

## ArevaEPRDCPEm Resource

---

**From:** Tesfaye, Getachew  
**Sent:** Friday, November 25, 2011 4:11 PM  
**To:** 'usepr@areva.com'  
**Cc:** Dehmel, Jean-Claude; Roach, Edward; Clark, Phyllis; Colaccino, Joseph; ArevaEPRDCPEm Resource  
**Subject:** Draft - U.S. EPR Design Certification Application RAI No. 528 (6177), FSAR Ch. 11  
**Attachments:** Draft RAI\_528\_CHPB\_6177.doc

Attached please find draft RAI No. 528 regarding your application for standard design certification of the U.S. EPR. If you have any question or need clarifications regarding this RAI, please let me know as soon as possible, I will have our technical Staff available to discuss them with you.

Please also review the RAI to ensure that we have not inadvertently included proprietary information. If there are any proprietary information, please let me know within the next ten days. If I do not hear from you within the next ten days, I will assume there are none and will make the draft RAI publicly available.

Thanks,  
Getachew Tesfaye  
Sr. Project Manager  
NRO/DNRL/NARP  
(301) 415-3361

**Hearing Identifier:** AREVA\_EPR\_DC\_RAIs  
**Email Number:** 3586

**Mail Envelope Properties** (0A64B42AAA8FD4418CE1EB5240A6FED151674E20D9)

**Subject:** Draft - U.S. EPR Design Certification Application RAI No. 528 (6177), FSAR Ch.  
11  
**Sent Date:** 11/25/2011 4:11:26 PM  
**Received Date:** 11/25/2011 4:11:26 PM  
**From:** Tesfaye, Getachew  
**Created By:** Getachew.Tesfaye@nrc.gov

**Recipients:**

"Dehmel, Jean-Claude" <Jean-Claude.Dehmel@nrc.gov>  
Tracking Status: None  
"Roach, Edward" <Edward.Roach@nrc.gov>  
Tracking Status: None  
"Clark, Phyllis" <Phyllis.Clark@nrc.gov>  
Tracking Status: None  
"Colaccino, Joseph" <Joseph.Colaccino@nrc.gov>  
Tracking Status: None  
"ArevaEPRDCPEm Resource" <ArevaEPRDCPEm.Resource@nrc.gov>  
Tracking Status: None  
"usepr@areva.com" <usepr@areva.com>  
Tracking Status: None

**Post Office:** HQCLSTR02.nrc.gov

<b>Files</b>	<b>Size</b>	<b>Date &amp; Time</b>
MESSAGE	908	11/25/2011 4:11:26 PM
Draft RAI_528_CHPB_6177.doc		69114

**Options**

**Priority:** Standard  
**Return Notification:** No  
**Reply Requested:** No  
**Sensitivity:** Normal  
**Expiration Date:**  
**Recipients Received:**

Draft

Request for Additional Information No. 528(6177), Revision 3

11/25/2011

U. S. EPR Standard Design Certification  
AREVA NP Inc.

Docket No. 52-020

SRP Section: 11.05 - Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems

Application Section: 11.5, including system interfaces in Sections 3.3, 9, 10, 11.2, 11.3 and 11.4

QUESTIONS for Health Physics Branch (CHPB)

11.05-28

OPEN ITEM

Supplemental question to responses on RAI 273, Questions No. 11.05-2, 11.05-5, 11.05-7, 11.05-8, 11.05-9, and 11.05-10 and RAI 405, Question 11.05-24. Based on a review of Revision 3 of the U.S. EPR FSAR and the FSAR mark up provided in the response to RAI 273, the staff has identified the following items to be addressed and resolved in the stated FSAR sections that are related to Chapter 11.5:

1. A review of FSAR Tier 2, Section 11.5 and Table 11.5-1 indicates that they were extensively revised with additional radiation monitoring systems (RMS) added as part of this revision. However, the sections addressing the design basis and design criteria were not updated to reflect the expanded scope of RMS instrumentation. For example, the basis and criteria should be revised to include the associated TMI-related requirements of Part 50.34(f)(2)(viii) and 50.34(f)(2)(xiv)(E). The applicant is requested to review and assign the appropriate TMI-related requirements against the radiation monitoring instrumentation listed in the revision of FSAR Tier 2, Table 11.5-1.
2. A review of FSAR Tier 2, Section 11.5.1 indicates that references to "Part 50.34(a)" and "Part 50.36(a)" are incorrect and should be corrected to read as "Part 50.34a" and "Part 50.36a," i.e., without parentheses. The applicant should check and make these corrections throughout FSAR Tier 2, Sections 11.2 to 11.5, as applicable.
3. A review of FSAR Tier 2, Section 11.5.2 indicates that the reference to FSAR Tier 2, Section 12.3.1.6 should be changed to FSAR Tier 2, Section 12.3.6.1 instead. The applicant should check and make such corrections throughout FSAR Tier 2, Sections 11.2 to 11.5, as applicable.
4. A review of FSAR Tier 2, Section 11.5.2 indicates that the references to FSAR Tier 2, Sections 3.10 and 3.11 should be reviewed and updated since neither section makes references to FSAR Section 11.5 or Table 11.5-1 for instrumentation that would require environmental or seismic qualification. The applicant should identify which radiation monitoring instrumentation falls within these requirements and update FSAR Tier 2, Sections 3.10, 3.11, and 11.5, as applicable.
5. A review of FSAR Tier 2, Section 11.5.3 and 11.5.4 and Table 11.5-1 indicates that several radiation monitors are not listed in Figure 11.5-1 and there is no logic for

