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Dominion®

October 2, 2008

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

Serial No. NA3-08-104R
Docket No. 52-017
COL/MJL

DOMINION VIRGINIA POWER
NORTH ANNA UNIT 3 COMBINED LICENSE APPLICATION
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION LETTER No. 026
(FSAR CHAPTER 2, 3, 5 and 11)

On August 19, 2008, the NRC requested additional information to support the review of certain portions of the North Anna Unit 3 Combined License Application (COLA). The responses are provided in Enclosures 1 through 7:

- RAI Question 02.04.13-1 — Presence or Absence of Chelating Agents
- RAI Question 02.04.13-2 — Radionuclide Transport Analysis – K_d
- RAI Question 02.04.13-3 — Radionuclide Transport Analysis – MODFLOW
- RAI Question 03.09.02-1 — Potential Adverse Flow Effects
- RAI Question 03.09.02-2 — FIV Program for Reactor Internals Schedule
- RAI Question 05.03 BTP-1 — PTLR and P-T Limits Approach Confirmation
- RAI Question 11.05-4 — CST Basin Sampling Provisions

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

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

Very truly yours,

Eugene S. Grecheck

DO89
NRO

COMMONWEALTH OF VIRGINIA

COUNTY OF HENRICO

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

Acknowledged before me this 2nd day of October, 2008

My registration number is 7173057 and my

Commission expires: August 31, 2012

Wanda K. Marshall

Notary Public

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

Enclosures:

1. Response to RAI Letter 026, RAI Question 02.04.13-1
2. Response to RAI Letter 026, RAI Question 02.04.13-2
3. Response to RAI Letter 026, RAI Question 02.04.13-3
4. Response to RAI Letter 026, RAI Question 03.09.02-1
5. Response to RAI Letter 026, RAI Question 03.09.02-2
6. Response to RAI Letter 026, RAI Question 05.03 BTP-1
7. Response to RAI Letter 026, RAI Question 11.05-4

Commitments made by this letter:

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

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

ENCLOSURE 1

Response to NRC RAI Letter Number 26

RAI Question Number 02.04.13-1

NRC RAI 02.04.13-1

The NRC staff has reviewed the radionuclide transport analysis results described in FSAR Section 2.4.13. In accordance with 10 CFR 100.20(c)(3) and 10 CFR 52.79(a)(1)(iii), please provide information on the presence or absence of chelating agents in the tank used for the source in the accidental release analysis.

Dominion Response

FSAR Section 2.4.13.1 provides an analysis of a postulated, accidental release of radioactive liquid effluents to the groundwater at the Unit 3 site. The analysis is based on the rupture of a liquid radwaste tank outside of containment. The ESBWR standard plant design does not require the use of chelating agents in liquid radwaste storage tanks. In addition, based on current operating experience at Surry and North Anna, Dominion does not currently use chelating agents in liquid radwaste storage tanks. Therefore, based on the above there are no plans to use chelating agents for NAPS Unit 3.

Proposed COLA Revision

None.

ENCLOSURE 2

Response to NRC RAI Letter 26

RAI Question Number 02.04.13-2

NRC RAI 02.04.13-2

The NRC staff has reviewed the radionuclide transport analysis results described in FSAR Section 2.4.13. In accordance with 10 CFR 100.20(c)(3) and 10 CFR 52.79(a)(1)(iii), please provide the technical basis for concluding that using literature-derived Kd values in the transport analysis that were larger than site-specific observed values is a conservative approach. Given the reported presence of rock fragments in the saprolite, provide a discussion of the potential effect of rock fragments on radionuclide adsorption and the technical basis for neglecting this effect in a conservative analysis. Also, provide a discussion of the effect of pH on measured Kd values and the technical basis for neglecting this effect in a conservative analysis.

Dominion Response

Basis for Literature-Derived K_d Values is Conservative

The radionuclide transport analysis screening, considering radioactive decay only, concluded that the following radionuclides would exceed a 0.01 (1%) ratio of groundwater concentration to the effluent concentration limit (ECL): H-3, Mn-54, Fe-55, Co-60, Ni-63, Zn-65, Sr-90, Y-90, Ru-106, Ag-110m, Cs-13, Cs-137, Ce-144 and Pu-239. Using these radionuclides and considering the physico-chemical process of adsorption in addition to radioactive decay, four radionuclides (H-3, Sr-90, Y-90 and Pu-239) were predicted to exceed the 1% (0.01) groundwater concentration to ECL ratio at the groundwater discharge location to Lake Anna. The distribution coefficients (K_d) used in this analysis were obtained from literature values as documented in FSAR 2.4.13 and, as stated therein, the literature data were assumed to be lognormally distributed. For the analysis, the 10^{th} percentile of the distribution was selected for conservatism.

