PMNorthAnna3COLPEmails Resource

From: Patel, Chandu
Sent: Tuesday, October 04, 2011 2:53 PM
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Subject: Draft RAIs for FSAR Section 12.3 -12.4, North Anna 3 COLA
Attachments: Draft RAI 5785.doc; Draft RAI 5786.doc; Draft RAI 5972.doc; Draft RAI 5976.doc; Draft RAI 5977.doc; Draft RAI 5979.doc

Hi All,

Please see attached draft RAIs 5785, 5786, 5972, 5976, 5977, and 5979 for North Anna 3 COLA. I would like to request Dominion to let me know if it needs any clarification on these RAIs before COB October 11, 2011. Otherwise, it will be issued as final after October 11, 2011. For other people, it is for information only.

Thanks,
Chandu Patel

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MESSAGE	390	10/4/2011 2:52:56 PM
Draft RAI 5785.doc	37370	
Draft RAI 5786.doc	36858	
Draft RAI 5972.doc	56314	
Draft RAI 5976.doc	44538	
Draft RAI 5977.doc	53242	
Draft RAI 5979.doc	32250	

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Request for Additional Information No. 5785 (Draft)

North Anna, Unit 3
Dominion
Docket No. 52-017
SRP Section: 12.03-12.04 - Radiation Protection Design Features
Application Section: 12.3

QUESTIONS for Health Physics Branch (CHPB)

12.03-12.04-***

10 CFR 20.1101(b) requires licensees to control external occupational exposure, and to ensure that engineering controls are used to keep occupational doses as low as is reasonably achievable (ALARA). 10 CFR Part 50 General Design Criterion (GDC) 61 requires licensees to ensure that there is adequate shielding for routine activities in the area of equipment that may contain radioactivity. The guidance contained in NUREG 0800 Standard Review Plan (SRP) Section 12.2 “Radiation Sources” and Regulatory Guide 1.206 “Combined License Applications for Nuclear Power Plants (LWR Edition),” section C.I.12.2.1 “Contained Sources,” states that the applicant is to provide the models, parameters and bases for all values used to calculate source magnitudes used as the basis for designing the radiation protection program and for shield design calculations. North Anna Power Station Unit 3 (NAPS) Departure DEP 9.2(1) “Replacement of Boron Recycle System with a Degasifier Subsystem” eliminated the reuse of reactor coolant water, so this additional waste water will need to be processed as liquid waste.

Based on the information contained in the US-APWR DCD Tier 2 Revision 2 Table 12.2-73 “Parameters for the US-APWR Demineralizers” the Liquid Waste Processing System will need to process 1.4E6 gallons more Reactor Coolant each cycle. However, NAPS COL FSAR Table 12.2-73R “Parameters for the US-APWR Demineralizers” does not appear to reflect the processing of this additional water by the Waste demineralizer (Anion-bed), Waste demineralizer (Cation-bed) or the Waste demineralizer (Mixed bed),

and, and therefore, the impact, if any, on the radiation area zones depicted on the maps contained in NAPS COL FSAR Figures 12.3-1 “Radiation Zones for Normal Operation/Shutdown”.

Please describe the effect, if any, on the radiation zone maps contained in NAPS COL FSAR Figures 12.3-1R “Radiation Zones for Normal Operation/Shutdown” from any increases in dose rates due to additional waste water processing, as described in FSAR Table 12.2.73,, or describe an alternative approach that provides an acceptable method of complying with those rules or regulations of the Commission, or portions thereof, that underlie the corresponding SRP acceptance criteria.

12.03-12.04-***

10 CFR 20.1406 requires applicants to describe design features provided for minimizing contamination of the facility and the environment. The following design objectives summarize the guidance contained in RG 4.21, 'Minimization of Contamination and Radioactive Waste Generation: Life Cycle Planning,' (June 2008) related to the prevention and early detection of leakage, and which recommends barriers to leakage, and maintenance and monitoring of components important to the prevention of leakage.

The COL Applicant is responsible for identifying the design features provided to prevent environmental contamination, for Systems, Structures and Components provided for handling, containing or storing radioactive material that are not described in the DCD, such as:

- Radioactive Waste processing equipment provided by the applicant,
- Steam and Condensate system storage and transfer systems,
- Overflow lines from secondary coolant tanks located outside of buildings,

- Startup Steam Generator Blowdown System components located outside of buildings,
- Water supplies to, steam from, and blowdown from Auxiliary Boiler steam supply systems that share makeup water sources with the plant feedwater and condensate systems,
- Equipment, floor and other drain systems that are in direct contact with the environment,
- Building heating, ventilating and air conditioning systems condensate drains,
- Below grade piping, penetration sleeves, and trenches that are in direct contact with the environment,
- Provisions for leakage testing of those portions of below grade piping that are in direct contact with the environment

The examples provided are illustrative in nature, and do not portray an exhaustive review of the systems, structures, and components that should be considered to demonstrate compliance with 10 CFR 20.1406. Appendix A "Examples of Measures to Control Contamination" of RG 4.21 contains examples of measures that might be taken to address the requirements of 10 CFR 20.1406.

Please revise and update the NAPS COL FSAR to include information, in the appropriate section of the NAPS COL FSAR where the system is described, that identifies the site specific design features not otherwise described in the DCD, or program elements supplementing the site specific facility design, not otherwise described in the DCD, that are directed towards minimizing facility and site

contamination, (A list would be acceptable.) Include a reference to these sections in Chapter 12.3 of the NAPS COL FSAR.

12.03-12.04-***

10 CFR 20.1101(b) requires licensees to control external occupational exposure, and to ensure that engineering controls are used to keep occupational doses as low as is reasonably achivable (ALARA). 10 CFR Part 50 General Design Criterion (GDC) 61 requires licensees to ensure that there is adequate shielding for routine activities in the area of equipment that may contain radioactivity. The guidance contained in Regulatory Guide 1.206 “Combined License Applications for Nuclear Power Plants (LWR Edition)” section C.I.12.3.1 and NUREG 0800 Standard Review Plan (SRP) Section 12.3-12.4 “Radiation Protection Design Features” state that areas inside the plant structures should be subdivided into radiation zones, with maximum design dose rate zones and the criteria used in selecting maximum dose rates identified.

The NAPS COL FSAR does not fully describe the shielding and radiation zones associated with the route of the new line added between the CVCS Hold Up Tanks and the Charging pump suctions pipes, as described in the guidance provided in RG 1.206 Section C.I.12.3.1 and SRP Section 12.3-12.4.

NAPS COL FSAR Figures 9.3.4-1R “Chemical and Volume Control System Flow Diagram,” Sheets 4 and 6 of 7, show a new connection via valves VLV-351-N and Locked Closed VLV-352-N to CHARGING PUMP 4637 N0-EE10024. NAPS COL FSAR Section 9.3.4, NAPS DEP 9.2(1) and NAPS COL FSAR Chapter 12 do not discuss this connection to the Charging Pumps. US-APWR DCD Tier 2, Revision 2, Figures 12.3-1 “Radiation Zones for Normal Operation/Shutdown (Sheet 15 of 34) Auxiliary Building at Elevation -26’-4” “[the location of the CVCS HUTs in the Auxiliary Building] and Figure 12.3-1 “Radiation Zones for Normal Operation/Shutdown (Sheet 4 of 34) Reactor

Building at Elevation -26'-4"""" [the location of the Charging pumps in the Reactor Building], do not show a pipe chase at Elevation -26'-4" between the Charging Pumps and the Chemical and Volume Control System (CVCS) Hold Up Tanks.

Please update and revise the NAPS COL FSAR to include a description of the design features (e.g. shielding, fission/activation product removal) provided to maintain the radiation zones depicted in USAPWR DCD Tier 2 Figures 12.3-1 along the path of the CVCS line between the CVCS Hold Up Tanks and the Charging Pumps and the changes to Figures 12.3 that depict the updated radiation zones along the route of this line.