the inclusion of those that are included in that figure. The following radiation monitor tag numbers are not included in Figure 11.5-1: R-1, R-12 to R-18, R-20 to R-23, R-25, R-26, R-28 to R-31, R-39, R-40, R-42, R-44, R-45, R-51 to R-54, R-55 to R-58, R-61, R-64, and R-65. For those tag numbers that are included for each plant system, there is a need to explain the reason for omitting others. For example, tag No. R-11 is shown in Figure 11.5-1 for the NABVS, but R-12 to R-15 are not shown. In another case with the RWBVS, tag No. R-21 is shown in Figure 11.5-1, but it is only a sample point, while tag No. R-20, R-22, and R-23, as radiation monitors, are not shown. The applicant is requested to devise a systematic rationale in justifying the inclusion of radiation monitors and sampling points in Figure 11.5-1 to ensure that at the design stage none of the equipment used to monitor and sample plant process and effluent streams are omitted.

6. A review of FSAR Tier 2, Section 11.5.3.1.1 (GWPS RMS) indicates that its description does not include any provisions for sampling. The description of system functions should be consistent with those described in referenced tables and figures. The listing of applicable ITP tests presented in FSAR Tier 2, Table 11.5-1 should include Test No. 092. Also, the applicant should review and assign the applicability of Test No. 092 to all radiation monitoring provisions listed in FSAR Tier 2, Table 11.5-1.
7. A review of FSAR Tier 2, Section 11.5.3.1.2 (MCES RMS) indicates that it does not include the turbine gland sealing system given that FSAR Tier 2, Section 10.4.3.3 states that the associated exhaust is monitored by radiation monitor R-3. The applicant is requested to expand the discussion on the main condenser evacuation system to include the monitoring of discharges from the turbine gland sealing system, and update FSAR Table 11.5-1 accordingly. The system designation entry in FSAR Tier 2, Table 11.5-1 should be expanded to read "Vent System for Air Removal (MAQ, MCES, TGSS)," and citations of FSAR Tier 2, Section 10.4.3 and Figure 10.4.3-1 should be included in FSAR Tier 2, Table 11.5-1. The use of radioactive check sources is inconsistently described for monitor R-3, the text refers to the use of portable check sources, while FSAR Tier 2, Table 11.5-1 states that the check source is built-in. The listing of applicable ITP tests presented in FSAR Tier 2, Table 11.5-1 should include Tests No. 064 and 065.
8. A review of FSAR Tier 2, Section 11.5.3.1.3 (Sampling Activity System RMS) and Table 11.5-1 indicates that the basis of the listed operational ranges described in Footnote 13 or 18 does not address radiological exposure units expressed in rad/hour for instrumentation that measure airborne radioactivity (as noble gases) at the point of discharge at the plant vent. It is not clear as to what the stated operational range of 1.0E-04 to 1.0E+04 rad/hour for radiation monitor R-6 represents with respect to locations within the plant/site and conditions of exposures at such locations. The applicant is requested to assign an operational range expressed as concentrations for Kr-85 and Xe-133 (as already applied in Table 11.5-1 for other monitors), or expand the provisions described in Footnotes 13 and 18 to Table 11.5-1 to identify the kind of external radiation exposures and exposure conditions that would require an operational range expressed in rad/hour instead of noble gas concentrations. The applicant should review and address this concern for other radiation monitors listed in FSAR Tier 2, Table 11.5-1 - see radiation monitors R-9, R-19, R-26, and R-27. For radiation monitors R-29 and R-30 a qualifier should be added in Footnote 19 to Table 11.5-1 to note that these detectors are not used for monitoring of gaseous process streams and airborne

effluent releases to the environment. With respect to monitors R-29 and R-30, Footnote 19 should refer to FSAR Tier 2, Table 12.3-4 for supporting technical details on operating characteristics. A review of the application of operating characteristics of monitors R-4 to R-6 (with respect to the inventory of post-accident monitoring variables) indicates that RMS nomenclatures in items 35 to 37 of FSAR Tier 2, Table 7.5-1 are not consistent nor complete with that described in FSAR Tier 2, Table 11.5-1. For example, monitors R-6 and R-26 are not listed in FSAR Tier 2, Table 7.5-1. The applicant is requested to review and revise the designations and functions of all radiation monitors with accident monitoring functions listed in FSAR Tier 2, Table 7.5-1 to ensure consistency with that of FSAR Tier 2, Table 11.5-1.