Site-specific K_d values for selected radionuclides determined from 20 saprolite and weathered rock samples (FSAR Table 2.4-207) were compared to the 10^{th} percentile of the literature values with the following results:

- The literature values used for 6 elements (Fe, Zn, Sr, Ru, Cs, Ce) are less than the minimum observed site-specific K_d values.
- The literature values used for 2 elements (Mn, Co) are bounded by the 1 percentile of the observed site-specific K_d values.
- The literature values used for 2 elements (Ag, Pu) are bounded by the 10 percentile of the observed site-specific K_d values.
- The literature values used for 1 element (Ni) is bounded by the 25 percentile of the observed site-specific K_d values.

A site-specific value was not obtained for Y-90 due to the short half-life of this radionuclide (2.7 days). A literature value for scandium was used for Y-90. A site-specific K_d value was not obtained for H-3 because this radionuclide is part of the water molecule and would not readily adsorb to the soil and rock matrix; therefore, the K_d value would be negligible.

The Ag and Pu K_d 10^{th} percentile literature values are comparable to the site-specific 10^{th} percentile values. The predicted groundwater concentration of Ag at the groundwater discharge location using the literature value is orders of magnitude below the ECL and, therefore, a slight decrease in the K_d value would not change the overall conclusion that Ag will be below the ECL at the groundwater discharge location. The FSAR predicted Pu groundwater concentration estimate is approximately one order of magnitude above the ECL at the groundwater discharge point based on the literature value (FSAR Table 2.4-208). A decrease in the K_d value (less than the 10^{th} percentile range of the site-specific values) may increase the predicted groundwater concentration but not to levels that would exceed the surface water ECL presented in FSAR Table 2.4-209. The Ni K_d value used in the analysis is between the 10^{th} and 25^{th} percentile of the site-specific values. The FSAR predicted groundwater concentration of Ni at the groundwater discharge location is eight orders of magnitude below the ECL and, therefore, this decrease in the K_d value based on site-specific information is not expected to change the overall conclusion that Ni is below the ECL at the groundwater discharge location or the surface water compliance point (FSAR Tables 2.4-208 and 209).

The analysis performed in FSAR Section 2.4.13 can also be re-evaluated using the site-specific K_d values from laboratory testing. If the 10^{th} percentile of the site-specific K_d is selected for the re-analysis, only Ni would have a lower distribution coefficient than that presented in the current analyses. As stated above, the predicted groundwater concentration of Ni at the groundwater discharge location is orders of magnitude below the ECL and, therefore, this decrease in the K_d value using the site-specific 10^{th} percentile is not expected to change the overall conclusion that Ni is below the ECL at the groundwater discharge location or the surface water compliance point

Basis for Neglecting Effect of Rock Fragments in the Saprolite on Radionuclide Adsorption

The saprolite penetrated by the Unit 3 ESP and COLA subsurface borings is classified as a micaceous, silty-clayey, fine to coarse sand or sandy silt with occasional (less than 10 percent) to some (between 10 and 50 percent) rock fragments (FSAR Section 2.4.12.1.2). In support of FSAR Section 2.4.13, four rock and 16 saprolite samples and a representative site groundwater sample were sent to Savannah River National Laboratory (SRNL) to determine site-specific distribution coefficients (K_d). The site-specific samples were chosen based on boring location, the availability of geotechnical soil and rock samples from these borings, and observation well screen locations. Samples selected for K_d testing were obtained from borings within the general area of the Unit 3 facility and, therefore, randomly account for heterogeneities in the water-bearing materials where an accidental release could occur.

Because the size of the sample needed to conduct both K_d and chemical tests on the saprolite did not leave enough material to perform particle size distribution tests, results from particle size distribution tests on soil samples obtained both above and below the K_d sample depths were used to indicate the physical composition of the materials to be tested. These particle size distribution test results indicate the following sample compositions: Gravel 0.0% to 3.7%, Sand 65.9% to 82.9%, and Fines 16.9% to 34.1%, confirming a predominate sand mixture composition, with a Unified Soil Classification of SM.

The rock samples sent to SRNL were prepared by crushing and grinding prior to testing. Processed rock material that passed through a #400 (38-μm) sieve was saved for K_d testing. The saprolite soil sample material that passed through a #10 (2-mm) sieve was saved for testing and, therefore, is composed of a mixture of sand and fines. The saprolite samples segregated for K_d analyses are considered to generally represent natural soil conditions at the site, a predominate sand/fines composition, as indicated in the previous paragraph.

