

## ArevaEPRDCDocsPEm Resource

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**From:** Wunder, George  
**Sent:** Thursday, April 03, 2014 8:13 AM  
**To:** ArevaEPRDCDocsPEm Resource  
**Subject:** FW: U.S. EPR RAI FSAR Chapter 11 RAI 554, Question 11.02-27  
**Attachments:** RPAC Evaluation of Draft Response to RAI 554 Q11 2 27 March 14 2013 JCD ....docx  
  
**Importance:** High

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**From:** Clark, Phyllis  
**Sent:** Friday, February 28, 2014 9:49 AM  
**To:** [nathan.hottle@areva.com](mailto:nathan.hottle@areva.com); GUCWA Len (EXTERNAL AREVA)  
**Cc:** Wunder, George; Segala, John  
**Subject:** FW: U.S. EPR RAI FSAR Chapter 11 RAI 554, Question 11.02-27  
**Importance:** High

Hi Nathan and Len,

Tom wanted me to forward this email to you. We can discuss this further with the technical reviewers at the March 5<sup>th</sup> public meeting. Please let me know if you have any questions.

Thanks,

Phyllis

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**From:** Clark, Phyllis  
**Sent:** Friday, February 28, 2014 9:41 AM  
**To:** RYAN Tom (AREVA); HONMA George (EXTERNAL AREVA)  
**Subject:** FW: U.S. EPR RAI FSAR Chapter 11 RAI 554, Question 11.02-27  
**Importance:** High

Hi Tom and George,

The following email and attached document is what I was talking about. This was part of the work that was stopped on Chapter 11 and 12. Therefore, RAI 554, question 11.02-27 will still need to be addressed. The response may impact the Chapter 2 table. If possible, this should be one of the RAI's we talk about at the March 5<sup>th</sup> meeting. Please let me know if you have any questions. I hope this helps.

Thanks,

Phyllis

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**From:** Clark, Phyllis  
**Sent:** Thursday, March 28, 2013 11:06 AM  
**To:** WILLIFORD Dennis (AREVA)  
**Cc:** Snyder, Amy; Segala, John  
**Subject:** FW: U.S. EPR RAI FSAR Chapter 11 RAI 554, Question 11.02-27  
**Importance:** High

Dennis,

Correction, Attached are comments for the advance response to RAI 554, Question 11.02-27. Please review and address the issues and submit a revised response to RAI 554, Question 11.02-27. Let me know if you have any questions.

Thanks,

Phyllis

*P. Clark*

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**From:** Clark, Phyllis

**Sent:** Thursday, March 28, 2013 10:10 AM

**To:** WILLIFORD Dennis (AREVA)

**Cc:** Snyder, Amy; Segala, John

**Subject:** REF: U.S. EPR RAI FSAR Chapter 11 RAI 554, Question 11.02-27

**Importance:** High

Dennis,

Attached are comments for the draft response to RAI 554, Question 11.02-27. Please review and address the issues and submit a revised response to RAI 554, Question 11.02-27. Let me know if you have any questions.

Thanks,

Phyllis

*P. Clark*

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**Hearing Identifier:** AREVA\_EPR\_DC\_Docs\_Public  
**Email Number:** 142

**Mail Envelope Properties** (DAC719623E968245BD52D036961111000208F9598570)

**Subject:** FW: U.S. EPR RAI FSAR Chapter 11 RAI 554, Question 11.02-27  
**Sent Date:** 4/3/2014 8:12:56 AM  
**Received Date:** 4/3/2014 8:12:58 AM  
**From:** Wunder, George

**Created By:** George.Wunder@nrc.gov

**Recipients:**  
"ArevaEPRDCDocsPEm Resource" <ArevaEPRDCDocsPEm.Resource@nrc.gov>  
Tracking Status: None

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

Files	Size	Date & Time
MESSAGE	2653	4/3/2014 8:12:58 AM
RPAC Evaluation of Draft Response to RAI 554 Q11 2 27 March 14 2013 JCD ....docx		
36125		

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

Final Draft March 14, 2013  
**RPAC Staff Radiological Observations on Areva Draft Response  
to  
RAI 554, Question 11.02-27 on U.S. EPR DCD**

**A. Assignment of Reg. Guide 1.143 Classification to RWMS Components**

**1. Proposed Source Terms**

The applicant has provided nine new tables for insertion in FSAR section 12.2. The new tables present expected radionuclide inventories for the major components of the RWMS. The following presents a summary of the rad material inventories and whether the total inventories are greater than the criteria defined in RG 1.143.