9. In FSAR Tier 2, Section 11.5.3.1.3 (Sampling Activity System RMS) and Table 11.5-1, a review of the stated operational range for radiation monitor R-4 (aerosol) indicates that it is found to be significantly less sensitive for Cs-137 when compared to other monitors with similar functions. The operational range for R-4 is stated to range from 1.0E-08 to 1.0E+02 uCi/cc for Cs-137. The operational ranges for other similar monitors range from 3.0E-10 to 1.0E-06 uCi/cc for Cs-137. Regarding the low end of the range, it is not clear as to why monitor R-4 should be 33 times less sensitive (1.0E-08/3.0E-10) than other monitors given that this is the last monitoring point in the plant vent before effluents are released to the environment. With respect to upper end of the range, it is not clear as to why the operational range of monitor R-4 should be up to 1.0E+02 uCi/cc for Cs-137. For example, the upper range for other radiation monitors with similar functions is noted to be 1.0E-06 uCi/cc for Cs-137, see R-7, R-10, R-11 or R-17 among others. If the concern is that the Cs-137 upper operational range of R-4 needs to be up to 1.0E+02 uCi/cc for accident conditions, then the stated upper range for I-131 is not operationally consistent since it is limited to 3.0E-07 uCi/cc for R-4. Besides R-4, the applicant is requested to review and address inconsistencies in the stated operational ranges assigned to radiation detectors used to monitor effluents during routine releases and under accident conditions, including those used to terminate or divert airborne process streams and effluent releases. The applicant should review and assign the applicability of Test No. 138 (Accident Monitoring) to radiation monitor R-6 since it is identified for accident monitoring in FSAR Tier 2, Table 11.5-1. Besides monitor R-4, the applicant should review and assign the applicability of Test No. 138 to all other radiation monitors designed to operate under accident conditions. The use of radioactive check sources is inconsistently described for monitors R-4 to R-6, the text refers to the use of portable check sources, while FSAR Tier 2, Table 11.5-1 states that check sources are built-in.
10. A review of FSAR Tier 2, Sections 11.5.3.1.4 (CBVS Low Flow Purge RMS) and Section 11.5.3.1.5 (CBVS Internal Filtration RMS) and Table 11.5-1, indicates that system descriptions and operational features should include references to FSAR, Tier 2, Section 12.3.4 and Table 12.3-4 as they present supporting information. A review of supporting information contained in FSAR, Section 9.4.7.2.3 indicates that the functions of monitors R-7 to R-9 for the containment building low-flow purge are not described, and instead describes the function of monitor R-10, which is assigned to the containment building internal filtration system. In addition, the discussion on the fuel handling accident in FSAR, Section 9.4.7.2.1 refers to FSAR Tier 2, Sections 9.4.5, 11.5.3.1.5, and 11.5.4.8 in noting that the containment building low-flow purge, with monitor R-10, is used for this safety function. However, this function is described in FSAR Section FSAR Tier 2, Section

11.5.3.1.5 and Table 11.5-1 using monitors R-7 to R-9, and the automatic control feature of monitor R-9 is not clearly described in FSAR Section 9.4.7.2.3. A review of FSAR Tier 2, Section 11.5.3.1.5 (CBVS RMS) and Table 11.5-1 indicates that listing of applicable ITP tests presented in FSAR Tier 2, Table 11.5-1 for monitor R-10 should include Tests No. 204 and 143. The applicant is requested to review and revise the monitoring functions to ensure internal consistency.

