

EXPERIENCE OF THE NEW MEXICO EEG IN EVALUATING THE WIPP PROJECT

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ABSTRACT

The Environmental Evaluation Group (EEG) of the State of New Mexico has been evaluating the public health and safety aspects of the Waste Isolation Pilot Plant (WIPP) project since 1978. The WIPP project is planned to be the first geological repository for nuclear wastes in the U. S. A. and will be used for the disposal of transuranic (TRU) waste generated by the nation's defense program as well as for experimental storage of defense high level waste (HLW). Since WIPP will not be licensed by the Nuclear Regulatory Commission (NRC), EEG is the only agency that has independently evaluated the project. The EEG's evaluation has resulted in a more thorough site characterization, relocation of the repository, better design of the operations and the monitoring systems and better design of the transportation cask. These are significant accomplishments for a group with no licensing authority and for a state with no veto power to stop the project, but working only under a Consultation and Cooperation Agreement with the U. S. Department of Energy.

INTRODUCTION

The Environmental Evaluation Group (EEG) was established in 1978 to conduct a technical review and evaluation of the potential radiation exposure to people, the health and safety impact and potential environmental degradation from the Waste Isolation Pilot Plant (WIPP) project, a repository being built in south-eastern New Mexico to dispose of defense transuranic waste and to experiment with defense high level waste. It is a full-time, multi-disciplinary group administratively located in the Environmental Improvement Division of the New Mexico Health and Environment Department, which is the agency primarily responsible for the protection of the public health & safety of the citizens of New Mexico. The Group is funded by the U. S. Department of Energy (DOE). Staff includes a geologist, hydrologist, environmental engineer, health physicist, quality assurance engineer, radiological monitoring expert, scientific liaison officer, librarian, administrative officer and two secretaries. Whenever necessary, consultants have played an active role in augmenting staff.

The Group assesses the environmental, health and safety aspects of various documents prepared by the Department of Energy and its contractors for completeness, scientific and technical adequacy, and either publishes its analyses or responds directly to DOE with letters, phone calls, meetings and reports. Staff also undertakes self generated work in areas that have been identified as requiring further analysis. Of 34 published reports by EEG, 7 are reviews of DOE documents and the remaining 27 are self-generated by the staff. EEG is neither a proponent nor an opponent of WIPP and addresses technical issues leaving the policy-making decisions to the appropriate state policy-makers including the Governor, Cabinet officials, the Legislature and city and county officials. Although it does not have regulatory authority, it is the only full-time organization independently monitoring the DOE WIPP Project.

WIPP MISSION

WIPP is intended to be a repository for permanent disposal of 6,200,000 cu ft of transuranic waste generated from the nation's defense programs. The waste is not fixed, up to 1% can be respirable and it is

stored in conventional DOT type 17-C 55 gallon Carbon steel drums with a design life of 20 years. (Storage began in 1970). The waste form is not fused in an insoluble glass matrix and there is no commitment by DOE for getters.

Up to 12,500 cu ft of the RH-TRU can have a maximum surface dose rate of 1000 r/h. Note that WIPP is also a temporary facility for DHLW which can have a maximum surface dose rate of 30,000 r/h.

Radioactive Inventory of WIPP

	Radio Activity (MCi)	Volume (M. Cu Ft.)
CH-TRU	2.8	6,200,000
RH-TRU	5.1	250,000
HLW	17.	150

DIFFERENCES WITH HLW REPOSITORY

Although there is a tendency in some quarters to describe TRU waste as "Low-Level Waste", the overall hazards associated with TRU wastes are not that dissimilar from HLW. DOE believes it is necessary to require deep geologic isolation from the environment for both types of wastes and the standards promulgated by the EPA for the disposal of high level and transuranic waste also require comparable isolation.

What are some of the differences between WIPP and the HLW waste repository program?

o Elimination of NRC licensing. Congress excluded NRC licensing of WIPP in the 1979 Authorization Act (PL 96-164).

Defense Wastes

	<u>NRC Licensing</u>
Uranium mill tailings	Yes
TRU	No
High Level Wastes	Yes

It is difficult to satisfactorily explain the apparent inconsistency of Congress on requiring NRC licensing for three different types of radioactive defense

wastes. In effect, WIPP is akin to an AEC project in which the same agency has the responsibility to proceed with the development of the repository, and until the promulgation of 40CFR191 in the fall of 1985, to also determine its degree of safety. This places a heavy burden on EEG to insure that the States' health and safety concerns are fully met.

o No veto power. While Congress provided this power to the Governor and Legislature for States under the NWPA, it was denied New Mexico. The original commitment of veto power to New Mexico eroded to consultation and concurrence and subsequently to consultation and cooperation.

