



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
AIR AND RADIATION

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WIPP Mailing List Members:

The National Advisory Council on Environmental Policy and Technology (NACEPT) WIPP Review Committee will hold a meeting on September 6-7, 1995, at the Hyatt Regency Hotel, 330 Tijeras N.W., Albuquerque, New Mexico to discuss issues that are pertinent to the development of EPA's final compliance criteria (40 CFR 194) for the WIPP. My staff has prepared papers on the issues to be discussed. The meeting is intended to focus on these compliance criteria issues.

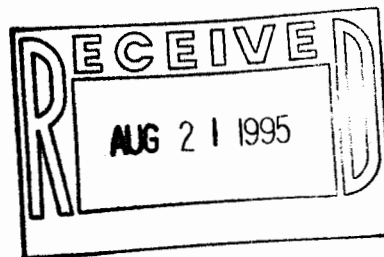
Enclosed are copies of the issue papers and a proposed schedule of the upcoming NACEPT meeting.

Sincerely yours,

Albert Colli

Albert Colli, Acting Chief
Radioactive Waste Management Branch
CSD, ORIA

Enclosures



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**National Advisory Council for Environmental Policy and Technology (NACEPT)
Waste Isolation Pilot Plant (WIPP) Review Committee
Meeting on Compliance Criteria (40 CFR 194) Issues**

Preliminary Agenda

September 6, 1995 (9:00 a.m. to 5:00 p.m.)

- 9:00-9:30 Welcome and Introduction (video) -- Cheryl Malina, EPA, Designated Federal Officer, NACEPT WIPP Review Committee
- 9:30-9:45 NACEPT Opening Remarks -- Chris Whipple, Chairman, NACEPT WIPP Review Committee
- 9:45-10:00 EPA Opening Remarks -- Larry Weinstock, Acting Director, Criteria and Standards Division
- 10:00-10:30 EPA Presentation on Credit for Passive Institutional Controls -- Mary Kruger, Acting Chief, WIPP Compliance Section
- 10:30-10:45 **BREAK**
- 10:45-11:15 EPA Presentation on Criteria for Peer Review -- Al Colli, Acting Chief, Radioactive Waste Management Branch
- 11:15-11:45 EPA Presentation on the Application of Release Limits -- Martin Offutt, Nuclear Engineer, WIPP Compliance Section
- 11:45-1:00 **LUNCH**
- 1:00-1:20 Department of Energy Issue Presentation (invited)
- 1:20-1:40 New Mexico Environment Department Issue Presentation (invited)
- 1:40-2:00 City of Carlsbad Issue Presentation (invited)
- 2:00-2:20 Southwest Research and Information Center Issue Presentation (invited)
- 2:20-2:40 New Mexico Attorney General Issue Presentation (invited)
- 2:40-3:00 **BREAK**
- 3:00-4:00 Opportunity for Public Comment
- 4:00-4:10 Closing Remarks -- Chris Whipple, Chair, NACEPT WIPP Review Committee

September 7, 1995 (9:00 a.m. to 3:00 p.m.)

- 9:00-9:10 **Opening Remarks -- Chris Whipple, Chair, NACEPT WIPP Review Committee**
- 9:10-10:20 **NACEPT WIPP Review Committee Issue Discussion**
- 10:20-10:30 **BREAK**
- 10:30-12:00 **NACEPT WIPP Review Committee Issue Discussion**
- 12:00-1:15 **LUNCH**
- 1:15-2:50 **NACEPT WIPP Review Committee Meeting Summary**
- 2:50-3:00 **Closing Remarks -- Chris Whipple, Chair, NACEPT WIPP Review Committee**

Peer Review

The use of peer review can increase confidence in the results of activities when their adequacy cannot otherwise be established through testing, alternate calculations or previously established standards and practices. At the WIPP, peer review may in general be usefully applied to those activities that are essential to demonstrating that the disposal system can meet the numerical standards for waste isolation provided by 40 CFR Part 191.

The need for increased confidence in the disposal system and thus for peer review arises due to the uncertainty inherent in the long-term projection of the behavior of the proposed disposal system. The WIPP in particular is the first system of this type, under consideration for disposal of long-lived, highly radioactive wastes. As a result, the search for solutions to the technical issues posed by geologic repositories has elicited considerable effort, but not complete agreement among the scientists and engineers in the broader technical community. Peer review of certain activities conducted at the WIPP can ensure that a more complete spectrum of knowledge and experience will be utilized.