Proposed FSAR Table	System Components	Total Invt. (Ci)	H-3 Only Invt. (Ci)	Ratios of A1 & A2	
				>A1 Ratio	>A2 Ratio
Table 12.2-24	Liquid waste storage tank	1.95E+02	6.92E+01	4.29E+00	8.76E+00
Table 12.2-25	Liquid waste evaporator	6.08E+02	8.90E+00	1.89E+01	3.50E+01
Table 12.2-26	Liquid waste concentrate tank	1.76E+03	3.40E+01	5.40E+01	1.01E+02
Table 12.2-27	Liquid waste monitoring tank	6.91E+01	6.90E+01	6.60E-02	6.73E-02
Table 12.2-28	Offgas purge circuit	2.16E+04	0.00E+00	9.89E+01	3.24E+02
Table 12.2-29	Offgas charcoal delay beds	3.53E+04	0.00E+00	1.66E+02	5.57E+02
Table 12.2-30	KPC concentrate buffer tank	3.93E+04	9.90E+00	1.06E+03	2.37E+03
Table 12.2-31	Waste resin tank	3.15E+05	1.50E+01	8.50E+03	1.90E+04
Table 12.2-32	SG blowdown demin. resin	3.23E+02	0.00E+00	1.04E+01	1.90E+01
Sums		4.14E+05	2.06E+02	9.91E+03	2.24E+04

The results indicate that, except for the liquid waste monitoring tanks, all other identified components are characterized by radioactive material inventories that exceed A1 and A2 values of Part 71, App. A, Table A-1. Since these ratios are greater than unity, the inventory would require a RW-IIa classification for these components, given the classification system of RG 1.143. Similarly, the inventories would result in occupational doses exceeding the 5 rem criterion should these components fail and result in unmitigated radiation exposure to workers. The low inventory for the liquid waste monitoring tank is expected since such tanks contain treated liquid radwaste that would be ready to be released as liquid effluents in compliance with Part 20, App. B, Table 2 ECLs, given appropriate in-plant dilution.

Except for the SG blowdown demineralizer resins, the results are consistent with the safety classification assigned to the RWPB housing the LWMS, GWMS, and SWMS, as described in U.S. EPR DCD FSAR Rev. 4, Sections 11.2, 11.3, and 11.4. Based on FSAR Rev. 4, Section 3.2.1 and Table 3.2.2-1 Footnote 16 nomenclature, RS (radwaste seismic) corresponds to RW-IIa; and CS (conventional seismic) covers both RW-IIb or RW-IIc classifications. The DCD's classification system is also listed in FSAR Rev. 4, Table 3.2.2-1 – see Sheet 158 for the RWPB; Sheet 134 for the SWMS; Sheet 135 for the LWMS; and Sheet 136 for the GWMS. These SSCs are classified as the equivalent of RW-IIa.

The next subsections provide more details about the acceptability of this information and its use in classifying RWMS using the RG 1.143 classification system.