The median K_d values of the crushed and ground rock samples are greater than those for the sediment samples, suggesting that the rock mineral composition or the increased surface area due to size reduction (grinding of the sample) may have a higher capacity to absorb metals (radionuclides used in testing) than intact rock fragments. Based on these tests, the impact of the size and volume of rock fragments in the saprolite on adsorption is inconclusive. The effect of rock fragments in the saprolite has not been neglected. Using the conservative 10th percentile of the distribution coefficient (K_d) values reduces the uncertainty of this unknown (assumes less adsorption than using the mean or average of the literature or site-specific values).

Basis for Neglecting Effect of pH on Measured K_d Values
Soil sample chemical testing (pH and Cation Exchange Capacity) was performed on the saprolite samples sent for laboratory adsorption distribution coefficient testing. Reported soil pH values are as follows: Minimum = 5.4; Maximum = 9.2; Average = 7.0; Geometric Mean = 6.9; and Standard Deviation = 0.9 with a skew of 1.1.

Soil pH values for 13 of the 16 saparolite samples generally ranged between 6.2 and 7.4. One sample had a value lower than this range (B-901/S5, pH of 5.4) and two samples had values higher than this range (B-951/S9, pH of 8.3 and B-951/S7, pH of 9.2). In general, some of the lowest site-specific K_d values are associated with B-901/S5 (pH 5.4) and some of the higher site-specific K_d values are associated with B-951/S7 and S9 (pH 9.2 and 8.3). These results are consistent with the literature, which indicates that K_d values generally increase with increasing pH for metals such as Sr. (Reference North Anna ESP Application, Site Safety Analysis Report, Section 2.4.13, Reference 65 - U. S. Environmental Protection Agency (EPA), *Understanding Variation in Partition Coefficient, K_d, Values, Volume II: Review of Geochemistry and Available K_d Values for Cadmium, Cesium, Chromium, Lead, Plutonium, Radon, Strontium, Thorium, Tritium (H_3), and Uranium*, EPA 402-R-99-004B, August 1999.)

The conservative 10th percentile of the literature K_d values used in the FSAR analysis, in general, correlates with the lower values of the site-specific K_d values. Therefore, the effect of pH has not been neglected. The uncertainty is reduced by selecting the 10th percentile of the literature values which, in general, is comparable to the lower percentiles of the site-specific values that show some correlation to lower soil pH.

Proposed COLA Revision

None.

ENCLOSURE 3

Response to NRC RAI Letter 26

RAI Question Number 02.04.13-3

NRC RAI 02.04.13-3

The NRC staff has reviewed the radionuclide transport analysis results described in FSAR Section 2.4.13. In accordance with 10 CFR 100.20(c)(3) and 10 CFR 52.79(a)(1)(iii), please provide a discussion of the consistency between the MODFLOW model results for post-construction groundwater heads in FSAR 2.4.12 and the groundwater transport analysis of FSAR 2.4.13, especially with respect to the conservativeness of the transport analysis and consistency of the transport pathway. Please provide technical justification for using a hydraulic conductivity value in the groundwater transport analysis (1.04 m/d) that is less than the maximum observed value (3.017 m/d). Please provide a discussion of the alternative groundwater transport pathways considered and a technical justification for the selected pathway being considered conservative.

Dominion Response

MODFLOW Consistency Between Groundwater Heads vs. Groundwater Transport Analysis
A summary of the post-construction groundwater flow model is provided in the response to RAI 02.04.12-1 (Dominion 9/19/08 Letter Serial No. NA3-08-095R). The results of the transport pathway parameters in FSAR 2.4.13 and the post-construction groundwater flow model are summarized as follows:

Parameter	FSAR 2.4.13	MODFLOW Model
Hydraulic Gradient (dh/dx)	0.040 ft/ft	Saprolite = Layer 1 Pre-Construction = 0.031 ft/ft Post-Construction = 0.017 ft/ft Bedrock = Layer 2 Pre-Construction = 0.038 ft/ft Post-Construction = NA
Hydraulic Conductivity (K)	3.4 ft/day	North $K_1 = 6 \times 10^{-4}$ cm/sec (1.7 ft/day) South $K_2 = 2 \times 10^{-4}$ cm/sec (0.6 ft/day) Saprolite & Bedrock = Same Excavation Backfill = 10^{-3} cm/sec (2.8 ft/day)
Effective Porosity (n_e)	0.25 (25%)	0.25

Using a distance of 1000 ft from the Radwaste Building to Lake Anna (Unit 3 intake forebay), the groundwater travel time is calculated as [Travel Distance]/[(K/n_e)(dh/dx)]. Incorporating the groundwater model parameters (Hydraulic Gradient = Layer 1, Hydraulic Conductivity = North K_1, and Effective Porosity = 0.25), the following comparison is presented:

- FSAR 2.4.13: [1000]/[(3.4/0.25)(0.040)] = 1840 days = 5.0 years
- Groundwater Model – Pre-Construction: [1000]/[(1.7/0.25)(0.031)] = 4745 days = 13.0 years
- Groundwater Model – Post-Construction: [1000]/[(1.7/0.25)(0.017)] = 8650 days = 23.7 years

A particle track was released in the groundwater model at three locations near the base of the Unit 3 Radwaste Building, resulting in a travel time of approximately 20.5 to 21.7 years to the groundwater discharge location. This travel time is slightly less than the 23.7 years, which is expected because the model incorporates, among other parameters, an estimation of the hydraulic conductivity of the excavation backfill material for Unit 3.