Request for Additional Information No. 5786 (Draft)

North Anna, Unit 3
Dominion
Docket No. 52-017
SRP Section: 12.03-12.04 - Radiation Protection Design Features
Application Section: 12.4

QUESTIONS for Health Physics Branch (CHPB)

12.03-12.04-***

10 CFR 20.1001(b) states in part: (b) It is the purpose of the regulations in this part to control the receipt, possession, use, transfer, and disposal of licensed material by any licensee in such a manner that the total dose to an individual (including doses resulting from licensed and unlicensed radioactive material and from radiation sources other than background radiation) does not exceed the standards for protection against radiation prescribed in the regulations in this part. . . ." Public dose is as defined in 10 CFR 20.1003, which states that it includes the dose received by a member of the public from exposure to ". . . any other source of radiation under the control of a licensee, . . ." exclusive of occupational, background, or medical administrations.
The requirement of 10 CFR 20.1301(a)(1) is “The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 mSv) in a year" while 20.1101(b) requires exposure to members of the public be as low as reasonably achievable. Regulatory Guide 1.206 “Combined License Applications for Nuclear Power Plants (LWR Edition)” Part III “Applications Referencing Certified Designs and/or Early Site Permits” Section C.I.12 “Radiation Protection” states that COL applicants referencing a certified design and an ESP should refer to Chapter 12 of Section C.III.1 for the information needed to prepare their COL applications, which states that multiunit plants provide estimated annual doses to construction workers in a new unit construction area, as a result of radiation from onsite radiation sources from the existing operating plant(s). North Anna Power Station Unit 3 (NAPS) COL FSAR Revision 3, Section 12.4.1.9 “Dose to Construction Workers” states that doses to construction workers were addressed in the Final Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna Site (FEIS), and that the 120 person-rem calculated in the North Anna Early Site Permit Application, Part 3, Environmental Report (ESP-ER) remains a conservative estimate. However, this information is not included in the NAPS COL FSAR.

Consistent with the guidance provided in RG 1.206 Section C.I.12, please update and revise the NAPS COL FSAR to include the estimated exposure to construction workers along with the associated methods, models and assumptions, or describe an alternative approach that provides an acceptable method for complying the Commission’s regulations in Part 20.

12.03-12.04-***

The requirement of 10 CFR 20.1301(a)(1) is “The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 mSv) in a year" while 20.1101(b) requires exposure to members of the public be as low

as reasonably achievable. Regulatory Guide 1.206 “Combined License Applications for Nuclear Power Plants (LWR Edition)” Part III “Applications Referencing Certified Designs and/or Early Site Permits” Section C.I.12 “Radiation Protection” states that COL applicants referencing a certified design and an ESP should refer to Chapter 12 of Section C.III.1 for the information needed to prepare their COL applications, which states that multiunit plants provide estimated annual doses to construction workers in a new unit construction area, as a result of radiation from onsite radiation sources from the existing operating plant(s). North Anna Power Station Unit 3 (NAPS) COL FSAR Revision 3, Section 12.4.1.9 “Dose to Construction Workers” states that doses to construction workers were addressed in the Final Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna Site (FEIS).

Neither the North Anna Early Site Permit Application, Environmental Report (ESP-ER) nor the NAPS COL FSAR described the impact of the following potential sources of direct radiation exposure to the construction worker exposure estimate:

- The Steam Generator Storage Building shown on ESP-ER Figure 1.1-2 “Site Plan With Building Legend” which is located between the Independent Spent Fuel Storage Installation (ISFSI) and the primary construction.
- Memorandum “North Anna, Unit 2, Reactor Pressure Vessel Head Replacement Reconciliation Inspection” - dated March 17, 2003 (ADAMS Accession No. ML030760715) stated that the North Anna, Unit 2, Reactor Pressure Vessel Head (RPVH) was replaced in January 2003, and could be a source of direct radiation exposure to construction workers.
- NAPS COL FSAR Appendix 11AA “Interim Radwaste Storage Facility” describes an interim radioactive waste storage building capable of storing 150 Curies of radioactive material from NAPS Unit 3; any similar interim radioactive waste storage location for NAPS Units 1 & 2 could be a source of direct radiation exposure to construction workers.

Please revise and update the NAPS COL FSAR to include a description of all of the sources of direct radiation exposure to construction workers, and the methods of monitoring and controlling this exposure, or describe an alternative approach that provides an acceptable method for complying with the Commission’s regulations in Part 20.

Request for Additional Information No. 5972 (Draft)

North Anna, Unit 3
Dominion
Docket No. 52-017
SRP Section: 12.03-12.04 - Radiation Protection Design Features
Application Section: Appendix 11AA

QUESTIONS for Health Physics Branch (CHPB)

12.03-12.04-***

Title 10 of the Code of Federal Regulations (10 CFR), Part 20, “Standards for Protection Against Radiation,” Subpart G “Control of Exposure From External Sources in Restricted Areas” requires licensees to control access to areas where personnel could be exposed to high dose rates. The guidance contained in Regulatory Guide (RG)1.206 ”Combined License Applications for Nuclear Power Plants” Section C.I.12.3.1 “Facility Design Features” states that applicants are to describe access control design features. The guidance contained in Regulatory Guide 8.38, “Control of Access to High and Very High Radiation Areas in Nuclear Power Plants” states that to the extent practicable, physical barriers should completely enclose very high radiation areas in a manner that is sufficient to thwart undetected circumvention of the barrier. The expectation provided within the guidance of RG-8.38, is that barriers for very high radiation areas should extend to the overhead and preclude anyone from climbing over the top of the barrier and that when an inaccessible very high radiation area is made accessible (e.g. removing a shield plug), the applicable controls for a very high radiation area are provided.

North Anna Power Station Unit 3 (NAPS) Combined License (COL) Figure 11AA-202 “Radiation Zones for IRSF (Sheet 1 of 3)” indicates that portions of the vault area may become a Very High Radiation Area (VHRA). NAPS COL FSAR Appendix 11AA “Interim Radwaste Storage Facility” Subsection 11AA.2 “Facility Description” states that a crane maintenance platform is provided to service and maintain the crane. Figure 11AA-203 “Fire Zones and Fire Areas Zones for IRSF” identifies a ladder to the crane platform. However, NAPS COL FSAR Appendix 11AA “Interim Radwaste Storage Facility” does not describe the physical barriers provided to prevent access to a VHRA via the crane access. Also, Subsection 11AA.2 states that the truck bay is partitioned from the storage vault area by a wall that serves to provide shielding and fall protection when vault access is deemed necessary, and Figure 11AA-201 “IRSF Layout Plan (Sheet 3 of 4)” depicts a notch in the shield wall between the truck bay and the vault area. However, NAPS COL FSAR Appendix 11AA “Interim Radwaste Storage Facility” does not describe the physical barriers provided to prevent access from the truck bay to the potential VHRAs located in the vault area.

Please revise and update the NAPS COL FSAR Appendix 11AA “Interim Radwaste Storage Facility” to describe the physical barriers provided to thwart inadvertent access to potential VHRAs within the Interim Radwaste Storage Facility, or provide the specific alternative approaches used and the associated justification.

12.03-12.04-***

Title 10 of the Code of Federal Regulations (10 CFR), Part 20, “Standards for Protection Against Radiation,” Subpart G “Control of Exposure From External Sources in Restricted Areas,” requires licensees to control access to areas where personnel could be exposed to high dose rates. Regulatory Guide (RG) 8.8 “Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As is Reasonably Achievable” Position C2.b(4) “Radiation Shields and Geometry,” provides guidance to regarding design features to reduce streaming from high dose rate areas. The Standard Review Plan (SRP) section 12.3-12.4 “Radiation Protection Design Features” states that labyrinth shielded penetrations should be used to minimize radiation steaming and scatter around shields.

North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Appendix 11AA “Interim Radwaste Storage Facility” subsection 11AA.4.2 “IRSF Drainage System” states that the floor of each vault is slightly sloped to a drain hub that connects to an embedded sloped pipe that extends into the truck bay. However, neither Figure 11AA-201 “IRSF Layout Plan,” nor Table 11AA-204 “Thicknesses of Concrete Walls that Enclose the Major Components,” describe the location of the pipes that extend into the truck bay nor the design features provided to prevent radiation streaming from the storage vaults into the truck bay.

Please revise and update the NAPS COL FSAR Appendix 11AA “Interim Radwaste Storage Facility” to describe the design features provided to prevent radiation streaming from radiation sources located within the storage vaults, or provide the specific alternative approaches used and the associated justification.

12.03-12.04-***

The guidance contained in Regulatory Guide 1.206 ”Combined License Applications for Nuclear Power Plants” C.I.12.3.1 “Facility Design Features,” notes that the applicant is to describe the design features provided to maintain occupational radiation exposure (ORE) as low as is reasonably achievable (ALARA). The guidance contained in Standard Review Plan (SRP) Appendix 11.4-A “Design Guidance for Temporary Storage of Low-Level Radioactive Waste” states that storage plans should address container protection and that good engineering judgment should be used to ensure that radioactive materials are contained safely. The guidance of SRP Appendix 11.4-A also states that when significant handling and personnel exposure can be anticipated, licensees should incorporate ALARA methodology in accordance with Regulatory Guide 8.8 “Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as is Reasonably Achievable”.

