RAI 4-1

Provide updated release and leak rate calculations under NCT and HAC for the new ATRIUM 11 fuel design which show the design will meet leak rate regulation requirements.

In Section 4.1.1 of the application, the applicant states that the fuel is leak tested to demonstrate that it is leak tight to 1x10-7 cm3/s. However, following one of the drop tests, fuel rods were leak tested and shown to have a leak rate of 5.5 x10-6 cm3/s, which is not leak tight. The applicant did not update the containment chapter to reflect the new ATRIUM 11 fuel design proposed in this amendment so the current release and leak rate calculations provided in Section 4.2.2 of the application are for the previously approved 10x10 fuel design. The applicant should provide updated release and leak rate calculations for NCT and HAC for the new ATRIUM 11 fuel design. Standard review plan guidance NUREG-1609 suggests that ANSI N14.5 provides an acceptable method to determine the maximum permissible volumetric leakage rates based on the allowed regulatory release rates under both normal conditions of transport and HACs.

This information is needed to determine compliance with 71.51(a) and (b).

AREVA Response

This response is divided into sections. The first section will detail the changes to the SAR made in response to this RAI. The second section will provide additional details as to how the changes address the RAI.

Section 1: The following revisions to the SAR were made in response to this RAI:

<u>Section 4.1.1 “Containment Boundary”</u>

This section was revised to better define the containment boundary. A summary of the changes are:

- Specifically the containment boundary is stated to be the zirconium cladding and the end caps which are welded to the cladding.
- A reference to figure 1-6 “Example Fuel Rod (Primary Containment) was added to provide a visual reference of the containment system.
- The section explicitly states that the fuel rods are manufactured under a Quality Assurance Program meeting the requirements of 10 CFR 71 subpart H. It additionally specifies that welds of the fuel rod end caps to the cladding are conducted under a qualified process and verified for integrity by such means as X-ray inspection, ultrasonic testing, or process control.
- The integrity of the closure welds for the fuel rods are periodically assessed using burst testing. This testing is performed in accordance with guidance provided in a national consensus standard specification for seamless zirconium tubes for fuel rod cladding (ASTM B811 13. Standard Specification for Wrought Zirconium Alloy Seamless Tubes for Nuclear Reactor Fuel Cladding, Annex A.1).
- The last sentence of this section was revised to clarify that the fuel rod is leak tested after fabrication.

<u>Section 4.2.2 Type B Packages</u>

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This section was revised to update the value of A_2 so that it is consistent with the A_2 value shown in Table 1-4 "Isotopes and A2 Fractions", which was revised as a part of revision 4 to the SAR for incorporation of the ATRIUM 11 fuel assembly. Additionally the values used to calculate the specific activity of fuel material (7.89 Ci and 562kg UO2) were updated to be consistent with Table 1-3 "Type B Quantity of Radioactive Material"

<u>Section 4.4 Containment Under For Hypothetical Accident Conditions (Type B Packages)</u>

The values updated in section 4.2.2 were updated in this section as well.

A conservative assumption was made in this section that the leak rate determined following the drop test would increase proportionally to the increased number of fuel rods in the ATRIUM 11 fuel assembly.

Based upon the updated values and the additional conservative assumption leak rate on a weekly basis was computed and the needed values updated.

Section 2: Additional details as to how the changes address the RAI.

The key element of the RAI is as follows: "The applicant did not update the containment chapter to reflect the new ATRIUM 11 fuel design proposed in this amendment so the current release and leak rate calculations provided in Section 4.2.2 of the application are for the previously approved 10x10 fuel design."

Section 4.4 provides the details as to leak rate calculation was performed. The leak rate used, 5.5×10^{-6} cm^3/s was used in these calculations because this was the leak rate measured following the drop test of the Certification Test Units (CTU's) discussed in section 2.12.1 "Certification Test", which starts on page 121 of the SAR. This leak rate is shown in Table 2-11 "Testing Summary" on page 125.

The leak rate determined by the drop test was determined to be appropriate to be used given that container drop analyses performed (Reference FS1-0025122) showed reasonable agreement with actual drop tests and that there would not be a breach of the containment boundary. As the reviewer notes however the CTU's were of the previously approved 10x10 design. The CTU had 91 fuel rods while the ATRIUM 11 has 112 fuel rods. As a result a conservative assumption was made that the amount released would increase proportionately to the number of fuel rods.

Additionally for the leak rate calculation in section 4.4 the revised A_2 fraction, shown in Table 1-4 "Isotopes and A2 Fractions" was used. The ATRIUM 11 fuel assembly weight of 281 kg, shown in Table 1-2 "Quantity of Radioactive Materials (Type A and Type B)" was used as well. To summarize then the following changes were made to leak rate calculation to incorporate the ATRIUM 11 fuel assembly:

- The leak rate was conservatively increased proportional to the increased number of fuel rods in the assembly.
- The A_2 fraction was updated.

- The weight of the ATRIUM 11 fuel assembly was used.

Based upon the items discussed above AREVA believes that the leak rate show in section 4.4 correctly incorporates the ATRIUM 11 fuel assembly and demonstrates compliance with 71.51(a) and (b).