Thus, the analysis presented in FSAR 2.4.13 is conservative compared to the post-construction groundwater conditions predicted by the groundwater flow model.

Justification for Using a Conductivity Less Than Maximum Observed Value
The technical justification for using the hydraulic conductivity value of 1.04 m/d (3.4 ft/day) is discussed in FSAR Section 2.4.13.1.3, Page 2-211. In particular, 14 of the 16 saprolite slug test hydraulic conductivity values in Table 2.4-16R are less than or equal to 3.4 ft/day. The two values that exceed 3.4 ft/day are those observed at observation wells OW-945 (1.16 m/d or 3.8 ft/day) and OW-946 (3.02 m/d or 9.9 ft/day). These two well locations are 2000 to 2500 ft upgradient from the Reactor Building (Figure 2.4-206) and are, therefore, not representative of hydraulic conditions along the groundwater pathway between the Radwaste Building and Lake Anna.

In addition, approximately half of the wells at the site that were slug tested are either between the center of the Unit 3 facility area (Reactor Building at OW-901) and the two upgradient wells (OW-945 & OW-946), or to the north and south of the facility area. The hydraulic conductivity values from these wells are below the value of 1.04 m/d (3.4 ft/day) that was reported for Well OW-848, located along the downgradient flow path from the facility area to Lake Anna. Therefore, the Unit 3 facility area and the areas immediate surrounding it all have hydraulic conductivity values of 1.04 m/d (3.4 ft/day) or less, indicating that the value used represents the highest hydraulic conductivity value determined within these areas.

The selection of 1.04 m/d (3.4 ft/day) is also based on the groundwater modeling results summarized in the response to RAI 02.04.12-1. The two primary calibration parameters used in the groundwater model were hydraulic conductivity and aquifer recharge rate. Calibration was achieved through a series of simulations using different values of the key parameters. The best agreement between computer and observed groundwater levels was obtained using a hydraulic conductivity of 0.52 m/d (1.7 ft/day) in the northern portion of the model domain and 0.17 m/d (0.6 ft/day) in the southern portion of the model domain. Both of these values are within the range of hydraulic conductivities from slug tests for their respective zones. Thus, the groundwater model calibration yields realistic hydraulic conductivity values that are less than the 1.04 m/d (3.4 ft/day) value used in FSAR 2.4.13.

Consideration and Justification of Alternative Groundwater Transport Pathways
The piezometric head contour maps presented in FSAR Section 2.4.12.1.2 (Figure 2.4-207 through Figure 2.4-214) indicate that groundwater flow is generally to the north and east towards Lake Anna, and to Freshwater Creek and Elk Creek, both of which flow to Lake Anna and form hydrologic boundaries to the west and south of the site. Further review of these maps suggests the following alternative pathways could be considered when evaluating a postulated accidental release to groundwater:

- Flow north-northeast in the saprolite to the Unit 3 intake forebay (final pathway selected);
- Flow northeast in the saprolite to the Units 1 & 2 intake bay;
- Flow southeast in the saprolite to the discharge canal;
- Flow north in the saprolite to Lake Anna; and
- Flow in fractured bedrock to the Unit 3 intake forebay.

The groundwater contour maps presented in FSAR 2.4.12 indicate a well-defined groundwater flow path in the unconfined aquifer to the north-northeast toward Lake Anna, the Unit 3 intake forebay, and the Units 1 & 2 intake bay. Therefore, flow southeast to the discharge canal is ruled out because the flow path to the canal and north to Lake Anna is longer than that to the intake bays. The contour maps also suggest flow is more pronounced to the Unit 3 intake forebay than along the longer distance to the Units 1 & 2 intake bay. This leaves two predominate pathways for consideration:

- Flow north-northeast in the saprolite to the Unit 3 intake forebay (final pathway selected); and
- Flow in fractured bedrock to the Unit 3 intake forebay.

