide a detail discussion of onsite humidity data as a baseline input for evaluating fogging and increased humidity due to the addition of a wet cooling tower.**

**c. ER Section 3.6.3.3**

**Include a discussion of any scale or other waste from the wet cooling tower and potential wastes from cleaning the dry towers.**

**d. ER Section 5.3.3.1**

**Because of the addition of a wet cooling tower, include a discussion of humidity on site at the level of the cooling tower exit.**

**e. ER Section 5.8.1.2**

**Provide an estimate of the maximum height of trees on the site that may help block the view of new facilities from offsite locations. The location of the cooling towers needs to be clearly identified in Figure 5.8-1.**

**f. ER Section 5.8.2.3**

**Discuss the potential impacts of operating Lake Anna above the 250 MSL level.**

**g. ER Section 6.4.1 and SSAR Section 2.3.3**

**Section 6.4 of the Environmental Standard Review Plan (NUREG-1555) states that in order to provide an adequate meteorological database for evaluating the effects of plant operation, basic onsite meteorological instrumentation should include atmospheric moisture measurements at a height(s) representative of water-vapor release at sites at which large quantities of water vapor are emitted during plant operation. Likewise, SSAR Section 1.8.2 states that the SSAR conforms to Proposed Revision 1 to Regulatory Guide (RG) 1.23, "Onsite Meteorological Programs." Section C.2 of Proposed Revision 1 to RG 1.23 states "ambient moisture should be monitored at approximately 10 meters and also at a height where the measurements will represent the resultant atmospheric moisture content if cooling towers are to be used for heat dissipation." Provide the additional onsite humidity meteorological information at a height where the measurements will represent the resultant atmospheric moisture content if wet cooling towers are to be used for heat dissipation for Unit 3.**

**h. ER Sections 7.1.1 and 7.2**

**Revise these sections of the ER to make them consistent with responses to the questions 13 and 14 of this letter.**

**i. ER Section 7.1.2**

**The increase in power level for the ESBWR should result in a revision to the calculated DBA doses. The time-dependent ratios of the LPZ site-to-design certification (site/DC) X/Q values presented in ER Table 7.1-1 are based on (1) four DC 50% X/Q values that are a function of time and (2) one site 50% X/Q value that is time-independent. The ER DBA LPZ dose calculations should be based on 50% LPZ X/Q values that vary throughout the course of each design basis accident in accordance with NRC guidance (e.g., Environmental Standard Review Plan 7.1 and Regulatory Guide 1.145) and the approach used in the SSAR Chapter 15 accident analyses. Therefore, (1)**

**provide 50% LPZ X/Q values that vary as a function of time for AP1000, ABWR and ESBWR, (2) replace the LPZ site/DC X/Q ratios presented in Table 7.1-1 by LPZ site/DC X/Q ratios where both the DC and site LPZ X/Q values are a function of time, and (3) revise Table 7.1-2 accordingly.**

**j. ER Section 9.3**

**Justify not reevaluating the North Anna site versus the alternative sites in the light of the changes to the cooling system. Discuss the differences that the cooling system change would have on the North Anna site rating.**

**16a Response**

ER Section 1.2 will be revised to indicate its CZMA consistency certification submittal to the Commonwealth of Virginia for concurrence review.

Application Revision

ER Section 1.2 is revised to reflect the above response.

**16b Response**

As noted in response to Question 7a, the normal atmospheric moisture content, as reflected by the relative humidity, is discussed in ER Section 2.7.4.1.4. The relative humidity that is reported is from the National Weather Service first order station at Richmond. The appropriateness of the use of Richmond data has been confirmed in a comparison of dewpoint temperatures from the North Anna site and Richmond. Over a 10 year period, the annual average dewpoint temperatures from the two locations were found to be very comparable, with the dry bulb and dewpoint temperatures from North Anna typically 1 – 2 degrees lower than the corresponding Richmond temperatures. ER Section 2.7.4.1.6 provides a discussion of local fogging. The closest location for which fog data is maintained is the NWS station in Richmond. The discussion in Section 2.7.4.1.6 points out that the frequency of fog conditions would be expected to be slightly different due to the proximity of the site to Lake Anna.

To further the characterization of the ESP site humidity under the current conditions, an evaluation of dewpoint depression has been performed and is reported below. The evaluation is based on NAPS site data for 3 years (1998 – 2000). The evaluation compiles the average number of hours per year that the dry bulb temperature is within 5 degrees of the dewpoint temperature as a function of season, time of day, and wind direction. This data may be useful in

providing a preliminary indication of conditions conducive to the formation of an extended visible plume or fog when wet cooling towers are in operation. The results of the dewpoint depression evaluation are presented in the following tables.

The prediction of plume and fog formation has been evaluated using the SACTI suite of programs as described in ER Section 5.3.3.2.1.

**Table 1a Dewpoint Depression for NAPS site**
**Winter (Dec/Jan/Feb)**

Number of Winter Hours Per Year that Dew-Point Depression <= 5F: 793.3

Percentage of Hours Per Winter that Dew-Point Depression <= 5F: 37%

| Time of Day | Wind From → DPD <= 5 ↓ | N | NNE | NE | ENE | E | ESE | SE | SSE | S | SSW | SW | WSW | W | WNW | NW | NNW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0100 | 37.7 | 3.3 | 2.0 | 1.3 | 0.3 | 1.7 | 0.3 | 0.3 | 0.7 | 2.0 | 3.7 | 1.7 | 1.7 | 2.3 | 9.0 | 4.0 | 3.3 |
| 0200 | 43.3 | 4.0 | 3.3 | 2.0 | 0.7 | 0.0 | 1.0 | 1.3 | 2.0 | 2.7 | 1.0 | 4.3 | 2.0 | 4.7 | 8.0 | 2.3 | 4.0 |
| 0300 | 46.0 | 7.0 | 2.0 | 1.3 | 1.0 | 1.0 | 0.7 | 0.3 | 1.0 | 3.7 | 3.0 | 3.0 | 1.0 | 4.3 | 11.0 | 2.7 | 3.0 |
| 0400 | 47.0 | 5.7 | 3.0 | 0.3 | 0.7 | 1.0 | 0.3 | 1.0 | 1.3 | 2.7 | 3.7 | 3.0 | 1.3 | 5.0 | 6.3 | 8.7 | 3.0 |
| 0500 | 49.3 | 5.7 | 1.3 | 1.3 | 0.3 | 1.0 | 0.7 | 2.0 | 1.0 | 1.7 | 4.0 | 2.0 | 2.7 | 6.7 | 9.0 | 6.7 | 3.3 |
| 0600 | 52.3 | 4.3 | 4.0 | 2.7 | 0.7 | 1.0 | 0.0 | 2.0 | 0.3 | 3.7 | 4.3 | 2.0 | 2.7 | 7.3 | 10.3 | 4.7 | 2.3 |
| 0700 | 54.3 | 3.7 | 2.3 | 2.7 | 0.3 | 2.0 | 1.0 | 2.0 | 0.7 | 4.7 | 5.7 | 2.0 | 3.0 | 4.7 | 9.0 | 7.0 | 3.7 |
| 0800 | 54.0 | 6.0 | 2.0 | 1.3 | 1.3 | 1.7 | 0.0 | 1.3 | 1.7 | 5.0 | 5.0 | 2.0 | 2.3 | 7.0 | 7.0 | 5.7 | 4.7 |
| 0900 | 46.0 | 6.0 | 2.3 | 2.3 | 1.0 | 0.7 | 0.3 | 1.0 | 0.3 | 4.0 | 4.7 | 2.3 | 2.7 | 3.7 | 3.7 | 7.7 | 3.3 |
| 1000 | 33.0 | 5.7 | 2.7 | 2.7 | 1.3 | 1.0 | 1.3 | 0.3 | 1.0 | 4.0 | 2.3 | 2.3 | 1.0 | 0.3 | 1.7 | 3.0 | 2.3 |
| 1100 | 25.7 | 4.0 | 2.7 | 1.7 | 0.7 | 0.7 | 1.0 | 0.3 | 1.3 | 1.7 | 3.3 | 2.3 | 1.0 | 0.0 | 0.0 | 1.3 | 3.7 |
| 1200 | 21.0 | 2.0 | 4.3 | 1.0 | 0.7 | 1.3 | 1.0 | 0.7 | 0.0 | 1.3 | 2.0 | 1.0 | 1.3 | 0.0 | 0.7 | 1.7 | 2.0 |
| 1300 | 19.7 | 3.7 | 1.7 | 0.7 | 1.0 | 1.3 | 0.0 | 0.0 | 0.3 | 1.3 | 2.0 | 2.0 | 0.3 | 0.7 | 0.7 | 1.3 | 2.7 |
| 1400 | 17.7 | 3.7 | 1.3 | 1.0 | 1.3 | 0.3 | 0.0 | 0.7 | 0.0 | 0.7 | 2.3 | 1.3 | 0.7 | 0.3 | 0.7 | 1.7 | 1.7 |
| 1500 | 17.3 | 2.7 | 2.3 | 0.3 | 1.0 | 0.0 | 0.3 | 1.0 | 0.3 | 1.0 | 2.3 | 1.3 | 0.0 | 0.3 | 1.0 | 1.3 | 2.0 |
| 1600 | 16.3 | 4.0 | 1.7 | 0.7 | 0.3 | 0.3 | 0.7 | 0.3 | 0.3 | 1.0 | 1.3 | 2.0 | 0.3 | 0.0 | 1.7 | 0.7 | 1.0 |
| 1700 | 16.7 | 1.3 | 1.7 | 1.3 | 1.0 | 0.0 | 0.7 | 0.7 | 0.3 | 1.0 | 2.0 | 1.3 | 0.3 | 0.7 | 0.3 | 1.3 | 2.7 |
| 1800 | 18.7 | 2.3 | 2.7 | 1.3 | 0.7 | 0.3 | 0.0 | 1.7 | 0.3 | 1.0 | 2.0 | 1.3 | 0.7 | 1.0 | 0.0 | 1.7 | 1.7 |
| 1900 | 21.7 | 2.7 | 2.0 | 1.3 | 1.7 | 0.3 | 0.7 | 1.3 | 1.0 | 0.7 | 0.7 | 2.3 | 2.0 | 0.0 | 1.7 | 1.0 | 2.3 |
| 2000 | 26.3 | 3.0 | 3.0 | 1.3 | 0.7 | 1.7 | 0.3 | 1.0 | 1.0 | 0.7 | 1.7 | 3.0 | 0.7 | 0.7 | 2.0 | 2.7 | 3.0 |
| 2100 | 31.0 | 2.3 | 2.7 | 2.7 | 0.7 | 1.0 | 1.3 | 0.0 | 1.0 | 2.0 | 2.7 | 2.7 | 0.7 | 2.0 | 4.0 | 3.3 | 2.0 |
| 2200 | 31.3 | 3.0 | 2.0 | 1.7 | 1.0 | 1.3 | 0.7 | 1.0 | 0.0 | 1.3 | 3.0 | 2.3 | 1.3 | 1.3 | 6.0 | 2.0 | 3.3 |
| 2300 | 32.0 | 3.7 | 1.7 | 0.7 | 0.3 | 0.3 | 0.7 | 0.7 | 0.3 | 2.0 | 1.7 | 3.7 | 0.3 | 1.3 | 8.0 | 4.7 | 2.0 |
| 2400 | 35.0 | 3.7 | 1.0 | 2.3 | 1.0 | 0.3 | 0.0 | 1.3 | 0.0 | 1.7 | 2.7 | 2.3 | 1.7 | 3.3 | 6.0 | 6.0 | 1.7 |
| Total | 793.3 | 93.3 | 55.7 | 36.0 | 19.7 | 20.3 | 13.0 | 22.3 | 16.3 | 51.3 | 67.0 | 53.7 | 31.7 | 57.7 | 107.7 | 83.0 | 64.7 |