North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Appendix 11AA “Interim Radwaste Storage Facility” subsection 11AA.3.2 “Source Term and Shielding” states that the design basis source term for shielding is based on a full storage area with 48 containers. NAPS COL FSAR Appendix 11AA Figures 11AA-201 IRSF “Layout Plan” Sheet 1 through 4 indicate that the storage configuration consist of 24 double stacked CNS-8-120B containers. CNS-8-120B is the designation for a shielded transportation cask that is not design to be stacked. High Integrity Containers (HIC) such as the model PL8-120 High Density Polyethylene (HDPE) or L8-120 carbon steel containers are also not designed to be directly stacked. However, NAPS COL

FSAR Appendix 11AA “Interim Radwaste Storage Facility” does not describe the design features that will allow double stacking these waste containers.

Please revise and update the NAPS COL FSAR Appendix 11AA “Interim Radwaste Storage Facility” to appropriately describe the waste storage container (i.e. container type and volume), the design features provided to protect the structural integrity of stored waste and the design provisions for maintaining ORE ALARA while stacking waste containers, or provide the specific alternative approaches used and the associated justification.

12.03-12.04-***

Title 10 of the Code of Federal Regulations (10 CFR), Part 20, “Standards for Protection Against Radiation,” Subpart K “Waste Disposal,” paragraph 2007 “Compliance with environmental and health protection regulations,” states that licensees are required to comply with other state and local regulations governing toxic or hazardous properties of materials. Consistent with this requirement, the acceptance criteria contained in Standard Review Plan (SRP) Appendix 11.4-A “Design Guidance for Temporary Storage of Low-Level Radioactive Waste” states that the acceptance criteria and performance objectives of any proposed storage facility or area will need to meet minimal requirements in design, operations, safety considerations, policy considerations, and compliance with other applicable Federal, State, and local regulations governing any other toxic or hazardous properties of radioactive wastes (such as mixed wastes characterized by the presence of hazardous chemicals and radioactive materials).

North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Appendix 11AA “Interim Radwaste Storage Facility” states that the Interim Radwaste Storage Facility (IRSF) is designed to safely handle, store, monitor, and control Class B and C stabilized waste generated as a result of normal operation. However, NAPS COL FSAR Appendix 11AA does not fully describe how the design of the IRSF is consistent with the guidance contained in SRP Appendix 11.4-A provided to demonstrate compliance with the provisions of 10 CFR 20.2007.

As appropriate, please revise and update NAPS COL FSAR Appendix 11AA “Interim Radwaste Storage Facility” to describe how the NAPS COL FSAR Appendix 11AA complies with the requirements of 10 CFR 20.2007, or provide the specific alternative approaches used and the associated justification.
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12.03-12.04-***

The guidance contained in Standard Review Plan (SRP) Appendix 11.4-A “Design Guidance for Temporary Storage of Low-Level Radioactive Waste” states that the quantity of radioactive material allowed is limited in part by the dose rate criteria of Title 40 “Protection of Environment” Code of Federal Regulations (CFR) Part 190 “Environmental Radiation Protection Standards For Nuclear Power Operations” which restricts the annual dose radiation from all sources of uranium fuel cycle.

North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Appendix 11AA "Interim Radwaste Storage Facility" section 11AA.1.2 "Design Criteria" states that the Interim Radwaste Storage Facility (IRSF The IRSF has sufficient shielding to maintain the direct radiation from the on-site storage to site boundary sufficiently low as not to exceed Title 10 of the Code of Federal Regulations (10 CFR), Part 20, "Standards for Protection Against Radiation," Subpart D "Radiation Dose Limits for Individual Members of the Public" limits. However, NAPS COL FSAR Appendix 11AA does not describe how the facility complies with the requirements of 40 CFR 190, consistent with the guidance of SRP Appendix 11.4-A, and the direct radiation from the IRSF is not listed in NAPS COL FSAR Table 11.3-202 "Comparison of Site Doses with 40 CFR 190 Limits."

Please revise and update NAPS COL FSAR Appendix 11AA "Interim Radwaste Storage Facility" to include compliance with the requirements of 40 CFR 190 in section 11AA.1.2 "Design Criteria", and using the assumed source term and shielding parameters provided in NAPS COL FSAR Appendix 11AA "Interim Radwaste Storage Facility", describe the expected contribution of direct radiation from the storage facility to the site boundary dose, or provide the specific alternative approaches used and the associated justification.

12.03-12.04-***

The guidance contained in Standard Review Plan (SRP) Appendix 11.4-A "Design Guidance for Temporary Storage of Low-Level Radioactive Waste" directs applicants to the guidance contained in SECY-94-198 "Review of Existing Guidance Concerning the Extended Storage of Low-Level Radioactive Waste." SECY-94-198 states that the facility design should describe how the adverse effects of extremes of temperature and humidity on waste and waste containers will be avoided.

North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Appendix 11AA "Interim Radwaste Storage Facility" (IRSF) section 11AA.4.2 "IRSF Drainage System" states that two sumps in the IRSF are provided to collect liquids. These sumps collect radioactive leakage or spillage, cleaning fluids and discharges from from containers as well any discharges from the fire protection sprinklers. Section 11AA.4.2 also states that water is provided for decontamination of both sumps when required. Section 11AA.4.7 "Instrumentation and Control" and Section 11AA.3.1 "Packaging, Storage, and Shipment Operations" state that level instruments and alarms are provided in the vault drain collection pipes to detect leakage into individual vault areas. NAPS COL FSAR Table 2.0-201 "Evaluation of Site/Design Parameters and Characteristics" indicates that the minimum dry bulb temperature is expected to be below freezing during portions of the year. Consistent with this statement, section 11AA.4.1 "IRSF Heating, Ventilation, and Air Conditioning" states that the fire water standpipe is provided with heat tracing to prevent freezing. However, section 11AA.4.1 "IRSF Heating, Ventilation, and Air Conditioning" states that no heating is provided in truck bay and the vault areas.

Please revise and update NAPS COL FSAR Appendix 11AA "Interim Radwaste Storage Facility" to describe how the design of the IRSF avoids adverse effects on waste containers, radiation monitoring equipment, leakage collection and detection equipment, and cleaning water supply systems due to extremes of temperature and humidity, or provide the specific alternative approaches used and the associated justification.

12.03-12.04-***

The guidance contained in Standard Review Plan (SRP) Appendix 11.4-A “Design Guidance for Temporary Storage of Low-Level Radioactive Waste” directs applicants to the guidance contained in SECY-94-198 “Review of Existing Guidance Concerning the Extended Storage of Low-Level Radioactive Waste”. SECY-94-198 states gas generation rates should be evaluated to ensure that the facility design precludes potentially explosive conditions.

North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Appendix 11AA “Interim Radwaste Storage Facility” (IRSF) section 11AA.3.5 “Gas Generation” states that the combustible gases, consisting of predominantly hydrogen, with a small amount of methane, are generated at a rate about 0.020 to 0.054 liters/hour per container using the resin gas generation rate G-values data as documented in WSRC-TR-97-00338, “Radiation Studies with Argentine Ion Exchange Material,” C.L. Crawford, Savannah River Site, US DOE, 6/2002. However some industry literature available to the NRC staff such as NUREG/CR-3383 BNL-NUREG-51691 “Irradiation Effects on the Storage and Disposal of Radwaste Containing Organic Ion-Exchange Media” indicates that radiolytic gas generation rates for resins typically used by industry may be greater than those assumed by the applicant. In addition, DOE maintains Radcalc, an American Society of Mechanical Engineers (ASME) Quality Assurance Requirements for Nuclear Facility Applications (NQA) 1 validated safety system software classified as Safety Level B originally based on GEND-041, "A Calculational Technique to Predict Combustible Gas Generation in Sealed Radioactive Waste Containers", a methodology the NRC accepted for use in ensuring compliance with NRC initiating event (IE) Information Notice No. 84-72 “Clarification of Conditions For Waste Shipments Subject To Hydrogen Gas Generation”.

Please revise and update NAPS COL FSAR Appendix 11AA “Interim Radwaste Storage Facility” to describe the basis for the assumed gas generation rates, or provide the specific alternative approaches used and the associated justification.

