Dominion®

North Anna 3 Combined License Application

Part 7: Departures Report

(Includes Information on Departures, Variances, Exemptions and Supplemental Information)

Revision 0
November 2007

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DEPARTURES

A *departure* is a plant-specific deviation from design information in a standard design certification rule.

There are no departures on this COL application from the ESBWR standard design described in the DCD. See COLA Part 2 for additional information regarding the ESBWR DCD.

VARIANCES

Introduction

A *variance* is a plant-specific deviation from one or more of the site characteristics, design parameters, or terms and conditions of an ESP or from the site safety analysis report (SSAR). A variance to an ESP is analogous to a departure from a standard design certification.

The following sections provide requests for variances from the proposed site characteristics for the North Anna ESP and from the ESPA SSAR. The requests comply with the requirements of 10 CFR 52.39 and 10 CFR 52.93. To support a decision whether to grant a variance, each variance request provides the technical justification and supporting cross-references to the Unit 3 FSAR information that meet the technically relevant regulatory acceptance criteria.

This COLA complies with the requirements of 10 CFR 52.79, *Contents of Applications; Technical Information in Final Safety Analysis Report*, and 10 CFR 52.39, *Finality of Early Site Permit Determinations*. In accordance with 10 CFR 52.79(b)(2) and 10 CFR 52.39(d), where the Unit 3 FSAR references the North Anna ESP and does not demonstrate that the design of Unit 3 falls within the ESP site characteristics, i.e, the proposed ESP site characteristics from FSER Supplement 1, Appendix A (Reference), this COLA includes the following requests for variances from the proposed ESP site characteristics:

NAPS ESP VAR 2.0-1 - Long-Term Dispersion Estimates (X/Q and D/Q)
NAPS ESP VAR 2.0-2 - Hydraulic Conductivity
NAPS ESP VAR 2.0-3 - Hydraulic Gradient
NAPS ESP VAR 2.0-4 - Vibratory Ground Motion

This COLA complies with the requirements of 10 CFR 52.39, *Finality of Early Site Permit Determinations*. In accordance with 10 CFR 52.39(d), where the Unit 3 FSAR references the North Anna ESP and does not incorporate the ESPA SSAR information by reference without the need for certain changes, this COLA requests the following variances from the ESPA SSAR information:

NAPS ESP VAR 2.0-5 - Distribution Coefficients (K_d)
NAPS ESP VAR 2.4-1 - Void Ratio, Porosity, and Seepage Velocity
NAPS ESP VAR 2.4-2 - NAPS Water Supply Well Information
NAPS ESP VAR 2.5-1 - Stability of Slopes
NAPS ESP VAR 12.2-1 - Gaseous Pathway Doses
NAPS ESP VAR 12.2-2 - Annual Thyroid Dose
NAPS ESP VAR 12.2-3 - Annual Liquid Effluent Releases

Variance: NAPS ESP VAR 2.0-1 – Long-Term Dispersion Estimates (χ/Q and D/Q)

Request

This is a request to use the Unit 3 maximum long-term dispersion estimates (χ/Q and D/Q values) provided in FSAR Table 2.3-16R for types of locations other than the EAB rather than the corresponding ESP values in FSER Supplement 1, Appendix A and in SSAR Table 2.3-16. The Unit 3 values do not fall within (are larger than) the ESP and SSAR values.

This variance results from a review of the Radiological Environmental Monitoring Program (FSAR Reference 2.3-201). The review determined that since the time of the SSAR, distances to several of the "closest receptors" had changed. FSAR Table 2.3-15R shows the closest of all receptors to be a residence in the Northwest direction. The χ/Q and D/Q evaluation, and the subsequent normal gaseous effluent dose evaluation, conservatively assumed that each receptor (meat animal, vegetable garden, residence) is at the distance of that closest receptor and in the East-Southeast direction, which is the direction with the maximum annual average χ/Q value at that distance.

Justification

This variance is acceptable because all estimated annual doses from normal gaseous effluent releases remain within applicable limits as shown in FSAR Table 12.2-201.