**Table 1b Dewpoint Depression for NAPS site**

**Spring (March/April/May)**

Number of Spring Hours Per Year that Dew-Point Depression <= 5F: 613.7

Percentage of Hours Per Spring that Dew-Point Depression <= 5F: 28%

| Time of Day | Wind From ➔ DPD <= 5 ↓ | N | NNE | NE | ENE | E | ESE | SE | SSE | S | SSW | SW | WSW | W | WNW | NW | NNW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0100 | 36.3 | 3.7 | 1.3 | 2.7 | 1.0 | 2.0 | 1.7 | 0.7 | 1.3 | 0.7 | 2.0 | 1.7 | 0.7 | 2.0 | 9.3 | 3.3 | 2.3 |
| 0200 | 39.3 | 2.7 | 2.0 | 1.7 | 0.7 | 0.7 | 1.3 | 2.3 | 1.0 | 1.7 | 0.7 | 2.0 | 1.3 | 3.0 | 9.3 | 5.7 | 3.3 |
| 0300 | 42.0 | 2.7 | 4.0 | 2.0 | 0.7 | 1.7 | 1.3 | 1.0 | 1.7 | 2.3 | 1.7 | 2.7 | 0.7 | 3.3 | 9.0 | 4.7 | 2.7 |
| 0400 | 46.7 | 1.7 | 4.3 | 2.0 | 1.7 | 0.3 | 2.0 | 1.0 | 1.0 | 3.0 | 3.0 | 2.0 | 1.7 | 4.3 | 8.7 | 7.0 | 3.0 |
| 0500 | 48.7 | 3.3 | 3.7 | 0.7 | 2.3 | 1.3 | 1.3 | 0.3 | 1.3 | 3.0 | 2.0 | 4.0 | 2.3 | 6.3 | 11.0 | 3.0 | 2.7 |
| 0600 | 50.3 | 5.3 | 2.3 | 2.0 | 2.0 | 2.7 | 0.7 | 1.0 | 1.0 | 2.0 | 3.0 | 3.0 | 2.0 | 4.7 | 10.7 | 5.3 | 2.7 |
| 0700 | 48.7 | 5.7 | 3.0 | 1.7 | 3.0 | 1.7 | 1.7 | 1.7 | 0.7 | 3.3 | 2.3 | 2.3 | 1.0 | 3.0 | 7.7 | 5.3 | 4.7 |
| 0800 | 37.7 | 5.0 | 3.3 | 0.3 | 3.3 | 2.0 | 2.0 | 0.3 | 0.3 | 2.3 | 2.7 | 1.3 | 0.7 | 1.3 | 2.0 | 6.0 | 4.7 |
| 0900 | 23.3 | 4.3 | 2.3 | 2.0 | 1.7 | 2.0 | 1.0 | 0.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.3 | 0.3 | 1.3 | 1.7 | 2.3 |
| 1000 | 19.3 | 3.3 | 2.0 | 2.0 | 2.0 | 2.7 | 1.0 | 0.3 | 0.0 | 1.0 | 1.3 | 1.0 | 0.0 | 0.0 | 0.0 | 0.7 | 2.0 |
| 1100 | 13.0 | 2.3 | 1.3 | 1.3 | 1.3 | 1.3 | 0.7 | 0.3 | 0.3 | 1.0 | 0.7 | 0.7 | 0.0 | 0.0 | 0.3 | 0.3 | 1.0 |
| 1200 | 12.0 | 2.7 | 2.3 | 1.3 | 1.0 | 1.0 | 0.7 | 1.0 | 0.3 | 0.0 | 0.3 | 0.0 | 0.3 | 0.0 | 0.0 | 0.3 | 0.7 |
| 1300 | 11.7 | 1.7 | 1.0 | 1.3 | 1.7 | 1.0 | 1.3 | 0.7 | 0.0 | 0.3 | 0.7 | 0.0 | 0.0 | 0.0 | 0.3 | 0.7 | 1.0 |
| 1400 | 9.7 | 1.7 | 1.3 | 1.3 | 0.3 | 1.0 | 1.3 | 0.7 | 0.0 | 0.0 | 0.3 | 0.3 | 0.0 | 0.0 | 0.3 | 0.3 | 0.7 |
| 1500 | 9.7 | 1.7 | 1.7 | 1.0 | 1.3 | 0.3 | 1.3 | 0.0 | 0.0 | 0.0 | 1.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.7 | 0.3 |
| 1600 | 10.7 | 2.0 | 1.0 | 2.0 | 0.7 | 1.7 | 0.3 | 0.3 | 0.0 | 0.0 | 0.7 | 0.7 | 0.3 | 0.0 | 0.7 | 0.0 | 0.3 |
| 1700 | 11.7 | 2.7 | 1.7 | 1.0 | 2.3 | 0.3 | 0.0 | 0.3 | 0.7 | 0.3 | 0.3 | 0.7 | 0.0 | 0.3 | 0.0 | 0.3 | 0.7 |
| 1800 | 12.3 | 1.7 | 2.0 | 1.7 | 1.7 | 1.0 | 0.0 | 1.0 | 0.3 | 0.0 | 0.3 | 0.3 | 0.3 | 0.3 | 0.7 | 0.0 | 1.0 |
| 1900 | 14.0 | 1.7 | 1.3 | 2.7 | 1.0 | 1.7 | 0.7 | 0.3 | 0.3 | 0.0 | 0.3 | 0.3 | 0.3 | 0.3 | 0.0 | 1.3 | 1.7 |
| 2000 | 15.7 | 1.3 | 2.7 | 2.3 | 1.3 | 1.3 | 1.3 | 0.3 | 0.7 | 0.3 | 0.3 | 0.3 | 0.0 | 0.7 | 0.3 | 0.7 | 1.7 |
| 2100 | 19.7 | 3.0 | 3.7 | 1.7 | 1.7 | 0.3 | 2.0 | 1.3 | 0.3 | 1.0 | 0.7 | 0.0 | 0.3 | 0.0 | 0.7 | 1.3 | 1.7 |
| 2200 | 23.7 | 4.0 | 1.3 | 2.3 | 2.3 | 0.7 | 2.3 | 0.7 | 0.3 | 1.3 | 1.0 | 0.3 | 0.7 | 0.0 | 1.0 | 3.0 | 2.3 |
| 2300 | 26.3 | 3.3 | 1.7 | 2.7 | 1.0 | 0.7 | 2.3 | 2.0 | 0.7 | 1.0 | 0.3 | 1.0 | 0.3 | 0.3 | 3.3 | 2.7 | 3.0 |
| 2400 | 31.3 | 4.3 | 1.3 | 2.7 | 1.0 | 1.0 | 0.7 | 1.3 | 1.3 | 1.3 | 1.0 | 0.7 | 1.0 | 0.7 | 6.7 | 3.3 | 3.0 |
| Total | 613.7 | 71.7 | 52.7 | 42.3 | 37.0 | 30.3 | 29.0 | 19.0 | 14.7 | 27.0 | 27.7 | 26.7 | 14.3 | 31.0 | 83.3 | 57.7 | 49.3 |

**Table 1c Dewpoint Depression for NAPS site**
**Summer (Jun/Jul/Aug)**

Number of Summer Hours Per Year that Dew-Point Depression <=5F: 720.3
Percentage of Hours Per Summer that Dew-Point Depression <= 5F: 33%

| Time of Day | Wind From ➔ DPD <= 5 ➔ | N | NNE | NE | ENE | E | ESE | SE | SSE | S | SSW | SW | WSW | W | WNW | NW | NNW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0100 | 48.0 | 3.3 | 2.0 | 1.3 | 1.0 | 1.3 | 1.0 | 2.3 | 2.7 | 2.3 | 4.7 | 5.7 | 2.7 | 6.0 | 7.3 | 2.7 | 1.7 |
| 0200 | 54.3 | 4.0 | 2.3 | 1.3 | 1.0 | 2.0 | 0.7 | 2.0 | 1.3 | 4.7 | 5.7 | 8.0 | 1.0 | 7.7 | 8.3 | 2.0 | 2.3 |
| 0300 | 59.0 | 4.7 | 3.7 | 2.0 | 1.0 | 1.7 | 0.7 | 0.7 | 1.7 | 7.3 | 5.0 | 7.3 | 2.7 | 8.0 | 7.7 | 1.7 | 3.3 |
| 0400 | 63.3 | 5.7 | 3.7 | 2.0 | 1.3 | 2.0 | 1.3 | 0.3 | 1.7 | 6.3 | 3.7 | 10.3 | 2.7 | 6.3 | 8.7 | 2.7 | 4.7 |
| 0500 | 67.7 | 6.7 | 2.7 | 1.7 | 4.3 | 2.0 | 0.3 | 0.3 | 1.0 | 6.3 | 8.3 | 8.0 | 3.7 | 6.7 | 8.0 | 4.7 | 3.0 |
| 0600 | 66.0 | 5.7 | 3.3 | 1.3 | 3.0 | 2.3 | 0.3 | 0.0 | 1.0 | 7.3 | 8.7 | 7.7 | 2.0 | 9.0 | 6.3 | 2.7 | 5.3 |
| 0700 | 54.3 | 6.3 | 3.7 | 1.3 | 3.0 | 2.3 | 0.7 | 1.0 | 0.0 | 6.3 | 6.0 | 8.7 | 2.3 | 3.3 | 3.3 | 2.0 | 4.0 |
| 0800 | 34.0 | 3.3 | 4.7 | 2.7 | 2.0 | 2.3 | 0.3 | 1.3 | 1.0 | 1.7 | 4.3 | 4.0 | 0.7 | 1.0 | 2.3 | 0.3 | 2.0 |
| 0900 | 20.7 | 2.0 | 2.0 | 2.7 | 2.3 | 1.3 | 0.3 | 0.3 | 2.0 | 0.3 | 3.7 | 1.0 | 0.3 | 0.7 | 0.3 | 1.0 | 0.3 |
| 1000 | 13.3 | 1.0 | 1.3 | 2.0 | 1.7 | 1.0 | 0.7 | 0.3 | 0.3 | 1.0 | 1.0 | 1.3 | 0.3 | 0.3 | 0.3 | 0.0 | 0.7 |
| 1100 | 8.3 | 0.7 | 2.0 | 0.0 | 0.3 | 1.0 | 1.3 | 0.7 | 0.3 | 0.3 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 |
| 1200 | 7.7 | 1.3 | 1.0 | 0.7 | 0.0 | 1.0 | 0.7 | 1.0 | 0.0 | 0.0 | 0.3 | 0.7 | 0.3 | 0.3 | 0.0 | 0.0 | 0.3 |
| 1300 | 6.3 | 0.7 | 1.3 | 0.7 | 0.7 | 0.7 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.0 | 0.3 |
| 1400 | 5.0 | 1.3 | 0.3 | 0.0 | 0.3 | 1.3 | 0.3 | 0.7 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 |
| 1500 | 5.7 | 1.0 | 1.0 | 0.0 | 0.7 | 1.3 | 0.3 | 0.3 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 |
| 1600 | 7.7 | 1.0 | 0.7 | 1.0 | 0.3 | 1.0 | 0.7 | 0.0 | 0.0 | 0.3 | 0.0 | 0.7 | 0.0 | 0.7 | 0.0 | 1.0 | 0.3 |
| 1700 | 6.7 | 1.0 | 1.0 | 0.3 | 0.7 | 0.7 | 0.7 | 0.0 | 0.7 | 0.0 | 0.7 | 0.3 | 0.0 | 0.0 | 0.3 | 0.0 | 0.3 |
| 1800 | 10.0 | 1.0 | 1.0 | 0.3 | 1.7 | 1.3 | 1.3 | 0.3 | 0.7 | 0.3 | 0.3 | 0.0 | 0.0 | 0.7 | 0.7 | 0.3 | 0.0 |
| 1900 | 12.0 | 0.7 | 1.0 | 1.0 | 1.0 | 2.0 | 0.7 | 1.0 | 0.0 | 0.3 | 1.3 | 0.0 | 1.0 | 0.0 | 0.3 | 0.7 | 1.0 |
| 2000 | 18.3 | 2.3 | 1.7 | 1.0 | 2.0 | 2.0 | 2.0 | 0.0 | 0.7 | 1.0 | 1.3 | 1.7 | 0.3 | 0.7 | 0.0 | 1.0 | 0.7 |
| 2100 | 28.7 | 2.7 | 1.7 | 2.3 | 2.3 | 3.3 | 2.0 | 2.0 | 0.7 | 2.0 | 1.3 | 2.0 | 2.0 | 0.7 | 1.7 | 1.0 | 1.0 |
| 2200 | 36.7 | 2.3 | 0.7 | 2.7 | 2.0 | 2.7 | 2.3 | 1.7 | 2.7 | 1.0 | 3.3 | 3.3 | 2.3 | 1.7 | 4.3 | 2.0 | 1.7 |
| 2300 | 41.7 | 2.0 | 2.0 | 3.0 | 0.7 | 1.7 | 2.7 | 1.7 | 0.7 | 3.7 | 3.3 | 5.3 | 1.7 | 4.0 | 4.3 | 4.0 | 1.0 |
| 2400 | 45.0 | 3.0 | 0.3 | 3.3 | 1.7 | 3.0 | 0.7 | 2.3 | 1.7 | 1.7 | 5.0 | 6.3 | 2.3 | 3.3 | 6.3 | 2.0 | 2.0 |
| Total | 720.3 | 63.7 | 45.0 | 34.7 | 35.0 | 41.3 | 23.3 | 20.3 | 20.7 | 54.7 | 68.0 | 84.0 | 29.0 | 61.0 | 71.0 | 32.0 | 36.7 |

