

## **Einzigler, Robert**

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**From:** Einzigler, Robert  
**Sent:** Wednesday, August 11, 2010 9:55 AM  
**To:** Cook, John  
**Cc:** Einzigler, Robert; Bjorkman, Gordon; Bajwa, Chris; Lorson, Raymond; Weaver, Doug; Pstrak, David; Regan, Christopher; Easton, Earl  
**Subject:** RE: Sandia project  
**Attachments:** comments on latest Sandia Draft.doc

John,

I do not care whether this report shows that we are safer or not as safe as reported in NUREG-6672. The answer is what it is. I think some of my comments might even lower the release fractions. I am concerned that the report be internally consistent, correct to the extent possible, and useful for some extended period of time. I am not sure all these goals are met. I am not sure whether that occurred because Sandia didn't have the task clear in their minds or just didn't execute it properly.

I saw nothing about evaluation of high burnup releases so I have to assume that per our agreement that there were other more pressing issues with the report that ate up the reserve funding. Just for the record, I am stating again that without considering high burnup fuel, this is a sterile and misleading report.

I have attached a list of comments on the current draft. Main issues come down to: inconsistencies, use of values that were not justified, use of values directly out of NUREG-6672 instead of correcting the values in 6672. I was under the impression that one of the reason for this report was to update 6672 and take out the errors. Therefore just lifting values from 6672 is inappropriate.

I think part of the problem was that Ruth was given a task outside her realm of expertise. I had two weeklong sessions with Ruth, whom I have a lot of respect for, but the gists of our discussions are not reflected in the breathe or accuracy of this report. Ruth did inform me, when I questioned the temperatures that were used that she did not have thermal support.

I did not review any of the properties of the materials being used as it was out of the scope of just looking at the release fractions, but you should make sure that ORNL reviews these properties.

I do not know how you want to handle these comments and comments that you might receive from other reviewers. I see two paths forward:

- 1) Have Sandia have another crack at fixing the report then start the review process again
- 2) Have the meeting with SNL/ORNL/NRC on Sept 22 with the purpose of discussing comments with ORNL/Sandia and getting some agreement with both parties on changes that have to be made, and points to look for in the external review.

In either cases I think that most of the points I have made in the attachment have to be addressed before this report is released.

I have sent a copy of the attachment to Ruth.

RE Einzigler

Information in this record was deleted in  
accordance with the Freedom of Information Act.  
Exemption 6  
FOIA/PA 2012-0317

**From:** Cook, John  
**Sent:** Wednesday, August 11, 2010 9:11 AM  
**To:** Einzigler, Robert  
**Subject:** RE: Sandia project

Too hectic today - will try tomorrow.

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**From:** Einziger, Robert  
**Sent:** Wednesday, August 11, 2010 7:37 AM  
**To:** Cook, John  
**Subject:** RE: Sandia project

Ok, meanwhile I am writing up some of my concerns

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**From:** Cook, John  
**Sent:** Wednesday, August 11, 2010 7:34 AM  
**To:** Einziger, Robert  
**Subject:** RE: Sandia project

(b)(6) so I won't be in the office. I'll try to call you mid-morning.

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**From:** Einziger, Robert  
**Sent:** Tuesday, August 10, 2010 4:16 PM  
**To:** Cook, John  
**Subject:** RE: Sandia project

Okay in the AM

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**From:** Cook, John  
**Sent:** Tuesday, August 10, 2010 2:40 PM  
**To:** Einziger, Robert  
**Subject:** RE: Sandia project

Bob-

OK, let's discuss tomorrow. But if we can't find a path forward to resolve your comments, there may not be a NRC/SNL/ORNL meeting. Thanks.

-John

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**From:** Einziger, Robert  
**Sent:** Tuesday, August 10, 2010 2:15 PM  
**To:** Cook, John  
**Cc:** Einziger, Robert  
**Subject:** Sandia project

John,

I have significant problems with the report. I will send you comment tomorrow

Heard the NRC/SNL/ORNL has been put off until Sept 22

Word has it that SNL did not do a technical review, just an editorial review.

Will send more tomorrow.

