BellBendCOLPEm Resource

From: Clark, Theresa
Sent: Thursday, July 02, 2009 5:53 PM
To: 'Miron, Adrian (mironan)'
Cc: Mcdowell, Bruce K; Rishel, Jeremy P; Tom Grant; BellBendCOL Resource; 'Ramsdell, James V Jr (Van)'; Fuller, Edward
Subject: RE: three questions

Adrian, please clarify the source of each of the values in the first paragraph. If they all came from the Calvert DEIS, I suggest that you discuss them with Jeremy and Van at PNL, because they probably know more about their background. I don't know where the 5E-8 "basemat melt-through probability" came from. In addition, the term "CDF for basemat melt-through" is incorrect--what we are discussing is containment release following a severe accident, not core damage. Because of the design features designed to keep corium contained and cooled in the spreading area, I would expect an small probability of basemat melt-through. Combined with the appropriate bins of core damage frequency for the plant, that would yield a large release frequency associated with the basemat pathway. The relevant release categories are RC601 and RC602, and the BB ER shows a release category frequency for RC602 of 3.61E-10, so this may be the source of the 4E-10 number referred to erroneously as a CDF.

In addition, this is the subject of RAI ACC 7.2-4, which has not yet been sent to the applicant. We need their response to come to a conclusion.

I will look at your other questions in more detail on Monday. Are you available for a teleconference with me and Ed Fuller (the Level 2 reviewer) and maybe Van Ramsdell on Monday afternoon (7/6/09), maybe at 3pm? Please let me know ASAP. Thanks.

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From: Miron, Adrian (mironan) [mailto:mironan@ucmail.uc.edu]
Sent: Thursday, July 02, 2009 5:36 PM
To: Clark, Theresa
Cc: Mcdowell, Bruce K; Rishel, Jeremy P; Tom Grant
Subject: three questions

Theresa:

My current version of Section 5.10 of the BB DEIS includes the following paragraphs.

"Table 5-15 gives a total core damage frequency estimate of 5.3×10^{-7} Ryr^{-1} for the U.S. EPR. NUREG-1150 indicates that the conditional probability of a basemat melt-through ranges from 0.05 to 0.25 for current-generation reactors. New designs include features to reduce the probability of basemat melt-through in the event of a core melt accident. On this basis, the staff believes that a basemat melt-through probability of 5×10^{-8} Ryr^{-1} is reasonable and still conservative. According to the AREVA probabilistic risk assessment for the U.S. EPR (AREVA 2007a), currently being evaluated for design certification by the NRC, the CDF for basemat melt-through with a large release is about 4×10^{-10} Ryr^{-1}.

Although the staff assumed that the probability of occurrence of a release via the groundwater pathway is significantly larger than a release via the atmospheric pathway for the U.S. EPR, the groundwater pathway is more tortuous and affords more time for implementing protective actions and, therefore, results in a lower risk to the public. As a result, the staff concludes that the risks associated with releases to groundwater are sufficiently small that they would not have a significant effect on overall risk of a severe accident for a U.S. EPR at the Bell Bend site."

These paragraphs were adapted from Calvert Cliffs DEIS and PNNL EIS template. I have three questions:

1. In my opinion, the basemat melt-through probability of 5×10^{-8} Ryr^{-1} mentioned in the second paragraph results from application of Bayes theorem in which P(A|B)=P(A) x P(B|A) / P(B). If we take A = a basemat melt-through event and B = a core damage event, P(A|B) becomes the conditional probability of 0.05 to 0.25, and P(B) becomes the CDF of 5.3×10^{-7} Ryr^{-1}, both referred in the first paragraph. Then P(A), or the basemat melt-through probability, is P(A)=P(B) x P(A|B) / P(B|A). I also assume that P(B|A) is 1 since it refers to the probability of core damage, given that basemat melt-through occurred, and therefore, P(A)=P(B) x P(A|B) in this case. I also think that a value around 0.1, which is in between 0.05 and 0.25, was assumed by the NRC for P(A|B). In this case P(A)=P(B) x P(A|B)= 5.3×10^{-7} Ryr^{-1} x 0.1 = 5×10^{-8} Ryr^{-1}, as stated in the text. Are my assumptions correct?

2. I could not find in the US EPR FSAR the 4×10^{-10} Ryr^{-1} value which represents the CDF for a basemat melt-through. This value is mentioned at the end of the first paragraph above. There is a release category (RC602 described as long term containment failure due to basemat failure) with a Release Category Frequency of 3.61E-10. Are those the same? If not, do you have a reference for the 4×10^{-10} Ryr^{-1} value and the section where I could find it in FSAR?

3. The second paragraph quoted above states that "the staff assumed that the probability of occurrence of a release via the groundwater pathway is significantly larger than a release via the atmospheric pathway for the U.S. EPR." Is that true? As far as I recall from the site audit, no quantitative study for the groundwater pathway was performed for the US EPR. Do you know of any study performed by NRC or someone else to back up this statement? If not, I think we need to change the wording and simply state that "In addition, the groundwater pathway is more tortuous and affords more time for implementing protective actions and, therefore, results in a lower risk to the public", which is certainly true.

I look forward for your reply.

Adrian

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