**Table 1d Dewpoint Depression for NAPS site**

**Fall (Sep/Oct/Nov)**

Number of Fall Hours Per Year that Dew-Point Depression <= 5F: 742.3

Percentage of Hours Per Fall that Dew-Point Depression <= 5F: 34%

| Time of Day | Wind From → DPD <= 5 ↓ | N | NNE | NE | ENE | E | ESE | SE | SSE | S | SSW | SW | WSW | W | WNW | NW | NNW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0100 | 46.0 | 4.3 | 0.7 | 0.3 | 1.0 | 1.7 | 1.3 | 2.0 | 0.7 | 3.0 | 4.7 | 5.3 | 2.7 | 6.0 | 6.0 | 3.0 | 3.3 |
| 0200 | 49.7 | 4.0 | 1.7 | 0.7 | 0.7 | 1.3 | 1.7 | 2.0 | 1.0 | 4.7 | 3.3 | 5.7 | 1.3 | 7.3 | 7.7 | 4.3 | 2.3 |
| 0300 | 53.7 | 4.3 | 1.0 | 1.0 | 1.0 | 1.0 | 1.3 | 2.7 | 1.0 | 3.7 | 5.0 | 5.3 | 2.7 | 11.0 | 5.3 | 4.3 | 3.0 |
| 0400 | 56.3 | 5.0 | 1.7 | 0.7 | 1.3 | 0.7 | 0.7 | 3.0 | 0.7 | 4.7 | 3.3 | 5.7 | 3.7 | 10.3 | 8.0 | 4.7 | 2.3 |
| 0500 | 61.0 | 6.7 | 1.0 | 2.3 | 1.3 | 0.7 | 1.0 | 2.7 | 1.0 | 4.3 | 6.0 | 6.0 | 4.7 | 12.0 | 4.3 | 4.3 | 2.7 |
| 0600 | 64.3 | 5.3 | 2.3 | 2.3 | 1.0 | 0.3 | 1.7 | 1.7 | 1.7 | 4.7 | 5.0 | 7.0 | 2.7 | 14.7 | 6.7 | 2.3 | 5.0 |
| 0700 | 62.3 | 4.0 | 3.3 | 0.7 | 2.3 | 0.7 | 1.0 | 1.7 | 2.0 | 4.0 | 7.0 | 6.0 | 2.3 | 13.0 | 7.0 | 3.3 | 4.0 |
| 0800 | 53.7 | 5.7 | 2.0 | 3.3 | 0.3 | 1.0 | 0.7 | 2.0 | 0.7 | 4.0 | 4.7 | 4.7 | 2.0 | 8.0 | 6.3 | 4.3 | 4.0 |
| 0900 | 34.3 | 2.0 | 4.3 | 1.3 | 1.7 | 1.3 | 1.7 | 1.7 | 0.7 | 1.7 | 2.7 | 3.0 | 1.3 | 0.7 | 2.7 | 5.0 | 2.7 |
| 1000 | 19.3 | 1.7 | 3.0 | 1.7 | 1.7 | 1.0 | 1.3 | 1.3 | 0.7 | 1.0 | 1.7 | 1.7 | 0.0 | 0.0 | 0.3 | 1.3 | 1.0 |
| 1100 | 13.3 | 1.0 | 2.0 | 0.7 | 1.0 | 1.7 | 0.7 | 1.0 | 0.7 | 1.3 | 0.7 | 0.3 | 0.0 | 0.3 | 0.0 | 0.3 | 1.7 |
| 1200 | 10.7 | 2.7 | 1.3 | 0.7 | 0.0 | 0.7 | 2.0 | 0.3 | 0.3 | 0.3 | 0.7 | 0.7 | 0.0 | 0.0 | 0.0 | 0.7 | 0.3 |
| 1300 | 9.7 | 3.0 | 1.3 | 0.3 | 0.3 | 0.0 | 0.7 | 1.3 | 0.3 | 0.3 | 0.7 | 0.3 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| 1400 | 7.7 | 2.0 | 1.3 | 0.0 | 0.0 | 0.3 | 0.7 | 1.3 | 0.0 | 0.3 | 0.0 | 0.3 | 0.0 | 0.0 | 0.3 | 0.3 | 0.7 |
| 1500 | 7.7 | 2.3 | 1.7 | 0.3 | 0.0 | 0.3 | 1.0 | 0.3 | 0.3 | 0.3 | 0.0 | 0.3 | 0.0 | 0.0 | 0.3 | 0.3 | 0.0 |
| 1600 | 8.0 | 1.3 | 1.3 | 0.7 | 0.3 | 0.7 | 0.7 | 1.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 |
| 1700 | 8.3 | 1.7 | 1.0 | 0.3 | 0.7 | 0.3 | 0.3 | 1.3 | 0.0 | 0.3 | 0.7 | 0.0 | 0.0 | 0.3 | 0.3 | 0.0 | 1.0 |
| 1800 | 10.0 | 2.0 | 0.7 | 1.7 | 0.0 | 0.0 | 0.3 | 0.7 | 0.7 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 1.7 |
| 1900 | 13.3 | 3.3 | 1.0 | 0.7 | 0.0 | 0.7 | 1.0 | 1.7 | 0.3 | 0.7 | 0.7 | 0.3 | 0.7 | 0.3 | 0.7 | 0.7 | 0.7 |
| 2000 | 23.0 | 3.7 | 1.3 | 0.3 | 0.7 | 1.3 | 1.0 | 2.3 | 0.3 | 0.3 | 1.7 | 1.3 | 0.3 | 1.3 | 5.3 | 0.7 | 1.0 |
| 2100 | 29.0 | 3.0 | 2.0 | 0.7 | 1.3 | 1.3 | 1.0 | 1.3 | 0.7 | 1.0 | 1.7 | 2.3 | 0.7 | 3.0 | 5.0 | 1.7 | 2.3 |
| 2200 | 30.7 | 4.3 | 1.0 | 0.7 | 0.7 | 2.3 | 0.7 | 1.7 | 1.3 | 1.3 | 2.3 | 3.0 | 0.7 | 2.3 | 5.7 | 1.3 | 1.3 |
| 2300 | 33.7 | 3.0 | 1.3 | 1.0 | 1.3 | 1.7 | 0.0 | 3.0 | 2.0 | 0.7 | 1.7 | 3.0 | 1.3 | 4.0 | 6.7 | 1.3 | 1.7 |
| 2400 | 36.7 | 2.7 | 0.3 | 2.0 | 0.3 | 2.0 | 0.7 | 2.3 | 1.0 | 2.0 | 4.0 | 4.3 | 1.3 | 4.3 | 4.7 | 2.3 | 2.3 |
| Total | 742.3 | 79.0 | 38.7 | 24.3 | 19.0 | 23.0 | 23.0 | 40.3 | 18.0 | 45.7 | 59.7 | 66.7 | 28.3 | 99.0 | 83.7 | 48.3 | 45.7 |

Application Revision

None.

**16c Response**

As noted in ER Sections 3.3.2.1 and 3.4.1.3.4, chemical treatment would be provided as necessary to prevent scaling. At the time of COL application development, the water quality data defined in ER Table 2.3-13 and from additional sampling, as required, would be used in the evaluation to determine the need for antiscalants. Over a period of time, suspended solids in the cooling tower make-up water would silt in the cooling tower basin. Further, any larger debris entering the basin would be blocked by screens at the intakes for the circulating pumps. Collected solids would be handled in accordance with appropriate local regulation under “truck and haul” permitting addressed in ER Section 3.6.3.3. No other wastes are expected from the wet cooling towers. Tower construction would use material that would not have the potential for leaching of hazardous chemicals.

Periodic cleaning of the dry cooling tower heat exchangers may be required to remove any air entrained solids (e.g. dust and dirt) that are trapped within the coil array as they pass through the radiator panels. A low volume, high pressure wash, utilizing no added cleaning agents, is typically used to remove the expected minor debris. The area under the dry tower would be designed to prevent runoff of wash water to storm drains. Collected solids would be handled in accordance with appropriate local regulation under “truck and haul” permitting addressed in ER Section 3.6.3.3.

Application Revision

ER Section 5.5.1.1 is revised to address potential waste constituents in the blowdown stream. ER Section 3.6.1 is revised to clarify the possible chemical constituents of effluents.