## 2. Steam Generator Blowdown Demineralizer System

For the SG blowdown demineralizer system, FSAR Rev. 4, Table 3.2.2-1, Sheet 156, the SSCs are classified as CS, which is equivalent to RW-IIb and RW-IIc. However, FSAR Rev. 4, Sections 10.4.8 and 12.2 did not initially present the basis for this classification. The SG blowdown demineralizer is located in the Nuclear Auxiliary Building, which is classified as Seismic Cat II structure and as RS or RW-IIa as indicated in FSAR Interim Rev. 5, Table 3.2.2-1, Sheet 159 and also consistent with that of FSAR Rev. 4, Table 3.2.2-1, Sheet 158. In the RAI response, Areva provided an estimate the potential inventory of radioactive materials, see FSAR Interim Rev. 5, Table 12.2-32 and Fig. 10.4.8-2 (sheet 3), which includes only the mixed-bed ion exchanger. Upon checking this inventory against RG 1.143 criteria, it was determined that the total activity would place the SGBD demineralizer system into a RW-IIa classification since both A1 and A2 ratios are greater than unity, which is due to Cs-137 and Cs-134 with a combined activity of 292 Ci. The total radioiodine inventory is just about 24 Ci and just in excess of the A2 values at a ratio of 1.02. If one ignores the I-131 data, the applicant needs to explain why such a high Cs inventory is projected for SG blowdown demineralizer spent resins. For comparison, the total Cs-137 and Cs-134 inventory is expected to be about 460 Ci for the liquid radwaste evaporator source term.

The proposed revision to FSAR Rev. 5, Section 10.4.8.1 should be more specific than just stating that the design is consistent with Reg. Position C.5 of RG 1.143 as it should state the type of classification that is assigned to this system in its design basis. As written, the response commits to RG 1.143, Reg. Position C.5, but the information and basis of the source term are incomplete given the classification system described in the response seems to apply only to the mix bed demineralizer and omits the inventory contained in the cation demineralizer, see Fig. 10.4.8-2 (Sheet 2). The staff concludes that the estimated inventory of radioactive materials is incomplete.

Areva has included a proposed revision of FSAR, Interim Rev. 5, Fig. 10.4.8-2 (sheet 3), but the revision is confusing since it refers to both RS (RW-IIa) and non-seismic without noting how each applies to the portions of the depicted system. For example, FSAR, Rev. 4, Fig. 10.4.8-2 (sheet 2) shows a cation demineralizer with a non-seismic classification assigned to it, but FSAR Section 3.2.1.4 states that RW-IIb and RW-IIc classifications would be labeled as "CS" (conventional seismic). Therefore, it is confusing as to why Fig. 10.4.8-2 does not include "CS" but instead contains "NSC" (non-seismic classification).

From the information presented in FSAR Interim Rev. 5, Table 12.2-32 and a review of the system description given in FSAR Rev. 4, Section 10.4.8.2, the assumed resin volume of 3.06 m<sup>3</sup> is not supported by the design basis. The footnote in FSAR Interim Rev. 5, Table 12.2-32 should state whether the assumed activity is decay corrected or reflects the highest expected inventory without decay correction.

The response provided for the SG blowdown demineralizer system is not acceptable.

## 3. Liquid Waste Management System

For the LWMS, Areva proposes FSAR Interim Rev. 5, Table 3.2.2-1, Sheets 135 and 136, by adding the RG 1.143 designation in the commercial code column for consistency with the reg. guide and design commitment described in FSAR Tier 2, Rev. 4, Section 11.2. The proposed revision classifies the monitoring tanks and discharge pumps as RW-IIc, given the information presented in FSAR, Interim Rev. 5, Table 12.2-27. Information on other source terms is provided in FSAR, Interim Rev. 5, Table 12.2-24 for liquid waste storage tank, Table 12.2-25 for

the liquid waste evaporator, and Table 12.2-26 for the liquid waste concentrate tank. All other major components are classified as RS or RW-IIa. Areva includes a proposed revision of FSAR, Interim Rev. 5, Fig. 11.2-1 in delineating the RS (RW-IIa) and CS (RW-IIb and RW-IIc) and how each applies to the depicted system.

