EEG-19

Review Comments on Environmental Analysis Cost Reduction Proposals (WIPP-DOE-136), July 1982

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State of New Mexico

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FOREWORD

The purpose of the Environmental Evaluation Group (EEG) is to conduct an independent technical evaluation of the potential radiation exposure to people from the proposed Federal radioactive Waste Isolation Pilot Plant (WIPP) near Carlsbad, in order to protect the public health and safety and ensure that there is minimal environmental degradation. The EEG is part of the Environmental Improvement Division, a component of the New Mexico Health and Environment Department -- the agency charged with the primary responsibility for protecting the health of the citizens of New Mexico.

The Group is neither a proponent nor an opponent of WIPP.

Analyses are conducted of available data concerning the proposed site, the design of the repository, its planned operation, and its long-term stability. These analyses include assessments of reports issued by the U.S. Department of Energy (DOE) and its contractors, other Federal agencies and organizations, as they relate to the potential health, safety and environmental impacts from WIPP.

The project is funded entirely by the U.S. Department of Energy through Contract DE-AC04-79AL10752 with the New Mexico Health and Environment Department.

Robert H. Neill
Director

GENERAL COMMENTS

The cost reduction proposals have the laudable goal of significantly reducing the total capital and operating cost connected with WIPP. Furthermore, since the proposed changes would reduce the size and operating rate of the project, they would be expected to have decreased environmental and socioeconomic impacts. However, some of these cost reduction proposals do decrease factors of safety in various components of the project or trade off one type of environmental detriment for another.

The report does not contain sufficient detail to justify all of the conclusions reached; more discussion and quantitative information (including costs) is necessary in some cases. Also, there are places where the report is unclear or contradictory. Without a more detailed evaluation, EEG is unable to conclude that each of these cost reduction proposals either has a net environmental/health and safety benefit or a cost savings that justifies a net detriment.

A revised Environmental Analysis should either include additional information or specifically reference backup documents where these conclusions have been justified. In addition, the EA needs to be revised to include the effect of the recently announced (11/18/82) decision by DOE to relocate the underground waste storage areas of the repository to the south.

SECTION I - PROPOSED ACTION AND ALTERNATIVES (Comments)

1.2 Cost Reduction Objectives

The statement that the "safety of the work force and the public shall be maintained" is misleading since some of the proposals will tend to decrease health or safety (even though the final result will probably still meet all regulatory requirements and objectives).

1.3.1 Reduce Storage Rate

This reduction seems reasonable. There appears to be no justification for having a 1.2 million cubic foot per year handling rate for a repository designed to operate for at least 20 years and store only 6.2 million cubic feet of wastes. However, since DOE has refused to give us a copy of the report cited as justification for the annual waste processing rate, this can be only a tentative conclusion.

It is noted that this annual handling volume is approximately the same as that used in the FEIS to estimate the routine and accidental effects of transporting waste to the site. Consequently the offsite transportation aspects would be similar to that predicted in the FEIS.

Incidental air quality and noise benefits would be expected from the overall cost reduction program because the 31% decrease in the number of operating personnel would probably result in less motor vehicle traffic and consequently in less exhaust emissions and vehicle noise. However, DOE has never provided the detailed assumptions on commuting patterns necessary to estimate the magnitude of this reduction. Credit should not be taken for these air quality and noise benefits because they have not been quantified and they may also be obtained in other ways (e.g. maximizing the use of buses). Therefore, we concur in the qualitative assessment of the storage rate reduction in Figure 3-1, page 44.

1.3.2 Eliminate One Shaft

Based on common mining experience, we expect three shafts to be adequate for WIPP. However, we don't have sufficient information on the waste handling and personnel flow to be certain of this. The report states in two places (pages 10 and 52) that personnel will routinely use the waste shaft for access to the underground and in one place (page 16) that this will be done only during emergencies. This important point needs to be clarified.