**16d Response**

With the use of wet cooling towers, warm, moist air will be discharged from the top of the towers. This would tend to cause the atmosphere to be saturated in the immediate vicinity of the tower discharge. As the vapor plume mixes with the cooler surrounding air, some of the water vapor would condense and fall to the ground in the area close to the towers. The remaining water vapor would dissipate into the atmosphere. Due to the buoyancy of water vapor and the

natural movement of air (e.g., currents and breezes), the mixing of the water vapor in the plume with the atmosphere would cause any increase in the overall humidity due to the towers to be transient and very localized. The environmental impacts of the operation of the wet cooling towers (specifically, fogging, icing, salt deposition, and visible plume height and length) were evaluated using the SACTI suite of computer programs. The evaluation, including methodology, assumptions, major inputs, and results, is discussed in ER Section 5.3.3.2.1.

Application Revision

ER Section 5.3.3.1 is revised to expand the discussion of the effect of the cooling towers on the local environment and to refer to the description of the evaluation in ER Section 5.3.3.2.1.

**16e Response**

ER Section 5.8.1.2 addresses noise. The comment 16e is understood to be in reference to ER Section 5.8.1.5.

As noted in ER Section 5.8.1.5, except for recreational users on Lake Anna and some residents along the lake shore, the ESP site is shielded by forested land. Forested areas are composed of both deciduous and coniferous trees. In particular, the area around the cooling tower area (as defined on ER Figure 5.8-1) is shielded by mostly coniferous trees to the north in the undeveloped area north of the lake finger shown on the Figure, and a mix of coniferous and deciduous trees to the northwest, west, south, and southeast. ER Section 2.4.1, Terrestrial Ecology, provides a description of the tree varieties on the North Anna site. Note, that as defined in Table 10.1-1 of ER, a 50-100 ft band of trees will be maintained along southern edge of the construction zone. In addition to these trees, a minimum band of trees along the western EAB boundary and the coniferous trees on the northern shore of the reservoir finger directly north of the defined construction area would be maintained.

In addition to the visual shielding provided by trees, it is noted that the site grade elevation of the ESP area and cooling tower area will be lower than the terrain surrounding the site to the north, west and south. This will provide additional visual shielding.

The height of the Unit 3 wet and dry cooling towers will vary depending on the design selected for the site. Tower height could vary from approximately 45 feet for a stand-alone dry tower capable of rejecting a minimum of 1/3 of the Unit 3 condenser heat duty up to 180 feet for a hybrid wet/dry tower capable of rejecting all condenser heat during EC operation while having the capability of rejecting heat via dry cooling as well. See response to RAI Item 3 for further detail.

The cooling towers would be within the defined cooling tower area shown in ER Figures 1.2-4 and 5.8-1 and SSAR Figure 1.2-4. As the cooling tower design has not yet been defined, their specific location cannot be defined at this time.

Application Revision

ER Sections 3.1.2.2, 5.3.3.2.4 and 5.8.1.5 are revised to recognize the potential height of Unit 3 cooling towers may be up to 180 feet, depending on the cooling tower design selected.

**16f Response**

Dominion evaluated shoreline areas in an effort to assess, in general, various impacts of potentially raising normal operating lake level 6 inches to 12 inches above 250 ft. MSL, in the event a Virginia permitting agency process determined the need for such an action. [Note: Raising normal operating lake level is not being proposed to demonstrate site suitability. And though not currently proposed, Virginia DEQ could require an increase in lake level to mitigate impacts on down-river flows. Increasing the lake level by approximately 7 inches would eliminate changes in the frequency and duration of the 20 cfs minimum instream flow.]

Dominion's evaluations included:

- a review of the US FWS National Wetlands Inventory, and various Lake Anna topographical maps;
- a physical survey by boat of the best estimate of areas that could be impacted; and
- an aerial survey of uplake, low gradient tributaries
- select interaction with local residents

The conclusion is that a rise in water level of 6 inches to 12 inches, because of the generally steep shoreline topography, would result in minimal changes to the types and amounts of wetlands other than to shift the prevailing vegetation in gradually sloping tributaries in an upland direction.

The review of the US FWS National Wetlands inventory indicated the presence of broader wetland areas uplake, particularly in the tributary headwaters above the Route 208 Bridge.

The physical boat survey included Freshwater Creek, Contrary Creek, and the main lake channel toward the dam. The survey began below the Route 208 Bridge in Freshwater Creek. Typical vegetation included rushes and sedges with river birch grading to yellow poplar with increases in elevation. This area

represents one in which increased lake level would be most evident due to the more gradually sloping shoreline. In many of the headwater lake tributaries, a successional shift, or movement in wetland vegetation in an upland direction with forest shrub/scrub transitioning to emergents, and emergents to submersed, would be expected. These shifts would likely develop over several years and depend on conditions such as soil type, water clarity and extent of canopy cover.

Contrary Creek, although a gently sloping tributary, also had same shoreline areas with more abrupt channel bank elevations. Rushes were observed intermittently in these areas. Due to the altered shoreline in some areas, the lateral extent of flooding and resulting changes to the types and amounts of wetlands appear to be less than in the neighboring headwater, Freshwater Creek.

Additional boat surveying of the main lake channel toward the dam, both upstream and downstream, showed shoreline topography of relatively steep banks. Some of these banks were nearly vertical gradients due to the effect of wind and wave action undercutting the banks. Several points and coves on either shoreline toward the dam confirmed that a lake level rise would likely result in little lateral or upland change within these areas. Much of the main lake shoreline is more exposed to wind and wave action and would unlikely contain rooted vegetation.

Uplake, near the southern shore about one mile above the Route 208 Bridge, there is an area of cleared and gently sloping land which would not be flooded by the postulated water level increase. There appeared to be dormant water willow in a protected area adjacent to this land.

A helicopter survey of the upper lake followed the boat survey, specifically to view the low gradient tributaries in both the North Anna and Pamunkey arms. The survey confirmed that changes associated with an increased water level would be most evident in these areas and result in the likely shift of wetland vegetation in an upland direction. Beaver activity was observed throughout these upper tributaries, with their dams already acting to flood and alter the wetland landscape. A direct result of the aerial survey was an identification of about 15 areas, ranging in size of approximately one-half acre to 25 acres, which could be impacted as described.

As a result of the evaluations described above, including ground-truthing points around the lake, the conclusion is that a 6 inches to 12 inches water level increase above the normal 250 ft. MSL, depending on seasonal variation in precipitation and lake management, over time, would most likely result in little to no net loss of wetland areas impacted, with many areas remaining largely unchanged. Other areas, most notably the gradually sloping headwater

tributaries, would exhibit an upland shift in the vegetation community concurrent with any sustained increase in normal water level.

In addition to wetland impacts, raising the lake level would likely affect usage of some residential and marina boat ramps and docks, including Lake Anna State Park. These might need some modification to avoid impacting the year-round and seasonal recreational usage of the lake. Raising the lake level could also increase the potential for localized flooding with higher downstream flows.

Application Revision

ER Section 5.8.2.3 is revised to reflect the above response.

**16g Response**

The NAPS onsite meteorology instrumentation measures the dewpoint temperature at an elevation of 10 meters from the ground. This data was converted to relative humidity and that data was used in the evaluation of environmental impact of the operation of the wet cooling towers as described in ER Section 5.3.3.2.1. The effect of elevation on relative humidity was evaluated and it has been shown that for the small difference in height considered here (approximately 23 meters for the towers used in the evaluation vs. the 10 meter data measurement point), the difference in relative humidity is insignificant. Therefore, the data collected at 10 meters is considered to be representative of that at the height of the water vapor release with the use of wet cooling towers and no exception to Section 6.4 of NUREG 1555 or Proposed Revision 1 to Regulatory Guide 1.23 is required.

Application Revision

None.

**16h Response**

As indicated in the response to Question 13, ER Section 7.1 has been revised to show source terms, X/Q values, and doses specific to the ESBWR design.

As indicated in the response to Question 14, ER Section 7.2 has been revised to show severe accident consequences specific to the ESBWR design.

Application Revision

ER Sections 7.1 and 7.2 have been revised to show ESBWR-specific data.

**16i Response**

The increase in power level does result in a change to the calculated design basis accident doses. These changes have been reflected in revisions to Chapter 15 of the SSAR and Chapter 7.1 of the ER. However, the change in power level does not affect the methodology for calculating the X/Q. Since the X/Q values decrease with time (short-term values being greater than long-term values), it is conservative to use the highest X/Q for the duration of each accident. The 50% probability X/Q value for 0 – 2 hours post-accident, is already a small fraction of the conservative value used in the SSAR analysis. Thus, the use of this single value over the duration of the accident, while it is conservative, is not excessively conservative and provides a reasonable basis to assess the environmental impacts of the unlikely events.

Application Revision

None.

16j Response

The North Anna site was selected as the preferred ESP site based on an evaluation performed that reviewed previous nuclear industry siting information and current power plant siting approaches. The results of this evaluation are documented in a report prepared by Dominion Energy, Inc. and Bechtel Power Corporation entitled, Study of Potential Sites for the Deployment of New Nuclear Plants in the United States, dated September 2002 [North Anna Early Site Permit Application, Part 3 – Environmental Report, Section 9.3, Reference 2]. For this evaluation, four candidate sites: North Anna, Surry, Savannah River, and Portsmouth were identified as potential sites. Each site was evaluated against 45 suitability criteria that were grouped into the following four major categories: Environmental, Sociological, Engineering, and Economic (see North Anna Early Site Permit Application, Part 3 – Environmental Report, Table 9.3-2). A ranking or score was assigned for each criterion based on a common ranking scale of 1 to 5, where 1 is the lowest ranking and 5 is the highest. In addition, the relative importance of each criterion was assigned a weighting factor to reflect its importance in the calculation of a site ranking within each category. The results of the evaluation showed a narrow total score spread (i.e., ranging from 351 to 377) with the North Anna ESP site ranking highest. In addition, the evaluation results showed that all four sites were considered to be environmentally acceptable locations for additional nuclear generating units.

The revised approach for Unit 3 cooling is to utilize a closed-cycle circulating water system with a combination of wet mechanical draft and dry cooling towers. To determine if there would be any differences in the alternative site evaluation due to a change in the cooling system design, a review of the 45 suitability criteria was conducted to first identify which criteria would be affected by such a change. From this review it was determined that the rankings assigned to the affected suitability criteria were not strictly based on the use of a once-through cooling system for Unit 3 and cooling towers for Unit 4. Although Lake Anna was considered to be a viable option as a cooling water source for one unit, the study recognized that further evaluations would be needed to assess the full impact of use of the lake for additional units; thus, other cooling system design options were considered as part of the ranking assignments, including the use of wet or dry cooling towers for both units. Therefore, the possible use of cooling system options other than the once-through cooling system approach was already considered in developing the ranking assignments for the North Anna site.

The primary environmental issues raised regarding use of a once-through cooling system for Unit 3 involved water consumption from Lake Anna, and potential thermal impacts to Lake Anna, in particular to aquatic life (including the striped bass population) due to higher temperatures in the North Anna reservoir. Under the revised approach for Unit 3 cooling, there would be less water consumption from Lake Anna and significantly reduced thermal effluent discharge to the Lake. That would, in turn, lead to less thermal impacts to the striped bass population or other aquatic life, when compared to the once-through cooling option. Other environmental considerations, such as terrestrial impacts on the surrounding area from cooling tower construction (e.g., habitat relocation) and from cooling tower operation (e.g., drift, noise, and aesthetic impacts due to occasional visible plumes) were taken into consideration when developing ranking assignments for these criteria; thus, there would be no additional impacts than those previously considered due to the revised cooling system approach. Since use of alternative approaches for the cooling system design was already considered in the alternative site evaluation performed, the impact of changes to the rankings assigned is considered to be minimal. Therefore, the cooling system design change would either have no impact or would result in a slightly higher ranking assignment for some of the affected suitability criteria, such as the aquatic habitat/organisms criterion, that were evaluated to determine site suitability.

