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Dominion®

February 10, 2009

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

Serial No. NA3-09-005R
Docket No. 52-017
COL/MEP

DOMINION VIRGINIA POWER
NORTH ANNA UNIT 3 COMBINED LICENSE APPLICATION
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION LETTER No. 031
(FSAR CHAPTER 12, 13 and 14)

On January 12, 2009, 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 5:

- RAI Question 12.03-12.04-10 Zinc Injection System
- RAI Question 12.03-12.04-11 Very High Radiation Areas
- RAI Question 13.03-3 Emergency Action Levels
- RAI Question 14.02-9 Personnel Monitors and Radiation Survey Instruments
- RAI Question 14.02-10 Laboratory Equipment and Whole Body Counters

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

D089
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 10th day of February 2009
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 031, RAI Question 12.03-12.04-10
2. Response to RAI Letter 031, RAI Question 12.03-12.04-11
3. Response to RAI Letter 031, RAI Question 13.03-3
4. Response to RAI Letter 031, RAI Question 14.02-9
5. Response to RAI Letter 031, RAI Question 14.02-10

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
R. Kingston, GEH
P. W. Smith, DTE Energy

ENCLOSURE 1

Response to NRC RAI Letter 031

RAI Question 12.03-12.04-10

NRC RAI 12.03-12.04-10

RAI 12.03/04-3 addressed the ESBWR Zinc Injection System. The staff requests additional information as follows:

a. *In response to RAI 12.03/04-3, the applicant states that North Anna 3 will not utilize ESBWR Zinc Injection System because GEH has reduced the amount of cobalt in contaminated applications throughout the plant and reduced the use of stainless steel in the coolant system. The applicant also states that reduced dose rates have been achieved at Japan's ABWR Kashiwazaki-Kariwa without the use of zinc injection by using low cobalt materials. Section 12.3.1 of the ESBWR DCD provides a description of some of the material considerations to minimize the cobalt content for primary coolant piping and other components in contact with the primary coolant in the ESBWR design. Provide your basis for selecting the listed components as candidates for cobalt minimization/elimination.*

b. *A majority of the operating BWRs in the US utilize zinc injection as a means to reduce dose rates resulting from cobalt plateout in contaminated applications throughout the plant. In light of this industry experience regarding the positive effects of using zinc injection to reduce cobalt plateout levels, provide the basis for your determination that the cobalt reduction measures described in Section 12.3.1 of the ESBWR DCD are adequate to reduce the cobalt levels in the reactor coolant to sufficiently low levels that use of a Zinc Injection System would not be necessary.*

c. *Section 1.2.2.12.15 of the ESBWR DCD states that the "ESBWR includes the capability to connect a Zinc Injection System, but the system itself is not part of the ESBWR Standard Plant design." State whether the applicant will retain the option of utilizing a Zinc Injection System in the event that the cobalt levels in the contaminated applications throughout the plant reach such levels that the use of a Zinc Injection System would prove to be beneficial in reducing such cobalt levels in the plant.*

Dominion Response

a. Basis for Component Selection

The selection of components for cobalt minimization/elimination was performed by General Electric-Hitachi (GEH) and is part of the standard ESBWR plant design. Discussions in DCD Section 5.2.3.2.2, Radiation Field Buildup, and DCD Section 12.4.6, Special Maintenance, provide some insight regarding those GEH decisions. Further questions should be directed to GEH.

b. Basis for Determining the Adequacy of Cobalt Reducing Measures

The use of zinc injection has been beneficial in plants where cobalt-containing alloys are relatively abundant in high fluence areas or are extensively used in feedwater piping. The ESBWR standard plant incorporates the following measures which are discussed in DCD Sections 5.2.3.2.2, 12.3.1, 12.4.1 and 12.4.6:

- Reducing the amount of cobalt in alloys used in high fluence areas (fuel assemblies and control rods)

- Using non-cobalt alloys for pins and rollers in control rods

- Restricting the cobalt content in stainless steel components in the reactor vessel and other selected stainless steel components that have large surface areas exposed to high flow rates toward the reactor vessel, and minimizing the use of Stellite, which is a high cobalt alloy