The delineation was found to be consistent with the proposed revision of FSAR Interim Rev. 5, Table 3.2.2-1 but inconsistent with other system entries in that table. For example, for the SWMS, as described in the proposed revision to FSAR Tier 2, Table 3.2.2-1 (sheet 134), the entry for "All other equipment" is assigned the "RG 1.143, RW-IIa" classification in the commercial code column. However, a review of the parallel classifications for the LWMS and GWMS indicates that a similar classification for "All other equipment" is not included in the proposed revision. Moreover, it is not clear as to how this information would be conveyed in the corresponding figures of the LWMS, GWMS, and SWMS in noting the seismic classification in the design area of each system. The applicant should confirm that the assignment of seismic classifications is presented consistently in FSAR Tier 2, Table 3.2.2-1 and among design areas given in FSAR Figures 11.2, 11.3, and 11.4.

From the information presented in FSAR Interim Rev. 5, Tables 12.2-24 to 12.2-27, the footnotes in the proposed tables should state whether the assumed activity is decay corrected or reflects the highest expected inventory without decay correction. Based on a review of the system description given in FSAR Rev. 4, Section 11.2.2, the assumed evaporator volume of 9 m<sup>3</sup> is not supported by the design basis presented in FSAR Rev. 4, Table 11.2-2. FSAR Rev. 4, Table 11.2-2 indicates an evaporator volume of approximately 15 m<sup>3</sup>. This is inconsistent with the evaporator volume of 9 m<sup>3</sup> provided in the proposed Rev. 5 markups to this RAI response and FSAR Rev. 4, Table 12.3-1, which indicates that the evaporator source term was modeled with a yet different assumed volume. Therefore, the FSAR applies three different volumes for the evaporator. The applicant should review the information presented in FSAR Chapter 11 and 12 and assign a consistent value for the volume of the evaporator. The applicant should review and confirm that this type of discrepancy is not replicated elsewhere in the response for the other systems.

The proposed revisions are deemed not acceptable.

#### **4. Solid Waste Management System**

For the SWMS, Areva proposes FSAR Interim Rev. 5, Table 3.2.2-1, Sheets 134 and 135, by adding the RG 1.143 designation in the commercial code column for consistency with the reg. guide and design commitment described in FSAR Tier 2, Rev. 4, Section 11.4. All major components are classified as RS or RW-IIa, given the information presented in FSAR Interim Rev. 5, Tables 12.2-30 and 12.2-31. However, Areva did not include a proposed revision of FSAR, Interim Rev. 5, Fig. 11.4-2 for the purpose of describing how the RS (RW-IIa) and CS (RW-IIb and RW-IIc) classification would be applied to all or portions of the depicted system and consistent with the proposed revision of FSAR interim Rev. 5, Table 3.2.2-1.

From the information presented in FSAR Interim Rev. 5, Tables 12.2-30 and 12.2-31 and a review of the system description given in FSAR Rev. 4, Section 11.4.2, the assumed waste concentrate and resin volumes of 10 and 15 m<sup>3</sup> are not supported by the design basis. The footnote in both proposed tables should state whether the assumed activity is decay corrected or reflects the highest expected inventory without decay correction.

The proposed revisions are deemed not acceptable.

## **5. Gaseous Waste Management System**

For the GWMS, Areva proposes to revise FSAR Rev. 4, Table 3.2.2-1, Sheet 136 by adding the RG 1.143 designation in the commercial code column for consistency with the reg. guide and design commitment described in FSAR Tier 2, Rev. 4, Section 11.3. All other major components are classified as RS or RW-IIa, given the information presented in FSAR Interim Rev. 5, Tables 12.2-28 and 12.2-29. However, Areva did not include a proposed revision of FSAR, Interim Rev. 5, Figure 11.3-1 for the purpose of describing how the RS (RW-IIa) and CS (RW-IIb and RW-IIc) classification would be applied to all or portions of the depicted system. Areva should confirm that the seismic classifications shown in FSAR, Rev. 4, Figure 11.3-1 are still consistent with the proposed revision of FSAR interim Rev. 5, Table 3.2.2-1.