The Agency intends to require peer review when its use would assist the Agency in determining the adequacy of DOE's application for certification of compliance with the Agency's environmental standards, 40 CFR Part 191. In the proposed 40 CFR Part 194, the Agency required peer review of the following six activities:

- (1) The evaluation, required under this part [40 CFR Part 194], of engineered barriers for the disposal system;
- (2) Consideration of processes and events that may affect the disposal system;
- (3) Quality assurance programs and plans;
- (4) Models and computer codes;
- (5) Data used to support models and computer codes; and
- (6) Waste characterization.

In developing the peer review section of the final rule, the Agency is considering a set of guidelines which focus on those areas of the WIPP program which may benefit from peer review. The Agency plans to use these guidelines in revising the above list in order to establish a consistent rationale for requiring the use of peer review. The committee is invited to suggest new areas of focus in addition to those listed below and to eliminate certain areas which are adequately covered by other means, such as quality assurance. The general approach would center around six critical program areas:

1. *Experimental design.* Have the programs of experimental testing been designed to gather the right data? Are those elements which are the source of large uncertainties in predictions being adequately studied?
2. *Methodology.* Are adequate methods employed to collect the data critical to an understanding of the repository? Where a consensus or a widely-practiced method does not exist (or new,

beyond state-of-the-art techniques are employed), have alternatives been sufficiently considered?

3. *Studies.* Do the technical studies which evaluate elements critical to repository design and performance use good science?

4. *Scientific basis.* How good is the scientific understanding of the natural processes which will influence the long-term fate of the repository? Is our consideration of these events comprehensive? Where consensus does not exist, have the alternative interpretations been sufficiently considered?

5. *Experimental data.* Has sufficient scrutiny been applied to data which are critical to repository performance or which are a major source of uncertainty?

6. *Assumptions made in performance assessment.* Are bounding assumptions made on events and processes which can affect the disposal system and on parameters which cannot be well-established by experimental means each sufficiently conservative?

The Agency seeks the advice of the committee on how to revise the above guidelines in order to establish a consistent rationale for the use of peer review. In general, the EPA does not wish to require peer review of a specific activity unless doing so would assist the Agency in deciding on the adequacy of DOE's application for certification of compliance. Rather, the Agency is interested in obtaining a comprehensive spectrum of knowledge on scientific issues having high uncertainty and effecting long term performance of the WIPP.

Release Limits

The EPA's disposal standards, 40 CFR Part 191, include "containment requirements" which set limits on the amount of radioactive waste that can exit the disposal system. The containment requirements use "release limits," one for each radionuclide, as a measure of whether a release of waste is likely to occur in an amount that would endanger public health. The Agency must set these release limits based on the physical state of the waste at a fixed moment in time -- such as 10 years, for example -- after the waste is disposed of in the WIPP.

The Department of Energy will perform calculations that predict the long-term behavior of the repository. These predictions will examine the number of curies of the different radionuclides which might be released into the accessible environment surrounding the WIPP. These predicted releases are compared to the release limits, also stated in curies, to determine if the EPA's containment requirements found in 40 CFR Part 191 have been met.

Typically, the amount of a given radioactive element that is present in the waste is measured in curies, a measure of level of radioactivity. Due to radioactive decay, the number of curies of each radionuclide will decrease with time. For example, a large portion of the waste will contain plutonium-238. After 88 years, one-half of the plutonium-238 will have decayed. For this reason, if the release limits are set after the waste has had time to decay, then the release limits will be smaller.¹ In terms of compliance, this would mean that permitted releases of radionuclides would be smaller. The containment requirements thus could be met by a larger release than if the waste had not been allowed to decay. The application of the release limits to the WIPP site, and therefore the amount of time the waste decays, is specified by the EPA's 40 CFR Part 194. Hence, the Agency must choose the fixed point in time when the number of curies of waste is assessed. In the proposed 40 CFR Part 194, the Agency proposed that this point in time should be 100 years after the repository has been backfilled and sealed.

The Agency received public comment on this proposal and found the comments to be divided between those who found 100 years appropriate and those who preferred zero years, the time of backfilling and sealing. Of those who preferred zero years, some stated that the requirements of 40 CFR Part 191, Appendix A, had already specified zero years.

¹Strictly speaking, the release limits would be determined based on the *expected* number of curies that would be present in the waste after, for example 10 years. Determining the expected number of curies requires a straight-forward calculation that would predict the number of curies at some time in the future, based on known rates of decay.