Also, as discussed in the GEH response to DCD RAI 9.3-39 (MFN 07-398):

> "The purpose of the Zinc Injection System in existing BWR plants is to reduce radiation levels in the primary containment due to cobalt (CO-60) deposition primarily on the recirculation system piping. Since the ESBWR does not have recirculation piping and ESBWR material selection has reduced stellite (a principal source of cobalt) in the plant, the beneficial effects of implementing Zinc Injection at startup are limited."

c. Retaining the Option of Utilizing a Zinc Injection System

DCD Section 9.3.11 states that "(t)he ESBWR Standard Plant design includes the capability to connect a Zinc Injection System (ZIS), but the system itself is not part of the ESBWR Standard Plant design". FSAR Section 9.3.11 incorporates this statement by reference without departures. Therefore North Anna Unit 3 retains the option of utilizing a Zinc Injection System.

Proposed COLA Revision

None.

ENCLOSURE 2

Response to NRC RAI Letter 031

RAI Question 12.03-12.04-11

NRC RAI 12.03-12.04-11

In response to RAI 12.03/04-3, the applicant revised FSAR Appendix 12BB (specifically the bracketed "Note" portion of Section 12.5.4.4 (Access Controls) of NEI 07-03) to address some access controls that will be implemented to restrict personnel access to Very High Radiation Areas (VHRA) at North Anna 3, in accordance with the requirements of 10 CFR 20.1602. The applicant's response did not address all of the information specified in this bracketed section of NEI 07-03. As specified in this section of NEI 07-03, the applicant should provide the following additional information in FSAR Appendix 12BB:

a. A listing of all areas in the plant designated as Very High Radiation Areas with reference to its location on plant layout diagrams in FSAR Sections 12.3-4.

b. The purpose why each of these areas would need to be accessed and the anticipated access frequency for each of these areas.

c. Detailed drawings for each Very High Radiation Area that indicate physical barriers that completely enclose the respective area in a manner that is sufficient to thwart undetected entry into the area. Alternately, if such detailed drawings are not available, describe how such barriers will be verified in the final design of the facility.

Dominion Response

a. Very High Radiation Areas

The following table identifies plant areas designated as a Very High Radiation Area (VHRA), specifies the condition under which the area is designated VHRA, and lists corresponding DCD plant layout drawings showing the VHRA.

Table 12BB-201
Very High Radiation Areas (VHRA)[1]

Zone	VHRA Location	VHRA Condition	DCD Plant Layout Drawings
1170	Lower Drywell	During power operation	12.3-1, 12.3-2, 12.3-3, 12.3-4, 12.3-10
1570	Upper Drywell	During power operation	12.3-5, 12.3-10
1702	Inclined Fuel Transfer Tube Room	During spent fuel transfer	12.3-7
	Other areas adjacent to Inclined Fuel Transfer tube	During spent fuel transfer	12.3-10

[1]Table shows dry areas only. Other areas identified as VHRA in DCD Section 12.3 drawings are submerged areas in the vicinity of spent fuel.

b. Access to Very High Radiation Areas

Access to VHRAs is not expected during normal plant operations. In the unlikely event access is required, entry into the VHRA would be controlled in accordance with the requirements of a specific (Special) Radiation Work Permit.

c. Physical Barriers to Preclude Inadvertent Access to VHRAs

Upper and lower drywells.

Access to each drywell is via a personnel hatch (airlock). Limit switches on the inner and outer airlock doors provide control room indication of door position. Interlocks prevent opening inner and outer doors simultaneously when the reactor is at-power, which is the only condition under which the drywells are VHRA. Administrative procedures prohibit normal personnel access to the drywells with the reactor at-power. FSAR Section 12.BB will be revised to include this information.

