

## Allen, William

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**From:** Michael.Conroy@dot.gov  
**Sent:** Friday, February 07, 2014 12:41 PM  
**To:** Allen, William  
**Subject:** FW: Proposed Teleconference on TN-BGC1 Questions with US DOT and NRC

Chris – see message below:

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**From:** DOUAUD Olivier (AREVA) [<mailto:olivier.douaud@areva.com>]  
**Sent:** Friday, February 07, 2014 12:07 PM  
**To:** Conroy, Michael (PHMSA)  
**Cc:** BOUYER Emilie (AREVA); KERR Benjamin (AREVA); MALHAIRE Jean-Francois (AREVA); LE BLEVENNEC Renaud (AREVA); KALIFA Marion (AREVA)  
**Subject:** RE: Proposed Teleconference on TN-BGC1 Questions with US DOT and NRC

Hello,

Please find hereafter our draft RAI responses for the further teleconference.

### Criticality review

#### *RAI 1*

We propose to prohibit the reprocessed uranium under content n°11 of the US validation.

#### *RAI 2*

You will find benchmarking informations about APOLLO 2 MORET 4 code in the different chapter 8 attachments:

- Attachment 1, para. 7, p. 42
- Attachment 8, para. 9, p. 20
- Attachment 12, para. 12, p. 14

#### *RAI 3*

1. For the usual French criticality safety criteria, we confirm that 19.5 kg is the intended payload for the content 11b (cf. §7.16 in attachment 10). However, to meet your criteria, we could lower this mass, which is limited, for the American transports by the limit mass for air transport.
2. In chapter 8 attachment 10, criticality safety analyses are made using CH2 instead of water as moderator. The optimum moderation was calculated. So, following this calculations model, all the hydrogenous materials can be loaded in the contents 11a to 11c.
3. Fire tests have been performed on this resin. It has been observed that the resin become friable on a maximal 4 mm thickness and is damaged on a total maximal 15 mm thickness. As there is a minimal 48 mm thickness, the resin remains undamaged on a minimal 33 mm thickness. Moreover, even though the resin becomes friable on a small thickness, without external load, the resin remains in place, attached to the inner wall.
4. cf. 3.
5. To meet your criterion, we will carry out more investigation to determinate a maximal uranium mass and/or another CSI.

6. For the contents 11c, 11f and 11h, the criticality safety analyses are performed searching for the optimum moderation, by varying uranium or moderator mass. Moreover, the criticality safety is maintained by the geometry. Therefore, there is no criticality safety criterion on uranium maximal mass (chapter 8). But there is a mechanical criterion on the content maximal mass, which induces a maximal uranium mass in the content. There is also no inconsistency between this two tables.

*RAI 4*

Please find enclosed the translated version of this note.

### **Shielding review**

*RAI 1*

We propose to prohibit the reprocessed uranium under content n°11 of the US validation

### **Materials review**

*RAI 1*

We propose to explicit this maximal polymer mass of 500 g under content n°11 of the US validation for non air transport. (thermolysis criterion).

*RAI 2*

At ambient temperatures, the PVC radiolytic efficiency is indeed equal to 0.7 where the polyethylene one is equal to 4.1.

However, as the activation energy for the PVC is equal to  $3.39 \times 10^4$  J/mol and the one for the polyethylene is equal to  $3.34 \times 10^3$  J/mol, at 144°C, PVC radiolytic efficiency is equal to 43.72 and the polyethylene one is equal to 6.16.

About the thermolysis analysis, the calculation is performed with values from the note SAND79-1245 "Gas generation from transuranic waste degradation: data summary and interpretation" and extrapolated to 144 °C with the Murphy 's Law.

*RAI 3*

We propose to prohibit uranium-zirconium alloy to be shipped as powder under content n°11 of the US validation.

*RAI 4*

The temperatures taking in account in the radiolysis and thermolysis analyses are the conservative values for the containment vessel in NCT (cf. chapter 5 para. 7.2.1 of the SAR) and in HAC (cf. chapter 5 para. 8.3.1 of the SAR) for zero power contents.

Moreover, add material like plastic covers into the containment vessel will not change these results as:

- There is no internal power in this content.
- In NCT, the thermal flow between the external package layer and the containment vessel is not influenced by the presence or no of the covers.
- In HAC, the add of materials will heighten the heat specific capacity of the containment vessel and also lower its temperature.

Regards,

Olivier Douaud  
Design Manager