PMNorthAnna3COLPEmails Resource

From: Andrea Johnson
Sent: Thursday, March 26, 2009 11:42 AM
To: Regina.Borsh@dom.com
Cc: Thomas Kevern; Michael Eudy; Janelle Jessie; NorthAnna3COL Resource; Ilka Berrios
Subject: RE: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 034 - North Anna Unit 3 COLA
Attachments: ML0908402717.pdf

Gina,

Attached please find RAI Letter No. 34.

Please let me know if you have any questions.

Andrea M. Johnson
Project Manager
U.S. Nuclear Regulatory Commission
Office of New Reactors
Division of New Reactor Licensing
NGE1 Projects Branch

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Subject: RE: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 034 - North Anna Unit 3 COLA
Sent Date: 3/26/2009 11:41:37 AM
Received Date: 3/26/2009 11:41:00 AM
From: Andrea Johnson

Created By: Andrea.Johnson@nrc.gov

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Expiration Date:
Recipients Received:

March 26, 2009

Mr. Eugene S. Grecheck
Vice President - Nuclear Development
Dominion
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 034 (SRP 1.0, 2.2.3, 2.4.12, 2.4.13, AND 2.5.4) RELATED TO THE NORTH ANNA UNIT 3 COMBINED LICENSE APPLICATION

Dear Mr. Grecheck:

By letter dated November 26, 2007, Dominion Virginia Power (Dominion) submitted a combined license application for North Anna Unit 3 pursuant to 10 CFR Part 52. The U.S. Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application.

The staff has identified that additional information is needed to continue portions of the review and the request for additional information (RAI) is contained in the enclosure to this letter. To support the review schedule, Dominion is requested to respond within 90 days of the date of this letter. If the RAI response involves changes to application documentation, Dominion is requested to include the associated revised documentation with the response.

Should you have questions, please contact me at (301) 415-2890 or andrea.johnson@nrc.gov.

Sincerely,

/RA/

Andrea M. Johnson, Project Manager
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-017

Enclosure: Request for Additional Information

E-RAI Tracking Nos. 2225, 2322, 2395, 2248, and 2249

March 26, 2009

Mr. Eugene S. Grecheck
Vice President - Nuclear Development
Dominion
Innsbrook Technical Center
5000 Dominion Boulevard
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Sincerely,

/RA/

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ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-017
Enclosure: Request for Additional Information
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Distribution:
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OFFICE	TR:SPCV	BC:SBCV	PM:DNRL:NGE1	OGC (NLO)	PM:DNRL:NGE1
NAME	SHaider*	MSnodderly*	AJohnson*	SBrock-Kirkwood*	TKevern*
DATE	03/09/2009	03/15/2009	03/16/2009	03/23/2009	03/25/2009
OFFICE	TR: RHEB	BC: RHEB	PM: DNRL:NGE1	OGC	PM:DNRL: NGE1
NAME	MMcBride*	RRaione*	AJohnson*	SBrock-Kirkwood*	TKevern*
DATE	02/25/2009	03/06/2009	03/09/2009	03/11/2009	03/13/2009
OFFICE	TR: RGS2	BC: RGS2	PM: DNRL:NGE1	OGC	PM:DNRL:NGE1
NAME	JThompson*	CMunson*	AJohnson*	SBrock-Kirkwood*	TKevern*
DATE	03/18/2009	03/18/2009	03/18/2009	03/24/2009	03/25/2009

*Approval captured electronically in the electronic RAI system.

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Request for Additional Information
North Anna, Unit 3
Dominion
Docket Number 52-017

SRP Section: 01 - Introduction and Interfaces
Application Section: Part 2 FSAR Chapter 1

QUESTIONS for ESBWR/ABWR Projects 1 (NGE1)

01-3

Section 302(b) of the Nuclear Waste Policy Act of 1982, as amended, states "The Commission, as it deems necessary or appropriate, may require as a precondition to the issuance or renewal of a license under section 103 or 104 of the Atomic Energy Act of 1954 [42 U.S.C. 2133, 2134] that the applicant for such license shall have entered into an agreement with the Secretary for the disposal of high-level radioactive waste and spent nuclear fuel that may result from the use of such license."

Please identify the DOE contract number applicable to North Anna Unit 3 for disposal of high-level radioactive waste and spent nuclear fuel or provide Dominion's plans, including the time frame, for entering into such a contract.