11. A review of FSAR Tier 2, Section 11.5.3.1.5 (CBVS Internal Filtration RMS) and Table 11.5-1, indicates that the assignment of monitor R-10 (aerosol particulates) is confusing since it is described in FSAR Tier 2, Sections 11.5.4.8 (RMS for RCS Leakage) and 5.2.5.5.3 (Containment Atmosphere Particulate Radiation Monitoring) and Table 11.5-1 as being dedicated to compliance with TS16.3.4.12 on RCS leakage rate of 1 gpm. It is not clear as to how monitor R-10 (aerosol) could perform simultaneously these dedicated functions, initiate the activation of the containment building low-flow purge, and demonstrate compliance with TS16.3.4.12 on allowable RCS leakage rates. The applicant is requested to review and resolve these conflicting operational descriptions of monitors R-7 to R-9 and R-10 in FSAR Tier 2, Sections 5.2.5.5.3, 6.2.4.2, 9.4.7.2, 9.4.7.5, 11.5.3.1.4, 11.5.3.1.5, and 11.5.4.8. Given the resolution of the issue identified above, the applicant should confirm whether Footnote 6 to Table 11.5-1 on compliance with TS16.3.4.14 on RCS leakage still applies to monitor R-10 as noted in FSAR Tier 2, Table 11.5-1. The instrumentation tag number suffix "CR041" for monitor R-8 is not explained in Footnotes 11 and 12 to FSAR Tier 2, Table 11.5-1. The applicant should expand the supporting descriptions in Footnotes 11 and 12 to include this missing suffix, and include others that are not listed, such as suffix CR051; CR501 to CR508; CR811, CR821, CR831; and CR841. The listing of applicable ITP tests presented in FSAR Tier 2, Table 11.5-1 should include Test No. 075. The applicant is requested to review and revise the monitoring functions to ensure internal consistency.
12. Based on a review of FSAR Tier 2, Section 11.5.3.1.6 (NABVS RMS) and Table 11.5-1, confirm whether a portable check source is needed for monitor R-16 given that it is described as a sample point with no instrumentation. Based on a review of FSAR Tier 2, Figure 9.4.3-2, confirm whether the exhaust from the hot workshop is directed to the NABVS cell 3 and monitored by R-14, and, if so, revise FSAR Figure 9.4.3-2 since it is not indicated there. If necessary, make the appropriate corrections to FSAR Tier 2, Table 11.5-1 and supporting descriptions as well.
13. A review of FSAR Tier 2, Section 11.5.3.1.7 (FBVS RMS) and Table 11.5-1 indicates that the description of monitor R-19 should note that besides isolating the fuel handling ventilation on high radioactivity, the exhaust is diverted to the NABVS iodine filter train. Confirm whether Footnote "13" in Table 11.5-1 should be instead indicated as Footnotes "1, 3" in qualifying automatic control features for monitors R-17 and R-18. In supporting information presented in FSAR Tier 2, Section 9.4.2.2.3, a loss of offsite power is stated to result in "... all motorized dampers will fail as is, limiting pathways for potentially contaminated air to leak out to the environment." One possibility is that dampers could fail in an open position; thereby, venting out contaminated exhaust air to the environment. The applicant is requested to evaluate how this design feature is consistent with the commitment made in FSAR Tier 2, Section 12.3.6, which states that the U.S. EPR design complies with Part 20.1406 by applying design concepts to prevent unintended releases of radioactivity. In addition to the FBVS, the applicant is requested to confirm whether

this design feature (i.e., dampers failing potentially in an open position) is a characteristic of the design of ventilation systems for other buildings, including the NABVS, SBVS, ABVS, and RWBVS.

14. Based on a review of FSAR Tier 2, Section 11.5.3.1.8 (RWPBVS RMS) and Table 11.5-1, confirm whether the text or table are correct in assigning ventilation cell numbers for monitor R-20 and R-22, as the assignments of Cell 1 and Cell 2 are internally inconsistent between FSAR Tier 2, Section 11.5.3.1.8 and Table 11.5-1. For example, the text refers to Cell 2 for monitor R-20, but the table cites Cell 1 for R-20. The same type of inconsistency applies to monitor R-22. Based on a review of FSAR Tier 2, Figure 9.4.8-1, confirm whether the exhausts from the workshop and decontamination room are directed to and monitored by monitor R-23 and R-24, and, if so, revise FSAR Tier 2, Figure 9.4.8-1 since it is not indicated there, nor in Table 11.5-1.
15. A review of FSAR Tier 2, Section 11.5.3.1.9 (SBVS RMS) and Table 11.5-1 indicates that the designation of monitor "R-66" is wrong and should be revised to read "R-26" instead. Confirm whether Footnote "13" in Table 11.5-1 should be instead indicated as Footnotes "1, 3" in qualifying automatic control features for monitor R-25. Confirm whether the entry in FSAR Table 11.5-1 on automatic control features is correct (no ACF features) and should be revised since the text states that monitor R-26 diverts the SBVS exhaust flow to the iodine filtration train upon detecting elevated levels of radioactivity.
16. Based on a review of FSAR Tier 2, Section 11.5.3.1.10 (AVS RMS), Table 11.5-1, and Figure 6.2.3-2, confirm whether the RWBVS is the appropriate sampling location for monitor R-28, based on the listed location in Table 11.5-1.
17. Based on a review of FSAR Tier 2, Section 11.5.3.1.11 (CR RMS) and Table 11.5-1, confirm whether references to FSAR Tier 2, Sections 6.4.2.2 and 12.3.4.2 are needed given the functions of monitors R-29 and R-30. A review of FSAR Tier 2, Section 11.5.3.1.11 and Table 11.5-1 indicates that the reference to FSAR Tier 2, Section 11.5.3.1.1 in FSAR Tier 2, Section 9.4.1.1 for monitors R-29 and R-30 should be changed to read Tier 2, Section 11.5.3.1.11 instead.
18. A review of FSAR Tier 2, Section 11.5.3.1.12 (ABVS RMS) and Table 11.5-1 indicates that the reference to FSAR Tier 2, Section 11.5.3.1.1 in FSAR Tier 2, Section 9.4.14.6 for monitor R-31 should be changed to read Tier 2, Section 11.5.3.1.12 instead.
19. A review of FSAR Tier 2, Section 11.5.3.2 (Liquid Effluents RMS) and Table 11.5-1 indicates that the description of automatic control features is inconsistent with that given in Section 11.2.1.2.3. In FSAR Section 11.2.1.2.3, the automatic control feature states: "Discrepancies between the two radiation sensors or between the two flow sensors also result in control signals that terminate the discharge and isolate the release line." This design feature, isolation of discharge on elevated radioactivity levels and/or discrepancies on ODCM pre-established discharge flow rates, is not described in Section 11.5.3.2 and not noted in Table 11.5-1. The applicant is requested to revise FSAR Tier 2, Section 11.5.3.2 and Table 11.5-1 to include this design feature. In addition, a review of FSAR Tier 2, Section 14.2.12.9.5, ITP Test No. 095 for the LWMS, indicates that the test method and acceptance criteria do not verify the automatic closure of both discharge valves when detecting discrepancies in pre-established discharge flow rates. Moreover, the test method refers to the use of internal check sources to confirm the operability