PUBLISHED ANALYSES

From the beginning we believed it to be necessary to publish our analyses and reports and to subject our work to scientific peer review in order to both maintain scientific credibility and to insure viability through visibility.

The following tabulations of 34 published reports and analyses on health and safety of the WIPP radioactive waste facility are grouped into six major headings.

Subject of Reports

Review of Regulatory Documents	7
Site Characterization	14
Breach Scenario Modeling	7
Transportation	3
Environmental Monitoring	2
Operations	1

Review of Regulatory type documents

Detailed technical reviews have been published on DOE's documentation and analysis in support of the WIPP project.

- o Geological Characterization Report, Vol. I and II
- o Draft and Final Environmental Impact Statement EIS, Vol. I and II
- o Waste Acceptance Criteria
- o Cost Reduction Proposals
- o Geotechnical Reports
- o Safety Analysis Report

Site Characterization

While other areas of work have difficulties and uncertainties in developing methodologies that generate confidence and assurance for the safe disposal of radioactive waste, site characterization is probably the most difficult of all due to the complexities of predicting a site's long-term future geological behavior. Therefore, a considerable effort has been expended by EEG in resolving geotechnical concerns and in quantifying the impact of unresolved questions and in narrowing the range of uncertainty.

Published examples of site characterization include:

- o Breccia chimneys
- o Hydrologic analyses of brine encounters
- o Origin of brines based on stable isotope concentrations
- o Geochemistry of brines
- o Reviews of geotechnical reports
- o Significance of Certain Aquifer Parameters in Predicting Doses
- o Sensitivity Analyses of Solute Transport
- o Chemistry of Rustler Fluids

- o Rustler Formation as a Transport Medium for Contaminated Groundwater
- o Stable Isotopes in Southeast NM Groundwater
- o Evaluation of the suitability of the site
- o Occurrence of gases in the Salado Formation where the wastes will be stored
- o Compilation of site selection criteria, considerations and concerns

Results were published of a workshop and a field trip on geotechnical considerations in order to begin obtaining closure on resolving geotechnical issues. A workshop on results of consequence modeling for post-closure releases and individual dosage assessment reports was also held.

Bringing together scientists of differing views has been extremely helpful in identifying the evidence required to provide satisfactory solutions to the resolution of the expected behavior of the geological barriers in the long-term future.

Breach Scenario Modeling

Calculations have been published of the potential radiation doses to people from both naturally occurring and man-made intrusions into the post-closure repository.

- o Review of the WIPP Draft EIS
- o Review of the Final EIS
- o Contaminated Well Scenario
- o Doses from drilling through repository and brine reservoir
- o Radiological consequences of extracting mined resources
- o Dosage calculation workshop of results of 5 breach scenarios

Transportation

- o Critical review and evaluation of the transportation section of the WIPP Draft Environmental Impact Statement, for both spent fuel and transuranic waste. Equations were derived, assumptions by DOE examined, calculations checked and additional dosage calculations identified to be performed by DOE and EEG.
- o Radiation doses were calculated from the deposition of radioactive materials released in hypothetical transportation accidents involving spent fuel, remote handled transuranic (RH-TRU) waste and contact-handled transuranic (CH-TRU) waste. The relative contribution from the inhalation of resuspended material, ingestion of contaminated food, milk or water and external gamma radiation from material on the surface was calculated.
- o Potential problems associated with hydrogen gas generation through alpha radiolysis of organic materials in the shipping containers for high curie contact-handled transuranic (CH-TRU) waste to WIPP were assessed.
- o The adequacy of the TRUPACT-1 shipping container design to transport TRU waste to WIPP was assessed.

Environmental Monitoring

A system for monitoring air, ground water, drinking water and external gamma has been established by EEG in the off-site area.

Operations

The following analyses have been performed in the operational activities of WIPP.

Reviews of the Waste Acceptance Criteria
Radiation Shielding in the Hot Cell
Evaluation of the Safety Analysis Report
Evaluation of Plant Classification of Systems,
Structures and Components

PERFORMANCE ASSESSMENT OF THE REPOSITORY

Although WIPP is not subject to the NRC licensing requirements of 10CFR60, it is subject to the EPA Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High Level and Transuranic Radioactive Wastes (40CFR191).

In the Overall Approach to the Final Rule, EPA stated that the Standards for Disposal (Subpart B) are to be implemented in the design phase. In the case of WIPP, the design phase was completed several years prior to the August 1985 announcement by EPA of the Final Rule.

While the January 1987 DOE Draft Mission Plan indicates that the schedule for the first High Level Waste repository may be delayed 5 years, the following table compares WIPP to the target dates previously outlined in the DOE Environmental Assessments to complete the EPA Subpart B Disposal Requirements as a condition to apply to NRC for a license to begin construction.