Request for Additional Information
North Anna, Unit 3
Dominion
Docket Number 52-017

SRP Section: 02.02.03 - Evaluation of Potential Accidents
Application Section: Section 2.2.3 & Section 6.4

QUESTIONS for Containment and Ventilation Branch 2 (ESBWR/ABWR Projects) (SBCV)

02.02.03-7

The following staff questions pertain to the “Nitrogen Storage” part of the applicant’s response to NRC RAI 02.02.03-2. The applicant should consider a revised RAI response by making any required corrections to the previous RAI response.

- There is no IDLH specified for nitrogen in RG 1.78 that treats nitrogen as an asphyxiant. The applicant has rather used TEEL-1, the DOE guideline on maximum concentration people could be exposed to without experiencing any adverse health effects, as the safety limit. ALOHA software reports TEEL-1, TEEL-2, and TEEL-3 values for nitrogen as 145,000 ppm, 280,000 ppm, and 500,000 ppm, respectively. The CAMEO Chemicals website (http://cameochemicals.noaa.gov/chemical/8898) shows the respective TEEL values for nitrogen revised down to 65000 ppm, 230000 ppm, and 400000 ppm, in 2008. The applicant has cited **14,500 ppm as the TEEL-1 value for nitrogen** in the RAI response. The applicant should cite the source of 14,500 ppm as TEEL-1 value for nitrogen, or correct it in the RAI response.

- The RAI response reported **“Nitrogen concentration at the intakes was calculated to be 7,150 ppm”**. Later, the applicant mentioned that “The concentrations at the nearest edge of the control building peak at approximately 680,000 ppm. The bounding calculated control room concentration of the released nitrogen was determined to be less than 800 ppm, clearly within all limits.”

  The applicant should explain the 7,150 ppm nitrogen concentration, which does not have any significance outside the control room where the nitrogen concentration peaks around 680,000 ppm. It does not occur inside the CR either where the nitrogen concentration stays below 800 ppm.

- In the RAI response, the applicant reported **“Essentially the oxygen content at the intake will remain above 19.5%, a limit sometimes used for indefinite stays**. The staff recognizes that the 60,000 ppm asphyxiation limit cited later by the applicant does correspond to 19.5% oxygen level and would not be violated inside the control room. However, the 680,000 ppm nitrogen concentration at the control room intake would correspond to about 7% oxygen content, which is much lower than the OSHA asphyxiation limit (19.5% oxygen). Therefore, the statement “Essentially the oxygen content at the intake will remain above 19.5%.....**”** is not true and needs to be corrected.

Request for Additional Information
North Anna, Unit 3
Dominion
Docket Number 52-017

SRP Section: 02.04.12 - Groundwater
Application Section: 02.04.12

QUESTIONS for Hydrologic Engineering Branch (RHEB)

02.04.12-2

The purpose of this RAI is to address the requirements of 10 CFR 50.55a, GDC 2, GDC 4, and 10 CFR 100.20(c)(3). These regulations require (1) a complete description of the effects of groundwater levels on the design bases of plant foundations, and (2) a complete description of the site dewatering system, including its reliability in maintaining groundwater conditions within the design bases of structures, systems, and components important to safety.

The applicant conducted groundwater modeling to estimate maximum post-construction groundwater elevations. A narrative description of the groundwater modeling was provided to Staff in the applicant's Letter No. 024 dated September 19, 2008 (in response to RAI 2.4.12-1). Based on the results of the modeling, the applicant concluded that the maximum post-construction groundwater elevation in the power block area will be 86.26 m (283 ft) NAVD88, 2.134 m (7 ft) below the design plant grade elevation. Since the maximum groundwater elevation is less than the DCD site parameter value of 0.61 m (2 ft) below plant grade (87.79 m, or 288 ft msl), the applicant concluded that a permanent dewatering system is not needed for safe operation of Unit 3.

Staff has concluded that the groundwater elevations predicted by the model are strongly dependent on the characteristics of the model drain cells that represent the site surface water drainage system (i.e. the drainage ditches) surrounding the power block. Staff request additional information supporting the applicant's conclusion that the groundwater elevations in the power block area will meet the maximum groundwater level requirement of the DCD over the life of the facility. Such information may include the following elements.

- Model sensitivity studies demonstrating the impact on groundwater elevations of the drain cell characteristics (elevations, conductance, and recharge rates).

- Additional evidence that the surface water drainage system will behave as a groundwater drain (as predicted by the groundwater model) over the life of the facility. This may include, for example, additional details of the surface water drainage system design and maintenance.