of monitor R-32 and conduct the test, however, FSAR Section 11.5.3.2 and Table 11.5-1 note that monitor R-32 relies on the use of a portable and not a built-in check source. The applicant is requested to revise FSAR Tier 2, Section 11.5.3.2 and Table 11.5-1 and ITP Test No. 095 to address these inconsistencies.

20. Based on a review of FSAR Tier 2, Section 11.5.4.1 (MSL RMS) and Table 11.5-1, the applicant should review and assign the applicability of Tests No. 143 and 144 to main steam line radiation monitors R-55 to R-58. A review of FSAR Tier 2, Section 11.5.4.1 and Table 11.5-1 indicates that FSAR Tier 2, Sections 10.3.3 and 10.3.4 do not identify the MSL radiation monitoring system described in FSAR Tier 2, Section 11.5.4.1 and Table 11.5-1. The applicant is requested to revise FSAR Tier 2, Sections 10.3.3 and 10.3.4 to include this information. A reference to FSAR Tier 2, Section 11.5.4.1 and Table 11.5-1 should be added to FSAR Table 10.3-4, (item 7 on main steam line radioactivity sensors) in addition to that of FSAR Tier 2, Section 7.3 for technical completeness. In addition, FSAR Tier 2, Section 10.3.1 does not identify the requirements of Part 20.1406 in its design bases and does not refer to supporting information on compliance with Part 20.1406 in FSAR Tier 2, Section 12.3.6.5 on contamination control measures for systems.
21. Based on a review of FSAR Tier 2, Sections 10.4.2.4 (MCES) and 11.5.4.2 (MCES RMS), the applicant should evaluate whether citing GDC 60 in the discussion of the potential presence of explosive gas mixtures in MCES discharges is the appropriate reference. The proper citation should be GDC 3, given its context, and because design features addressing the requirements of GDC 60 and 64 are addressed elsewhere in FSAR Tier 2, Section 10.4.2.4 and also in FSAR Tier 2, Sections 11.3 and 11.5.4.2. Based on a review of FSAR Tier 2, Figures 10.4.2-2 and 9.4.3-3 on the routing of MCES/TGSS discharges, confirm whether the direct MCES/TGSS exhaust into the NABVS plenum is consistent the commitment of FSAR Tier 2, Section 12.3.6.5 on contamination control measures and compliance with Part 20.1406 if radioiodines were present in such system discharges.
22. Based on a review of FSAR Tier 2, Section 11.5.4.3 (SG BD RMS) and Table 11.5-1, the applicant should add references to FSAR Tier 2, Sections 9.3.2 and 10.4.8 for supporting design details. FSAR Tier 2, Sections 10.4.8.3.2 and 10.4.8.4 do not describe the functions of monitors R-46 to R-49 during abnormal operations and do not show locations of radiation monitors in system drawings. A review of FSAR Tier 2, Section 11.5.4.3 and Table 11.5-1 indicates that the reference to FSAR Tier 2, Section 10.4.8.3.2 in FSAR Tier 2, Section 10.4.8.3.2 for monitors R-46 and R-49 should be changed to read FSAR Tier 2, Section 10.4.8.3.3 instead. In light of the information presented in FSAR Sections 11.5.4.3 and 10.4.8, confirm whether the description of isolation functions (triggered by the combined detection of elevated levels of radioactivity and a cool down signal) should be indicated in Table 11.5-1 since it does not show this function. FSAR Tier 2, Section 10.4.8.1 does not identify the requirements of Part 20.1406 in its design bases and does not refer to supporting information on compliance with Part 20.1406 in FSAR Tier 2, Section 12.3.6.5 on contamination control measures for systems.
23. With respect to the SGBD RMS, a review of the information presented in FSAR Tier 2, Section 10.4.6.3 (CPS) indicates that references to FSAR Tier 2, Section 10.4.6.3 should be added to those already listed under the text and figure headings of FSAR Tier 2, Table 11.5-1. With respect to sampling provisions, the description should refer to FSAR Tier 2, Section 9.3.2 and Table 9.3.2-2 for supporting details. With respect to ITP Test No. 067 for the SGBD, the test method and acceptance

criteria do not refer to the use of a portable check source in confirming the function of monitors R-46 to R-49. The applicant is requested to revise the description of the test method and acceptance criteria by noting the use of an appropriate type of check source.

