Attachment A

Overview Summary of Planned Change Request Decision

I. Introduction

DOE submitted a planned change request in April 2006 to decrease the amount of emplaced magnesium oxide (MgO) from 1.67 to 1.2 times the quantity of emplaced carbon in the disposed waste. EPA's position on the engineered barrier is that, as the quantity of magnesium oxide is decreased and approaches a one-to-one relationship with emplaced carbon, a better understanding of system uncertainties are needed. In April 2006, EPA requested that DOE analyze the importance of system uncertainties to gain an understanding of their impact on MgO performance. In November 2006, DOE responded with a detailed uncertainty analysis, but also introduced new issues related to MgO and their impact on the disposal system at the Waste Isolation Pilot Plant (WIPP) (see Attachment B for details). Since DOE's November 2006 response, EPA has been working to better understand and resolve these issues in order to assess the performance implications of the proposed change.

II. EPA's Review

Because of potential uncertainties in predicting future characteristics at the WIPP and performance uncertainties of WIPP's only engineered barrier, MgO, EPA is concerned about any decrease in the amount of MgO emplaced with waste. MgO is emplaced to control disposal room chemical conditions, absorb carbon dioxide (CO_2) gas generated, and limit radioactive materials transport. Even though EPA has not made it a specific requirement, EPA has taken great comfort in the excess MgO, or safety factor. EPA believes that excess MgO overwhelms uncertainties associated with our understanding of the disposal system performance. Therefore, when DOE requested a change to the MgO emplacement, EPA wanted to ensure that this action would not be detrimental.

EPA's review determined that three areas and their uncertainties needed to be clearly understood: 1) How much carbon is in each disposal room, 2) How much carbon dioxide gas is generated, and 3) How will the MgO effectively control chemical conditions and limit radioactive material transport (see Section 1.0 of Attachment B for details). EPA also had an independent review of its contractor report to assure the adequacy of their work (see Attachments C and D for details). One final result of this review is that the approach and assumptions DOE used overestimates the amount of MgO needed.

IIA. **How much carbon is in each room?** EPA examined DOE's approach to estimating how much celluloses, plastics, and rubber materials (CPR) (the sources of carbon at WIPP) are emplaced in the disposal system. EPA determined that DOE's approach appears adequate and that DOE reasonably estimates the amount of carbon in the waste emplaced at WIPP. The non-regulatory WIPP oversight group, PECOS Management Services, Inc. (PECOS), concluded that DOE's estimation approach is the weakest part of DOE's analysis but may be biased high for many waste streams and generally appears to overestimate the amount of carbon in the waste (see Attachment E Conclusions for details). EPA concluded that DOE reasonably estimates the amount of carbon in waste room when calculating the amount of MgO needed. (See Attachment B and E for more details)

IIB. How much carbon dioxide gas is generated in a disposal room? EPA concludes that DOE uses conservative estimates of the amount of CO_2 gas generated in a disposal room because it is assumed that all carbon is converted to CO_2 gas. Carbon dioxide is generated by microbial degradation of CPR waste materials placed in disposal rooms. To degrade CPR, microbes need a nurturing environment, sufficient food (CPR), access to this food source, and sufficient water to sustain the microbes' existence. Microbes operate along very particular pathways: first, they will consume along the denitrification pathway, and then the sulfate pathway, and finally the methanogenesis pathway (see Section 2.2 of Attachment B).

In addition, microbes may not be able to degrade some of the CPR, thus reducing the amount of carbon converted to CO_2 gas. Conditions have to be favorable for CO_2 to be generated, and conditions favorable for microbe survival may not occur in the disposal rooms. To be conservative, presently, EPA requires DOE to assume that ALL carbon in the waste in a room turns into CO_2. PECOS believes that this approach is "…overly conservative…" (See Attachment E page 8). The conservative requirement that all solid carbon is converted to gas compensates for errors that may be associated with estimates of CPR mass.

IIC. Reactivity of the MgO DOE provided information on the potential reactivity of the MgO at 96% from the current supplier. EPA found the information reasonable, and requires DOE to ensure that the MgO reactivity remains at 96% by regularly testing MgO samples.

IID. Is this review conservative? EPA believes that this approach is conservative. EPA notes a number of conservative assumptions during its review including: conservative estimates of available carbon from the degradation of CPR, and conservative estimates of the amount of CO_2 generated. It is likely that not all available carbon will react to generate CO_2 gas, and that CO_2 may react with other materials, but this effect is not included. In addition, methanogenesis is expected to take place but is not included (see Attachment B, page 5-3). PECOS also believes that DOE's approach is overly conservative (see Attachment E Sections IV and V for details).

III. Independent Technical Review of SC&A Analysis (Attachments C and D)

EPA required its contactor, SC&A, to have a documented independent technical review of their report. SC&A's quality assurance manager selected Dr. Donald Langmuir to review SC&A's work. Dr. Langmuir agreed with SC&A's conclusions except two (see Attachment D, page 4 for details). He had concerns about segregation of MgO and molecular diffusion. Dr. Langmuir's comments were diligently considered and SC&A responded in Attachment D. The final report was modified as warranted (see Attachment B) to address and clarify these issues. SC&A and EPA believe that these issues have been abundantly dealt with during the history of the WIPP regulatory process, in particular during the Compliance Certification Application Conceptual Model Peer Reviews in 1996 and 1997. PECOS also concurs that these issues are not significant (see Attachment E, sections "The efficiency of mixing processes" and "The physical segregation of MgO from CO_2").

EPA also furthered addressed Dr. Donald Langmuir's main concern that MgO may make some form of a concrete-like material and not be able to react with CO_2 in a waste room (see Attachment E, Section 2.2; also see Attachment B, Section 3.2 and Attachment D). In summary, EPA reexamined work done during the past fifteen or more years on the ability of MgO to be available for reaction with CO_2. This includes the experimental work conducted for the conceptual model peer review at time of the WIPP certification. Based on the existing documentation that addresses this issue, EPA concludes that if CO_2 is generated by microbial activity, MgO will be available to react if DOE continues to use MgO of high purity and calculates the needed MgO on a room-by-room basis.

IV. Stakeholder Comments:

From August 29, 2007 to October 11, 2007 EPA asked for comments from members of the public. PECOS Management Services, Inc (see Attachment E for details), provided a report with the conclusion that the safety factor reduction to 1.2 is appropriate and could even be reduced further. EPA received no other comments from individuals or groups on this topic.

V. Conclusion:

EPA approves this planned change with conditions. First, DOE is to continue to calculate and effectively track both the carbon disposed and the required MgO needed on a room-by-room basis. In addition, DOE must, on a regular basis, verify that the reactivity of MgO is maintained at 96% as assumed in DOE's analyses.