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September 28, 2011
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Attn: Document Control Desk
U.S. Nuclear Regulatory Commission
Dr. King Stablein
Office of Nuclear Material Safety and Safeguards
Division of High-Level Waste Repository Safety
Mail Stop EBB-2-BO2
Washington, DC 20555

Subject: History and Value of Uncertainty and Sensitivity Analyses Acquired In-House
Over the Past 20 Years—Final Report (IM 14002.01.441.170)

Dear Dr. Stablein:

This letter retransmits the subject report, incorporating the comments provided by the U.S. Nuclear Regulatory Commission (NRC) on the original report transmitted on July 28, 2011. Please note that the title of the report has been changed to "History and Value of Uncertainty and Sensitivity Analyses at the Nuclear Regulatory Commission and Center for Nuclear Waste Regulatory Analyses."

The Center for Nuclear Waste Regulatory Analyses (CNWRA®) received NRC comments on the original draft report in an email dated August 31, 2011. An attachment to this letter shows the NRC comments and CNWRA responses. The resulting changes to the report made by CNWRA may be seen in Version 6.0 (dated September 27, 2011) of the following SharePoint document:

YM Licensing Review > Knowledge Management > Knowledge Capture Reports >
Mohanty_Uncertainty and Sensitivity Analyses_170 > 170_Final Report_NRC
Comments > Mohanty_170

The NRC staff indicated in an email dated September 21, 2011, that the revised report was acceptable. The final formatted version of the report is preserved at the SharePoint location shown above.

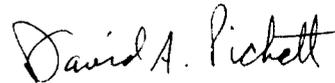


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Please contact Jude McMurry at (210) 522-6935 or me at (210) 522-5582 if you have any questions regarding this report.

Sincerely yours,



David Pickett
Senior Program Manager
Integrated Spent Fuel Regulatory
Program—Geologic Disposal

DP/ar

Enclosure
Attachment

cc:

NRC

D. DeMarco
R. Jackson
V. Whipple
L. Kokajko
A. Mohseni
J. Davis
J. Rubenstone
J. Guttman
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Item-by-Item Response to NRC Comments

9/20/2011

Response to specific comments can be seen directly in Share Point.

General Comments:

1. *“The focus of the document needs to be with respect to how uncertainty and sensitivity analyses can be used to improve understanding of how a system (facility) performs. To that end it would be beneficial if the conclusions chapter could be enhanced to provide a bit more discussion on the applicability of specific approaches to specific problems – some if it is there but the discussion is based varied as the chapters describes the various techniques. In my opinion it would be useful to order the chapter more along the concerns there are in analyzing a system (e.g., many variables, low probability events) and describe the techniques that were found to useful. However, this may not be feasible at this time so I leave it to the authors to decide but I believe it would make the document more useful. [Of course revisions at the end would need to be supported by potential changes to the conclusions at the end of each chapter.]”*

Staff response to first general comment:

We believe that a major re-ordering of the report at this late date is difficult given the remaining timeframe for the knowledge capture project. However, the staff has deliberately avoided making strong recommendations for individual methods because of the impossibility of being able to forecast under what conditions a particular method would be best. Because different sensitivity analysis methods were developed and used at different stages of performance assessments (i.e., different iterations), their utility and impacts changed over time. As more knowledge was gained about the performance assessment model’s behavior, the need for certain sensitivity analysis methods also changed. But during various iterations of performance assessment, we concentrated on a “consensus” method for determining which parameters are most important and then eliminating the spurious ones. This process is described in report sections 5.2 and 5.3. The draft report has been revised in various places to address this comment, including the Executive Summary, page x, and section 7.5 Conclusions.

2. *I believe the discussion that attempts to link the use of sensitivity and uncertainty to development of regulations should be removed– consistent with comment #1 this is a document regarding the use of S&U analyses to assist understanding of a system. Of course the knowledge gained is useful in everything we do but the linking to the regulations is often overstated (in my opinion) and is just not the purpose of this document.*

Staff response to second general comment:

In all cases, the staff has removed references to the impact of S&U on regulations. This will be pointed out in our response to the detailed comments.