In summary, based on a review of the site study, the changes in the cooling system design would have minimal impact on the North Anna site ranking versus the alternative sites. Therefore, this design change would not affect the overall conclusion reached in the site study that there are no obviously superior sites to the North Anna ESP site.

Application Revision

ER Section 9.3.4.2 is revised to include a discussion that the cooling system design change has minimal impact on the North Anna site rankings and the conclusions reached in the alternative site evaluation.

**Question 16 General Response**

A comprehensive review of the application was performed to identify any additional sections that might be affected by the cooling system design or power level increase. Two sections were identified. SSAR Section 3.1.4, "Plant Appearance" and ER Section 5.8.2.3, "Impacts on Lake Anna Recreational Area" were modified to acknowledge the location of the cooling towers and the potential for visual impact.

Application Revision

SSAR Section 3.1.4 and ER Section 5.8.2.3 are revised to reflect the above response.

**17. Possible Bald Eagle Nesting (NRC 3/13/06 letter)**

**During the course of our review, the Friends of North Anna, by letter dated August 31, 2005, gave the locations of what might be two bald eagle nesting areas within three miles of the North Anna discharge canal. Please determine whether or not these are bald eagle nesting areas in the vicinity of the North Anna site, the locations of any nests, and the effect of plant construction and operation on these nests.**

**17 Response**

In response to a NRC follow-up inquiry about potential eagle nests sited or located around the shoreline of the plant discharge canal or the Waste Heat Treatment Facility (WHTF)(March 13, 2006), Dominion conducted both an aerial and ground-truthing survey of the area based on two sets of GPS coordinates reported from local residents. The surveyors had extensive field experience and knowledge in raptor biology. Results of the helicopter survey confirmed the presence of one nest belonging to a red-tailed hawk, not a bald eagle.

The nest was located on a point of residentially developed land along the first lagoon of the WHTF, southeast of the ESP site and with coordinates slightly different than those reported. The second set of coordinates suggested the possible presence of a second nest located in proximity to the first. However, due to the active presence of the hawk in the vicinity of the coordinates, the second set was not verified. The surveyors concluded that no active eagle nests currently exist within a few miles of the North Anna Power Station and ESP site, based in part on the confirmed sighting of the red-tailed hawk. This conclusion is supported by no known recent report of eagle nests around Lake Anna by the Virginia Department of Game & Inland Fisheries, working with the noted Center for Conservation Biology of the College of William and Mary.

From a more historic perspective, an active eagle nest was last reported in the northwest region of Lake Anna in 2002, west of Route 522. It would not be unusual to visually "spot" a bald eagle around Lake Anna's 200 plus miles of shoreline because the habitat is generally conducive to support feeding and nesting. Although nests were not seen from this survey or from recent state surveys, it is likely that the nesting location of any bald eagles being reported would be outside the primary and secondary noise buffer zones, approximately 750 feet and 1300 feet, respectively. The red-tailed hawk nest was located outside these zones. In conclusion, noise impacts to the avian habitat from construction activities at the North Anna Power Station or the ESP site would be small.

Application Revision

None.

**Enclosure 2**
**Description of Changes in Revision 6**
**North Anna Early Site Permit Application**

| North Anna Early Site Permit Application<br>Description of Changes in Revision 6 | |
|---|---|
| **Affected Section, Table, or Figure** | **Reason for Change** |
| **Part 2 Chapter 1** | |
| ▪ SSAR Section 1.2.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ SSAR 1.3.2.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ SSAR Table 1.3-1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ SSAR Table 1.9-1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| **Part 2 Chapter 2** | |
| ▪ SSAR Section 2.3.2.2.1 | ▪ Response to question 7a of March 2, 2006 NRC letter |
| ▪ SSAR Section 2.3.2.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 7a and 7b of March 2, 2006 NRC letter |
| ▪ SSAR Section 2.3.2.4 | ▪ Response to question 8a and 8b of March 2, 2006 NRC letter |
| ▪ SSAR Section 2.4.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 10m(1), 10m(2), 10m(3), and 10m(4) of March 2, 2006 NRC letter |
| ▪ SSAR Section 2.4.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ SSAR Section 2.4.7.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 10m(1), 10m(2), 10m(3), and 10m(4) of March 2, 2006 NRC letter |
| ▪ SSAR Section 2.4.7.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ SSAR Section 2.4.7.5 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ SSAR Section 2.4.8 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ SSAR Section 2.4.10 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ SSAR Section 2.4.11.1 | ▪ ESP Supplement Serial No. 06-010 |

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| | January 13, 2006 |
| ▪ SSAR Section 2.4.11.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ SSAR Section 2.4.11.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 10i of March 2, 2006 NRC letter |
| ▪ SSAR Table 2.4-6 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| **Part 2 Chapter 15** | |
| ▪ SSAR Sections 15.1, 15.2, 15.3, 15.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 131, 13b, and 13c of March 2, 2006 NRC letter |
| ▪ SSAR Table 15.4-1 | ▪ Response to question 131, 13b, and 13c of March 2, 2006 NRC letter |
| ▪ SSAR Tables 15.4-5a to 15.4-5d | ▪ Response to question 13a, 13b, and 13c of March 2, 2006 NRC letter |
| ▪ SSAR Tables 15.4-12a to 15.4-12b | ▪ Response to question 13a, 13b, and 13c of March 2, 2006 NRC letter |
| ▪ SSAR Tables 15.4-19a to 15.4-19c | ▪ Response to question 13a, 13b, and 13c of March 2, 2006 NRC letter |
| ▪ SSAR Tables 15.4-23a to 15.4-23b | ▪ Response to question 13a, 13b, and 13c of March 2, 2006 NRC letter |
| ▪ SSAR Tables 15.4-28 to 15.4-31 | ▪ Response to question 13a, 13b, and 13c of March 2, 2006 NRC letter |
| ▪ SSAR Table 15.4-17 | ▪ Minor correction |
| ▪ SSAR Table 15.4-19 | ▪ Minor correction |
| **Part 3 Chapter 1** | |
| ▪ ER Section 1.1.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 1.1.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 1.2-1 | ▪ Response to question 12d of March 2, 2006 NRC letter |
| ▪ ER Section 1.2 | ▪ Response to questions 12d and 16a of March 2, 2006 NRC letter |

| Part 3 Chapter 2 | |
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| ▪ ER Section 2.3.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Figure 2.3-2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 2.3.3.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 2.4.1.8 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 4 of March 2, 2006 NRC letter |
| ▪ ER Section 2.4 References | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 2.7.1.4 | ▪ Corrected number of days of fogging |
| ▪ ER Section 2.7.4.1.6 | ▪ Corrected number of days of fogging |
| ▪ ER Section 2.7.4.1.7 | ▪ Response to question 8a and 8b of March 2, 2006 NRC letter |
| **Part 3 Chapter 3** | |
| ▪ ER Tables 3.3-1 and 3.3-2 | ▪ Response to question 1b of March 2, 2006 NRC letter |
| ▪ ER Section 3.1.2.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.1.4 | ▪ Clarification for cooling towers |
| ▪ ER Section 3.1.5 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Consistency with ER Section 5.8.1.2 |
| ▪ ER Table 3.1-1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Addition of ESBWR values<br>▪ Typographical error |
| ▪ ER Table 3.1-9 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 1a of March 2, 2006 NRC letter<br>▪ Response to question 2a of March 2, 2006 NRC letter<br>▪ Response to question 10b of March 2, 2006 NRC letter<br>▪ Added Unit 3 Cooling Tower height |
| ▪ ER Tables 3.1-2, 3.1-7, 3.1-8 | ▪ Addition of ESBWR values |
| ▪ ER Section 3.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |

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| ▪ ER Section 3.2.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.2.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 16e of March 2, 2006 NRC letter |
| ▪ ER Section 3.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.3.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.3.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.3.2.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.3.2.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 3.3-1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 1b of March 2, 2006 NRC letter |
| ▪ ER Table 3.3-2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 1b of March 2, 2006 NRC letter |
| ▪ ER Figure 3.3-1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Minor numerical revision |
| ▪ ER Figure 3.3-2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.4.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 1c, 3, 10e, 10h, and 10j of March 2, 2006 NRC letter |
| ▪ ER Section 3.4.1.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.4.1.3.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.4.1.3.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.4.1.3.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.4.2.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |

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| ▪ ER Section 3.4.2.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.4.2.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Figure 3.4-3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Figure 3.4-4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Figure 3.4-7 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Figure 3.4-11 (New) | ▪ Response to question 3 of March 2, 2006 NRC letter |
| ▪ ER Section 3.6.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question16c of March 2, 2006 NRC letter |
| ▪ ER Section 3.7.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.7.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 3.8.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 3.8-1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 15 of March 2, 2006 NRC letter |
| **Part 3 Chapter 4** | |
| ▪ ER Section 4.1.1.6.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER 4.2.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER 4.3.1.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER 4.3.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER 4.3.2.1 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| **Part 3 Chapter 5** | |
| ▪ ER Section 5.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 1d of March 2, 2006 NRC letter |
| ▪ ER Section 5.1.1.1 | ▪ ESP Supplement Serial No. 06-010 |

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| ▪ ER Section 5.1.1.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 1d of March 2, 2006 NRC letter |
| ▪ ER Section 5.2.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.2.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.2.1.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.2.1.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 10e and 10j of March 2, 2006 NRC letter |
| ▪ ER Section 5.2.1.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.2-1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.2.2.1 | ▪ Response to question 10f of March 2, 2006 NRC letter |
| ▪ ER Section 5.2.2.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.2.2.1.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.2.2.1.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 10f of March 2, 2006 NRC letter |
| ▪ ER Table 5.2-2 | ▪ Minor numeric change |
| ▪ ER Tables 5.2-3 and 5.2.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.2.2.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 11a of March 2, 2006 NRC letter |
| ▪ ER Section 5.2.2.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.2.2.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 10e and 10j of March 2, 2006 NRC letter |
| ▪ ER Section 5.2.2.5 | ▪ Response to question 6c of March 2, |

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| | 2006 NRC letter |
| ▪ ER Section 5.2 References | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 11a of March 2, 2006 NRC letter |
| ▪ ER Table 5.2-5 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.2-6 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.2-7 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.2-8 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Figure 5.2-2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Figure 5.2-3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.1.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.1.1.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.1.2.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-4 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.1.2.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.1.2.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-6 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-7 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-8 (Deleted) | ▪ ESP Supplement Serial No. 06-010 |

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| | January 13, 2006 |
| ▪ ER Section 5.3.1.2.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.1.2.5 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.2.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.2.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.2.1.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.2.1.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.2.1.4 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.2.2.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.2.2.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.2.2.4 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.3.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 7c(1), 7c(2), 7c(3), 7c(4), 7d, and 16d of March 2, 2006 NRC letter |
| ▪ ER Section 5.3.3.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.3.3.2.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 1e of March 2, 2006 NRC letter |
| ▪ ER Section 5.3.3.2.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 8c of March 2, 2006 NRC letter |
| ▪ ER Section 5.3.3.2.3 | ▪ Consistency with ER Section 5.8.1.2 |
| ▪ ER Section 5.3.3.2.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 16e March 2, |

