HLWYM HEmails

From: Sitakanta Mohanty
Sent: Friday, April 15, 2005 7:08 PM
To: Bruce Goodwin
Subject: FW: Emailing: Review of DOE EIS.doc
Attachments: Review of DOE EIS.doc

-----Original Message-----
From: Dennis Leneveu [mailto:leneveud@shaw.ca]
Sent: Friday, April 15, 2005 3:26 PM
To: smohanty@cnwra.swri.edu
Subject: Emailing: Review of DOE EIS.doc

Sitakanta

Attached is a quick review of the Summary and Chapter 5 of the US DOE EIS. Ihope this meets your needs.

Dennis LeNeveu

The message is ready to be sent with the following file or link attachments:
Review of DOE EIS.doc

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Hearing Identifier: HLW_YuccaMountain_Hold_EX
Email Number: 1544

Mail Envelope Properties (smohanty@cnwra.swri.edu20050415190800)

Subject: FW: Emailing: Review of DOE EIS.doc
Sent Date: 4/15/2005 7:08:05 PM
Received Date: 4/15/2005 7:08:00 PM
From: Sitakanta Mohanty

Created By: smohanty@cnwra.swri.edu

Recipients:
"Bruce Goodwin" <goodwinb@mts.net>
Tracking Status: None

Post Office:

Files	**Size**	**Date & Time**
MESSAGE	644	4/15/2005 7:08:00 PM
Review of DOE EIS.doc	35904	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
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General Review of Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada, Volume 1, Summary and Chapter 5

by. D.M. LeNeveu

Friday, April 15, 2005

Overview

In general the summary and chapter 5 of the Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada are very readable and very comprehensive. All credible pathways for dose appear to be covered. Uncertainty in both models and data is thoroughly discussed. The Monte Carlo method for quantifying uncertainty is appropriate. The very low consequence obtained for all scenarios including disruptive events is reassuring and lends support to the viability of the Yucca Mountain site.

Potential Conceptual Problems

In my opinion there are some overriding conceptual difficulties or omissions in this document that would merit further consideration.

One question that is avoided and that would be of great interest to a local intervener is: Why Yucca Mountain? One should have confidence that the site was chosen for technical rather than political reasons. Other siting options are discussed briefly in the summary where it is mentioned that in 1986 the DOE narrowed the number of sites to three. In 1987 the Yucca Mountain was chosen by Congress as the only site. The rational was not given.

Another area lacking in information is the experience and choices of other countries for nuclear fuel waste management. The choice of an unsaturated zone is rather unique among the nations studying disposal options.

Presumably one of the main features in favour of the Yucca Mountain site is the large depth of the unsaturated zone that restricts the amount of water available to the waste package. A critical feature in determining the margin of safety associated with this site is groundwater transit times from the repository to the water table below. I could find no numbers or discussion of groundwater transit times in the Summary or in Chapter 5.

There appears to be no discussion of the storage capacity of the site with respect to the total volume of nuclear waste currently accumulated and the future volumes likely to accrue. This information should be presented to bring the scope of the site into context with respect to the nature of the problem.

The only alternative presented to the Yucca Mountain site is the so called no-action alternative where wastes remain at 72 commercial sites and 5 DOE sites for at least 10,000 years. One would wonder if Yucca Mountain were rejected why other sites would not be considered. Allowing only two possibilities unduly biases the choice. There is some reference to the consideration of other sites in the Summary if Yucca Mountain is rejected however other sites are not considered as formal possibilities at this time.

From the Canadian experience that I am familiar with, when interveners are presented with overwhelming technical analysis of the margin of safety associated with the site, they tend to focus on moral and ethical issues such as monitored retrievable storage, the lack of national or local consensus in site selection and the legality and ethics of co-disposal of high level reprocessed waste or defence waste with spent fuel waste. Such issues might be beyond the scope of this document however reference could be given to other documents where these issues are addressed.