- Discussion of whether high water levels in the drainage ditches (such as during storms) can cause high groundwater levels in the power block area as a result of infiltration from the drains.

- A discussion of how groundwater monitoring data obtained during plant operation will be used to evaluate groundwater elevations in the power block area.

SRP Section: 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters
Application Section: 02.04.13

QUESTIONS for Hydrologic Engineering Branch (RHEB)

02.04.13-4

The purpose of this RAI is to address the requirements of 10 CFR 20, Appendix B, which requires that radionuclides released in liquid effluents do not result in concentrations at the nearest source of potable water that exceed the concentrations listed in Table 2, column 2.

Staff request additional information demonstrating that the applicant's transport analysis constitutes a bounding analysis, i.e. an analysis that is based on the largest or smallest parameter values measured onsite, which consequently calculates the highest receptor-point radionuclide concentrations consistent with onsite measurements.

As currently presented in the FSAR, the transport analysis uses a groundwater hydraulic conductivity (to compute groundwater velocity) that is less than the maximum value observed at the site. In addition, the transport analysis uses K_d values based on literature data that, in some cases, are greater than the minimum observed site-specific values. Staff requests the results of a transport analysis that uses the maximum observed hydraulic conductivity and the minimum site-specific K_d values for comparison with the 10 CFR 20, Appendix B, Table 2 effluent concentration limits.

Request for Additional Information
North Anna, Unit 3
Dominion
Docket Number 52-017

SRP Section: 02.05.04 - Stability of Subsurface Materials and Foundations
Application Section: 2.5.4

QUESTIONS for Geosciences and Geotechnical Engineering Branch 2 (RGS2)

02.05.04-12

In RAI 2.5.4, Question 3, the staff asked for additional information on material and engineering properties of the concrete fill that will replace weathered rock exposed at the bottom of excavation for Seismic Category I building foundation mats. In response, you stated that the properties of the concrete fill were yet to be determined, but the concrete mix would be designed to have a shear wave velocity within the same range as the Zone II-IV rock at the NAPS site. You also stated that the FSAR would be revised to include at statement that the shear wave velocity of the concrete fill would be within the range of Zone III-IV rock.

The staff reviewed this information and concludes that although the concrete fill has similar shear wave velocity as that for the Zone III-IV rock, it may not have the same shear strength. Therefore, in order for the staff to fully evaluate and determine the acceptability of stability analysis results for foundations where concrete fill is to be placed, please provide engineering properties of concrete fill. If the properties are assumed, please clarify how to ensure the in-place concrete fill will have the same engineering properties as that assumed in stability analyses.

02.05.04-13

In RAI 2.5.4, Question 4, the staff asked for a description of how to ensure that the static and dynamic properties of the backfill soil will meet or exceed both the requirements of the ESBWR DCD and the parameter values used for the site response/stability evaluations. In response, you clarified that the FWSC was the only Seismic Category I structure that would be founded on backfill, and stated that the estimated lower bound velocity will be above the minimum shear wave velocity of 300 m/s (1,000 ft/s) stated in the ESBWR DCD. You also discussed the adequacy of the analyses results for liquefaction potential, bearing capacity and earth pressures, and settlement of the backfill.

The staff reviewed the response, and found that you did not provide the means by which the successful meeting of these criteria would be proven during and after construction. Please provide (1) a detailed description on how to ensure that the static and dynamic properties of the backfill soil will meet or exceed both the requirements of the ESBWR DCD and the parameter values used in the analyses as described in the application, such as site seismic response analysis, bearing capacity and settlement estimates and SSI analysis; and (2) explain how you will confirm that the design criteria of the ESBWR DCD and the parameter values related to backfill have been met during and after construction.

02.05.04-14

In RAI 2.5.4, Question 5, the staff asked for clarification on the difference between the shear wave velocity of the backfill presented in FSAR Figure 2.5-244 (152 to 724 m/s) and that of FSAR Table 2.0-201 (minimum 1073 m/s) for the area beneath the FWSC building. In response, you stated that the estimated shear wave velocity shown on FSAR Figure 2.5-244 is plotted versus depth, whereas the minimum shear wave velocity beneath the FWSC, given in Table 2.0-201, is a weighted average of the backfill velocities and the velocities of the underlying units, including the bedrock. The staff reviewed your response and concludes that the minimum shear wave velocity listed in FSAR Table 2.0-201 is the average soil shear wave velocity over more than 500 ft of subsurface materials including the bedrock, which does not realistically represent the backfill material to be placed below the foundation. Please provide the minimum shear wave velocity parameter for soil below the foundation so that the staff can evaluate the adequacy of backfill properties used in the site stability analysis.