24. Based on a review of FSAR Tier 2, Section 11.5.4.4 (CCWS RMS) and Table 11.5-1, the applicant should review and assign the applicability of Test No. 046 to CCWS radiation monitors R-35 to R-38.
25. A review of FSAR Tier 2, Section 11.5.4.7 (CWS for Gaseous Waste Disposal Sampling System) and Table 11.5-1 indicates that this portion of the CWSS, described under FSAR Section 11.5.4.7, does not reference FSAR Tier 2, Sections 11.5.4.18 (SCWS RMS) and 9.2.8 (SCWS). In addition, FSAR Tier 2, Section 9.2.8.4 does not refer to sampling point R-61 as a complementary provision to monitors R-59 and R-60, and does not show the location of R-61 on system drawings. Based on a review of FSAR Tier 2, Sections 11.5.4.7 and Table 11.5-1, the applicant should review and delete the stated liquid monitor response range for R-61 given that it is only a sampling point and is not equipped with a radiation monitor. The listing of applicable ITP tests presented in FSAR Tier 2, Table 11.5-1 should include Test No. 052 for monitors R-59 and R-60. With respect to sampling, the system description should refer to FSAR Tier 2, Section 9.3.2 and Table 9.3.2-2 for details. The applicant should consider combining the descriptions of FSAR Tier 2, Section 11.5.4.7 and 11.5.4.18 into a single section given the system description of FSAR Tier 2, Section 9.2.8.
26. A review of FSAR Tier 2, Section 11.5.4.9 (ESWS RMS) indicates that the description of the radiation monitoring system should make a distinction between the trains since FSAR Tier 2, Section 9.2.1 and Table 11.5-1 differentiate between the essential service water system, and the dedicated essential service water system. As compared to descriptions of other systems, the description of the ESWS is incomplete in FSAR Tier 2, Section 11.5.4.9. The description does not address automatic control features, safety classification, type of check sources being used to check the operability of the radiation monitoring system, references on location of detectors and sampling points in system diagrams or drawings, and references to supporting FSAR sections, including FSAR Tier 2, Section 9.2.1. The listing of applicable ITP tests presented in FSAR Tier 2, Table 11.5-1 should include Test No. 048 for monitors R-66 to R-70. A review of the information presented in FSAR Tier 2, Sections 9.2.1.7 and 14.2.12.5.7 indicates that the descriptions of system monitoring and tests do not identify alarms upon detecting elevated levels of radioactivity. With respect to sampling provisions, the description should refer to FSAR Tier 2, Section 9.3.2 and Table 9.3.2-2 for details.
27. A comparison of FSAR Tier 2, Section 11.5.4.10 (Fuel Pool Purification System RMS) with descriptions presented in FSAR Tier 2, Section 9.1.3.4 (item 9) indicates that the FPPS radiation monitor will provide timely detection and notification upon system leakage. A review of the functions of monitor R-39 in FSAR Tier 2, Table 11.5-1 indicates that it is only a sampling point and not a monitor equipped with radiation detection capabilities. A review of FSAR Tier 2, Figure 9.1.3-2 indicates that the sample point is not shown in the system drawing. The applicant is requested reconcile these differences in monitor and/or sampling point descriptions and functions in FSAR Tier 2, Sections 11.5.4.10 and 9.1.3.4, and make the appropriate changes to FSAR Tier 2, Table 11.5-1 and Figure 9.1.3-2. The applicant is requested to revise the balance of RMS system descriptions in this

subsection in presenting a balance and consistent set of information and references when compared to other subsections. The listing of applicable ITP tests presented in FSAR Tier 2, Table 11.5-1 should include Tests No. 001 and 144 if R-39 is indeed equipped with a radiation detector. In addition, FSAR Tier 2, Sections 9.1.3 does not identify the requirements of Part 20.1406 in its design bases and does not refer to supporting information on compliance with Part 20.1406 in FSAR Tier 2, Section 12.3.6.5 on contamination control measures for the FPCPS.