12.03-12.04-***

Regulatory Guide 1.206 ”Combined License Applications for Nuclear Power Plants” section C.I.12.3.4 “Area Radiation and Airborne Radioactivity Monitoring Instrumentation” states that the applicant should provided information regarding the range, sensitivity, accuracy, precision, calibration methods and frequency; alarm setpoints; recording devices; locations of detectors, readouts, and alarms as well as the criteria for selection, for area radiation monitoring (ARM) instrumentation. Standard Review Plan (SRP) section 12.3-12.4 “Radiation Protection Design Features” states that if removable shielding is used for sources having radiation levels greater than 1 Gy per hour (100 rads per hour), local audible and visible alarming radiation monitors must be installed to alert personnel if temporary shielding is removed; each ARM should have a local audible alarm; and that American National Standards Institute (ANSI)/ American Nuclear Society (ANS)-6.8.1-1981, “Location and Design Criteria for Area Radiation Monitoring Systems for Light Water Nuclear Reactors,” should be used to establish the ranges and locations of area radiation monitors. ANSI/ANS-HPSSC-6.8.1-1981 section 4.3 “Monitoring Range”, describes the required range for radiation monitors based on the

expected normal and maximum dose rates. ANSI/ANS-HPSSC-6.8.1-1981 Section 4.2 “Detector Locations” states that preference should be given to locating detectors in areas that are expected to be occupied and that can experience significant transient dose rates, and that the detectors should be located in areas that prevent inadvertent shielding by structural materials.

North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Appendix 11AA “Interim Radwaste Storage Facility” (IRSF) does not describe the consistency of the area radiation monitoring instrument design with the guidance provided in ANSI/ANS-HPSSC-6.8.1-1981. While US-APWR Design Control Document (DCD) Tier 2 Table 12.3-4 “Area Radiation Monitors” (ARM) describes the type and nominal range each area radiation monitor detector that is part of the certified design, neither the NAPS COL FSAR for section 12.3 “Radiation Protection Design Features” nor NAPS COL FSAR Appendix 11AA “Interim Radwaste Storage Facility” include similar information for the NAPS Unit 3 site specific IRSF Area Radiation Monitor (RME-RE-120). Also, while US-APWR DCD Tier 2 Figure 12.3-1 “Radiation Zones for Normal Operation/Shutdown” depicts the location of the certified design plant area radiation monitors, neither the NAPS COL FSAR for section 12.3 “Radiation Protection Design Features” nor NAPS COL FSAR Figure 11AA-201 “IRSF Layout Plan” depict the location of the NAPS Unit 2 site specific RME-RE-120 radiation monitor. Since only one ARM is installed in the IRSF the staff is unable to determine if the shield walls preclude detection of high radiation levels in the vault area that could result from the removal of a shield plug to a very high radiation area containing waste containers. While NAPS COL FSAR Appendix 11AA states that RME-RE-120 alarms in the crane operating room and the Main Control Room (MCR), it does not indicate if a local alarm or indication is provided at the ARM in the truck bay.

Please revise and update NAPS COL FSAR Appendix 11AA and NAPS COL FSAR Section 12.3 to describe the features and the associated basis of the IRSF area radiation monitoring system design that assure consistency with the guidance of SRP Section 12.3-12.4 and RG 1.206 Subsection C.I.12.3, or provide the specific alternative approaches used and the associated justification.

12.03-12.04-***

Regulatory Guide (RG) 1.206,”Combined License Applications for Nuclear Power Plants” Section C.I.11.5 “Process and Effluent Radiological Monitoring and Sampling Systems” and
Standard Review Plan (SRP) section 11.5 “Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems,” state that Regulatory Guide 1.21, “Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants”, American National Standards Institute (ANSI) N42.18-2004, “Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents,” and ANSI/ Health Physics Society (HPS) N13.1-1999, “Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities,” provide guidance on the selection and design requirements of continuous radiation monitoring equipment for sampling airborne radioactive materials in nuclear facilities. This guidance ensures compliance with the requirements of Title 10 of the Code of Federal Regulations (10 CFR), Part 20, “Standards for Protection Against

Radiation," Appendix B "Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage".

North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Subsection 12.3.4 "Area Radiation and Airborne Radioactivity Monitoring Instrumentation" states that the description, discussion, and locations of the area and airborne radiation monitors are provided in NAPS COL FSAR Appendix 11AA "Interim Radwaste Storage Facility". However, NAPS COL FSAR Appendix 11AA "Interim Radwaste Storage Facility" (IRSF) does not describe the consistency of the design of the airborne radiation monitoring instrument with the guidance provided in RG 1.21, RG 1.206, ANSI/HPS-N13.1-1999 or ANSI N42.18-2004 to describe the type and nominal range of particulate monitors, the features provided to ensure representative sampling of the effluent stream and the failure position of isolation dampers. While US-APWR Design Control Document (DCD) Tier 2 Table 11.5-1 "Process Gas and Particulate Monitors" describes some of these features for radiation monitors provide as part of the certified design, neither NAPS COL FSAR Section 11.5 "Process Effluent Radiation Monitoring and Sampling System" nor NAPS COL FSAR Appendix 11AA "Interim Radwaste Storage Facility" include the range, sensitivity, check source or calibration isotope information for the NAPS site specific IRSF Exhaust Fan Airborne Radiation Monitor (RME-RE-121). Also, the applicant has not described the NAPS site specific design features provided to ensure representative sampling of the IRSF ventilation system exhaust by the radiation monitor.

Please revise and update NAPS COL FSAR Appendix 11AA and NAPS COL FSAR Section 11.5 to describe the features and the associated basis of the IRSF airborne activity radiation monitoring system design that assure consistency with the guidance of SRP Section 11.5 and Regulatory Guide 1.206,"Combined License Applications for Nuclear Power Plants" Section C.I.11.5, or provide the specific alternative approaches used and the associated justification.

12.03-12.04-***

Regulatory Guide 1.206 "Combined License Applications for Nuclear Power Plants" Section C.I.12.3.5 "Dose Assessment" states that the applicant should provide dose estimates associated with radioactive waste handling and special maintenance that are based on typical activities, number of personnel, occupancy times and average dose rates.

US-APWR Design Control Document (DCD) Tier 2 Table 12.4-4 "Occupational Dose Estimates During Waste Processing" does not include dose estimates for the North Anna Power Station Unit 3 (NAPS) site specific activities associated with moving waste to the Interim Radwaste Storage Facility (IRSF), periodic inspections of the material stored in the IRSF, retrieval and processing (e.g. additional dewatering or repackaging) for shipping of waste that has been stored in the IRSF for an extended period.

Please revise and update North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Section 12.4.1 "Occupational Radiation Exposure" and Table 12.4-4 "Occupational Dose Estimates During Waste Processing" to describe and tabulate the

occupational dose estimate associated with the use of the site specific IRSF or provide the specific alternative approaches used and the associated justification.

12.03-12.04-***

North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Subsection 1.2.1.7.2.9 “Interim Radwaste Storage Facility The Interim Radwaste Storage Facility (IRSF)” states that the IRSF is designed to safely handle, store, monitor, and control Class B and C stabilized waste generated as a result of normal operation, including anticipated operational occurrences (AOO) based on the provisions of NRC Standard Review Plan (SRP) 0800, Section 11.4, “Solid Waste Management System,” Appendix 11.4-A, “Design Guidance for Temporary Storage of Low-Level Radioactive Waste,” and the guidance of NRC Generic Letter (GL) 81-38, “Storage of Low Level Radioactive Wastes at Power Reactor Sites,” and NRC Commission Paper SECY 94-98. However, the correct SECY paper reference should be SECY 94-0198 “Review of Existing Guidance Concerning the Extended Storage of Low-Level Radioactive Waste” (ML0716404620).

Please revise and update NAPS COL FSAR Subsection 1.2.1.7.2.9 to list the correct document, or provide the specific alternative approaches used and the associated justification.