The hydrogeologic evaluation of the data collected from the subsurface investigation and water level data from the observation well clusters suggest an unconfined aquifer comprised of the saprolite and the underlying bedrock. The water transmissivity in the bedrock generally decreases with depth due to a corresponding decrease in the number and extent of fractures and the width of the openings between their surfaces. Therefore, a pathway in the unconfined aquifer from the Unit 3 facility area toward the Unit 3 intake forebay was considered to be the most conservative. The post-construction groundwater model confirms groundwater flow toward the Unit 3 intake forebay.

Proposed COLA Revision

None.

ENCLOSURE 4

Response to NRC RAI Letter 026

RAI Question 03.09.02-1

NRC RAI 03.09.02-1

The FSAR incorporates by reference Section 3.9.2, "Dynamic Testing and Analysis of Systems, Components, and Equipment," in the ESBWR DCD Tier 2, which addresses criteria, testing procedures, and dynamic analyses employed to ensure the structural and functional integrity of piping systems, mechanical equipment, reactor internals, and their supports under vibratory loadings. ESBWR DCD Subsection 14.2.8.1.42, "Expansion, Vibration and Dynamic Effects Preoperational Test," states that its objective is to verify that critical components and piping runs are properly installed and supported such that expected steady-state and transient vibration and movement due to thermal expansion does not result in excessive stress or fatigue to safety-related plant systems and equipment. Nuclear power plant operating experience has revealed the potential for adverse flow effects from vibration caused by hydrodynamic loads and acoustic resonance within reactor coolant, steam, and feedwater systems as well as reactor internal components such as steam dryers. Please describe the implementation of the program to address potential adverse flow effects on safety-related piping and components in these systems.

Dominion Response

As discussed in response to NRC RAI 03.09.06-6 (Dominion 9/11/08 Letter, Serial No. NA3-08-092R), Dominion intends to use the overall Initial Test Program (which includes pre-operational and start-up testing) to address the concern of potential adverse flow effects on safety-related piping and components in these systems. The program will confirm attributes of the components design as described in the DCD. Implementation of the test program is described in FSAR Section 14.2 and Table 13.4-201.

DCD Section 3.9.2, "Dynamic Testing and Analysis of Systems, Components and Equipment," presents the criteria, testing procedures, and dynamic analyses employed to ensure the structural and functional integrity of piping systems, mechanical equipment, reactor internals, and their supports under vibratory loadings, including those due to fluid flow and postulated seismic events as discussed in SRP 3.9.2.

DCD Section 3.9.2.1, "Piping Vibration, Thermal Expansion and Dynamic Effects," further states that, "(T)he overall test program is divided into two phases: the preoperational test phase and the initial startup test phase. Piping vibration, thermal expansion and dynamic effects testing is performed during both of these phases as described in Chapter 14." DCD Section 3.9.2.1.1, "Vibration and Dynamic Effects Testing," states that the purpose of these tests is to confirm that the piping, components, restraints and supports of specified high and moderate-energy systems have been designed to withstand the dynamic effects of steady state flow-induced vibration (FIV) and anticipated operational transient conditions.

DCD Section 3.9.3.5, "Valve Operability Assurance," discusses operability assurance of active Code valves, including actuators and states that, "(T)he ESBWR general valve requirements specification includes requirements related to design and functional qualification of safety-related valves that incorporate lessons learned from nuclear power plant operations and research programs." DCD Section 3.9 tables also address load combinations that include SRV opening loads (acoustic wave).

With respect to component supports of which dynamic restraints are one type, DCD Sections 3.9.3.7 and 3.9.3.8 address analyses or tests that are performed for component supports to assure their structural capability to withstand the seismic and other dynamic excitations.

With respect to reactor internals, ESBWR DCD Section 3.9.2.3, "Dynamic Response of Reactor Internals Under Operational Flow Transients and Steady-State Conditions," states that, "(t)he major reactor internal components within the vessel are subjected to extensive testing, coupled with dynamic system analyses, to properly evaluate the resulting FIV phenomena during normal reactor operation and from anticipated operational transients."

The above referenced preoperational and startup tests are described in more detail in DCD Section 14.2.8.1.42, "Expansion, Vibration and Dynamic Effects Preoperational Test," and in DCD Section 14.2.8.2.10, "System Vibration Test."

Proposed COLA Revision

None.

ENCLOSURE 5

Response to NRC RAI Letter 026

RAI Question 03.09.02-2

NRC RAI 03.09.02-2

The staff needs sufficient time to review the comprehensive flow induced vibration assessment program for reactor internals. In accordance with RG 1.20, Rev 3 and SRP Sections 3.9.2 and 3.9.5., Dominion is requested to indicate when it proposes to submit to NRC an implementation schedule for these programs. The schedule should allow sufficient time for the NRC staff to review these programs prior to implementation.