28. A review of FSAR Tier 2, Section 11.5.4.11 (NIV&D RMS) and Table 11.5-1 indicates that the locations of the two sampling points for R-40 and R-44 are not described as to their placement in the system. The applicant is requested to specify the locations of the two sampling points and complete the balance of system descriptions, as needed, in the rest of Table 11.5-1, such as references on system drawings and to other supporting FSAR sections. Confirm whether these two entries in FSAR Tier 2, Table 11.5-1 could be combined as one single entry given that they support one single subsystem and have the same functions. With respect to sampling provisions, the description should refer to FSAR Tier 2, Section 9.3.2 and Table 9.3.2-2 for details. In FSAR Tier 2, Section 9.3.2, sampling points R-40 and R-44 should be added to the NIV&D (primary effluents) entry in FSAR Table 9.3.2-1, and sampling point R-65 should be added to FSAR Table 9.3.2-2 for turbine building drains.
29. In light of the ramifications of the above item, along with the fact that FSAR Tier 2, Rev. 3, Sections 11.5.3 and 11.5.4 now includes additional systems, the applicant is requested to review and add systems to FSAR Tables 9.3.2-1 and 9.3.2-2 to ensure the inclusion of all process systems that have interfaces with contaminated systems, such as CCWS, SCWS, and ESWS. Moreover, the applicant is requested to review and revise the nomenclature of all listed systems in FSAR Tables 9.3.2-1 and 9.3.2-2 to ensure the use of consistent terminology. For example, is the system entry listed as "Closed Cooling Water System" a place holder for the CCWS or could it be interpreted to include all systems with that design characteristic, such as CCWS, SCWS, and ESWS? For systems that would be added to FSAR Tables 9.3.2-1 and 9.3.2-2, the applicant is requested to identify the corresponding monitoring or sampling points based on the information presented in FSAR Tier 2, Sections 11.5.3 and 11.5.4 and Table 11.5-1. The listing of applicable ITP tests presented in FSAR Tier 2, Table 11.5-1 should include Tests No. 153 for R-40 and none for R-44. A review of Test No. 153 indicates that the NID&V is not listed in the listing of identified systems in subsection 1.2 of the test objectives. The applicant is requested to review and confirm the applicability of Test No. 153 for the NIV&D (R-40 and R-44) since they are only sampling points with no instrumentation, and FSAR Tier 2, Table 11.5-1 does not present information that could be used as test acceptance criteria. Finally, the applicant should consider the applicability of Test No. 098 (Equipment and Floor Drainage System) as a relevant test for R-40 and R-44.
30. A review of FSAR Tier 2, Section 11.5.4.12 (Laundry Room and Decontamination System RMS) and Table 11.5-1 indicates that the system nomenclatures and reference to its FSAR section are internally inconsistent. Rather than an "n/a" entry for the ITP test for this system, the entry should explain (with a separate footnote) that the procurement, installation, operational checks, quality assurance, and calibration of this RMS are to be addressed by the COL applicant with information provided by the vendor of the system since this equipment is not a permanently

installed system. If not, the applicant is requested to include in FSAR Tier 2, Section 14.2.12, a test abstract for the Laundry Room and Decontamination System RMS.

31. A review of FSAR Tier 2, Section 11.5.4.13 (Solid Radwaste System RMS) and Table 11.5-1 indicates that the number of radiation detectors is inconsistent with the information presented in FSAR Section 11.4.2.2 and 11.4.2.3.2. The applicant is requested to confirm whether the system consists of an array of five or seven radiation detectors, with two other detectors performing separate functions. Note that FSAR Tier 2, Table 11.5-1 list eight radiation detectors. The information presented in FSAR Tier 2, Section 11.5.4.13 states that the system includes the means to collect samples, but FSAR Tier 2, Table 11.5-1 states that there are no provisions for in-process sampling. In FSAR Tier 2, Table 11.5-1, confirm that the reference to FSAR text for information should be FSAR Sections 11.4.2.3.2 and 11.4.2.2, but not Section 11.4.1.2.4 as shown. The listing of applicable ITP tests presented in FSAR Tier 2, Table 11.5-1 should include Test No. 144 for monitor R-43. The associated ITP test for this system should be explained with a separate footnote stating that the procurement, installation, operational checks, quality assurance, and calibration of this RMS are to be addressed by the COL applicant with the vendor of the system. If not, the applicant is requested to include in FSAR Tier 2, Section 14.2.12, a test abstract for the Solid Radwaste System RMS.
32. A review of FSAR Tier 2, Section 11.5.4.14 (Reactor Boron and Water Makeup System RMS) and Table 11.5-1 indicates that the location of sampling point R-45 is not described as to its placement in the system. The applicant is requested to specify the location of the sampling point by referencing to the appropriate subsections and figures in FSAR Tier 2, Section 9.3.4. The listing of applicable ITP tests presented in FSAR Tier 2, Table 11.5-1 for R-45 should include Tests No. 007 and 005 since the Reactor Boron and Water Makeup System is part of the CVCS.
33. A review of FSAR Tier 2, Section 11.5.4.15 (Turbine Building Drains and Vents System RMS) and Table 11.5-1 indicates that the system nomenclature is internally inconsistent. FSAR Tier 2, Table 11.5-1 refers to this system as the "Plant Drainage System." Given the description of the turbine building ventilation system in FSAR Tier 2, Section 9.4.4, all sources of airborne radioactivity are routed to the NABVS, which is monitored by its own set of radiation monitors. Accordingly, the applicant should confirm whether the inclusion of "vents" in the title of the "Turbine Building Drains and Vents System" is appropriate since monitor R-50 monitors only liquids in drains. If not, the applicant is requested to revise the listing of radiation monitors in FSAR Tier 2, Table 11.5-1 and identify those that will be used to monitor radioactivity in turbine building vents and revise FSAR Tier 2, Section 9.4.4 accordingly. The applicant is requested to confirm the type of check source using in checking the operability of monitor R-50, FSAR Tier 2, Section 11.5.4.15 states that it will be a portable check source, while FSAR Tier 2, Table 11.5-1 states that the check source is built-in into the monitor. The applicant is requested to specify the location of the sampling point by referencing the appropriate subsection from FSAR Section 10.4, given that FSAR Tier 2, Section 11.5.4.15 states that R-50 is located before the retention pond, but Figure 11.5-1 shows it after the retention pond. With respect to sampling provisions, the description should refer to FSAR Tier 2, Section 9.3.2 and Table 9.3.2-2 for details. In addition, the applicant should consider the applicability of Test No. 098 (Equipment and Floor Drainage System) as relevant for monitor R-50.