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| | 2006 NRC letter |
| ▪ ER Section 5.3.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 6c of March 2, 2006 NRC letter |
| ▪ ER Section 5.3.4.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 6a and 6b of March 2, 2006 NRC letter |
| ▪ ER Section 5.3.4.2 | ▪ Response to question 2b of March 2, 2006 NRC letter |
| ▪ ER Section 5.3 References | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-14 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-15 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-16 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-17 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-18 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-19 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-20 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-21 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 5.3-22 through 5.3.-41 (New) | ▪ Added by response to question 1e of March 2, 2006 NRC letter |
| ▪ ER Figure 5.3-2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Figures 5.3-5 through 5.3-16 (Deleted) | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.4.2.1 | ▪ Addition of ESBWR values |
| ▪ ER Section 5.4.2.1 References | ▪ Minor correction |
| ▪ ER Table 5.4-1 | ▪ Minor correction |
| ▪ ER Table 5.4-3 | ▪ Minor correction |
| ▪ ER Table 5.4-6 | ▪ Addition of ESBWR values |
| ▪ ER Table 5.4-7 | ▪ Addition of ESBWR values |
| ▪ ER Table 5.4-8 | ▪ Addition of ESBWR values |
| ▪ ER Table 5.4-9 | ▪ Addition of ESBWR values |
| ▪ ER Table 5.4-10 | ▪ Addition of ESBWR values |

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| ▪ ER Table 5.4-11 | ▪ Addition of ESBWR values |
| ▪ ER Table 5.4-12 | ▪ Addition of ESBWR values |
| ▪ ER Table 5.4-16 | ▪ Addition of ESBWR values |
| ▪ ER Section 5.5.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.5.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 16c of March 2, 2006 NRC letter |
| ▪ ER Section 5.5.1.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.6.1 | ▪ Typographical error |
| ▪ ER Section 5.7.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.8.1.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 2a and 2b of March 2, 2006 NRC letter |
| ▪ ER Section 5.8.1.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.8.1.5 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 5 and 16e of March 2, 2006 NRC letter |
| ▪ ER Section 5.8.1.6 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 5.8.2.3 | ▪ Response to question 16f of March 2, 2006 NRC letter<br>▪ Clarification regarding cooling towers |
| ▪ ER Table 5.10-1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Consistency with ER Section 5.3.3.1 |
| **Part 3 Chapter 6** | |
| ▪ ER Section 6.1.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 6.3.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 6.5.2.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 6.5.2.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| **Part 3 Chapter 7** | |
| ▪ ER Section 7.1 | ▪ Response to question 13a, 13b, |

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| | 13c, and 16h of March 2, 2006 NRC letter |
| ▪ ER Section 7.1.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 7.1.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 7.1 References | ▪ Minor correction |
| ▪ ER Table 7.1-1 and 7.1-2 | ▪ Response to question 13a, 13b, 13c, and 16h of March 2, 2006 NRC letter |
| ▪ ER Table 7.1-6a to 7.1-6d | ▪ Response to question 13a, 13b, 13c, and 16h of March 2, 2006 NRC letter |
| ▪ ER Tables 7.1-13a to 7.1-13b | ▪ Response to question 13a, 13b, 13c, and 16h of March 2, 2006 NRC letter |
| ▪ ER Table 7.1-201 to 7.1-20c | ▪ Response to question 13a, 13b, 13c, and 16h of March 2, 2006 NRC letter |
| ▪ ER Table 7.1-24a to 7.1-24b | ▪ Response to question 13a, 13b, 13c, and 16h of March 2, 2006 NRC letter |
| ▪ ER Table 7.1-2 to 7.1-32 | ▪ Response to question 13a, 13b, 13c, and 16h of March 2, 2006 NRC letter |
| ▪ ER Table 7.1-18 | ▪ Minor correction |
| ▪ ER Table 7.1-20 | ▪ Minor correction |
| ▪ ER Section 7.2 | ▪ Response to question 14a and 16h of March 2, 2006 NRC letter |
| **Part 3 Chapter 9** | |
| ▪ ER Section 9.3.4.2 | ▪ Response to question 16j of March 2, 2006 NRC letter |
| ▪ ER Section 9.4.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 9.4.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 9.4.1.1.1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 9.4.1.1.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 10l of March 2, 2006 NRC letter |
| ▪ ER Section 9.4.1.1.3 | ▪ ESP Supplement Serial No. 06-010 |

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| | January 13, 2006 |
| ▪ ER Section 9.4.1.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 9.4.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 9.4.2.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 9.4.2.3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 9.4.2.4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 9.4.2.5 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 9.4-1 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Consistency with ER Section 5.8.1.2 |
| ▪ ER Table 9.4-2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 10l of March 2, 2006 NRC letter<br>▪ Consistency with ER Section 5.8.1.2 |
| ▪ ER Table 9.4-3 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 10l of March 2, 2006 NRC letter |
| ▪ ER Table 9.4-4 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Consistency with ER Section 5.8.1.2 |
| ▪ ER Table 9.4-5 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Consistency with ER Section 5.8.1.2 |
| ▪ ER Table 9.4-6 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Response to question 10l of March 2, 2006 NRC letter |
| ▪ ER Table 9.4-9 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 9.4-10 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Table 9.4-11 | ▪ ESP Supplement Serial No. 06-010 |

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| | January 13, 2006 |
| **Part 3 Chapter 10** | |
| ▪ ER Table 10.1-2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006<br>▪ Consistency with ER Section 5.3.3.1 |
| ▪ ER Section 10.2.1.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 10.2.1.6 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |
| ▪ ER Section 10.3.2 | ▪ ESP Supplement Serial No. 06-010 January 13, 2006 |

**Dominion Nuclear North Anna, LLC**
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Dominion®

June 21, 2006

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

Serial No. 06-507
ESP/JDH
Docket No. 52-008

**DOMINION NUCLEAR NORTH ANNA, LLC**
**NORTH ANNA EARLY SITE PERMIT APPLICATION**
**RESPONSE TO NRC QUESTIONS AND REVISION 7 TO THE NORTH ANNA ESP APPLICATION**

In a May 24, 2006 letter (Serial No. 06-440), Dominion Nuclear North Anna, LLC (Dominion) submitted its responses to a May 10, 2006 NRC request for additional information, NRC comments in a May 12, 2006 site audit summary report, and follow-up telephone questions from the NRC environmental project manager related to the site audit. Those responses have been incorporated in the enclosed Revision 7 of the North Anna Early Site Permit (ESP) application.

On June 2 and 5, 2006, NRC conducted additional telephone conference calls with Dominion to further discuss the application. As a result, in a June 7, 2006 letter, NRC requested that Dominion provide information in response to five additional questions. Dominion's responses to those five questions are provided in Enclosure 1 and have also been incorporated in Revision 7 of the North Anna ESP application.

A summary of the changes in Revision 7 of the North Anna ESP application is provided as Enclosure 2. A CD containing Revision 7 of the North Anna ESP application is provided as Enclosure 3.

If you have any questions or require additional information, please contact Tony Banks at 804-273-2170 or Joe Hegner at 804-273-2770.

Very truly yours,

Eugene S. Grecheck
Vice President-Nuclear Support Services

Enclosures:

1. Response to June 7, 2006 NRC questions.
2. Summary of Changes to North Anna ESP Application Revision 7.
3. One CD-ROM labeled “North Anna Early Site Permit Application, Docket No. 52-008, September 2003; Revision 7, June 2006, NRC ADAMS Edition,” containing the following files:

001 North Anna ESP Application R7 (1 of 6).pdf; 13.5MB; publicly available
002 North Anna ESP Application R7 (2 of 6).pdf; 20,333,587 bytes, publicly available
003 North Anna ESP Application R7 (3 of 6).pdf; 49,720,156 bytes, publicly available
004 North Anna ESP Application R7 (4 of 6).pdf; 36,955,037 bytes, publicly available
005 North Anna ESP Application R7 (5 of 6.pdf; 38,933,988 bytes, publicly available
006 North Anna ESP Application R7 (6 of 6).pdf; 28,420,032 bytes, publicly available

Commitments made in this letter: None

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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 Support Services, of Dominion Nuclear North Anna, LLC. He has affirmed before me that he is duly authorized to execute and file the foregoing document on behalf of Dominion Nuclear North Anna, LLC, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 21st day of June, 2006.

My Commission expires: My Commission Expires July 31, 2007

Vera F. Thomas

Notary Public

(SEAL)

**Enclosure 1**

**Response to June 7, 2006 NRC Questions**

**June 7, 2006 NRC Letter (General Comment)**

The staff has reviewed revision 06 of the ESP application and it has discovered apparent discrepancies in the application.

It is our understanding the ER Table 3.1-1 indicates various reactor designs that were used to develop the bounding site specific plant parameter envelope (PPE) values contained in ER Table 3.1-9. The values in ER Table 3.1-1 are generic values not site specific values. Therefore, the site specific values in ER Table 3.1-9 differ from the values in ER Table 3.1-1. Likewise, ER Tables 3.1-7 and 3.1-8 provide radionuclide activity values for various designs whereas, ER Tables 5.4-6 and 5.4-7 provide bounding values for radionuclide activity.

Based on the above observations, the staff is requesting that Dominion provide responses to the following questions:

**NRC Question 1 (June 7, 2006)**

Clarify the purpose of the ER Tables 3.1-1, 3.1-9, 5.4-6, and 5.4-7 in ER section 3.1-3 and 3.1-6. Make consistent changes to the corresponding tables in the SSAR.

Response

The staff's understanding of the purposes of ER Tables 3.1-1 and 3.1-9 is correct. For clarification, ER Table 3.1-1 has been renamed "Generic Plant Parameters Envelope" and ER Table 3.1-9 has been renamed "Bounding Site-Specific Plant Parameters Envelope." Similarly, SSAR Table 1.3-1 has been renamed "Generic Plant Parameters Envelope" and SSAR Table 1.9-1 has been renamed "Bounding Site-Specific Plant Parameters Envelope." The text in ER Section 3.1 and SSAR Section 1.3 has been revised to further clarify the purpose of the two tables.

The radionuclide activity releases in ER Tables 5.4-6 and 5.4-7 are composite, bounding values based on multiple reactor designs. To eliminate inconsistencies, ER Tables 3.1-7 and 3.1-8 have been deleted and any references to these tables have been changed to ER Tables 5.4-6 and 5.4-7. SSAR Tables 1.3-7 and 1.3-8 have been revised to be identical to ER Tables 5.4-6 and 5.4-7.

Application Revision

The application has been revised as indicated.

**NRC Question 2 (June 7, 2006)**

> The reference of ER Table 3.1-1 in Table 3.1-9 should be removed due to differences between the site specific and generic PPE values.

Response

The references to ER Table 3.1-1 have been removed from ER Table 3.1-9. Similarly, all references to SSAR Table 1.3-1 have been removed from SSAR Table 1.9-1.

Application Revision

The application has been revised as indicated.

**NRC Question 3 (June 7, 2006)**

> The footnote in ER Tables 5.4-6 and 5.4-7 is misleading. Please clarify the footnote to indicate that the radionuclide values in ER Tables 5.4-6 and 5.4-7 are the bounding values for the application.