The Agency has selected two options for the fixed point in time to be used in calculating the release limits, and solicits the advice of the committee on which option would be more appropriately applied to the WIPP.

1. *Zero years, meaning the moment the repository is backfilled and sealed.*
2. *100 years after the repository is backfilled and sealed.* The release limits would be somewhat smaller at 100 years, due to the decay of radionuclides.

Passive Institutional Controls

The use of passive institutional controls (PIC's) at the WIPP could, if effective, deter future generations from inadvertently drilling into the disposal system in the course of exploring for and extracting natural resources. Passive institutional controls could consist of permanent markers at the location of the disposal system or institutionally maintained archives that preserve a record of the disposal system. EPA's standard which applies to all geologic repositories¹, 40 CFR Part 191, requires that PIC's be implemented in order to safeguard the integrity of the repository against the possibility of future intrusion by humans. In 40 CFR Part 194, the criteria for certification of compliance with 40 CFR Part 191, the Agency wishes to specify how this requirement would apply to the disposal system at WIPP.

Passive institutional controls are viewed as a necessary complement to active institutional controls, which would limit access to the disposal site through conventional means of security, for example, guards and fences. Active institutional controls cannot be expected to persist for long periods of time. In fact, the disposal standards do not permit the Department of Energy to assume that active institutional controls will remain effective for more than 100 years following closure of the repository. Well-designed and well-constructed passive institutional controls could remain in place for thousands of years. The EPA's disposal standards, 40 CFR Part 191, require that passive institutional controls be implemented for the WIPP due to the long-lived nature of the wastes envisioned for disposal in geologic repositories. However, the disposal standards make no statements about the period of time during which PIC's can be assumed to be effective.

Elsewhere in 40 CFR Part 191, EPA requires that a quantitative projection of releases of waste from the disposal system be conducted that would compute the predicted releases resulting from both natural processes and future generations' drilling into the disposal system.² A performance assessment would require an estimate of the rate of drilling, expressed as a number of boreholes per 10,000 years per square kilometer. The rate of inadvertent drilling into the disposal system has a profound effect on the predicted quantity of releases from the disposal system, more so than any envisioned natural process. *The Agency solicits the advice of the committee on whether credit should be given for the use of PIC's at WIPP. Credit would be awarded as a percentage reduction in the predicted rate of drilling that would be used in performance assessments.*

Examining historical examples of PIC's can assist the present generation in designing PIC's which, if discovered in the future, might successfully traverse the linguistic, cultural and technological barriers future generations would encounter. Such PIC's could include monuments, pyramids, archeological finds and institutionally maintained archives. The

¹The existing 40 CFR Part 191 would not apply to those sites characterized under section 113(a) of the Nuclear Waste Policy Act of 1982, as amended, such as Yucca Mountain.

²The required analysis is defined to be a "performance assessment" by 40 CFR Part 191.

messages contained in such historical examples have in some cases been partially reconstructed and can offer insights into which characteristics could be incorporated into successful PIC's for the WIPP. Historical examples of institutionally maintained archives have been partially successful at preserving records for several centuries, and these too can offer lessons for the WIPP. The disposal standards, 40 CFR Part 191, require the implementation of such institutionally maintained records, further stipulating that they contain information about the location, nature and hazards of the waste.

A separate inquiry must be performed to assess the percentage reduction that PIC's might earn for the future drilling rate into the repository. The DOE must use PIC's, but the specific design and the level of effort necessary is left to their discretion. The possibility of credit for the use of PIC's might prompt DOE to increase the level of effort employed. If the Agency decides that PIC's would have a high likelihood of deterring future intruders, then providing a percentage reduction in the predicted rate of drilling would be logically consistent. However, predicting the effectiveness of PIC's is made difficult by the absence of a scientific methodology as might be used, for example, in predicting the long-term outcome of geological processes. Without this methodology, the burden of prediction falls on formally elicited expert judgment. The Department of Energy has previously relied on expert judgment to estimate the reduction in the future drilling rate that would be caused by PIC's. However, the reliability of such predictions cannot be tested, confirmed or otherwise guaranteed.

The Agency received public comment on this question. Respondents were divided between those who believed a percentage reduction in the drilling rate was unrealistic, due to skepticism about the effectiveness of PIC's, and those who believed that future generations would be sophisticated enough to properly interpret PIC's. Additionally, many respondents offered specific instructions for the design of PIC's for the WIPP.

Is our confidence in the performance of passive institutional controls such that the Agency should grant a percentage reduction in the future rate of drilling into the disposal system, as used in performance assessments?