Because of the change in Unit 3 maximum long-term dispersion estimates, some of the gaseous effluent doses are higher than the corresponding ESP value. See the related variances NAPS ESP VAR 12.2-1 and NAPS ESP VAR 12.2-2, which are addressed below.

Variance: NAPS ESP VAR 2.0-2 – Hydraulic Conductivity

Request

This is a request to use the Unit 3 maximum hydraulic conductivity value provided in FSAR Section 2.4.12.1.2 rather than the corresponding ESP value in FSER Supplement 1, Appendix A and in SSAR Table 1.9-1. The Unit 3 value does not fall within (is larger than) the ESP and SSAR value.

The ESP value of 1.04 m/day (3.4 ft/day) represents the upper limit of the values obtained by in situ hydraulic conductivity testing of observation wells installed for the ESP subsurface investigation. These values varied from 0.076 to 1.04 m/day (0.25 to 3.4 ft/day) as shown in SSAR Table 2.4-16. The corresponding maximum hydraulic conductivity value reported in FSAR Section 2.4.12.1.2 is 3.0 m/day (9.9 ft/day) based on an expanded range from 0.076 to 3.0 m/day (0.25 to 9.9 ft/day). This data set includes in situ hydraulic conductivity test results for the observation wells installed for the ESP subsurface investigation plus additional observation wells installed for the Unit 3

subsurface investigation. Unit 3 values provided in FSAR Section 2.4.12.1.2 associated with hydraulic conductivity that do not fall within (are larger than) the ESP/SSAR values are as follows:

Value	ESP/SSAR Value	Unit 3 Value
Maximum – Saprolite	3.4 ft/day	9.9 ft/day
Geometric mean – Saprolite	1.3 ft/day	1.74 ft/day
Maximum – Bedrock	3 ft/day	6.3 ft/day

The variance in hydraulic conductivity values results from the hydraulic conductivity testing of the additional observation wells installed for the Unit 3 subsurface investigation.

Justification

The variance in hydraulic conductivity values is acceptable because:

1. Compliance with 10 CFR 20 is demonstrated in FSAR Section 2.4.13 with the use of a hydraulic conductivity value of 1.04 m/day (3.4 ft/day) to evaluate radionuclide concentrations resulting from a postulated accidental release of liquid effluents in the groundwater pathways. The calculated radionuclide concentrations are conservative as the hydraulic conductivity of 1.04 m/day (3.4 ft/day) is greater than 87.5 percent of the data included in FSAR Table 2.4-16R, in addition to other conservative assumptions used in the evaluation. The field test data that established the Unit 3 values includes only two measurements that exceed the ESP maximum hydraulic conductivity value of 1.04 m/day (3.4 ft/day). These two measured values are not relevant to the evaluation of the postulated accidental release of liquid effluent from the radwaste building to the groundwater pathways because they were observed at well locations that are not in the pathway from the radwaste building to the lake.

2. The groundwater flow model used to evaluate the maximum groundwater elevation at the Unit 3 site incorporated the hydraulic conductivity values measured for the Unit 3 subsurface investigation. The maximum groundwater elevation is predicted to be 2.13 m (7 ft) below the Unit 3 design plant grade. As shown in FSAR Table 2.0-201, this Unit 3 site characteristic value for maximum groundwater elevation falls within the DCD site parameter value in DCD Table 2.0-1. The ESBWR design assumes a maximum groundwater level no higher than 0.61 m (2 ft) below the design plant grade elevation at a site and the Unit 3 site characteristic value of 2.13 m (7 ft) below the Unit 3 design plant grade meets this requirement.

Variance: NAPS ESP VAR 2.0-3 – Hydraulic Gradient

Request

This is a request to use the Unit 3 hydraulic gradient value provided in FSAR Section 2.4.12.1.2 rather than the corresponding ESP value in FSER Supplement 1, Appendix A and in SSAR Table 1.9-1. The Unit 3 value does not fall within (is larger than) the ESP and SSAR value.