34. A review of FSAR Tier 2, Section 11.5.4.16 (Clean Drains System RMS) and Table 11.5-1 indicates that the sampling location is not identified for R-65 and it is not clear as to how this sampling point differs from that included with monitor R-50 given that both are used to monitor drains from the turbine building. The applicant is requested to specify the location of the sampling point by referencing to the appropriate subsection in FSAR Section 10.4. With respect to sampling provisions, the description should refer to FSAR Tier 2, Section 9.3.2 and Table 9.3.2-2 for details. In addition, the applicant should consider the applicability of Test No. 098 (Equipment and Floor Drainage System) as relevant for monitor R-65.
35. A review of FSAR Tier 2, Section 11.5.4.17 (CVCS-HP Coolers RMS) indicates that monitor R-64 initiates an automatic isolation of the CCWS train upon detecting high activity, but FSAR Tier 2, Table 11.5-1 indicates that R-64 has no such function. The applicant is requested to address this inconsistency and confirm the automatic isolation functions of monitors R-51 to R-54. A review of FSAR Tier 2, Section 9.2.2 indicates that the description identifies the functions of monitors R-53 and R-54 on the CCWS loops in the event of a leak from the CVCS. However, a review of FSAR Tier 2, Section 9.3.4 indicates that it does not include a description and functions of radiation monitors R-51 to 54 and R-64. In addition, FSAR Tier 2, Sections 9.2.2 does not identify the requirements of Part 20.1406 in its design bases and does not refer to supporting information on compliance with Part 20.1406 in FSAR Tier 2, Section 12.3.6.5.3 for the CCWS. The applicant is requested to address these inconsistencies among FSAR Tier 2, Sections 11.5.4, 9.2.2 and 9.3.4 and supporting tables and figures. In addition, the applicant should consider the applicability of Tests No. 046 (CCWS) and those for the CVCS for supporting information on testing pre-requisites and alarms and interlocks.
36. Based on a review of FSAR Tier 2, Section 11.5.4.17 (CVCS-HP RMS) and Table 11.5-1, the stated low end of the operational range for radiation monitor R-51 to R-54 indicates that it is found to be significantly less sensitive for Cs-137 when compared to other monitors with similar functions. The operational range for R-51 to R-54 is stated to range from 3.0E-05 to 3.0E+00 uCi/cc for Cs-137. The operational ranges for other similar liquid monitors vary from 1.0E-06 to 1.0E-03 uCi/cc for Cs-137. Regarding the low end of the range, it is not clear as to why monitors R-51 to R-54 should be 30 times less sensitive (3.0E-05/1.0E-06) than other monitors given that this is the last line of monitoring and opportunity in detecting the presence of radioactive materials in non-radioactive systems. The applicant is requested to review and address the inconsistencies in the stated low end of operational for such radiation detectors.
37. Based on a review of FSAR Tier 2, Section 11.5.4.18 (SCWS RMS) and Table 11.5-1 and FSAR Section 9.2.8 (SCWS), it is not clear as to why monitor R-64 is included in the safety evaluation of FSAR Tier 2, Section 9.2.8.4 since R-64 is used to monitor the presence of radioactivity in the CCWS. See information in FSAR Tier 2, Sections 9.2.2 and 11.5.4.17 and Table 11.5-1 and Figure 9.2.2-4. The applicant is requested to address this inconsistency and revise all appropriate FSAR sections, tables, and figures.
38. A review of FSAR Tier 2, Sections 11.2.1 and 11.2.1.2 indicates that the design of the LWMS is consistent with Regulatory Guide 1.143, but the associated revision of FSAR Tier 2, Section Table 3.2.2-1 does not reflect the assigned classification of RW-IIa. The applicant is requested to revise FSAR Tier 2, Section Table 3.2.2-1 (last column) and add the RW-IIa classification – see corresponding complete

entries made for GWMS in the same table. Note this comment also applies to the related entry for the SWMS in the same table, and the applicant is requested to correct that entry as part of this RAI.

39. A review of FSAR Tier 2, Section 11.2.3.8 indicates that the commitment to the stated guidance on quality assurance should be revised to read as "... the system constructor." and not as "... the system conductor."