02.05.04-15

In RAI 2.5.4, Question 6, the staff asked for clarification on the values of allowable dynamic bearing capacity for the RB/FB. In response, you stated that the dynamic bearing capacity value of 10,200 kPa (214 ksf) was the computed value for concrete while the 12,401 kPa (259 ksf) value was calculated for the Zone III-IV bedrock. You then stated that FSAR Table 2.0-201 would be revised to a lower value to reflect the concrete dynamic bearing capacity. Since no specific concrete fill property was described in the application, please clarify how the properties of the concrete fill, such as engineering properties and thickness underneath the foundation in all directions, were determined and used in the allowable bearing capacity calculation without knowing the actual concrete fill design and placement at foundation.

02.05.04-16

In RAI 2.5.4, Question 7b, the staff asked for clarification on whether the overturning forces were considered in the foundation allowable bearing capacity analysis. In response, you stated that overturning forces were considered in the analysis. You stated that for all major structures, the minimum dynamic values exceeded the ESBWR DCD design and the “local failure will not occur in the 2.5-m (8.2-ft) thick reinforced concrete mat foundation of the FWSC.” The staff reviewed this information but concludes that local failure not occurring in the concrete mat does not exclude the possibility of local failure in the backfill layers beneath the concrete mat. In order to fully evaluate the adequacy of the bearing capacity analysis results, please address the possibility of local failure within the backfill layer beneath the concrete mat in the foundation stability analysis.

02.05.04-17

In RAI 2.5.4, Question 8, the staff asked for clarification and justification of the coefficient of friction used to calculate the factor of safety against sliding at the interface of the basemat and underlying material. In response, you stated that the coefficient of friction at the interface of the basemat and underlying material was dependent on the composition of the mudmat, the design of which is still in development by the ESBWR vendor, General Electric-Hitachi (GEH) and that this issue is currently being addressed in DCD RAI 2.8-96 S03. However, in order for the staff to adequately assess and evaluate the site-specific factor of safety against sliding at the interface of the basemat and the underlying material, the coefficient of friction is needed. To that end, please justify and clarify the site-specific coefficient of friction used to calculate the site-specific factor of safety against sliding between the basemat and underlying material.

02.05.04-18

In RAI 2.5.4, Question 10, the staff asked for an explanation of why the seismic loading induced maximum settlement estimated in the FSAR is significantly smaller than that presented in the SSAR. In response, you stated that this difference is due to Cone Penetration Tests (CPTs) that were performed at different locations with soil property variations presented in SSAR and FSAR data, and because the peak ground accelerations used in the FSAR analysis were 40 percent lower than those used in the SSAR analysis. The staff reviewed this information and noticed that the differences are not significant with the SSAR showing even higher strength parameters for the saprolite soil (see FSAR Table 2.5-212 and SSAR Table 2.5-45). Since generally the value of cyclic stress ratio used as input to the dynamic settlement analysis is directly proportional to the peak ground acceleration, please explain why the SSAR estimated dynamic settlement was almost 3 times of that estimated in the FSAR while there is only a 40 percent difference for peak ground accelerations used in these two calculations.

02.05.04-19

In RAI 2.5.4, Question 11, the staff asked for justification on why the dynamic bearing capacity can be estimated by adding one third over static bearing capacity. In response, you explained the capacity-to-demand (c/d) adjustment for static pressures and stated that since dynamic foundation bearing pressures occur infrequently, it is reasonable to adopt a lower c/d for dynamic bearing pressures, which is equivalent to a higher applied bearing pressure. You also referred to the International Building Code (IBC) (2003) as a basis for estimating the dynamic bearing capacity by adding one third over static bearing capacity. After reviewing Table 1804.2 of the IBC, it is clear to the staff that this code does not indicate that only one and one-third of the calculated static bearing capacity should be used as dynamic bearing capacity, but specifies that the dynamic bearing capacity must be estimated using "the alternate load combinations in Section 1605.2.2 that include wind or earthquake loads." In order to complete the evaluation of the adequacy of dynamic bearing capacity for this site, please provide details on what load combinations were used in the dynamic bearing capacity estimate and why one and one-third of static bearing capacity can be used as dynamic bearing capacity for this site without actual analysis.