Request for Additional Information No. 5976 (Draft)

North Anna, Unit 3
Dominion
Docket No. 52-017
SRP Section: 12.03-12.04 - Radiation Protection Design Features
Application Section: 12.2, 12.3

QUESTIONS for Health Physics Branch (CHPB)

12.03-12.04-***

The guidance contained in Regulatory Guide (RG) 8.8 “Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as is Reasonably Achievable” states that the applicant should estimate the quantity and isotopic composition of the radioactive material to be contained, deposited, or accumulated in station equipment. The guidance contained in Regulatory Guide (RG)1.206 ”Combined License Applications for Nuclear Power Plants” Section C.1.12.2.1 “Contained Sources,“ and Standard Review Plan (SRP) 12.2 “Radiation Sources” state that the applicant is to provide the models, parameters and bases used to calculate source magnitudes, including isotopic composition for all values.
North Anna Power Station Unit 3 (NAPS) combined license (COL) FSAR Figure 12.3-1R “Radiation Zones for Normal Operation/Shutdown: Site (Sheet 1 of 34)” and NAPS COL FSAR Figure 1.2-1R “Site Plan (Sheet 1 of 2),” Legend item 37 identifies the cooling tower blowdown sump as a separate site specific structure, not described in the US-APWR Design Control Document (DCD), that is located on the NAPS Unit 3 site. NAPS COL FSAR Section 11.2 “Liquid Waste Management System” Subsection 11.2.2 “System Description” states that the treated liquid effluents released from NAPS Unit 3 are piped directly into the cooling tower blowdown sump. In addition, US-APWR DCD Tier 2, Table 11.1-9 “Realistic Source Terms”, which is based on a total primary to secondary leakage rate of 75 lbm/day (about 6% of the Technical Specifications limit for leakage from 1 steam generator), states that the activity of the Steam Generator (SG) blowdown may exceed 3 E-6 µCi/g, excluding activity from iodine isotopes and noble gases. A portion of this activity is removed from the SG blowdown fluid and concentrated in the resins contained within the SG blowdown demineralizers. NAPS COL FSAR Figure 10.4.8-2R “Steam Generator Blowdown System Flow Diagram” shows that the Steam Generator Blowdown Demineralizers backwash lines, which do not have a radiation monitor, can be directed to either the cooling tower blowdown sump. NRC staff experience with operating plants indicates that fluid used to back wash demineralizers during the transfer of spent resin to waste may contain resin fines and a portion of the radioactive material deposited in the demineralizer resin.
NAPS COL FSAR Section 12.2 “Radiation Sources” does not identify the blowdown sump as a component containing radioactive material and does not describe the methods models and assumptions used to ascertain the quantity of radioactive material in this component.

Please revise and update NAPS COL FSAR Section 12.2 “Radiation Sources” to describe the source term content of this structure, including sources of radioactive material, the methods, models and assumptions used as the basis for that determination, or provide the specific alternative approaches used and the associated justification.

12.03-12.04-***

Title 10 of the Code of Federal Regulations (10 CFR), Part 20, “Standards for Protection Against Radiation,” 10 CFR 20.1406(b) “Minimization of contamination” requires licensees to describe design features provided to reduce contamination of the facility, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste. Guidance related to the prevention and early detection of leakage, which includes barriers to leakage, and maintenance and monitoring of components important to the prevention of leakage is provided in RG 4.21, 'Minimization of Contamination and Radioactive Waste Generation: Life Cycle Planning,' (June 2008) and in Regulatory Guide (RG) 1.206 ”Combined License Applications for Nuclear Power Plants,” Section C.I.12.5.3.4 “Contamination Control”.

North Anna Power Station Unit 3 (NAPS) combined license (COL) FSAR Figure 12.3-1R “Radiation Zones for Normal Operation/Shutdown: Site (Sheet 1 of 34)” and NAPS COL FSAR Figure 1.2-1R “Site Plan (Sheet 1 of 2),” Legend item 37 identify the cooling tower blowdown sump as a separate site specific structure, not described in the US-APWR Design Control Document (DCD), that is located on the NAPS Unit 3 site. NAPS COL FSAR Section 11.2 “Liquid Waste Management System” Subsection 11.2.2 “System Description” states that the treated liquid effluents released from NAPS Unit 3 are piped directly into the cooling tower blowdown sump. In addition, NAPS COL FSAR Figure 10.4.8-2R “Steam Generator Blowdown System Flow Diagram” shows that the Steam Generator Blowdown Demineralizers backwash lines can be directed to the Blowdown Sump. NRC staff experience with operating plants indicates that fluid used to back wash demineralizers during the resin transfer operations may contain resin fines and a portion of the radioactive material deposited in the demineralizer resin.

However, neither the NAPS COL FSAR Subsection 10.4.8 “Steam Generator Blowdown System,“ nor Subsection 12.3 “Radiation Protection Design Features” describe the design features to reduce contamination of the facility, facilitate eventual decommissioning, and minimize, to the extent practicable and the generation of radioactive waste from this NAPS site specific structure that is not described in the US-APWR DCD.

Please revise and update NAPS COL FSAR Section 12.3 to describe the design features provided to minimize contamination of the facility and the environment, consistent with the guidance contained in RG 4.21 and the requirements of 10 CFR 20.1406, from the site specific portions of the cooling tower blowdown system, or provide the specific alternative approaches used and the associated justification.

12.03-12.04-***

The acceptance criteria of Standard Review Plan (SRP) Section 12.3-12.4 “Radiation Protection Design Features” are based in part on meeting 10 CFR 20.1101(b) “Radiation protection programs” and the definition of as low as is reasonably achievable (ALARA) in 10 CFR 20.1003, “Definitions”, that is, making every reasonable effort to maintain exposure as low as possible. The guidance contained in Regulatory Guide 8.8 “Information Relevant for Ensuring that Occupational Radiation Exposures at Nuclear Power Stations is Reasonably Achievable,” and Regulatory Guide (RG)1.206 ”Combined

License Applications for Nuclear Power Plants" Section C.I.12.3.1 "Facility Design Features" describe action to be taken during facility design, engineering, construction and operation, to maintain ORE ALARA and to describe the facility.

North Anna Power Station Unit 3 (NAPS) combined license (COL) FSAR Figure 12.3-1R "Radiation Zones for Normal Operation/Shutdown: Site (Sheet 1 of 34)" and NAPS COL FSAR Figure 1.2-1R "Site Plan (Sheet 1 of 2)," Legend item 37 identify the cooling tower blowdown sump as a separate site specific structure, not described in the US-APWR Design Control Document (DCD), that is located on the NAPS Unit 3 site. NAPS COL FSAR Section 11.2 "Liquid Waste Management System" Subsection 11.2.2 "System Description" states that the treated liquid effluents released from NAPS Unit 3 are piped directly into the cooling tower blowdown sump. In addition, NAPS COL FSAR Figure 10.4.8-2R "Steam Generator Blowdown System Flow Diagram" shows that the Steam Generator Blowdown Demineralizers backwash lines can be directed to the Blowdown Sump. NRC staff experience with operating plants indicates that fluid used to back wash demineralizers during the resin transfer operations may contain resin fines and a portion of the radioactive material deposited in the demineralizer resin.

NAPS COL FSAR Figure 12.3-1R "Radiation Zones for Normal Operation/Shutdown: Site (Sheet 1 of 34)" shows the location of the cooling tower blowdown sump, however, it does not provide radiation zone information for this structure.

Please revise and update NAPS COL FSAR Figures 12.3-1R to provide radiation zone information consistent with the guidance contain in the Standard Review Plan section 12, or describe the specific alternate approaches and the associated justification.

12.03-12.04-***

The acceptance criteria of Standard Review Plan (SRP) Section 12.3-12.4 "Radiation Protection Design Features" are based in part on meeting 10 CFR 20.1101(b) "Radiation protection programs" and the definition of as low as is reasonably achievable (ALARA) in 10 CFR 20.1003, "Definitions", that is, making every reasonable effort to maintain exposure as low as possible. The guidance contained in Regulatory Guide 8.8 "Information Relevant for Ensuring that Occupational Radiation Exposures at Nuclear Power Stations is Reasonably Achievable," and Regulatory Guide (RG)1.206 "Combined License Applications for Nuclear Power Plants" Section C.I.12.3.1 "Facility Design Features" describe action to be taken during facility design, engineering, construction and operation, to maintain ORE ALARA and to describe the facility.

North Anna Power Station Unit 3 (NAPS) combined license (COL) FSAR Figure 12.3-1R "Radiation Zones for Normal Operation/Shutdown: Site (Sheet 1 of 34)" and NAPS COL FSAR Figure 1.2-1R "Site Plan (Sheet 1 of 2)," Legend item 37 identify the cooling tower blowdown sump as a separate site specific structure, not described in the US-APWR Design Control Document (DCD), that is located on the NAPS Unit 3 site. NAPS COL FSAR Section 11.2 "Liquid Waste Management System" Subsection 11.2.2 "System Description" states that the treated liquid effluents released from NAPS Unit 3 are piped directly into the cooling tower blowdown sump. In addition, NAPS COL FSAR Figure 10.4.8-2R "Steam Generator Blowdown System Flow Diagram" shows that the Steam Generator Blowdown Demineralizers backwash lines can be directed to the Blowdown Sump. NRC staff experience with operating plants indicates that fluid used to back wash

demineralizers during the resin transfer operations may contain resin fines and a portion of the radioactive material deposited in the demineralizer resin. NAPS COL FSAR Table 1.8-1R “Significant Site-Specific Interfaces with the Standard US-APWR Design” states that Treated liquid effluent is discharged to the cooling tower blowdown sump and subsequently drained to the Waste Heat Treatment Facility (WHTF); sludge is transferred to a truck for off-site disposal.