Dominion Response

The comprehensive flow induced vibration assessment program for reactor internals has been submitted by GEH to the staff via the following documents:

- DCD Revision 5, Section 3L, "Reactor Internals Flow Induced Vibration Program," submitted June 1, 2008.
- NEDE-33259P, "ESBWR Reactor Internals Flow Induced Vibration Program," December 2007.
- NEDE-33312P, "Steam Dryer Acoustic Load Definition," November 2007.
- NEDE-33313P, "Steam Dryer Structural Evaluation," November 2007.
- NEDC-33408P, "ESBWR Steam Dryer Plant Based Load Evaluation Methodology," February 2008.

RG 1.20, "Comprehensive Vibration Assessment Program for Reactor Internals During Preoperational and Initial Startup Testing," Revision 3, Section C.2.5, "Schedule," requires 5 items to be addressed for an acceptable schedule.

(1) *The reactor internals design should be classified as a prototype or a specific nonprototype category.*

Response:
Per DCD Appendix 3L.1, the ESBWR reactor internals are non-prototype Category II.

(2) *During the staff's review of the COL application a commitment should be established regarding the scope of the comprehensive vibration assessment program.*

Response:
A description of the program scope is provided in DCD Appendix 3L. NA3 FSAR incorporates DCD Appendix 3L by reference, thus Dominion has committed to the comprehensive vibration assessment program scope as described in DCD Section 3L.

(3) *A description of the vibration measurement and inspection phases of the comprehensive vibration assessment program should be submitted to the NRC in sufficient time to permit utilization of the staff's related recommendations. (For scheduling purposes, the applicant should allow 90 days for the staff's review and comment period).*

Response:
A description of the program's vibration measurement and inspection phases is provided in DCD Appendix 3L.

(4) *A summary of the vibration analysis program should be submitted to the NRC at least 60 days prior to submission of the description of the vibration measurement and inspection programs (Item 3 – above).*

Response:
A summary of the vibration analysis program is provided in DCD Appendix 3L.

For details on the vibration analysis program refer to DCD Section 3L.5, "Startup Test Program."

The comprehensive vibration assessment program impact (hammer) tests, as described in DCD Section 3L.4.6, will be developed and available for NRC review no later than 60 days prior to their intended use. Flow Induced Vibration Testing as described in DCD Section 14.2.8.2.11, "Reactor Internals Vibration Test (Initial startup Flow-Induced Vibration Testing)," will be developed and made available to the NRC not less than 60 days prior to scheduled fuel load.

(5) *The preliminary and final reports which together summarize the results of the vibration analysis, measurement, and inspection programs, should be submitted to the NRC within 60 days and 180 days, respectively, following the completion of the vibration testing.*

Response:
Dominion is committed to submit preliminary and final reports within 60 days and 180 days, respectively, following the completion of the vibration testing.

In response to COL Information Item 3.9.9-1-H, FSAR Section 3.9.2.4, "Initial Startup Flow-Induced Vibration Testing of Reactor Internals," states that, "(a) vibration assessment program as specified in RG 1.20 will be completed no later than one year after the time of application." As described above, DCD Section 3L and the referenced GEH Reports satisfy the vibration assessment program description requirement.

Therefore, FSAR Section 3.9.2.4 will be revised to address providing the schedule information in accordance with the applicable scheduling portions of position C.3 of RG 1.20 for non-prototype internals (see position C.2.5, "Schedule" for these requirements).

Proposed COLA Revision

FSAR Section 3.9.2.4 will be revised as shown on the attached markup.

FSAR Table 1.9-202, "Conformance with Regulatory Guides," will be revised as shown on the attached markup.

Markup of North Anna COLA

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

NAPS COL 1.9-3-A

Table 1.9-202 Conformance with Regulatory Guides

RG Number	Title	Revision	Date	RG Position	Evaluation
1.12	Nuclear Power Plant Instrumentation for Earthquakes	Rev. 2	Mar-97	C.1, C.4 – C.7	Conforms
				C.3, C.8	Conforms. The seismic monitoring program, including the necessary test and operating procedures, will be implemented prior to receipt of fuel on site.
1.13	Spent Fuel Storage Facility Design Basis	Rev. 2	Mar-07	General	Conforms
1.14	Reactor Coolant Pump Flywheel Integrity	Rev. 1	Aug-75	General	Not applicable
1.16	Reporting of Operating Information–Appendix A Technical Specifications	Rev. 4	Aug-75	General	Conforms
1.20	Comprehensive Vibration Assessment Program for Reactor Internals During Preoperational and Initial Startup Testing	Rev. 3	Mar-07	C.1	Conforms.
				C.2	Conforms ~~Not applicable. Unit 3 does not have prototype reactor internals.~~
				C.3	Conforms. ~~Section 3.9.2.4 describes that the vibration assessment program will be completed one year after the time of application.~~

3.7.1.3 Supporting Media for Seismic Category I Structures

Add the following at the end of the first paragraph.