Detailed Comments:

1. *Executive Summary, page ix – “This is really a bit of a stretch – NRC did not exist in the early 1970s – in the early 1980s the analyses were just beginning – I would say the late 1980s for the use of performance assessments – prior to that there were more discipline specific analyses.”*

Staff response – See changes on page ix. Staff modified dates to reflect majority of work starting in earnest in the 1980’s.

2. *Executive Summary, page ix – “I have no idea what this sentence means.”*

Staff response - Offending sentence has been deleted.

3. *Page 1-1 – “Delete this”*

Staff response - Offending sentence has been deleted

4. *Page 1-1, “This sentence needs to be DELETED – this sentence implies there is some sort of connection between the two (PRA policy statement and Part 63) and that is simply not true. This is completely misleading – we started part 63 development in 1995 – published a proposed rule in 1999. Part 63 had a separate track that made use of the PRA policy statement as further support for RIPB but there was no direct connection. Part 63 was based primarily on NAS recommendations and PA work at the NRC. These kind of statements are not needed in this document.”*

Staff response - Reference to risk-informed regulations has been deleted.

5. *Page 2-9 – “This sentence is not useful – delete it. What would be useful is to describe that peak dose from a particular realization may be useful for understanding the types of conditions that lead to specific dose values (e.g., what conditions lead to low doses – to high doses, etc.) – just saying is useful to a regulator is not needed nor helpful.”*

Staff response – Staff doesn’t fully agree that this should be deleted. The sentence following gives an example of where this kind of information might be useful to a regulator. Deleted “to inform the regulators”.

6. *Page 2-13 – “There is a lot of speculation in the first paragraph – some of which is unsupported (e.g., one disadvantage of the peak-of-the-mean approach is that it is subject to ‘risk dilution’ – I believe this should be a “potential” disadvantage because it*

really depends on many aspects as to whether there is risk dilution – one can force it in a calculation to see the effect but that does not mean an analyst will do that when they are trying not to dilute risk – this implies the analyst acts blindly in doing the simulations. Then it is stated “The mean-of-the-peaks dose would probably be conservatively evaluated for wide parameter distributions and therefore not be subject to risk dilution” maybe not but would it be subject to other things (e.g., incorrectly portraying the risk). This section should be revised and be a bit more careful regarding limitations and benefits of any approach.”

Staff response – Staff has modified this paragraph to be less insistent that the peak of the mean approach is superior, and now gives a more moderated view that give pros and cons for the approaches discussed.

7. Page 2-16 – *“It is okay to raise this concern – this document should provide answers regarding how we have dealt with solving this problem over the years – we do have confidence in our results are not misrepresenting performance.”*

Staff response – This paragraph and some preceding material has been modified that discusses approaches to addressing the concerns about risk dilution, granularity, and peak-of-the-mean vs. mean-of-the-peaks.

8. Page 3-1 – *“Be careful with the advice here that suggests assume artificial total failure as a means to focus attention on improving models - please provide some caution here that care must be exercised in doing this – when one just assumes total failure what if this is incredibly unlikely to occur would one really want to spend time improving the reliability if it can’t happen. A bit more discussion to provide some context would be helpful.”*

Staff response – paragraph has been modified to add a note of caution about barrier component failure analysis.

9. Page 3-2 – *“This makes no sense as written – the peak-of-the-mean is what is called for not “more closely” – do not need this pointer – just delete. In general, as noted above, this document just gets into trouble when it tries to talk regulations rather than just talking to how approaches aid understanding. [also in conclusions in Section 5.7 – a similar situation occurs – yes there are differences depending on metric but is this truly a big deal – one will be more sensitive to the timing of dose – that is the point to be made and not that the regulation requires something – stick to the benefits of the technique and not the regulations which is a red herring in this document]”*

Staff response – Reference to 10CFR63 has been removed.