NAPS COL FSAR Section 12.3 “Radiation Protection Design Features,“ does not describe the site specific cooling tower blowdown sump or the design features provided to minimize Occupational Radiation Exposure to station personnel due to exposure radioactive material contained in the due to the operation, cleaning or maintenance of the blowdown sump.

Please revise and update NAPS COL FSAR Section 12.3 to describe the design features provided to minimize ORE from the cooling tower blowdown sump, or describe the specific alternate approaches and the associated justification.

12.03-12.04-***

Title 10 of the Code of Federal Regulations (10 CFR), Part 20, “Standards for Protection Against Radiation,” 10 CFR 20.1406(b) “Minimization of contamination” requires licensees to describe design feature to reduce contamination of the facility, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste. Guidance related to the prevention and early detection of leakage, which includes barriers to leakage, and maintenance and monitoring of components important to the prevention of leakage is provided in RG 4.21, 'Minimization of Contamination and Radioactive Waste Generation: Life Cycle Planning,' (June 2008) and in Regulatory Guide (RG) 1.206 ”Combined License Applications for Nuclear Power Plants,” Section C.I.12.5.3.4 “Contamination Control”. 10 CFR 20 Subpart F “Surveys and Monitoring” requires licensees to perform those surveys necessary to evaluate concentrations and quantities of radioactive material.
North Anna Power Station Unit 3 (NAPS) combined license (COL) FSAR Figure 12.3-1R “Radiation Zones for Normal Operation/Shutdown: Site (Sheet 1 of 34)” and NAPS COL FSAR Figure 1.2-1R “Site Plan (Sheet 1 of 2),” Legend item 37 identify the cooling tower blowdown sump as a separate site specific structure, not described in the US-APWR Design Control Document (DCD), that is located on the NAPS Unit 3 site. NAPS COL FSAR Section 11.2 “Liquid Waste Management System” Subsection 11.2.2 “System Description” states that the treated liquid effluents released from NAPS Unit 3 are piped directly into the cooling tower blowdown sump.
The pipes leading to and from the cooling tower blowdown sump are site specific components, not described in the US-APWR Design Control Document (DCD), that are located on the NAPS Unit 3 site. However, the NAPS COL FSAR does not describe the site specific design features provided to minimize contamination of the facility or the environment from piping leading to and from this sump.

Please revise and update NAPS COL FSAR Section 12.3 “Radiation Protection Design Features” to describe the design features of the pipes containing radioactive fluids leading to and from the Blowdown Sump that are provided to minimize contamination of the facility and the environment, consistent with the guidance contained in RG 4.21 and

the requirements of 10 CFR 20.1406, or describe the specific alternate approaches and the associated justification.

Request for Additional Information No. 5977 (Draft)

North Anna, Unit 3
Dominion
Docket No. 52-017
SRP Section: 12.03-12.04 - Radiation Protection Design Features
Application Section: 12.2, 12.3, 9.3.4, 1.2.1.5.4.5

QUESTIONS for Health Physics Branch (CHPB)

12.03-12.04-***

The guidance contained in NUREG 0800 Standard Review Plan (SRP) Section 12.2 “Radiation Sources” and Regulatory Guide 1.206 “Combined License Applications for Nuclear Power Plants (LWR Edition),” section C.I.12.2.1 “Contained Sources,” states that the applicant is to provide the models, parameters and bases for all values used to calculate source magnitudes used as the basis for designing the radiation protection program and for shield design calculations.
North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Revision 2 Departure DEP 9.2(1) “Replacement of Boron Recycle System with a Degasifier Subsystem” eliminated the reuse of reactor coolant water from the Chemical and Volume Control System (CVCS). NAPS COL FSAR Section 1.2.1.5.4.5 “Process Auxiliary Systems” and NAPS COL FSAR Subsection 9.3.4.2.5 “Degasifier Subsystem”, state that the degasifier, a site specific component that is not described in the US-APWR Design Control Document (DCD), is installed downstream of the CVCS holdup tanks to remove dissolved gases prior to transfer to the Liquid Waste Management System. NAPS COL FSAR Figures 9.3.4-1R “Chemical and Volume Control System Flow Diagram (Sheet 6 of 7)” and 9.3.4-1R “Chemical and Volume Control System Flow Diagram (Sheet 7 of 7)” show a return line (2790) from the degasifier to the CVCS Holdup Tanks (HUT) and a return line from the degasifier feed dimeneralizer (2775) to the CVCS HUTs in addition to the line from the degasifier to the Waste Holdup Tank, without providing a description of the intended use of these lines, or the potential impact on the Degasifier, associated purification media, and area dose rates.
The NAPS COL FSAR does not fully describe the impact on the contained sources in the CVCS components, the impact on area dose rates, any additional shielding requirements or any changes to radiation zones in meeting the guidance provided in RG 1.206 and SRP Section 12.2.

Please describe the purpose of these lines, the changes to the methods, models and assumptions used to determine degasifier and purification media activity, changes to shielding and the impact on radiation zones. Please revise and update the NAPS COL FSAR Sections 1.2.1.5.4.5 “Process Auxiliary Systems”, 9.3.4 “Chemical and Volume Control System”, 12.2 “Radiation Sources” and 12.3 “Radiation Protection Design Features” to describe the features or describe specific alternate approaches and the associated justification.

12.03-12.04-***

Title 10 of the Code of Federal Regulations (10 CFR), Part 20, “Standards for Protection Against Radiation,” Section1101(b) “Radiation protection programs” requires that

Occupational Radiation Exposures (ORE) be maintained as low as is reasonably achievable (ALARA) as defined in 10 CFR 20.1003, “Definitions”, that is, making every reasonable effort to maintain exposure as low as possible. The guidance contained in Regulatory Guide (RG) 8.8 “Information Relevant for Ensuring that Occupational Radiation Exposures at Nuclear Power Stations is Reasonably Achievable,” RG 1.206 Subsection C.I.12.3 “Radiation Protection Design Features” and Standard Review Plan Section 12.3-12.4 “Radiation Protection Design Features”, call for the description of design features provided for maintaining ORE ALARA.
North Anna Power Station Unit 3 (NAPS) Combined License (COL) “Departures Report” states that NAPS DEP 9.2(1) “Replacement of Boron Recycle System with a Degasifier Subsystem,” replaces the Boron Recycle System with a site specific degasifier subsystem not described in the US-APWR Design Control Document (DCD). As a result, in NAPS COL FSAR Section 12.3 “Radiation Protection Design Features”, references to the boric acid recycle system components were deleted but were not replaced with the descriptions of the components of the degasifier systems. For example, NAPS COL FSAR Subsection 12.3.1.1.1.2 “Balance of Plant Equipment” item C “Evaporators” was deleted without replacement by the Degasifier; NAPS COL FSAR Subsection 12.3.1.1.2.E “Equipment Layout,” deleted the reference to the boric acid recycle system without adding the Degasifier subsystem and NAPS COL FSAR Subsection 12.3.2.2.5 “Auxiliary Building Shielding Design,” deleted references to the boric acid recycle system without replacement with the Degasifier.

As a result, NAPS COL FSAR Section 12.3 does not include a description of the design features of the site specific degasifier subsystem, as discussed in the guidance contained in RG 1.206 and SRP Section 12.3-12.4 provided to maintain Operational Radiation Exposure ALARA consistent with the guidance of Regulatory Guide 8.8 Regulatory Position C.2. That degasifier system is not described in the US-APWR Design Control Document (DCD) either.

Please revise and update NAPS COL FSAR Subsection 12.3 to fully describe the site specific design features of the degasifier subsystem provided to maintain ORE ALARA consistent with the guidance of RG 8.8 and the requirements of 10 CFR 20.1101(b), or describe the specific alternate approaches and the associated justification.