NAPS SUP 3.7-3 Section 2.5.4 provides site-specific properties of subsurface materials.

3.7.2.4 Soil/Structure Interaction

Add the following at the end of the first paragraph.

NAPS SUP 3.7-4 Section 2.5.4 describes the site-specific properties of subsurface materials.

3.7.2.8 Interaction of Non-Category I Structures with Seismic Category I Structures

Add the following at the end of this section.

NAPS SUP 3.7-5 The locations of structures are provided in Figure 2.1-201.

3.7.4 Seismic Instrumentation

Add the following at the end of the first paragraph.

NAPS SUP 3.7-6 The seismic monitoring program described in this subsection, including the necessary test and operating procedures, will be implemented prior to receipt of fuel on site.

3.8 Seismic Category I Structures

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

3.9 Mechanical Systems and Components

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

3.9.2.4 Initial Startup Flow-Induced Vibration Testing of Reactor Internals

Replace the last two paragraphs with the following.

NAPS COL 3.9.9-1-H ~~A vibration assessment program as specified in RG 1.20 will be completed no later than one year after the time of application.~~

A vibration assessment program as specified in RG 1.20 is provided in DCD Appendix 3L and the following referenced GEH Reports.

- NEDE-33259P, "ESBWR Reactor Internals Flow Induced Vibration Program"
- NEDE-33312P, "Steam Dryer Acoustic Load Definition"
- NEDE-33313P, "Steam Dryer Structural Evaluation"
- NEDC-33408P, "ESBWR Steam Dryer Plant Based Load Evaluation Methodology"

Information on a schedule in accordance with the five applicable scheduling portions of position C.3 of RG 1.20 (refer to Section C.2.5) for non-prototype internals is as follows.

- In response to C.2.5, Item (1), the reactor internals design has been classified by GEH in DCD Section 3L.1 as non-prototype Category II.
- In response to C.2.5, Items (2), (3) and (4), Unit 3 is committed to the comprehensive vibration assessment program including the scope, the vibration measurement and inspection phases and the summary as described in DCD Appendix 3L with no departures.
- In response to C.2.5, Item (5), Unit 3 will submit the preliminary and final reports which together summarize the results of the vibration analysis, measurement, and inspection programs to the NRC within 60 days and 180 days, respectively, following the completion of the vibration testing.

3.9.3.1 Loading Combinations, Design Transients and Stress Limits

Replace the last sentence with the following.

STD COL 3.9.9-2-H

The piping stress reports identified in this DCD section will be completed within six months of completion of ITAAC Table 3.1-1. The FSAR will be revised as necessary in a subsequent update to address the results of this analysis.

ENCLOSURE 6

Response to NRC RAI Letter 026

RAI Question 05-03 Branch Technical Position-1

NRC RAI 05-03 Branch Technical Position-1

FSAR Section 5.3, Reactor Vessel, incorporates by reference sections of the ESBWR DCD including Section 5.3.2.1, which addresses pressure-temperature (P-T) limits and contains representative P-T-curves. DCD Revision 4 deleted the COL information item considered necessary by the staff [5.3-1.A Pressure/Temperature Limits and Fracture Toughness Data (Deleted)]. Based upon staff-applicant interactions, it is the staff's understanding that (1) GEH will develop a topical report containing ether a) bounding P-T limits for NRC review and approval or b) a pressure temperature limit report (PTLR) along with other appropriate supporting documents (following NRC Generic Letter 96-03) that will contain bounding pressure temperature limits for NRC review and approval; and (2) the COL applicant will update FSAR Chapter 5 and technical specifications with appropriate P-T limits for NRC review and approval. Please confirm the staff's understanding of the resolution of this issue. In addition, consider the following as COL information item 5.3-X-H, "The COL Holder shall update the P/T limits along with a request for license amendment prior to fuel loading, if required, using the plant-specific material properties for NRC review and approval."

Dominion Response

As discussed with the staff in ESWBR Design Centered Working Group (DCWG) NRC public meetings on May 22, 2008 and June 11, 2008 and during a subsequent teleconference, the following actions were agreed to in order to address P-T limits in the COLA:

1. GEH will develop a topical report containing an ESBWR PTLR along with other appropriate supporting documents (following NRC Generic Letter 96-03) that will contain bounding P-T limits. This GEH topical report is scheduled to be submitted by GEH before December 31, 2008 to the NRC for review and approval.
2. The bounding P-T limit curves in the GEH topical report will be incorporated into the COLA Technical Specifications.
3. FSAR Section 5.3.1.5 will be revised to state that bounding P-T limit curves will be included in the Technical Specifications and provided to the NRC for review before December 31, 2008.
4. It is anticipated that after COL issuance, Dominion would submit a license amendment request to:
    a. Replace the bounding P-T limits in Technical Specifications with curves based on plant-specific material properties; or
    b. If the GEH PTLR topical report is approved by the NRC, incorporate the PTLR into the technical specifications and remove the P-T limits from the Technical Specifications.