Facility	Completion of Compliance Demo
WIPP TRU	10/92
Nevada HLW	9/93
Texas HLW	3/91
Washington HLW	1/91

There have been differing interpretations by DOE and the State of New Mexico as to whether the waste to be emplaced in WIPP for the first 5 years is "storage" or "disposal". The EPA definition for storage includes an intent to retrieve for subsequent use, processing or disposal. Since there is no published intent to retrieve for these purposes, it appears to be disposal. To date, there are no plans for experiments with the emplaced CH-TRU wastes. Additionally, DOE has been working for over a year on permanent land withdrawal legislation for WIPP-hardly a necessary requirement for a R & D facility.

The shipping schedule calls for 1200 annual shipments, (23/week), which will amount to the emplacement of 40,000 drums/year.

The major challenge facing EEG is to work on our independent evaluation of the extent of compliance of the WIPP facility with these standards as well as review and evaluate the DOE documentation and analysis in support of conformance with the standards.

SHIPPING CONTAINER FOR CH-TRU WASTE

The Contact Handled Transuranic (CH-TRU) waste is scheduled to be transported in a shipping container called TRUPACT and designed to accommodate 36 drums. Approximately 30,000 shipments will be required to transport the 6 million cubic feet of CH-TRU waste over a 25 year period.

Transportation regulations (49CFR173.7 (d)), that have been issued by the U. S. Department of Transportation permit the DOE to design, evaluate, test and certify their own package provided the regulations are equivalent in safety to those specified by the U. S. Nuclear Regulatory Commission in 10CFR71.

TRUPACT I was designed in 1978 with two features that did not meet the NRC and DOT transportation regulations:

1. it has only single containment, which is not permitted for most forms of radioactive material if the shipment contains greater than 20 Curies of plutonium; and
2. the waste storage cavity is continuously vented through filters to the atmosphere.

A report entitled "Adequacy of TRUPACT-I Design for Transporting CH-TRU wastes to WIPP" by James K. Channell, John C. Rodgers and Robert Neill, EEG-33 was published in July 1986.

Prior to the issuance of that report, the DOE announced in May 1986 that they will redesign the TRUPACT to include double containment for shipments of plutonium in excess of 20 curies and to eliminate the venting feature. Needless to say, EEG wishes to give the highest praise and to compliment DOE for their actions in modifying the design to meet the federal regulations without resorting to exemptions or variances by either the Department or the U. S. Department of Transportation.

ACCOMPLISHMENTS

What are some of the accomplishments of the EEG efforts?

1. Relocation of the repository. After a 15 to 25 million barrel brine reservoir was intercepted at a point 460 feet north and 600 feet below the planned location of radioactive waste, EEG recommended the relocation of the repository 1-1/4 miles to the south to a zone that was structurally less complex, did not have anticlines, or an observed brine reservoir. Eight months later, DOE concurred.
2. DOE agreed to conduct additional tests to flow a brine reservoir, delineate the extent of brine under the repository through geophysical techniques and to measure the flow and transport characteristics of the aquifer most likely to be involved in a breach scenario. Unfortunately the work has proceeded very slowly.
3. DOE agreed to redesign the shipping container (TRUPACT), to be used for the 30,000 CH-TRU shipments to incorporate NRC requirements of double containment for shipments exceeding 20 Ci Plutonium and to eliminate venting - also required by DOT and NRC. (The average shipment will contain 120 Ci Pu.)
4. EEG sponsored 5 major meetings providing a forum for dissenting views on the adequacy of the geology to prevent the waste from returning to the biosphere and to quantify the radiation doses from different breach and leach scenarios. While these sessions did not achieve a technical consensus, they did approach agreement on the information needed to be able to predict long-term future behavior based on reconstruction of the past history. Credit for these very successful sessions is also shared with DOE and Sandia, the U. S. Geological Survey, the National Academy of Sciences and

and Universities of New Mexico and other universities. It is essential that technical concerns be aired through structured scientific debate, not only to try and resolve their future significance but to provide assurance to policy makers and the public that these issues are being openly and adequately addressed.

Possibly the most important accomplishment by EEG is the successful demonstration that a state can create a multi-disciplinary scientific review group operating in a critical but non-adversarial format, and conduct independent, objective evaluations that impact in the

design and operation of a proposed nuclear waste repository.

States clearly have responsibilities and authorities under the NWPA and an independent multi-disciplinary scientific review and evaluation is one of the most important tasks since a State's interests are not necessarily served by the various federal agencies involved in the disposal of spent fuel, high level and transuranic waste.