12.03-12.04-***

Title 10 of the Code of Federal Regulations (10 CFR), Part 20, “Standards for Protection Against Radiation,” Section1101(b) “Radiation protection programs” requires that Occupational Radiation Exposures (ORE) be maintained as low as is reasonably achievable (ALARA) as defined in 10 CFR 20.1003, “Definitions”, that is, making every reasonable effort to maintain exposure as low as possible. The guidance contained in Regulatory Guide (RG) 8.8 “Information Relevant for Ensuring that Occupational Radiation Exposures at Nuclear Power Stations is Reasonably Achievable,” RG 1.206 Subsection C.I.12.3 “Radiation Protection Design Features” and Standard Review Plan Section 12.3-12.4 “Radiation Protection Design Features”, call for the description of design features provided for maintaining ORE ALARA.
Supplemental Response to NRC Request for Additional Information (RAI) North Anna Power Station Unit 3 (NAPS) Combined License (COL) Letter 65 RAI 5548, Question 09.03.04-1 dated June 9, 2011, states that a connection between the Chemical and Volume Control System (CVCS) Holdup Tanks (HUT) and the charging pumps was

incorporated in to the plant design to allow reuse of borated water in order to reduce the operational consumption of boric acid. The RAI response further states that during refueling, the reactor coolant system (RCS) water level will be lowered by draining the RCS to one of the three available CVCS HUTs where it is stored until needed near the end of refueling operations when it can be transferred back to the RCS. This site specific intended use of the CVCS HUTs is not described in US-APWR Design Control Document (DCD) Tier 2 Revision 2 Subsection 12.2.1.1.3 “Chemical and Volume Control System” or in North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Subsection 12.2.1.1.3 “Chemical and Volume Control System,” NAPS COL FSAR Subsection 9.3.4.2.6.10 “Holdup Tanks,” or the NAPS COLA “Departures Report”. The NAPS COL FSAR Sections 12.2 and 12.3 do not fully describe the impact from the reuse of RCS fluid containing the fluid potentially containing activity concentrations specified in US-APWR DCD Tier 2 Revision 2 Subsection 12.2 “Radiation Sources” or the effect of the design change in combination with the expected shutdown related crud burst activity concentration. The ALARA requirements of 10 CFR 20.1101(b) are not addressed in COL FSAR Sections 12.2 “Radiation Sources” and 12.3 “Radiation Protection Design Features” for this design change.

Please revise and update the NAPS COL FSAR Sections 12.2 and 12.3 to describe this site specific intended use of the CVCS Holdup Tanks and Holdup Tank Pumps, the impact on the assumed source term in the CVCS Holdup Tanks and the impact of this use of the CVCS Holdup Tanks on the area dose rates from the new line, and ALARA requirements of 10 CFR 20.1101(b), or describe the specific alternate approaches and the associated justification.

12.03-12.04-***

Title 10 of the Code of Federal Regulations (10 CFR), Part 20, “Standards for Protection Against Radiation,” Section1101(b) “Radiation protection programs” requires that Occupational Radiation Exposures (ORE) be maintained as low as is reasonably achievable (ALARA) as defined in 10 CFR 20.1003, “Definitions”, that is, making every reasonable effort to maintain exposure as low as possible. The guidance contained in Regulatory Guide (RG) 8.8 “Information Relevant for Ensuring that Occupational Radiation Exposures at Nuclear Power Stations is Reasonably Achievable,” and RG 1.206 ”Combined License Applications for Nuclear Power Plants” Section C.I.12.3.1 “Facility Design Features,” state that areas inside the plant structures, should be subdivided into radiation zones, with maximum design dose rate zones and the criteria used in selecting maximum dose rates identified. 10 CFR Part 50 “Domestic Licensing of Production and Utilization Facilities” Appendix A “General Design Criteria for Nuclear Power Plants” (GDC) Criterion 61 ”Fuel storage and handling and radioactivity control,” requires licensees to ensure that there is adequate shielding for routine activities in the area of the equipment.

North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Figures 9.3.4-1R “Chemical and Volume Control System Flow Diagram” Sheets 4 and 6 of 7, shows a new connection via valves VLV-351-N and VLV-352-N between the Chemical and Volume Control System (CVCS) Holdup Tanks (HUT) and the CVCS charging pump suctions, that is site specific and not described in the US-APWR Design Control Document (DCD). USAPWR Design Control Document (DCD) Tier 2 Revision 2 Figures 12.3-1 “Radiation Zones for Normal Operation/Shutdown (Sheet 15 of 34) Auxiliary

Building at Elevation -26'-4" "[the location of the CVCS HUTs in the Auxiliary Building) and Figure 12.3-1 "Radiation Zones for Normal Operation/Shutdown (Sheet 4 of 34) Reactor Building at Elevation -26'-4"""" [the location of the Charging pumps in the Reactor Building], do not show a pipe chase at Elevation -26'-4" between the Charging Pumps and the CVCS HUTS.
The NAPS COL FSAR Section 9.3.4 "Chemical and Volume Control System," NAPS DEP 9.2(1) "Replacement of Boron Recycle System with a Degasifier Subsystem," and NAPS COL FSAR Chapter 12 "Radiation Protection," do not fully describe the design features (e.g. shielding, fission/activation product removal) provided to maintain ORE ALARA or to maintain the radiation zones along path of the NAPS site specific line between the CVCS HUTs and the CVCS charging pump suction as described in US-APWR Figure 12.3-1.

Please revise and update NAPS COL FSAR Section12.3 "Radiation Protection Design Features" to describe the site specific design features provided to maintain ORE ALARA, and revise NAPS COL FSAR Figure 12.3-1R "Radiation Zones for Normal Operation/Shutdown," to depict the updated radiation zones, or describe the specific alternate approaches and the associated justification.

12.03-12.04-***

Title 10 of the Code of Federal Regulations (10 CFR), Part 20, "Standards for Protection Against Radiation," Section1101(b) "Radiation protection programs" requires that Occupational Radiation Exposures (ORE) be maintained as low as is reasonably achievable (ALARA) as defined in 10 CFR 20.1003, "Definitions", that is, making every reasonable effort to maintain exposure as low as possible. The guidance contained in Regulatory Guide (RG) 8.8 "Information Relevant for Ensuring that Occupational Radiation Exposures at Nuclear Power Stations is Reasonably Achievable," and RG 1.206 "Combined License Applications for Nuclear Power Plants" Section C.I.12.3.1 "Facility Design Features," state that the design should minimize ORE through the use of maintenance requirements and chemistry controls.

US-APWR Design Control Document (DCD) Tier 2 Revision 2 Subsection 9.3.4.2.2.1 "Ionic Purification" states that reactor coolant filters are provided downstream of the demineralizers to collect particulates and resin fines. North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Figures 9.3.4-1R "Chemical and Volume Control System Flow Diagram" Sheets 4 and 6 of 7, shows a new connection between the Chemical and Volume Control System (CVCS) Holdup Tanks (HUT) and the CVCS charging pump suctions that apparently does not contain any filters. Since NAPS COL FSAR Figure 9.3.4-1R "Chemical and Volume Control System Flow Diagram (Sheet 6 of 7)" shows numerous unfiltered lines from demineralizer bed backwash retention elements returning to the CVCS HUTs, it is possible to inject resin fines contained in the CVCS HUTs directly into the Reactor Coolant System (RCS) via the normal charging flow path. The potential exists for the presence of resin fines downstream of resin retention elements and as a result, adverse impacts of resin decomposition products on RCS pressure boundary components and the adverse impact on ORE.
The NAPS COL FSAR Section 12.3 does not fully describe the design features provided to maintain ORE ALARA by preventing potential injection, and subsequent chemical degradation, of resin fines from the CVCS HUTs into the RCS.

Please revise and update NAPS COL FSAR Section 12.3 “Radiation Protection Design Features” and Subsection 9.3.4 “Chemical and Volume Control System,” to describe the design features provided to prevent the introduction of resin fines from the CVCS Holdup Tanks into the Reactor Coolant System, or describe the specific alternate approaches and the associated justification.

12.03-12.04-***

Title 10 of the Code of Federal Regulations (10 CFR), Part 20, “Standards for Protection Against Radiation,” Section1101(b) “Radiation protection programs” requires that Occupational Radiation Exposures (ORE) be maintained as low as is reasonably achievable (ALARA) as defined in 10 CFR 20.1003, “Definitions”, that is, making every reasonable effort to maintain exposure as low as possible. The guidance contained in Regulatory Guide (RG) 8.8 “Information Relevant for Ensuring that Occupational Radiation Exposures at Nuclear Power Stations is Reasonably Achievable,” and RG 1.206 ”Combined License Applications for Nuclear Power Plants” Section C.I.12.3.1 “Facility Design Features,” state that the design should minimize ORE through the use of maintenance requirements and chemistry controls.
US-APWR Design Control Document (DCD) Tier 2 Revision 2 Subsection 9.3.4.2.2.1 “Ionic Purification” which states that reactor coolant filters are provided downstream of the demineralizers to collect particulates and resin fines. North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Figures 9.3.4-1R “Chemical and Volume Control System Flow Diagram” Sheets 4 and 6 of 7, shows a new site specific connection, not described in the US-APWR DCD, between the Chemical and Volume Control System (CVCS) Holdup Tanks (HUT) and the Reactor Coolant System (RCS) CVCS line 3"-CVS-01F1, the Reactor Coolant Pump (RCP) seal water return line. The RCP seal water returns from all four RCP seal packages through the Seal Water Return filters to the Volume Control Tank without passing through any identified check valves. Any incident of backflow through the RCP seal water return line could result in flushing particulate material off of the Seal Water Return Filters into all four RCP seal packages. NAPS COL FSAR Table 9.3.4-3R “Chemical and Volume Control System Equipment Design Parameters (Sheet 1 of 6)” states that the two Holdup Tank Pumps are each rated for 130 gpm and 200 psig. Industry literature documents the adverse impact of foreign material on the reliability of the RCP seals, which serve as RCS pressure boundary components. RCP seal degradation has an adverse impact on ALARA and ORE due the the need for increased maintenance and inspection of the RCP seals. In addition, operating experience concerning RCP seal failures show that they may result in an increase in ORE due to loss of RCS inventory into containment, and the resultant plant shutdowns to clean up the leakage, repair the seal package, and repair any other damage incurred.