SSAR Section 2.4.12.1.2 states that there is a hydraulic gradient toward Lake Anna of about 3 m per 100 m (3 ft per 100 ft). The corresponding Unit 3 hydraulic gradient in FSAR Section 2.4.12.1.2 is calculated to be 4 m per 100 m (4 ft per 100 ft).

The variance in hydraulic gradient results from the use of additional groundwater data collected from the Unit 3 subsurface investigation.

Justification

The variance in hydraulic gradient is acceptable because compliance with 10 CFR 20 is demonstrated in FSAR Section 2.4.13 with the use of the higher hydraulic gradient of 4 m per 100 m (4 ft per 100 ft) to evaluate radionuclide concentrations as a result of a postulated accidental release of liquid effluents in the groundwater pathways.

Variance: NAPS ESP VAR 2.0-4 – Vibratory Ground Motion

Request

This is a request to use the Unit 3 horizontal and vertical spectral acceleration (g) values for the site-specific safe shutdown earthquake (SSE) at the top of competent rock (Zone III-IV) rather than the corresponding ESP spectra. The Unit 3 values do not fall within (are slightly larger than) the ESP and SSAR values at frequencies less than 3 Hz for the horizontal spectrum, and less than 4 Hz for the vertical spectrum, although by only 1.05 percent and 1.4 percent or less, respectively.

The Unit 3 site-specific SSE horizontal and vertical spectra at the top of competent material (Zone III-IV) at elevation 83.2 m (273 ft) are plotted in FSAR Figure 2.5-205. The corresponding ESP spectra at elevation 76.2 m (250 ft) are provided in FSER Supplement 1, Appendix A, Figure 2, and in SSAR Figure 2.5-48A. FSAR Figure 2.0-206 compares the Unit 3 and ESP horizontal response spectra. FSAR Figure 2.0-207 compares the Unit 3 and ESP vertical response spectra. While the ESP values exceed or essentially match the Unit 3 values, at frequencies less than 3 or 4 Hz, FSAR Table 2.0-202 and FSAR Table 2.0-203 show that the Unit 3 values exceed the corresponding ESP values by a small amount.

This variance in spectral acceleration (g) values results from the use of the additional data from the Unit 3 subsurface investigation. The data showed that the top of competent rock under Unit 3 Seismic Category I structures is higher than assumed for the ESP. Also, the data provided the seismic wave transmission characteristics of the materials specifically under the Unit 3 Seismic Category I structures.

Justification

The variance in spectral acceleration (g) values is acceptable because the ESBWR certified seismic design response spectra (CSDRS) is used for design of Unit 3 Seismic Category I structures, and not the Unit 3 site-specific SSE spectra at the top of competent material. FSAR Table 2.0-201 demonstrates Unit 3 foundation input response spectra (FIRS) for Unit 3 Seismic Category I structures fall within the ESBWR CSDRS. See "SSE Horizontal Ground Response Spectra" and "SSE Vertical Ground Response Spectra" under Seismology in Part 1 of that table.

Variance: NAPS ESP VAR 2.0-5 – Distribution Coefficients (K_d)

Request

This is a request to use the Unit 3 distribution coefficient (K_d) values provided in FSAR Table 2.4-209 (10% K_d) rather than the corresponding values in SSAR Table 1.9-1 and SSAR Table 2.4-20. The Unit 3 values do not fall within (are smaller than) the SSAR values and therefore would predict higher doses than the K_d values in the SSAR.

This variance in K_d values results from a more conservative approach to selecting Unit 3 values for estimating the radionuclide migration to surface waters via subsurface pathways. Both the SSAR and the Unit 3 K_d values were assigned using literature values. However, the Unit 3 K_d values were selected assuming the literature data to be log-normally distributed and then selecting the 10th percentile of the distribution to conservatively assign a low value for the radionuclide transport analysis. NUREG/CR-6697 (Reference 2.4-215), Attachment C, Table 3.9-1, was used to assign the mean and standard deviation for each of the distributions.