Inclined Fuel Transfer System

DCD Sections 9.1.4.12 and 12.3.1.4.4 identify the following physical controls, interlocks and annunciators to control access to areas immediately adjacent to the Inclined Fuel Transfer System (IFTS):

- Controls prevent personnel from inadvertently or unintentionally being left in those areas at the time the access doors are closed.
- During IFTS operation or shutdown, personnel are prevented from (a) either reactivating the IFTS while personnel are in a controlled maintenance area, or (b) entering a controlled IFTS maintenance area while irradiated fuel or components are in any part of the IFTS.
- Both an audible alarm and flashing red lights are provided both inside and outside the controlled maintenance areas to indicate IFTS operation.
- Radiation monitors with alarms are provided both inside and outside the controlled maintenance areas.
- A key-lock system in both the IFTS main operation panel and in the control room is provided to allow access to any IFTS maintenance area.

Barriers to areas adjacent to the IFTS will be verified via ITAAC as identified in DCD Tier 1 Table 2.5.10-1, item 6. Reference to the DCD sections discussed above will be added to FSAR Section 12BB.

Proposed COLA Revision

Table 12BB-201 (shown above) will be added to FSAR Section 12BB. FSAR Section 12BB, paragraph 12.5.4.4 will be revised to read:

> Table 12BB-201 identifies the Very High Radiation Areas (VHRAs). Access to a VHRA is normally precluded by administrative and physical controls. In the unlikely event entry into a VHRA is required, access is permitted only with a

specific (Special) radiation work permit (RWP). Note that the areas identified are only VHRA during the condition specified in the table. When these conditions are not met, a Special RWP is not required for entry.

With the reactor at power, the containment upper and lower drywells are VHRA and administrative controls prohibit personnel access. Drywells can only be accessed via airlocks. Opening an airlock door causes a control room alarm, further protecting personnel from accidental exposure.

DCD Sections 9.1.4.12 and 12.3.1.4.4 identify access controls for areas immediately adjacent to the IFTS. Barriers to these areas are verified via ITAAC as identified in DCD Tier 1 Table 2.5.10-1. The barriers include physical barriers, interlocks and alarms.

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.

12.5.3.3 **Personal Protective Clothing and Equipment**

Delete the last sentence in the first paragraph.

12.5.4.2 **Methods to Maintain Exposures ALARA**

Delete the second paragraph.

12.5.4.4 **Access Control**

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

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

Table 12BB-201 identifies the Very High Radiation Areas (VHRA). Entry into a VHRA is allowed only with a specific (Special) radiation work permit. The areas identified are only VHRA during the conditions specified in the table. A Special RWP is required only when these conditions exist.

DCD Sections 9.1.4.12 and 12.3.1.4.4 identify access controls for areas immediately adjacent to the IFTS. Barriers to these areas are verified via ITAAC as identified in DCD Tier 1 Table 2.5.10-1.

With the reactor at power, the containment upper and lower drywells are VHRA and administrative procedures prohibit personnel access. Drywells can only be accessed via airlocks. Opening an airlock causes an MCR alarm, further protecting personnel from accidental exposure.

12.5.4.12 **Quality Assurance**

Replace the bracketed text in the first paragraph with Section 17.5.

12BB.1 **References**

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

STD COL 12.5-3-A

Table 12BB-201 Very High Radiation Areas (VHRA)[1]

Zone	VHRA Name	VHRA Condition	DCD Drawings
1170	Lower Drywell	During power operation	12.3-1, 12.3-2, 12.3-3, 12.3-4, 12.3-10
1570	Upper Drywell	During power operation	12.3-5, 12.3-10
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	Other areas adjacent to Inclined Fuel Transfer tube	During spent fuel transfer	12.3-10

1. Table shows dry areas only. Other areas identified as VHRA in DCD Section 12.3 drawings are submerged areas in the vicinity of spent fuel.

ENCLOSURE 3

Response to NRC RAI Letter 031

RAI Question 13.03-3

NRC RAI 13.03-3

The initial Emergency Action Levels (EALs), which are required by 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50, must be approved by the NRC. Recent combined license (COL) applications have been submitted that do not fully address certain aspects of the required EAL scheme. This is because various equipment set points and other information cannot be determined until the as-built information is available; e.g., head corrections, radiation shine, final technical specifications, and equipment calculations and tolerances. The NRC has been evaluating possible options to ensure applicants address the regulations and provides the following:

Option 1 – Submit an entire EAL scheme, which contains all site-specific information, including set points. Until this information is finalized, EALs would remain an open item.