The NAPS COL FSAR Section 12.3 does not fully describe the design features provided to maintain ORE ALARA by preventing foreign material damage to the RCP seal packages, due to back flow through the seal water return filters.

Please revise and update NAPS COL FSAR Section 12.3 “Radiation Protection Design Features” and Subsection 9.3.4 “Chemical and Volume Control System,” to describe the design features provided to prevent potential damage to the RCP Seal Packages, and the subsequent increase in ORE, from the use of the CVCS Holdup Tank Pumps to

return water to the Reactor Coolant System, or describe the specific alternate approaches and the associated justification.

12.03-12.04-***

Title 10 of the Code of Federal Regulations (10 CFR), Part 20, “Standards for Protection Against Radiation,” Section1101(b) “Radiation protection programs” requires that Occupational Radiation Exposures (ORE) be maintained as low as is reasonably achievable (ALARA) as defined in 10 CFR 20.1003, “Definitions”, that is, making every reasonable effort to maintain exposure as low as possible. The guidance contained in Regulatory Guide (RG) 8.8 “Information Relevant for Ensuring that Occupational Radiation Exposures at Nuclear Power Stations is Reasonably Achievable,” RG 1.206 Subsection C.I.12.3 “Radiation Protection Design Features” describe the use of plant chemistry controls for maintaining ORE ALARA.
Supplemental Response to NRC Request for Additional Information (RAI) North Anna Power Station Unit 3 (NAPS) Combined License (COL) Letter 65 RAI 5548, Question 09.03.04-1 dated June 9, 2011, states that a connection between the Chemical and Volume Control System (CVCS) Holdup Tanks (HUT) and the suction line of the charging pumps was incorporated in to the plant design to allow reuse of borated water in order to reduce the operational consumption of boric acid. The response further states that prior to transferring the stored water back to the RCS, the holdup tank contents will be sampled, analyzed, and confirmed to meet currently applicable water quality requirements. NAPS COL FSAR Subsection 5.2.3.2.1 “Chemistry with Reactor Coolant” states that RCS reactor coolant will meet the Electric Power Research Institute (EPRI) Primary Water Chemistry Guidelines.
Industry experience demonstrates that selection and implementation of chemistry program controls impacts plant ALARA and ORE.
RCS chemistry controls are established to maintain exposures ALARA and the commitment made in NAPS COL FSAR Subsection 5.2.3.2.1 to confirm that RCS makeup water meets the requirements of the EPRI Primary Water Chemistry Guidelines are reasonable expectations.
In NAPS COL FSAR Table 9.3.2-6R “Process Grab Sample Points” sample points 17 and 18 changed from the Boric Acid Evaporator Feed Pump Discharge, to the Holdup Tank Pump Discharge, but the “Analysis” parameters were not changed to reflect the RCS coolant chemistry specifications provided in US-APWR Design Control Document (DCD) Tier 2 Revision 2 Table 9.3.4-1 “Water Chemistry Specification for the Reactor Coolant.”

Please revise and update NAPS COL FSAR Table 9.3.2-6R to describe chemistry analysis parameters consistent with the requirements for RCS makeup water, or describe the specific alternate approaches and the associated justification.

12.03-12.04-***

Title 10 of the Code of Federal Regulations (10 CFR), Part 20, “Standards for Protection Against Radiation,” Section1101(b) “Radiation protection programs” requires that Occupational Radiation Exposures (ORE) be maintained as low as is reasonably achievable (ALARA) as defined in 10 CFR 20.1003, “Definitions”, that is, making every reasonable effort to maintain exposure as low as possible. The guidance contained in

Regulatory Guide 1.206 ”Combined License Applications for Nuclear Power Plants” Section C.I.12.3.1 “Facility Design Features,” state that features should be provided to reduce ORE. SRP Section 9.3.2 “Process and Post-Accident Sampling Systems” states that, consistent with 10 CFR Part 50 “Domestic Licensing of Production and Utilization Facilities” Appendix A “General Design Criteria for Nuclear Power Plants” (GDC) Criterion 60 “Control of releases of radioactive materials to the environment,” licensees should minimize personnel exposure by providing for flushing and draining of sample lines.

North Anna Power Station Unit 3 (NAPS) Combined License (COL) FSAR Revision 2 Departure DEP 9.2(1) “Replacement of Boron Recycle System with a Degasifier Subsystem,” states that the Boron Recycle System was replaced with a degasifier subsystem and the interfaces between the affected portion of the Chemical and Volume Control System (CVCS) (i.e., the boric acid evaporator) and the Boric Acid Tanks, Primary Makeup Water Tanks and associated systems were removed.

The NAPS DEP 9.2(1) also modified Figure 9.2.6-3R “Demineralized Water System Flow Diagram,” removing the demineralized water supply designated as “LMS D-9 N0-EE10158 3453,” to the Chemical Drain Tank Sample line that is used for purging the sample line.

Please revise and update the NAPS COL FSAR to describe the basis for removal of the Chemical Drain Tank Sample line purge connection, how this change is consistent with stated purpose of DEP 9.2(1) provided in the NAPS COLA “Departures Report”, the ALARA requirements of 10 CFR 20.1101(b) and the requirements of GDC 60 to control the release of radioactive materials to the environment by the use of purging and draining of sample lines, or describe the specific alternate approaches and the associated justification.

Request for Additional Information No. 5979 (Draft)

North Anna, Unit 3
Dominion
Docket No. 52-017
SRP Section: 12.03-12.04 - Radiation Protection Design Features
Application Section: 12.3, 9

QUESTIONS for Health Physics Branch (CHPB)

12.03-12.04-***

Title 10 of the Code of Federal Regulations (10 CFR), Part 20, “Standards for Protection Against Radiation,” Section1101(b) “Radiation protection programs” requires that Occupational Radiation Exposures (ORE) be maintained as low as is reasonably achievable (ALARA) as defined in 10 CFR 20.1003, “Definitions”, that is, making every reasonable effort to maintain exposure as low as possible. The guidance contained in Regulatory Guide (RG) 8.8 “Information Relevant for Ensuring that Occupational Radiation Exposures at Nuclear Power Stations is Reasonably Achievable,” RG 1.206 Subsection C.I.12.3 “Radiation Protection Design Features” and Standard Review Plan Section 12.3-12.4 “Radiation Protection Design Features,” state that control of Reactor Coolant System chemistry maintains ORE ALARA. 10 CFR 20.1406(b) “Minimization of contamination” requires licensees to describe design feature to reduce contamination of the facility, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste.

US-APWR Design Control Document (DCD) Tier 2 Subsection 12.1.2.1 “General Design Considerations for Keeping Exposures ALARA” states that the US-APWR design supports the use of zinc injection as one of the possible methods to ORE.
Mitsubishi Heavy Industries (MHI), the applicant for the US-APWR DCD has stated that while the standard design does ensure that zinc injection can be employed and includes provisions for future implementation by applicants, the zinc injection system is not directly a part of the standard certified design, and no specific equipment is included for zinc injection in the standard certified design. Industry literature documents the impact zinc injection has on reducing ORE and reducing facility contamination.
The North Anna Power Station Unit 3 (NAPS) combined license (COL) FSAR Revision 2, Chapter 12 “Radiation Protection” does not describe the use of zinc injection, nor does NAPS COL FSAR Chapter 9 “Auxiliary Systems” describe the locations of components, piping and interfaces to plant systems, of the zinc injection system, nor does NAPS COL FSAR Section 12.3 “Radiation Protection Design Features” describe the use of the zinc injection components for ORE.

Please revise and update NAPS COL FSAR Chapter 9 and Chapter 12 “Radiation Protection” to describe the use of zinc injection at NAPS 3, and to include the description of the locations of components, piping and interfaces of the zinc injection system to plant systems described in the NAPS COL FSAR Chapter 9, or provide the specific alternative approaches used and the associated justification.