Response

The footnotes explained the differences between ER Tables 5.4-6 and 5.4-7 and corresponding ER Tables 3.1-7 and 3.1-8. Since the latter tables have been deleted (see Question 1 response), the footnotes have also been deleted. Footnotes were added to explain how ABWR and ESBWR activities were adjusted in arriving at the composite values. The only place in the ER that radionuclide release values are now presented is in Tables 5.4-6 and 5.4-7. Further, SSAR Tables 1.3-7 and 1.3-8 have been revised to be identical to ER Tables 5.4-6 and 5.4-7.

Application Revision

The application has been revised as indicated.

**NRC Question 4 (June 7, 2006)**

The staff has identified the following discrepancies in SSAR tables 1.3-1, 1.3-2, 1.3-7, 1.3-8, 1.9-1 and ER tables 3.1-1, 3.1-2, 3.1-7, 3.1-8, 3.1-9, 5.4-6, and 5.4-7, and the bounding notes of various tables:

a. SSAR Table 1.3-1 (Item 10) indicates that the source term is based on “Bounding Notes” or “Bound Notes” 1, 3, 4, 5 and 13 out of SSAR Table 1.3-2. SSAR Table 1.3-2 indicates that notes 1, 3, 4 and 5 reflect the designs of the AP1000, ABWR/ESBWR, PBMR, and the ACR-700, while note 13 cites the ABWR, AP1000, ACR-700 as the basis, but it excludes the PBMR design. However, ER Table 3.1-2 redefines note 13 as being comprised of the ABWR, AP1000, ACR-700, and the ESBWR designs.

b. SSAR Table 1.3-7 indicates that its footnotes refer to the ACR-700, ABWR, and AP1000 designs. However, ER Table 3.1-7 indicates that the basis for the source term is different as it refers to the ACR-700, ESBWR with a 25% margin, ABWR, and the AP1000 designs.

c. ER Table 3.1-9 indicates that the basis of the liquid effluent source term is ER Table 3.1-1 (Item 10) and ER Table 5.4-6. However, the source term in ER Table 5.4-6 has been maximized and is higher than that given in SSAR Table 1.3-7 and ER Table 3.1-7 supporting the use of the PPE concept.

d. There are inconsistent values of liquid effluent source term radioactivity levels (by radionuclides and as totals) among SSAR and ER Tables 1.3-7, 3.1-7, and 5.4-6, with some radionuclides being excluded, e.g., Zn-69m, Br-83, Ru-105, Ba-139, and La-142 from SSAR Table 1.3-7. Also, some activity levels cited in SSAR Table 1.3-7 and ER Table 3.1-7 seems to be inconsistent with those given in Tables 1.3-1 and 3.1-1.

e. ER Table 3.1-1 provides a link to the various reactor designs from which the bounding values in ER Table 3.1-9 are derived. ER Table 3.1-9 contains the site specific bounding values (or PPE values) that the reactor design selected at the COL stage must fit within. Please explain this discrepancy or clarify the titles of ER Table 3.1-1 and ER Table 3.1-9 to remove the confusion.

The above examples are based on using ER Table 5.4-6 for liquid effluents, similar discrepancies were also noted using ER Table 5.4-7 for gaseous effluents. Dominion should review the application for inconsistencies/discrepancies elsewhere in the application and provide the corrected information in revision 07 of the application.

Response

Changes have been made to SSAR Section 1.3 and ER Section 3.1 to remove inconsistencies. Specific comments are addressed below.

a. Bounding Notes 12 and 13 in SSAR Table 1.3-2 have been revised to include the ESBWR in the list of designs considered for source terms, consistent with Notes 12 and 13 of ER Table 3.1-2.

b. ER Tables 3.1-7 and 3.1-8 have been deleted (see Question 1 response) with the references to these tables replaced by references to ER Tables 5.4-6 and 5.4-7. SSAR Tables 1.3-7 and 1.3-8 have been revised to be identical to ER Tables 5.4-6 and 5.4-7, thereby eliminating inconsistencies.

c. The references to ER Table 3.1-1 have been deleted from ER Table 3.1-9. Now ER Tables 3.1-1 and 3.1-9 refer to ER Table 5.4-6 for the liquid source terms. The section on gaseous source terms has been similarly revised.

d. See Response b above.

e. ER Table 3.1-1 has been renamed “Generic Plant Parameters Envelope” and ER Table 3.1-9 has been renamed “Bounding Site-Specific Plant Parameters Envelope.” The text in ER Section 3.1 has been revised to further clarify the purposes of the two tables. The SSAR has been similarly revised.

The application has been reviewed for inconsistencies/discrepancies. This resulted in a change in text from a prior revision, eliminating differences in tables, and correcting a typographical and a grammatical error. A summary of the changes is provided in Enclosure 2 which identifies where a response to the June 7, 2006 RAIs has resulted in a change to the application.

Application Revision

The application has been revised as indicated.

**NRC Question 5 (June 7, 2006)**

> Provide a conversion for liquid and gaseous effluents releases (from Ci/yr to µCi/ml) that meets the requirements of 10CFR Part 20, Appendix B, Table 2, Columns 1 and 2 (e.g., refer to ESBWR DCD Revision 1, Tier 2, Table 12.2-17 and 12.2-19b). The derivation of effluent concentrations (µCi/ml) should be based on the source terms (Ci/yr) presented in ER Tables 5.4-6 and 5.4-7 using North Anna specific data. Dominion should include this information in the SSAR.

Response

ER Tables 5.4-6 and 5.4-7 have been revised to show five columns of information: (1) isotope name, (2) activity release (Ci/yr), (3) effluent concentration (µCi/ml), (4) 10 CFR 20 effluent concentration limit (ECL) (µCi/ml), and (5) fraction of ECL. ER Section 5.4.2 has been revised to briefly explain how the effluent concentrations are calculated. SSAR Tables 1.3-7 and 1.3-8 have been revised to be identical to ER Tables 5.4-6 and 5.4-7. SSAR Section 1.3.1 has been revised to briefly explain how the effluent concentrations are calculated.

Application Revision

The application has been revised as indicated.

**Enclosure 2**

Summary of Changes to North Anna ESP Application Revision 7

| Summary of Changes to North Anna ESP Application Revision 7 | |
|---|---|
| **Affected Section, Table, or Figure** | **Reason for Change** |
| | |
| **Part 2 Chapter 1** | |
| ▪ Section 1.3.1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 1.3.3 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 1.3 References | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 1.3-1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 1.3-2 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 1.3-7 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 1.3-8 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 1.9 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 1.9-1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| **Part 2 Chapter 2** | |
| ▪ Section 2.5.4.2.2 | ▪ Corrected typographical error |
| **Part 2 Chapter 15** | |
| • Section 15.4 | • Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| • Table 15.4-1 | • Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| • Table 15.4-5a | • Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| • Table 15.4-5b | • Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| • Table 15.4-5d | • Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| • Table 15.4-12b | • Dominion letter (Serial No. 06-440), dated May 24, 2006 |

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|---|---|
| • Table 15.4-19b | • Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| • Table 15.4-19c | • Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| • Table 15.4-23b | • Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| • Table 15.4-28 | • Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| • Table 15.4-29 | • Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| • Table 15.4-31 | • Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| **Part 3 Chapter 2** | |
| ▪ Section 2.7.5.1 | ▪ Corrected grammatical error |
| ▪ Table 2.7-20 | ▪ Removed text leftover from previous revision |
| **Part 3 Chapter 3** | |
| ▪ Section 3.1.3 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 3.1.6 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 3.1-1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 3.1-2 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 3.1-7 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 3.1-8 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 3.1-9 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 3.2 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 3.3 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 3.3.1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 3.3-1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 3.3-2 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |

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| ▪ Section 3.4.1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 3.4.1.1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 3.4.1.2 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 3.4.2 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 3.5 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 3.5.1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 3.5.2 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 3.5.3 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| **Part 3 Chapter 5** | |
| ▪ Section 5.3.1.1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 5.3.2.1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 5.3.3.1 | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Section 5.3.3.2.1 | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Section 5.3.3.2.4 | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Section 5.4.2.1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 5.4.2.2 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 5.4 References | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 5.4.6 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 5.4.7 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 5.5.1.1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Section 5.8.1.2 | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |

| | |
|---|---|
| ▪ Section 5.8.1.5 | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| **Part 3 Chapter 6** | |
| ▪ Section 6.4.1.1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| **Part 3 Chapter 7** | |
| ▪ Section 7.1.4 | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Table 7.1-2 | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Table 7.1-6a | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Table 7.1-6b | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Table 7.1-6d | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Table 7.1-13b | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Table 7.1-20b | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Table 7.1-20c | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Table 7.1-24b | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Table 7.1-29 | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Table 7.1-30 | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| ▪ Table 7.1-32 | ▪ Dominion letter (Serial No. 06-440), dated May 24, 2006 |
| **Part 3 Chapter 9** | |
| ▪ Section 9.3.3.4.1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 9.4-1 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |
| ▪ Table 9.4-5 | ▪ Dominion letter (Serial No. 06-507), dated June 21, 2006 |

Dominion Nuclear North Anna, LLC
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Dominion®

July 31, 2006

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

Serial No. 06-631
ESP/JDH
Docket No. 52-008

**DOMINION NUCLEAR NORTH ANNA, LLC**
**NORTH ANNA EARLY SITE PERMIT APPLICATION**
**RESPONSE TO NRC QUESTIONS AND REVISION 8 TO THE NORTH ANNA ESP APPLICATION**

On June 21, 2006, Dominion submitted Revision 7 of the North Anna ESP application. On July 6, 2006, Dominion and NRC held a conference call and on July 12, 2006, NRC conducted a site audit. Both activities were to discuss clarifications needed for the NRC staff to complete its review. Those activities were documented in a summary published by the NRC on July 18, 2006. The summary listed thirteen questions and potential clarifications. Dominion's responses to those thirteen items are provided in Enclosure 1 and have been incorporated in Revision 8 of the North Anna ESP application.

A summary of the changes in Revision 8 of the North Anna ESP application is provided as Enclosure 2. A CD containing Revision 8 of the North Anna ESP application is provided as Enclosure 3.

If you have any questions or require additional information, please contact Tony Banks at 804-273-2170 or Joe Hegner at 804-273-2770.

Very truly yours,

Eugene S. Grecheck
Vice President-Nuclear Support Services

Enclosures:

1. Response to July 18, 2006 NRC questions.
2. Summary of Changes to North Anna ESP Application Revision 8.
3. One CD-ROM labeled “North Anna Early Site Permit Application, Docket No. 52-008, September 2003; Revision 8, July 2006, NRC ADAMS Edition,” containing the following files:

   001 North Anna ESP Application R8 (1 of 6).pdf; 13.6MB; publicly available
   002 North Anna ESP Application R8 (2 of 6).pdf; 20,164,188 bytes, publicly available
   003 North Anna ESP Application R8 (3 of 6).pdf; 49,749,548 bytes, publicly available
   004 North Anna ESP Application R8 (4 of 6).pdf; 21,529,641 bytes, publicly available
   005 North Anna ESP Application R8 (5 of 6.pdf; 38,063,782 bytes, publicly available
   006 North Anna ESP Application R8 (6 of 6).pdf; 28,455,383 bytes, publicly available

Commitments made in this letter: None

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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 Support Services, of Dominion Nuclear North Anna, LLC. He has affirmed before me that he is duly authorized to execute and file the foregoing document on behalf of Dominion Nuclear North Anna, LLC, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 31st day of July, 2006.