Option 2 – Submit emergency plan Section D, "Emergency Classification System," which addresses the four critical elements of an EAL scheme (listed below). The NRC will determine the acceptability of the EAL scheme.

- *Critical Element 1 – Applicant proposes an overview of its emergency action level scheme including defining the four emergency classification levels, (i.e., Notification of Unusual Event, Alert, Site Area Emergency, and General Emergency), as stated in NEI 99-01, Revision 5, with a general list of licensee actions at each emergency classification level.*

- *Critical Element 2 – Applicant proposes to develop the remainder of its EAL scheme by using a specified NRC endorsed guidance document. In the development of its EALs, the proposed EALs should be developed with few or no deviations or differences, other than those attributable to the specific reactor design. NEI 07-01, if endorsed, will be applicable to the AP1000 and ESBWR (passive) reactor designs, and NEI 99-01 is applicable to all (non-passive) reactor designs. If applicable, EALs related to digital instrumentation and control must be included. The NRC must find in the Safety Evaluation Report that this approach is acceptable for each site.*

- *Critical Element 3 – Applicant proposes a License Condition (LC) that the applicant will create a fully developed set of EALs in accordance with the specified guidance document. These fully developed EALs must be submitted to the NRC for confirmation at least 180 days prior to fuel load.*

- *Critical Element 4 – The EALs must be kept in a document controlled by 10 CFR 50.54(q), such as the emergency plan; or a lower tier document, such as the Emergency Plan Implementing Procedures.*

Please review the two options provided above, identify which option will be chosen, and provide the detailed EAL information in support of the chosen option. Please inform the NRC which option you intend to pursue within two weeks of receipt of this RAI.

Dominion Response

RAI 13.03-3 identifies two options regarding the development and implementation of emergency action levels (EALs). Dominion has elected to implement Option 2. Option 2 requires an applicant to submit detailed EAL information to address the four critical EAL elements defined in the RAI.

As described in NEI's January 29, 2009 letter to NRC, NEI is developing a standard RAI response template that will address the four elements specified by Option 2. Once NRC notifies NEI by letter that the template is acceptable for reference, Dominion will supplement its response within 30 days and submit plans in accordance with the approved NEI template for addressing the four EAL elements.

Proposed COLA Revision

None.

ENCLOSURE 4

Response to NRC RAI Letter 031

RAI Question 14.02-9

NRC RAI 14.02-9

Dominion's response to RAI 14.02-5 states that site-specific personnel monitors and radiation survey instruments do not meet the RG 1.68 criteria for plant features to be tested in the Initial Test Program (ITP). Therefore, the applicant states that these monitors will not be included in the ITP but, instead, will be tested in accordance with the Radiation Protection Program (as delineated in NEI template 07-03). Accordingly, the applicant proposed to delete Section 14.2.9.1.3 , "Personnel Monitors and Radiation Survey Instruments Preoperational Test" from the North Anna FSAR and take exception to Appendix A, Item 1.k(2) , "personnel monitors and radiation survey instruments" of RG 1.68.

In complying with COL Item 12.5-2-A (Compliance with Paragraph 50.34(f)(2)(xxvii) of 10 CFR and NUREG-0737 Item III.D.3.3), the applicant commits to having a portable monitoring system capable of sampling and analyzing for radioiodine in areas of the plant during and following an accident. Since this system is used to ensure that specified design conditions of the facility are not exceeded during any condition of normal operation, including anticipated operational occurrences, or as a result of postulated accident conditions, provide your reasoning for not including this system in the ITP.

Dominion Response

Laboratory and portable instrumentation used for radiation protection are maintained under the plant's radiation protection program. This equipment in not physically attached to the plant, thus, it is not a plant structure, system, or component. Such equipment is not installed by the constructor, not turned over by the constructor to the owner, and is therefore not subject to the Initial Test Program. However, by adopting NEI 07-03 (refer to FSAR Appendix 12BB), Dominion commits to having all necessary radiation protection equipment available when it is needed.

