

**Supplemental RAIs**  
**ESBWR Tier 2, Rev. 3 DCD Chapter 11**  
**June 6, 2007**

1. Supplemental RAI 11.2-4

In RAI 11.2-4, the staff requested that the applicant revise Table 11.2-1 of the DCD Tier 2, to reflect the guidance of RG1.143, Revision 2, for atmospheric tanks. In its response, the applicant agreed to revise the table in accordance with RG 1.143. The staff reviewed the revised table attached to the applicant's response letter, and in Revision 3 of the DCD Tier 2. The staff found that the applicant retained a footnote that adds the use of fiberglass reinforced tanks that are constructed in accordance with the requirements of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPVC) Section X. This is not consistent with the guidance in RG1.143. BPVC Section X does not have any specific guidance on the use of fiberglass tanks in radiation zones or for the retention of radioactive liquids. 10 CFR 50.34(h)(3) states that the applicant must present justification for deviation from the established review criteria, as published in the applicable SRP section. Therefore, the staff requests that the applicant either provide documentation to demonstrate that the use of fiberglass reinforced plastic tanks for retention of liquids containing radioactive waste is acceptable, that this will not pose a risk to the health and safety of the public or the plant workers; or that the provision to use fiberglass reinforced plastic tanks be removed.

2. Supplemental RAI 11.2-5

In RAI 11.2-5, the staff requested that the applicant revise Table 11.2-1 to reflect the guidance of RG1.143, Revision 2 for tanks rated in the 0-15 PSI range. In its response, the applicant agreed to revise the table to comply with the RG. The staff reviewed the revised table attached to the applicant's response letter, and Revision 3 of the DCD Tier 2. The staff found that the applicant retained a footnote that adds the use of fiberglass reinforced tanks which are constructed in accordance with the requirements of ASME BPVC Section X. Based on the same reasons discussed in the above evaluation for the RAI 11.2-4 response, the staff finds RAI 11.2-5 response not acceptable.

3. Supplemental RAI 11.2-11

In RAI 11.2-11, the staff requested additional detail to be provided for Figure 11.2-1, "Liquid Waste Management System Process Diagram." For example, the diagram did not show sufficient detail to identify all sources of liquid input volumes, the points of collection of liquid waste, the flow paths of liquids through the system including all bypasses, and the specific point of release of liquid effluents to the environment. The level of details should be sufficient to allow staff review in accordance with the guidance of SRP Section 11.2, Rev. 2, July 1981, Review Criterion III.1. In its response the applicant stated that the DCD Tier 2 would be revised to include a new Figure 11.2-2, "Liquid Waste Management System Process Stream Information Directory." Additionally, a description of Figure 11.2-2 was added in Section 11.2. The staff reviewed the revised figures in Revision 3 of the DCD Tier 2, and still could not find the specific point(s) of release of liquid effluents to the environment (e.g., interfacing with the

circulating water system).

4. Supplemental RAI 11.2-13

In RAI 11.2-13, the staff asked the applicant to describe how the classifications and design criteria applied to the liquid radioactive waste management system (including piping, tanks, and structures used to contain leakage) satisfy the requirements of GDC 61 with respect to designing radioactive waste systems to assure adequate safety under accident conditions. In its response, the applicant stated that the LWMS was designed to Quality Group D and modified by RG 1.143, Revision 2, Section 7 and Table 1. Referring to the response to RAI 11.2-9 and RAI 11.2-10, compliance with RG 1.143 guidance was addressed for the LWMS. The staff reviewed the response to RAI 11.2-13, and previously reviewed the responses to RAI 11.2-6 through 11.2-10 relating to the LWMS being consistent with RG 1.143 Revision 2. Based on the SRP Section 11.2, the compliance with RG 1.143 forms the bases for satisfying GDC 61. A COL applicant referencing the ESBWR certified design should describe the quality assurance (QA) program for design, fabrication, procurement, construction of structures, and installation of permanent or mobile LWMS systems and components in the plant in accordance with its overall QA program. However, DCD Rev. 3, Section 11.2.6 does not commit the COL applicant to conform with the QA guidance specified in Regulatory Guides 1.21, 1.33, and 4.15.