My Commission expires: August 31, 2008

Margaret B. Bennett
Notary Public

(SEAL)

**Enclosure 1**

**Response to July 18, 2006 NRC Questions**

**July 18, 2006 NRC Letter (General Comment)**

Dominion submitted Revision 07 of the ESP application on June 21, 2006, to address questions identified by the staff in a June 07, 2006, teleconference (teleconference summary dated June 07, 2006, ADAMS Accession Number ML061580174). In reviewing Revision 07, the staff concluded that Dominion addressed the questions, however, questions 4.a and 5 were only partially addressed. The staff requests responses to the following questions and comments to fully resolve the apparent discrepancies discussed in questions 4.a and 5.

**NRC Question 1 (July 18, 2006)**

Site Safety Analysis Report (SSAR) Table 1.3-1 and ER Table 3.1-1, PPE Section 9.3.1

Bounding note 12 should be referenced instead of note 6 to provide more clarity.

Response

The tables have been revised to refer to Bounding Note 12.

Application Revision

SSAR Table 1.3-1 and ER Table 3.1-1 have been revised as indicated.

**NRC Question 2 (July 18, 2006)**

SSAR Table 1.3-2 and ER Table 3.1-2, Notes 12 and 13

Indicate that liquid and gaseous source terms reflect ABWR with an adjusted power of 4300 MWt and ESBWR scaled up by a margin of 25 percent.

Response

Notes 12 and 13 refer to SSAR Tables 1.3-7 and 1.3-8 and ER Tables 5.4-6 and 5.4-7. These four referenced tables already indicate that ABWR activities were scaled up to 4300 MWt and ESBWR activities were by 25 percent. For further clarity, Notes 12 and 13 have been revised to repeat this information.

Application Revision

SSAR Table 1.3-2 and ER Table 3.1-2 have been revised as indicated.

**NRC Question 3 (July 18, 2006)**

SSAR Table 1.3-7 and ER Table 5.4-6

Table footnotes should indicate that the composite liquid effluent activities are based on ABWR, AP1000, ACR-700, and ESBWR, and the stated adjustments to the ABWR and ESBWR.

Response

The footnotes have been revised to clarify the bases for the composite values.

Application Revision

SSAR Table 1.3-7 and ER Table 5.4-6 have been revised as indicated.

**NRC Question 4 (July 18, 2006)**

SSAR Table 1.3-8 and ER Table 5.4-7

Table footnotes should indicate that the composite gaseous effluent activities are based on ABWR, AP1000, ACR-700, and ESBWR, and the stated adjustments to the ABWR and ESBWR.

Response

The footnotes have been revised to clarify the bases for the composite values.

Application Revision

SSAR Table 1.3-8 and ER Table 5.4-7 have been revised as indicated.

**NRC Question 5 (July 18, 2006)**

ER Table 3.1-9

In the "Doses Consequences" section, provide reference to ER Table 5.4-7 in discussing normal dose compliance for 10 CFR 20 for gaseous limits.

Response

ER Table 5.4-7 was not cited for dose consequences because this table shows effluent concentrations, not doses. However, since concentrations are related to doses, the reference list has been revised to include Table 5.4-7.

Application Revision

ER Table 3.1-9 has been revised as indicated.

**NRC Question 6 (July 18, 2006)**

ER Table 3.1-9

In the "Liquid Radwaste System" section, provide reference to ER Table 5.4-6 in discussing normal dose compliance for 10 CFR 20 for liquid effluents.

Response

ER Table 5.4-6 was not cited for dose consequences because this table shows effluent concentrations, not doses. However, since concentrations are related to doses, the reference list has been revised to include Table 5.4-6.

Application Revision

ER Table 3.1-9 has been revised as indicated.

**NRC Question 7 (July 18, 2006)**

ER Table 3.1-9

In the “Source Term” section, change tritium release from “3530 Ci/yr (7060 Ci/yr)” to “3500 Ci/yr (7000 Ci/yr)” consistent with the value in ER Table 5.4-7.

Response

The table entry has been corrected.

Application Revision

ER Table 3.1-9 has been revised as indicated.

**NRC Question 8 (July 18, 2006)**

ER Section 5.4.1.1

It is stated that the dilution factor (DF) is 10:

a. Explain why a DF of 1000 was used in Table 5.4-6 rather than 10.
b. Is it still conservative?
c. What is the basis for a DF of 1000?
d. Which blowdown rates of Table 3.1-9 are used?
e. For clarity, add a note that the existing units provide a total of approximately 430,000 gpm in the discharge canal ((based on UFSAR Table 11.2-20).

Response

a. In prior revisions of the application, the dilution factor of 10 in ER Table 5.4-1 reflected LADTAP II input. LADTAP II was run with an effluent discharge rate of 10,000 gpm and a dilution factor of 10. In LADTAP II, a discharge rate of 10,000 gpm with a dilution factor of 10 yields the same results as a discharge rate of 100 gpm with a dilution factor of 1000 since the composite activity releases per year defined in ER Table 5.4-6 are contained within both discharge models. Either way, the effective dilution flow is 100,000 gpm. When this effective dilution flow is divided by the plant effluent discharge rate of 100 gpm, the dilution factor is 1000. The effluent concentrations in ER Table 5.4-6 are also based on a dilution flow of 100,000 gpm, consistent with the LADTAP II dose calculations. Table 5.4-1 has been revised to remove the entry for dilution factor and to show an effluent discharge rate of 100 gpm and a dilution flow rate of 100,000 gpm. Table 3.1-9 is revised to be consistent with section 5.4.1.1 and Table 5.4-1.
b. Section 5.4.1.1 has been revised to remove the statement that “the dilution factor is a conservative low value of 10.” It now mentions a DF of 1000. The DF of 1000 is still conservative because of the composite activity releases utilized.
c. The DF of 1000 is based on a liquid effluent discharge rate of 100 gpm and a dilution flow of 100,000 gpm.
d. The blowdown rates of Table 3.1-9 are for heat sink applications only. They are not used for effluent dilution calculations. However, in determining the allowed effluent discharge from the new units at such time as the units are constructed and placed in operation, credit for the blowdown flow to the WHTF may be taken to achieve required dilution.

**NRC Question 8 (July 18, 2006) cont.**

e. Section 5.4.1.1 has been revised to document that the existing units' evaluation for effluent dilution is based on a flow of 430,000 gpm in the discharge canal.

Application Revision

ER Tables 3.1-9, 5.4-1 and Section 5.4.1.1 have been revised as indicated.

**NRC Question 9 (July 18, 2006)**

ER Section 5.4.2.1

It is stated that the sum of the fractions of effluent concentration limits (ECL) is within unity. Using a DF of 10 as provided in ER Section 5.4.1.1 and Table 5.4.1, the results of the staff's independent evaluation do not confirm these results. This needs to be reconciled with the actual DF used in Table 5.4-6 and Table 3.1-9 data.

Response

As indicated in the response to Question 8a, the effluent concentrations in Table 5.4-6 are based on a dilution flow of 100,000 gpm, which corresponds to a DF of 1000 when compared to the effluent discharge rate of 100 gpm. ER Section 5.4.1.1 and Tables 3.1-9 and 5.4-1 have been revised to reflect a DF of 1000. The concentrations and doses have not been revised as a result of this definition change.

Application Revision

ER Section 5.4.1.1 and Tables 3.1-9 and 5.4-1 have been revised as indicated.

**NRC Question 10 (July 18, 2006)**

ER Table 5.4-1

It is stated that the DF for discharge is 10.

a. The staff's independent evaluation indicates that a DF of 1000 was applied to obtain the results in Table 5.4-6.
b. Explain why a DF of 10 was used for all calculations except for 10 CFR Part 20, App. B, Table 2 compliance.
c. Provide the basis for using a DF of 1000, using the blowdown rates of Table 3.1-9.
d. It would be more clear to replace the effluent discharge rate of "100 gpm with 10,000 gpm dilution" with "100 gpm" and replacing "Dilution factor for discharge 10" with "Site specific dilution flow rate 100,000 gpm."

Response

a. As indicated in the response to Question 8a, the effluent concentrations in Table 5.4-6 are based on a dilution flow of 100,000 gpm, which corresponds to a DF of 1000. Table 5.4-1 has been revised to remove the dilution factor of 10 and to show an effluent discharge rate of 100 gpm and a dilution flow rate of 100,000 gpm.
b. As indicated in the response to Question 8a, the dose calculations and the 10 CFR Part 20 effluent calculations are both based on a DF of 1000. Table 5.4-1 has been revised to reflect this.
c. The blowdown rates of Table 3.1-9 are for heat sink applications only. They are not used for effluent dilution calculations.
d. Table 5.4-1 has been revised as suggested.

Application Revision

ER Table 5.4-1 has been revised as indicated.

**NRC Question 11 (July 18, 2006)**

SSAR Section 3.5.1.6

This section references Section 2.2.3.2.1. The appropriate reference should be Section 2.2.3.2.

Response

The typographical error has been corrected.

Application Revision

SSAR Section 3.5.1.6 has been revised as indicated.

**NRC Question 12 (July 18, 2006)**

SSAR Sections 1.3.1, 1.9, ER Sections 3.1.6 and 5.4.2

Expand the discussion on the basis consideration of source terms, in light of the various reactor designs and the increase in the power level. Expand the description of the considerations applied in developing the bounding site specific PPE values from generic PPE values.

Response

SSAR Section 1.3.1 has been revised to provide a discussion on how the composite source terms are obtained from multiple reactor designs. SSAR Section 1.9 now refers to the added discussion in Section 1.3.1. In the revised ER, Section 3.1.6 refers to SSAR Section 1.3.1 and Section 5.4.2 refers to Section 3.1.6.

Application Revision

SSAR Sections 1.3.1 and 1.9 and ER Sections 3.1.6, 5.4.2.1, and 5.4.2.2 have been revised as indicated.

**NRC Question 13 (July 18, 2006)**

ER Section 5.4.4.3

Typographical error on the third line, "(40 CFR 90)" should read as "(40 CFR 190)."

Response

The typographical error has been corrected.

Application Revision

ER Section 5.4.4.3 has been revised as indicated.

**Enclosure 2**

Summary of Changes to North Anna ESP Application Revision 8

| Summary of Changes to North Anna ESP Application Revision 8 | |
|---|---|
| | |
| **Affected Section, Table, or Figure** | **Reason for Change** |
| | |
| **Part 2 Chapter 1** | |
| ▪ Section 1.3.1 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| ▪ Table 1.3-1 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| ▪ Table 1.3-2 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| ▪ Table 1.3-7 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| ▪ Table 1.3-8 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| ▪ Section 1.9 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| | |
| **Part 2 Chapter 3** | |
| ▪ Section 3.5.1.6 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| | |
| **Part 3 Chapter 3** | |
| ▪ Section 3.1.6 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| ▪ Table 3.1-1 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| ▪ Table 3.1-2 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| ▪ Table 3.1-9 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| | |
| **Part 3 Chapter 5** | |
| ▪ Section 5.4.1.1 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| ▪ Section 5.4.2.1 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |

| | |
|---|---|
| ▪ Section 5.4.2.2 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| ▪ Section 5.4.4.3 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| ▪ Table 5.4-1 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| ▪ Table 5.4-6 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |
| ▪ Table 5.4-7 | ▪ Dominion letter (Serial No. 06-631), dated July 31, 2006 |

**Enclosure 3**

**One CD-ROM labeled “North Anna Early Site Permit Application, Docket No. 52-008, September 2003; Revision 8, July 2006, NRC ADAMS Edition”**