Justification

The variance in K_d values is acceptable because compliance with 10 CFR 20 is demonstrated in FSAR Section 2.4.13 with the use of the lower K_d values to evaluate radionuclide concentrations as a result of a postulated accidental release of liquid effluents in the groundwater pathways. Also, samples from the Unit 3 site were analyzed and the measured K_d values are presented in FSAR Table 2.4-208. The measured results show that the Unit 3 site characteristic values are conservative.

Variance: NAPS ESP VAR 2.4-1 – Void Ratio, Porosity, and Seepage Velocity

Request

This is a request to use the Unit 3 values for void ratio, porosity, and seepage velocity of saprolite rather than the SSAR values. The Unit 3 values are as follows from FSAR Section 2.4.12.1.2: void ratio equals 0.45, total porosity equals 31 percent, effective porosity equals 25 percent, and seepage velocity equals 0.085 m/day (0.28 ft/day). Corresponding SSAR Section 2.4.12.1.2 values

for saprolite are as follows: void ratio equals 0.7, total porosity equals 41 percent, effective porosity equals 33 percent, and seepage velocity equals 0.037 m/day (0.12 ft/day). The Unit 3 values result in a seepage velocity that does not fall within (is larger than) the SSAR value.

The variance in Unit 3 values for void ratio, porosity, and seepage velocity from the SSAR values results from the use of additional data collected from the Unit 3 subsurface investigation.

Justification

The variance in values for void ratio, porosity, and seepage velocity is acceptable because compliance with 10 CFR 20 is demonstrated in FSAR Section 2.4.13 which evaluates radionuclide concentrations as a result of a postulated accidental release of liquid effluents in the groundwater pathways.

Variance: NAPS ESP VAR 2.4-2 – NAPS Water Supply Well Information

Request

This is a request to use corrected information for Unit 3 regarding the NAPS water supply wells rather than the SSAR information. The information in FSAR Table 2.4-17R revises SSAR Table 2.4-17 to correct certain information that is now known to be different and to reflect updated information on water supply wells at the NAPS site.

This variance results from the need to provide corrected information for well No. 2 and the Security Training Building well which is based on a reconsideration of technical content of the references for SSAR Table 2.4-17.

Justification

This variance in the NAPS water supply well information is acceptable because the corrected and new information continues to support the conclusions in SSAR Section 2.4.12.1.3 that: “Any groundwater supply required by the new units would likely come from an increase in the storage capacity for the existing wells or from drilling additional wells. In either event, additional groundwater withdrawal by the new units is not expected to impact any offsite wells due to: 1) their distance from the site, 2) the direction of the hydraulic gradient toward Lake Anna and the lake’s recharge effect, and 3) the existence of hydrologic divides between the ESP site and the offsite wells.”

Variance: NAPS ESP VAR 2.5-1 – Stability of Slopes

Request

This is a request to use the information presented in FSAR Section 2.5.5 on slopes and the safety of the slopes rather than the information in SSAR Section 2.5.5. The slopes near Unit 3 are different from those anticipated in the SSAR, and, for the seismic slope stability analysis, the peak ground acceleration being applied is different. The method of analysis remains essentially the same.

This variance results from the need to provide Unit 3-specific information which is different from that presented in the SSAR.

Justification

This variance in Unit 3 slopes and slope analyses is acceptable because the slopes being considered in FSAR Section 2.5.5 are lower, less steep, and have a smaller applied seismic acceleration than the slopes analyzed in SSAR Section 2.5.5. As a result, the Unit 3 slopes have a higher computed factor of safety against failure, and are shown to be stable under both long-term static and short-term seismic conditions.

Variance: NAPS ESP VAR 12.2-1 – Gaseous Pathway Doses

Request

This is a request to use updated information for Unit 3 gaseous effluent doses rather than the SSAR information which referred to ESP-ER Section 5.4. Several of the gaseous pathway doses to the maximally exposed individual (MEI) in FSAR Table 12.2-18bR do not fall within (are greater than) the corresponding values in ESP-ER Table 5.4-9. The Unit 3 values which are higher are shown in bold font in FSAR Table 12.2-18bR.