5. Supplemental RAI 11.2.3-1

In RAI 11.2.3-1, 11.2.3-2, and 11.2.2-4, the staff requested the applicant to clarify the basis of the decontamination factors (DF) listed in DCD Tier 2, Rev. 1, Table 11.2-3, and their applications in deriving the estimated radioactive liquid effluent source term identified in DCD, Rev. 3, Section 12.2.2.3. DCD Rev. 3, Table 12.2-3 presents updated decontamination factors assigned by types of liquid wastes and groupings of radionuclides. The revised DFs are consistent with those presented in NUREG-0016 for general purpose ion-exchange and adsorbent media and filtration systems. However, DCD Rev. 3, Section 11.2.6 does not commit the COL applicant to the description and performance of installed mobile processing equipment with that described in DCD Tier 2, Rev. 3, Tables 11.2-2c and 11.2-3. For example, a COL applicant referencing the ESBWR certified design should identify ion-exchange and adsorbent media and filtration systems it plans to use depending upon the expected characteristics of liquid process and effluent streams.

6. Supplemental RAI 11.3-3

In RAI 11.3-3, the staff requested the applicant to describe how the OGS design pressure of the components was selected to provide the capability to withstand an internal hydrogen explosion. In addition, the staff asked the applicant to provide numerical performance criteria for the hydrostatic test demonstrating this capability. In its response the applicant stated that the ESBWR offgas system design used the methodology outlined in GE report, NEDE-11146 "Pressure Integrity Design Basis for New Gas Systems," to establish hydrogen explosion pressure integrity in offgas piping. NEDE-11146 has been previously submitted and approved by the NRC to evaluate and establish design pressure integrity for the Grand Gulf offgas system during internal hydrogen explosions. The staff finds this methodology to be adequate, and Section 3.2.2 of DCD Tier 2, Revision 3, does reference the NEDE report. In addition, the

applicant identified a COL Item in Section 11.3.8 of the DCD Tier 2, Revision 2. The OGS design parameters, major equipment items as well as other system data, as shown in DCD Tier 2, Table 11.3-2, are to be defined by the COL applicant. This COL Action Item addressed a portion of the RAI, and was identified as “COL Information” item 11.3.8-1. Based on the methodology and COL action item, RAI 11.3-3 was resolved. However, in Revision 3 of the DCD Tier 2, “COL Information” item 11.3.8-1 was removed. The removing of this COL item is not acceptable.

7. Supplemental RAI 11.4-15

The staff reviewed the applicant’s response to RAI 11.4-15, and finds the response not acceptable. The safety significance of the SWMS is at the same level as the liquid waste management system and gaseous waste management system. The level of detail for the SWMS in ITAAC should be similar to the liquid waste management system and gaseous waste management system, which include an ITAAC table to describe “design commitment,” “inspection, tests, and analyses,” and “acceptance criteria,” and a process diagram.

8. Supplemental RAI 11.4-6a-c

RAI 11.4-6a - A review of the system components listed in DCD Rev. 3, Table 11.4-1 and Figure 11.4-1 indicates that the “HIC Return Pumps” and “Sorting Table” are not shown in Figure 11.4-1. Accordingly, update the table and figure to indicate where in the SWMS these components are located.

RAI 11.4-6b - A review of the estimated radwaste inventories listed in DCD Rev. 3, Table 11.4-2 indicates that the amount listed for the “Wet Solid Waste Total” is inconsistent with each of the listed waste streams comprising this total. Accordingly, update the value of the total waste estimate.

RAI 11.4-6c - A review of DCD Rev. 3, Table 11.4-2 indicates that the last footnote refers to the use of evaporation as a mean of achieving waste volume reduction for concentrated wet wastes. However, the use of evaporators is not discussed in DCD Rev. 3, Section 11.4.2. Accordingly, revise the footnote to eliminate “evaporation” as a waste reduction method or add the use of this type of waste processing technology to DCD Section 11.4.2 and update the associated DCD tables and Figure 11.4-1.