Thanks

REE

- 1- To be relevant, the abstract needs to tell the parameters of the fuel, and the casks being studied. I.e. fuel type, BU, cask pressure etc.
- 2- Same comment as #1 for the "Public Summary"
- 3- Last paragraph of Sec 1.1 indicates the study is for LBU fuel, but in fact the section on release fractions is a muddling of HBU and LBU phenomena.
- 4- 1<sup>st</sup> paragraph Section 3.6 - If the fuel is modeled as a total mass and not individual rods, how can they tell how many rods in the cask would fail and the number of locations they would fail at. Does this analysis take into account the temperature gradient in the fuel? Does the analysis account for the fact that some of the fuel may stay in the cask for a very long time, and the temperature of the cladding during transportation may be below the ductile/brittle temperature transition in some locations, especially for higher burnup fuel?
- 5- Bottom of page 61. – refers to the strains being less than half the 4% strain capacities indicated in Sanders (1992). This strain capacity was a guess and should not be relied up. This section should have some discussion of the present day thinking of what the strain limit should be.
- 6- Table-III-5. Why weren't the values for irradiated Zircaloy, in Geelhood and Beyer, which at least for low burnup fuel been recommended by NRC, been used instead of the properties of unirradiated Zircaloy-4 in this table?
- 7- Section V.5.3 – 1<sup>st</sup> paragraph – indicates that larger particles are filtered by even larger particles within the cask. This is not true. This type of filtering only takes place with the rod it affects the rod –to-cask releases not the cask –to-atmosphere release as implied.
- 8- Section V.5.4.1 – 2<sup>nd</sup> to last bullet of page 465 - Why wasn't the activity of the Co-60 decayed for the 9 years in storage. Crud inventories are quoted at the time of removal from the reactor.
- 9- Section V.5.4.1 – last bullet of page 465 - Why was the whole mass of the Crud converted into Co-60 activity. The preponderance of the mass for BWR Crud is  $\text{Fe}_2\text{O}_3$  This results in an excessively high Co-60 activity
- 10- Page 466, 1<sup>st</sup> line – state what the conservative assumptions are (breakup of crud flakes), and how they affect the airborne fraction.
- 11- Page 466, last sentence of paragraph under Eq. V-6 – This statement is wrong. There will be a driving force from the cask pressurization and a heat up of this gas due to the decay heat of the fuel.
- 12- Page 466 – Eq V-7 – The internal temperature used is incorrect. The temperature used should not be the temperature of the seals during the fire but rather the average temperature of the gas in the cask, which is heated due to both the fire and decay heat of the fuel. Due to the time lags I am not sure whether this temperature will be higher or lower than the seal temperature. It should have been calculated.
- 13- Page 468, 1<sup>st</sup> full line- what does "relatively high burnup fuel" mean?
- 14- Page 468, The section from the middle of the paragraph above Fig. V-6 to the end of the paragraph below V-6 including Fig.V-6 should be removed. This release fraction treatment deals with fuels with burnups below 45 GWd/MTU yet this verbiage deals with fuel characteristics of HBU fuel. HBU fuel should be treated separate calculations. In addition while an opinion by Hansen is stated on the behavior of the rim, there is equally compelling information for other positions.
- 15- Page 468, last paragraph – Hansen gives a range of release rates from  $1 \times 10^{-6}$  to  $2 \times 10^{-5}$ . This incorporates the value used in the calculation of  $4.8 \times 10^{-6}$  but there is no reason to pick the value chosen. These release fractions are somewhat lower than the value by Einziger  $3 \times 10^{-5}$  but this is to be expected since: 1) Hansen's test samples showed very little fuel cracking, and 2) Hansen's values do not account for the fuel that will be released upon initial impact and fracture of the cladding, it only accounts for

particulate that would be released because it was entrained in the rod depressurization stream.

16- Table V-19, this table gives the release fractions and the source of the release fractions.

- i) The  $F_{CE}$  for the particles and volatiles is only the (1-f) factor and does not include the depressurization factors; interestingly the (1-f) were from NUREG-6672 and derived for the case of a cask pressurized to 5 atmospheres not the one atmosphere used in this calculation. The report needs to be consistent. If the cask is being depressurized 1 atmosphere then justification is needed for using 5 atmosphere data.
- ii)  $F_{RC}$  is only for a LBU rod that has not fractured additionally during the impact releasing additional gas. For LBU the gas release of fractured fuel has been estimated to be ~12%. It could be as high as 40% for HBU
- iii)  $F_{CE}$  for gas is inconsistent with the text that says the depressurization was 2/3
- iv) A range of values should be used for  $F_{RC}$  for particulates.