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Ms. Pauline Brooks, Project Officer
Division of Waste Management
MS 623 SS
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Pauline:

As you requested I have enclosed with this letter a summary of my thoughts on the recent NRC workshop on computer program validations. As we discussed, my thoughts probably vary from the consensus at the meeting in part because my focus is more on licensing than on research. Please contact me if you have any questions.

Sincerely,

Douglas K. Vogt
Project Manager

DKV:kg

Attachment

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Summary of Workshop on Code Validation

1. The NRC's research projects should concentrate on research that can help resolve licensing uncertainties that the NRC needs to resolve in the next five years. There are many areas of technical uncertainty that are not addressed by current NRC or DOE programs. Many of these uncertainties will need to be addressed at the time the NRC reviews a DOE license application. I believe that these research items should be given the highest priority. The following discussion relates primarily to specific discussions given by presenters.
2. The work that Dr. Gelhar at MIT is doing on dispersion is very interesting. He appears to have developed a concise theoretical explanation of the heretofore poorly understood phenomenon. Although the work is extremely interesting and well done, I question whether it is highly relevant to repository licensing. The sites that DOE has proposed for license applications appear to have very long travel times to the accessible environment. For these very long travel times, dispersion is not an important parameter in estimating the concentrations of contaminants released to the accessible environment. If through some accidental event, the repositories performance is degraded, and the travel times through the environment become very short (for example, on the order of a thousand years) then convective transport not dispersion becomes the primary mode of transport in the environment. It is my personal belief that the effects of dispersion are probably not important unless the travel times in the environment is somewhere between one and ten thousand years. Since it appears there is a low likelihood of travel times of this approximate range, I feel that research priorities would be better focused on areas where greater uncertainties exist.
3. Transport Phenomenon. Dr. Neuman has developed a very interesting approach to solving the "inverse problem" in hydrogeology. Work performed by one of his graduate students provides a sound basis for using mathematical methods to estimate groundwater transport model parameters. I would recommend that the NRC licensing staff investigate the work performed by Dr. Newman to determine if they can apply this work in near term.
4. The work in support of the Hydrocoin benchmarking is very interesting. I believe that better understanding of the capabilities and limitations of computer programs will be uncovered by continued benchmarking. I recommend continued support of these efforts.
5. Geochemistry. Work being done in geochemistry at Scandia National Laboratory appears to be very well done. I would recommend, however, focusing on radionuclides that have the potential for K_d in the far field of less than 10 to 100. Research should also concentrate on radionuclides with half-lives greater than about 100 years. For the range of sites now

being examined by the Department of Energy the migration of radionuclides with K_d of greater than 10 to 100 will be sufficiently slowed so that it is highly unlikely that the nuclides will reach the accessible environment over very long time periods (over 10 thousand to 1 million years). Similarly, radionuclides with half-lives less than about one hundred years will have decayed to essentially background level in the time that it takes them to travel to the accessible environment. Sorption may be very important for certain critical radionuclides and therefore determining which radionuclides will be examined in more detail is critical.

6. There was an interesting observation that many operating mines, particularly in salt, fail in time periods much shorter than that seen for repository construction through final closure. The probabilities of these failures can be estimated through existing mining failure data. Projected failure rates for a repository prior to repository closure may be on the order of one to a few tens of percent. Since this is a relatively high likely failure mode for repository and impacts are severe, I believe that the NRC should investigate alternatives for closure of a breached repository.
7. Dr. Preuss of LBL made an interesting proposal for analyses of heat pipe phenomenon that may exist for flow in fractured media. Experimental work was identified to be carried out by Dr. Evans at University of Arizona at an existing field site. It appears that this may be a very cost effective method of gathering some critical information to get a better handle on one uncertainty dealing with repository site performance.
8. The Geochemical analyses in zones where large temperature gradients exist is very complex. Areas where water may be undergoing phase change further complicate these geochemical analyses. Investigations of sorptive mechanisms may be extremely important in these areas. It is recommended that investigations concentrate on radionuclides that are likely to have small values of K_d in the far field.
9. Professor Radke at U.C. Berkeley provided an interesting presentation on the migration of contaminants through bentonite, a candidate backfill, and packing material. His work while based on a simple conceptual model and laboratory experiment provided useful insights into important mechanisms for transport phenomenon across waste package barriers. Additional work in this area may be warranted.