9. Supplemental RAI 11.5-5

In RAIs 11.5-5, 11.5-11, 11.5-12, 11.5-13, 11.5-16, 11.5-17, 11.5-20, 11.5-21, and 11.5-22, as they relate to DCD Tier 2, Rev. 1, Sections 11.5.3 and 11.5.4, the staff requested the applicant to provide elaborations and address the requirements of Regulatory Guides 1.21 and 4.15 on sampling requirements for batch and continuous releases, sampling and analyses frequencies, types of radionuclides or radionuclide groupings for which analyses are required, and PRMS subsystem calibration and maintenance. In DCD Rev. 3, Sections 11.5.3 and 11.5.4, the applicant corrected these inconsistencies. Therefore, these RAIs are resolved, with the exception of RAI 11.5-5. In Revision 3 of the DCD Tier 2, Sections 11.5.2, 11.5.4, and 11.5.5 the applicant does not indicate whether the design of the process and effluent sampling systems follows the guidance of IE Bulletin 80-10 “Contamination of Non-radioactive System

and Resulting Potential for Unmonitored, Uncontrolled Release to Environment” and whether the design avoids interconnections with non-radioactive systems that could become radioactive through improper interfaces with radioactive systems. Similarly, the applicant does not indicate whether the design of the process and effluent sampling systems complies with the requirements of 10 CFR 20.1406, as it relates to the design and operational procedures to minimize contamination and minimize the generation of radioactive wastes. While DCD Rev. 3, Section 12.6 addresses some requirements associated with Part 20.1406, the discussions of DCD Section 12.6 are broadly generic and do not focus on specific design issues for the PRMS.

#### 10. Supplemental RAI 11.5-6

In RAI 11.5-6, as it relates to DCD Tier 2, Rev. 1, Sections 11.5.3 and 11.5.4, the staff requested the applicant to describe how the Reactor Building HVAC Exhaust system captures discharges from the Isolation Condenser Vent exhaust. In Revision 3 of the DCD Tier 2, Section 11.5.3.1.5, the discussion about the air exhaust from the atmospheric area above each condenser pool is incomplete. Although the exhaust is monitored by the Isolation Condenser Vent Exhaust RMS, it is not clear from this discussion and information presented in DCD Rev. 3, Sections 5.4.6.5 and 5.1.2 and Figure 5.1-3, what design features are provided to prevent the exhaust from the atmospheric area above each condenser pool from becoming an uncontrolled and unmonitored release to the environment.

#### 11. Supplemental RAI 11.5-8

In RAI 11.5-8, as it relates to DCD Tier 2, Rev. 1, Sections 11.5.3 and 11.5.4, the staff requested the applicant to address inconsistencies in addressing competing objectives of Regulatory Guides 1.21 and 1.97 in describing dynamic response ranges and expected activity levels. The specific information is presented in DCD Rev. 1, Tables 11.5-1, 11.5-2, 11.5-4, and 11.5-9. In Revision 3 of the DCD Tier 2, Section 11.5.2.1 and Table 11.5-9, the applicant states that the PRMS dynamic instrumentation response ranges are consistent system designs and qualifications under the provisions of Regulatory Guide 1.97. A review of DCD Rev. 3, Sections 7.5 indicates that the instrumentation design requirements are based on Rev. 4 of Regulatory Guides 1.97. A review of Rev. 4 of the regulatory guide indicates that it does not provide criteria for instrumentation variables as does Revision 2 or 3 of the same guide. In Rev. 4 of the guide, the basis and numerical values for instrumentation are to be established in the “licensing basis documentation,” which is non-existent at this time. The discussion in DCD Rev. 3, Section 11.5.2.1 and basis for the chosen dynamic response ranges listed in DCD Rev. 3, Table 15.5-9 reflect adoption of the design and qualification criteria and instrumentation variables of Tables 1 and 2 of Regulatory Guide 1.97, either as Revision 2 or 3. DCD Rev. 3, Section 7.5.1, discussing conformity with Regulatory Guide 1.97, states that “compliance cannot be specified at this time” and that “compliance to these requirements is [to be] addressed during the detailed design phase.” However, DCD Rev. 3, Sections 7.5.7 and 11.5.7 (COL Information) do not identify this issue as COL action items. Accordingly, the inconsistency in confirming compliance with either Revision 2/3 or Revision 4 of Regulatory Guide 1.97 for accident monitoring instrumentation described in DCD Rev. 3, Sections 7.5.1 and 11.5.2 is left for the applicant to resolve.