From the information presented in FSAR Interim Rev. 5, Tables 12.2-28 and 12.2-29 and a review of the system description given in FSAR Rev. 4, Section 11.3.2 and Tables 11.3-1 and 11.3-2, the assumed source volume of 290 and 14.25 m<sup>3</sup> are not supported by the design basis. The footnote in both proposed tables should state whether the assumed activity is decay corrected or reflects the highest expected inventory without decay correction.

The proposed revisions are deemed not acceptable.

## **6. CVCS and Boric Acid Storage Tank and GWP Interface**

For the CVCS and GWP systems interfaces, Areva proposes to revise FSAR Rev. 4, Table 3.2.2-1, Sheet 69, by adding the RG 1.143 designation for the boric acid storage tanks and connections to GWPS isolation valves. The valves are located in the Fuel Building, which is a seismic category I structure, as noted in FSAR Rev. 4, Table 3.2.2-1, Sheet 158. FSAR, Rev. 4, Fig. 9.3.4-4 (Sheet 2) shows the RS (RW-IIa) classification to that portion of the vent system. The proposed revision seems inconsistent since the vent line, via a T-connection, also connects to a drain line, which is classified as non-seismic in FSAR, Rev. 4, Fig. 9.3.4-4 (Sheet 2). The proposed revision to FSAR Rev. 4 Section 9.3.4 should be more specific than just stating that the design is consistent with Reg. Position C.5 of RG 1.143.

The proposed revisions are deemed not acceptable.

## **7. FSAR Section 12.2.1 - Contained Sources**

For the revised source term provided in FSAR Tier 2, Table 12.2-15, the applicant does not explain why the source term has been changed in the proposed revision. The applicant needs to explain why the source term is changing.

The source term for the evaporator has changed several times since Revision 3 of the FSAR. In Revision 3, the source term was based on three months of operation and the total source term energy flux was estimated to be 3.88e+14 MeV/sec. It was then stated that administrative limits would be applied, resulting in a revised the source term of 1.84e+12 MeV/sec. After several joint discussions with staff, the applicant deemed that applying administrative limits was problematic and it was stated during a joint conference call that the approach would no longer base the source terms on administrative limits (response to RAI 539 (ML12031A065) in which it is expected that the applicant will remove the administrative limits has not yet been submitted to the NRC). However, the proposed revision now lists a total source energy of 1.71e+13 MeV/sec, based on 160 days of operation. The applicant needs to explain why the source term for the evaporator, assuming 160 days of operation, is significantly lower than when it was

based on 3 months of operation. In the information presented in FSAR Chapter 12.2, the source terms should be based on an assumed 0.25 percent failed fuel and provide the maximum source term expected at that failed fuel rate without the use of mitigating procedures in lowering the source term. The applicant should provide sufficient clarification to explain the change.

The applicant should ensure that consistent assumptions are used throughout the development of the various source terms, as energy spectra and by radionuclide inventories, and justify and explain differences as warranted. For example, FSAR Table 12.2-16 states that the concentrate tank source term is based on a tank volume of 36 cubic meters, but FSAR Table 12.2-26 states the source term for the concentrate tanks is based on 34 cubic meters.

Also, the applicant needs to ensure that the source term (as additions/changes) proposed in FSAR Section 12.2 (and with that already provided in Section 12.2) are consistent with information provided throughout the FSAR. For example, process component volumes provided in FSAR Chapters 11 and 12 must be consistent with the volumes used to calculate the source terms described in Chapter 12. Where discrepancies within the FSAR exist, appropriate FSAR changes should be made, unless justified by specific assumptions.

Finally, FSAR Tier 2, Section 12.2.1.11 lists the steam generator blowdown demineralizer as part of the solid waste management system. It doesn't seem appropriate to list this under the SWMS given that it is described in FSAR Tier 2, Section 10.4.8.2.

The proposed revisions are deemed not acceptable.

## **8. Conclusions**

The applicant is requested to review and address the above issues and submit a revised response to RAI 554, Question 11.02-27.