Section 12.5 of NEI 07-03, Generic FSAR Template Guidance for Radiation Protection Program Description, provides milestones for implementation of the radiation protection program. The milestones are;

- Initial receipt of by-product, source, or special nuclear material
- Initial fuel receipt
- Initial fuel load
- Initial transfer, transport, or disposal of radioactive materials

For each milestone, NEI 07-03 defines the degree of radiation protection program implementation. NEI 07-03 specifies that prior to initial loading of fuel in the reactor, all of the radiation protection program functional areas described in Section 12.5 related to facilities, instrumentation, and equipment needed for fuel load and plant operations will be fully implemented. Section 12.5.3 (Facilities, Instruments and Equipment) of NEI 07-03 states:

> Adequate facilities, instrumentation and equipment are provided to support implementation of the radiation protection program during routine operations, refueling and other outages, abnormal occurrences, and accident conditions. The

types and characteristics of facilities, instrumentation, and equipment provided are consistent with the guidance in Regulatory Guides 1.97 (and guidance provided in Branch Technical Position 7-10, Revision 5 to NUREG 0800), 8.2, 8.4, 8.6, 8.8, 8.9, 8.10, 8.15, and 8.28 and the criteria in NUREG-0737, Items II.B.3 and III.D.3.3.

Section 12.5.3.2 (Monitoring Instrumentation and Equipment) of NEI 07-03 states:

> Radiation monitoring instrumentation and equipment are selected, maintained and used to provide the appropriate detection capabilities, ranges, sensitivities and accuracies required for the types and levels of radiation anticipated at the plant and in the environs during routine operations, major outages, abnormal occurrences, and postulated accident conditions. The quantities of instrumentation and equipment are sufficient to meet the anticipated needs of the plant during all anticipated conditions –taking into account the amount of instrumentation and equipment that may be unavailable at any one time due to periodic testing and calibration, maintenance, and repair.

Section 12.5.3.2 continues with subsections delineating the types of equipment that will available as follows;

- Laboratory and fixed instrumentation, which includes in part:
  - A whole-body counter to detect and quantify personnel intakes of radioactivity.
  - A Multi-channel gamma analysis system to identify and measure gamma emitting radionuclides in solid, liquid and gaseous samples. Some of the sample types analyzed include primary reactor coolant, liquid and gaseous waste and airborne contaminants.

- Portable monitoring instrumentation and equipment, which include in part:
  - Beta-gamma survey meters to monitor the plant and environs during and following an accident.
  - Portable air sampling and analysis system to determine airborne radioiodine concentrations during and following an accident consistent with the criteria in NUREG-0737, Item III.D.3.3.
  - Portable sampling and onsite analysis capability to assess airborne radio-halogens and particulates released during and following an accident consistent with the criteria in Regulatory Guide 1.97 (and guidance provided in Branch Technical Position 7-10, Revision 5 to NUREG 0800).

- Personnel monitoring instrumentation and equipment

In summary, Dominion has incorporated NEI 07-03 in the North Anna 3 FSAR. NEI 07-03 provides adequate descriptions of the radiation protection instruments and equipment that will be available at specified milestones for the radiation protection program. Availability implies that equipment is tested and ready for service. Such instruments and equipment are not plant structures, systems or components, and are therefore not included in the Initial Test Program.

Proposed COLA Revision

None.

ENCLOSURE 5

Response to NRC RAI Letter 031

RAI Question 14.02-10

NRC RAI 14.02-10

Dominion's response to RAI 14.02-6 states that site-specific laboratory equipment used to analyze or measure radiation levels and radioactivity concentrations do not meet the RG 1.68 criteria for plant features to be tested in the Initial Test Program (ITP). Site-specific laboratory equipment can be used to analyze post-accident primary reactor coolant samples, as well as liquid and gaseous waste samples, and airborne contaminants. Whole-body counters are used to detect and quantify personnel intakes of radioactivity. Some of these systems are used to ensure that specified design conditions of the facility are not exceeded during any condition of normal operation, including anticipated operational occurrences, or as a result of postulated accident conditions. Provide your reasoning for not including these systems in the ITP.

Dominion Response

See response to RAI 14.02-9.

Proposed COLA Revision

None.