12. Supplemental RAI 11.5-9

In RAI 11.5-9, as it relates to DCD Tier 2, Rev. 1, Sections 11.5.3 and 11.5.4, the staff requested the applicant to address inconsistencies in describing the display RMS channel ranges, dynamic response ranges, and expected activity levels. The specific information is presented in DCD Rev. 1, Tables 11.5-1, 11.5-2, 11.5-4, and 11.5-9. A review of these sections and tables of DCD Rev. 3 revealed the following inconsistencies. DCD Rev. 3, Table 11.5-1 describes the responses of PRMS subsystems using two radiological units, dose rates (mSv/h) and concentrations (MBq/m<sup>3</sup>). The subsystems with dynamic ranges described as radiation exposure rates include the Reactor Building HVAC Exhaust, Refuel Handling Area HVAC Exhaust, Control Building Air Intake HVAC, LCW Drywell Dump Discharge System, Fuel building General Area HVAC, Isolation Condenser Vent Exhaust, Containment Purge Exhaust, Fuel Building Fuel Pool HVAC, Turbine Building Normal Ventilation System, Turbine Building Compartment Area Air HVAC, Offgas Pre-treatment System, Charcoal Vault Ventilation, and Technical Support Center HVAC Air Intake. Since these subsystems are installed to measure radioactivity in process and effluent streams and air intakes, the units need to be expressed in radiological units that are consistent when measuring liquid and gaseous concentrations. In DCD Rev. 3, Table 11.5-9, the basis for the dynamic ranges of the same PRMS subsystems are expressed in units defined in terms of concentrations (MBq/m<sup>3</sup>) and not in units of dose rates (mSv/h). A review of the dynamic detection ranges listed in DCD Rev. 3, Tables 11.5-2 and 11.5-4 are also inconsistent with those listed in DCD Rev. 3, Table 11.5-9.

13. Supplemental RAI 11.5-23

In Revision 3 of the DCD, Tier 2, Section 12.2.1.3 fails to refer to the use of a specific computer code used to calculate doses.

A review of the applicant's response to RAI 11.5-23 and revised text in Rev. 3 DCD Section 12.2.1.3 indicates that of the two computer codes used to calculate doses at and beyond the EAB, one is not included in DCD Table 12.3-1. Accordingly, the applicant should revise Table 12.3-1 to include the "SKYIII-PC" computer code along with all other listed codes.

14. Supplemental RAI 11.5-24

In Revision 3 of the DCD, Tier 2, the applicant proposed responses refer to a non-existent DCD Section and incomplete NRC regulations.

In its response to RAI 11.5-24, the applicant refers to specific sections of the DCD where information may be found on the PASS. Among several citations, the response refers to a non-existent section of the DCD, namely Sect. 7.9.2.5. Accordingly, the applicant should revise its response by referring to the proper DCD section.

In its response to the RAI and proposed revised text for Rev. 3 DCD Section 9.3.2 (p.9.3-1), the applicant refers to an incomplete citation of Part 20, namely "Part **20.20** & 20.1101(b)". Accordingly, the applicant should update the text in its RAI response and DCD Section 9.3.2 for the purpose of citing the correct section of 10 CFR Part 20.