With respect to the staff's request for considering an additional COL information item in DCD Section 5.3, GEH has responsibility to determine whether to include new COL items in the DCD. However, Dominion notes that DCD, Revision 5, Chapter 16, contains a COL information item (16.0-1-A, 3.4.4-1) that requires COL applicants to either incorporate a PTLR, or in lieu of a PTLR, insert P-T limits as figures in the COLA Technical Specification Section 3.4.4. Hence, no additional COL item is necessary in the DCD.

Proposed COLA Revision

The FSAR will be revised as shown on the attached markups.

Markup of North Anna COLA

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

An unidentified leakage rate-of-change alarm provides an early alert to the operators to initiate corrective actions prior to reaching a Technical Specifications limit.

5.2.6 **COL Information**

5.2-1-H **Preservice and Inservice Inspection Program Plan**

STD COL 5.2-1-H This COL Item is addressed in Section 5.2.4 and Section 5.2.4.11.

5.2-2-H **Leak Detection Monitoring**

STD COL 5.2-2-H This COL Item is addressed in Section 5.2.5.9.

5.3 Reactor Vessel

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

5.3.1.5 **Fracture Toughness**

Compliance with 10 CFR 50, Appendix G

Replace the last sentence in the first paragraph with the following.

STD COL 16.0-1-A 3.4.4-1 Bounding pressure-temperature limit curves will be included in the Technical Specifications and provided to NRC for review before December 31, 2008.

5.3.1.8 **COL Information for Reactor Vessel Material Surveillance Program**

Replace this section with the following.

STD COL 5.3-2-A The description of the reactor vessel material surveillance program is provided in DCD Section 5.3.1.6. This program description addresses the following areas:

- Basis for selection of material in the program (DCD Section 5.3.1.6.1)
- Number and type of specimens in each capsule (DCD Section 5.3.1.6.1)
- Number of capsules and proposed withdrawal schedule (DCD Section 5.3.1.6.1)
- The method for calculating neutron flux and fluence calculations for vessel wall and surveillance specimens and conformance with guidance of RG 1.190 (DCD Section 5.3.1.6.2)

ENCLOSURE 7

Response to NRC RAI Letter No. 026

RAI Question Number 11.05-4

NRC RAI 11.05-4

A review of North Anna Unit 3 FSAR Section 11.5.4.6 and ESBWR DCD Tier 2, Revision 5, Section 9.2.6.2 indicates that the supplemental information presented in FSAR Table 11.5-201 does not include a system line item identifying sampling provisions for condensate water that might be present in the condensate storage tank basin. The condensate storage tank basin is designed to contain the entire volume of the storage tank in the event of a tank rupture or spill. The basin's design includes a sump with provisions to pump water out of the basin to the LWMS or to release it to the storm drain, depending on radionuclide concentrations and requirements of Table 2, Col. 2 of Appendix B to Part 20 and design objectives of Appendix I to Part 50. FSAR Table 11.5-201 does not identify any sampling provisions and criteria for the case where water contained in the condensate tank basin would be discharged to the storm drain. Accordingly, a new system line item should be added to Table 11.5-201 in describing sampling provisions and criteria given the possibility of discharging such water to the storm drain. This information would ensure that such provisions are clearly identified in the FSAR and not likely to be omitted during the development of the sampling and analysis program for the plant specific offsite dose calculation manual in confirming compliance with liquid effluent concentration limits of Table 2 in Appendix B to Part 20 and numerical design objectives of Appendix I to Part 50.

Dominion Response

The condensate storage tank (CST) basin includes provisions for routing basin contents to the LWMS or to the storm drain system after obtaining and analyzing a grab sample to comply with action required in Inspection and Enforcement Bulletin 80-10. This aspect of the sampling provisions for the storm drain system is addressed in the response to RAI 11.05-2, which provided a mark-up of FSAR Table 11.5-201 showing the addition of a new Footnote 10 for Line Item 11, *Storm Drains,* in that table. New Footnote 10 states: "Grab samples can be obtained from the Condensate Storage Tank (CST) basin sump. See DCD Section 9.2.6.2." Accordingly, a new system line item need not be added to Table 11.5-201.

The response to RAI 11.05-2 is available as Dominion Letter No. NA3-08-051 (ADAMs Accession No. ML081900515).

Proposed COLA Revision

None.