This variance is due to a change in maximum long-term dispersion estimates from those used in the ESP Application as discussed above under NAPS ESP VAR 2.0-1.

Justification

This variance is acceptable because estimated annual doses from normal gaseous effluent releases remain within applicable limits. FSAR Table 12.2-18bR shows the annual gaseous pathway doses to the maximally exposed individual (MEI) for Unit 3 and compares each to the corresponding estimate from the ESP-ER Table 5.4-9. Not all doses increased for the three locations with higher long term dispersion estimates because the normal release source term is lower for Unit 3 than the composite source term used to bound the multiple reactor types considered in the ESP Application. The effect of these changes is slight increases in thirteen Unit 3 total body and thyroid doses when compared to the earlier estimates for the ESP. The Unit 3 values that exceed the corresponding ESP value are shown in bold font in FSAR Table 12.2-18bR.

Although some of the individual pathway doses increased compared to the ESP Application, all gaseous effluent doses are acceptable when compared with the applicable limits in FSAR Table 12.2-201. As shown, the Unit 3 annual total body dose meets the 10 CFR 50, Appendix I, limit. This table also shows that the Unit 3 total body dose estimate is lower than the corresponding ESP value.

The gaseous effluent pathway thyroid dose for the MEI is also compared with the applicable limit in FSAR Table 12.2-201. While it meets the 10 CFR 50, Appendix I, limit, this table shows that the

Unit 3 thyroid dose estimate is higher than the corresponding ESP value. This variance, NAPS ESP VAR 12.2-2, is addressed below.

Variance: NAPS ESP VAR 12.2-2 – Annual Thyroid Dose

Request

This is a request to use updated information for the Unit 3 annual thyroid dose from gaseous effluents rather than the SSAR information which referred to ESP-ER Section 5.4. The iodines and particulates gaseous pathway dose to the thyroid in FSAR Table 12.2-201 does not fall within (is greater than) the corresponding value in ESP-ER Table 5.4-10. The Unit 3 value which is higher is shown in bold font in FSAR Table 12.2-201.

This variance is due to a change in maximum long-term dispersion estimates from those used in the ESP Application as discussed above under NAPS ESP VAR 2.0-1.

Justification

This variance is acceptable because the estimated Unit 3 annual thyroid dose from iodines and particulates in the normal gaseous effluent releases remains within the applicable 10 CFR Part 50, Appendix I limit.

Variance: NAPS ESP VAR 12.2-3 – Annual Liquid Effluent Releases

Request

This is a request to use the Unit 3 maximum annual liquid release values provided in FSAR Table 12.2-19bR rather than the corresponding ESP value in EIS Appendix I and ESP-ER Table 5.4-6. The Unit 3 values for some nuclides do not fall within (are larger than) the ESP and ER values, as shown in bold font in FSAR Table 12.2-19bR.

This variance results from a change in the annual release values for the ESBWR since the ESP-ER table was submitted. ESP-ER Table 5.4-6 presented the annual release values for a single unit nuclear plant, based on a composite of possible radionuclide releases from a number of reactor designs including the ESBWR. ESP-ER Table 5.4-6 also contained more radionuclides than FSAR Table 12.2-19bR, due to the use of the composite set of nuclides from multiple reactor designs.

Justification

This variance is acceptable because the estimated Unit 3 concentrations of normal liquid effluent releases remain within the applicable concentration limits and the annual doses from normal liquid effluent releases remain within applicable limits.

The estimated Unit 3 concentrations of normal liquid effluent releases for all nuclides meet the 10 CFR 20 concentration limits as shown in FSAR Table 12.2-19bR.

The estimated annual doses from Unit 3 to the MEI from liquid effluents are compared with the applicable limit in FSAR Table 12.2-202. The Unit 3 dose meets the 10 CFR Part 50, Appendix I, limit, and the Unit 3 dose estimates are lower than the corresponding ESP values.

Reference

NUREG-1835, Safety Evaluation Report for an Early Site Permit (ESP) at the North Anna ESP Site, Supplement 1, U.S. Nuclear Regulatory Commission, November 2006.