Particular Concerns with the Analysis

One issue of concern in the section on radionuclide inventory is the lack of Cl36 appearing as one of the nuclides analyzed. This has been typically one of the mayor contributors to dose in studies done by other countries. This could be a potentially serious oversight and should be looked into.

The discussion and acknowledgement of the inherit uncertainty in models and data appears to be comprehensive and thorough. It is stated that generally conservative assumptions are used so that any error due to uncertainty will tend to over estimate the margin of safety. However when we examine the estimated effects of recent model changes we find many of them are anticipated to result in higher doses. It seems in practice the model has not been applying conservative assumptions rigorously during development. If conservative assumptions were always used, new model changes would invariably lead to lower doses not higher. In the light of this fact, the disposal case could be bolstered by the development of simplified bounding models.

When we examine the sensitivity analysis for the first 10,000 years we find that the most influential parameters such as waste package lid failure and episodic infiltration involve extremely uncertain processes. In particular lid package failure depends on human engineering projected well beyond the level on human experience for the proposed materials.

At much longer time scales when most packages have failed doses are much higher even though many of the more toxic radionuclides have decayed. This would suggest the results for times up to 10,000 years are very fragile.

In the Canadian submissions that I am familiar with, there was an analysis of barrier effectiveness and an emphasis of redundancy of barriers. Each barrier was examined in isolation and rated in terms of the delay time and dose reduction factor. For instance if all waste packages failed immediately, how much protection does the geosphere alone provide?

The discussion of dose consequence results is not very intuitive. One useful measure is dose in relation to background radiation. The background radiation at Yucca Mountain is not discussed.

In the discussion of criticality, the argument of the requirement for specifically designed spherical geometry seems very compelling. However there are instances of fission occurring naturally in a geological rather than man-made setting such as at Okla in Gabon that dispel the notion that a particular man-made geometry is a requirement for criticality. The argument that water is required for a moderator for criticality to occur is also weak. It is claimed that the fuel will not be exposed to much liquid water in an unsaturated environment. However a main fuel leaching scenario in the NRC, TPA code is the bathtub scenario where a fuel package partially fills with water for very long times. Furthermore there is a potential that fissile material such as plutonium can re-concentrate in the waste package due to selective leaching or dissolution and precipitation effects. Perhaps the criticality scenarios need to be revisited.

The volcanic ash plume scenario also seems to be rather deficient in considerations of all ramifications. For instance it appears that the major pathway considered is inhalation of contaminated ash. However contaminated ash will be deposited in surface waters and in soils providing long term exposure pathways that do not appear to be considered.

The effects of glaciations do not appear to be comprehensively discussed or analyzed. Climate cycles appear to take into account only changes in recharge and disregard such effects as glacial scouring, glacial lakes, changes in discharge patterns etc.

Compelling confidence building exercises for individual process models are not presented. Such evidence as natural analogues, comparison to results from other codes, participation in international benchmarking studies and comparison to experimental data are not presented. For instance the Chernobyl incident provides a potential analogue for the ash plume model. Evidence from the dose consequence and sources of exposure following Chernobyl perhaps could be used to compare against the predictions form the ash plume model.

The NRC has independently developed the TPA code, a performance assessment model for Yucca Mountain. A comparison of the DOE model against the TPA model would be a valuable and instructive exercise.

Potential Independent Validation Work

In the light of the above comments there is considerable potential for independent validation work. Such work might include the following.

1) Comparison to natural analogues
2) Comparison of individual process models to other codes or to experimental data
3) Independent analysis of the dose reduction due to each barrier independently. In particular the geosphere could be analyzed in terms of all waste packages initially failed
4) Comparison to results from the NRC TPA code
5) Analysis of the effects of a criticality excursion assuming that one occurs.

6) More analysis of particular what if scenarios such as total early waste package failure
7) Development and consideration of more catastrophic failure modes such as effect of a steam excursion occurring in a waste package, migrating toward a fault and thus to the surface.
8) Comparison to disposal analyses from other countries
9) Development of simplified bounding models
10) Analysis of the dose potential of Cl36