EXEMPTION REQUESTS

An *exemption* must be obtained if information proposed in the COL application is inconsistent with one or more NRC regulation. Exemptions are submitted pursuant to 10 CFR 52.7 and 52.93 and must comply with the special circumstances in 10 CFR 50.12(a).

Table 3-1 identifies the exemptions requested by Dominion and provides the information specified by NRC regulations.

Table 3-1 Exemption Requests

FSAR Section	Exemption	Discussion
13.7	Pursuant to 10 CFR 52.7 and 52.93, (as amended and promulgated effective September 27, 2007), Dominion hereby requests an exemption from the requirement of 10 CFR 52.79(a)(44) to provide a "description of the fitness-for-duty program required by 10 CFR 26 and its implementation" in its application for a combined operating license for North Anna Unit 3. Dominion proposes to provide the FFD Program description required by 10 CFR 52.79(a)(44) based on the revised 10 CFR 26 regulations that are expected to be promulgated and become effective in early 2008.	In an April 17, 2007, affirmation session (Ref. SRM-M070417B), the Commission approved a final rule amending FFD regulations in 10 CFR 26 for both the construction and operating phases for a new nuclear plant. The new and revised Part 26 regulations are expected to be promulgated and become effective in 2008. The construction phase of the Fitness for Duty Program as applied to new plants is not required to be implemented until the commencement of on-site construction of safety- or security-related systems, structures and components. Dominion will not begin these activities until after the amendments to 10 CFR Part 26 regulations take effect. The operational phase of the FFD Program is required to be implemented prior to fuel load. In view of the near-term effectiveness of new FFD regulations, we believe that it would be more efficient for both Dominion and the NRC to submit the FFD Program description required by 10 CFR 52.79(a)(44) based on the revised Part 26 rules rather than the rules currently in effect. Accordingly, Dominion hereby submits a request for an exemption from current Part 52 regulations pursuant to 10 CFR 52.7, "Specific Exemptions," and 10 CFR 52.93, "Exemptions and Variances."

Table 3-1 Exemption Requests

Granting this request, which is authorized by law, would allow the NRC to conduct its acceptance review of North Anna Unit 3 COL application based on the revised rules that will become effective in the near future. Dominion does not expect the NRC to issue the requested COL until the revised FFD rules take effect. For this and other reasons, granting this exemption request will not present an undue risk to the public health and safety, and is consistent with the common defense and security.

The pending amendments to Part 26 create "special circumstances," as defined in 10 CFR 50.12 (Specific Exemptions) that warrant granting this exemption. Applying the current Fitness for Duty regulations in reviewing the FFD Program description required by 10 CFR 52.79(a)(44) would not serve, and is not necessary to achieve, the underlying purposes of the rule. Further, the underlying purpose of 10 CFR 52.79(a)(44) can be satisfied by meeting the requirements of the revised FFD regulations that will become effective in the near future.

Moreover, compliance with the current rule would cause undue hardship for Dominion and would also be inefficient and burdensome for the NRC staff. That approach would require Dominion to prepare, and NRC to review, information based on Fitness for Duty regulations that will soon be superseded by Part 26 amendments, and then (presumably) complete a similar submittal under the revised FFD rules.

For these reasons, Dominion requests approval of the requested exemption from the Part 52 requirement to provide a description in the FSAR of an FFD Program that meets the current Part 26 Fitness for Duty regulations.

SUPPLEMENTS

Supplements (or supplemental information) is FSAR information that includes information not related to COL items, departures, variances, conceptual design, ESPA corrections, or permit conditions; or is information to demonstrate that the design of the facility falls within the site characteristics and design parameters specified in the DCD.

Supplemental information is provided throughout the FSAR primarily to conform with RG 1.206 guidance. In addition, supplemental information is added in FSAR Section 3.9 to address a DCD option, in FSAR Sections 3.10, 5.4, 6.5 and 15.3 to address SRP acceptance criteria, and in FSAR Chapter 17 to ensure completeness.