Although in normal mining operations joint use of a shaft is commonplace, we consider joint use a very important issue, since the material is radioactive; this needs to be evaluated in greater detail than contained in this report. Among the questions needing answers are:

1. Why is routine joint use necessary?
2. If use is not routine, in what types of emergencies would personnel use the shaft?
3. What is the underground configuration of personnel areas, waste movement, shops, etc.? This is needed for rational analyses of personnel exposures under current and proposed designs.
4. What sequence of events would occur during a power outage with CH-TRU, RH-TRU or experimental high-level waste in the shaft?
5. A quantitative assessment of the possible levels of radiological contamination that might develop in the shaft and the resulting exposures to personnel is needed. Also, what is done if a serious contaminating event occurs?
6. Clarification is needed on the handling of experimental high level wastes. Are there changes from the original design?
7. One or more new scenarios involving accidents with CH-TRU, RH-TRU, and experimental high-level waste or with personnel in this shaft would be desirable. It is not obvious that existing scenarios cover all the important events that could occur in this new system.

The conceptual changes in the ventilation system appear reasonable. The plan to change air doors at each shift change is common in mine operation and should pose no problems. However, more detail is needed as to which doors, airlocks, or regulators would be changed at the time the operation is shifted from mining to disposal. Also, the last paragraph in this section (page 13) describing flow reversal during fire in the construction area is not clear. Separate diagrams addressing door, etc. changes and flow reversal may answer most of these questions without going into excessive detail.

Without more information, we cannot conclude that the reduced size of these facilities is adequate. Of particular concern are the health physics facilities, the radiological control area, the change rooms, and the central monitoring system.

1.3.5 Simplify Central Monitoring System

Our principal concern with this proposed modification is the decrease in the probability that the system will always be operational. Not only is the availability of standby power less certain (see discussion under 1.3.10) but the elimination of a structure designed to withstand the Design Basis Tornado (DBT) and Design Basis Earthquake (DBE) increases the liklihood that the CMCR itself could be damaged and inoperable. Also, it is unclear whether the HEPA filtration system (described in 3.3.8 of the SAR) included in the original design to insure continuous occupancy of the CMCR during periods of radiological contamination would still be present in the reduced design.

There is a need for more quantitative information. What is the probability that power will be lost or that damage will occur to the CMCR making it inoperable? Will all required underground operations be manually operable if the CMCR is inoperable? Will an adequate communication system exist if the CMCR is inoperable? Also, scenarios are needed to describe the events that might occur if this system was inoperable for a few minutes or a few hours during normal situations and during emergency situations.

1.3.6 Simplify Security Control System

The modified surface facility design and the resulting change in the security control system would result in all personnel, including visitors, entering the facility through the same gate as the wastes. Also, it places the support building about 20 feet from the waste handling building, compared to almost 1000 feet in the old design. More information is needed on personnel movement and location compared to waste movement and storage before we can conclude that the proposed design does not result in unnecessary radiation exposure.

of this proposed change so that the expected net increased environmental impact can be better evaluated against the expected cost savings. Figure 3-1 correctly notes an increased environmental impact from noise and air quality. However, it is not apparent that the resource consumption and occupational safety impacts would be neutral.

1.3.10 Simplify Power System

The proposal is to go from two automatically actuated standby diesel generators housed in a structure built to DBT/DBE requirements to one, manually started diesel generator housed in a weather protection structure that is not built to DBT/DBE requirements. We have no problem with the changed concept of providing only sufficient standby power for a safe shut down (rather than the continued disposal operations currently planned). Also, the short period of time before standby power is started manually is not expected to be a problem to those underground because of natural ventilation. However, there is concern about the decreased certainty that standby power will exist when it is needed because:

1. A single standby generator may be inoperable (as in the cases at Trojan and Rancho Seco power plants in the last 12 months).
2. Power outages are often caused by high winds (which can exceed 80 mph), and tornados occasionally occur. Without DBE/DBT protection for emergency power, including switch gear, there is a possibility that standby power would also be knocked out by the same event.

Consequently, there is a need to evaluate a number of items before a decision is made to adopt the proposed power system:

1. The frequency, duration, and causes of loss of off-site power;
2. The quality assurance system that will be maintained to insure that the standby generator is operational;
3. The probability that the generator will be inoperable from natural causes, human error, or human neglect;
4. The natural ventilation patterns expected underground during power outage. Of particular concern is reverse flow that may occur from the waste storage area.

1.3.14 Resource Recovery in Zone IV

Our comments on this issue will not be exhaustive nor will they be EEG's official comments on the Resource Recovery issue. This is necessary because the DOE Policy Statement has not been released and there is some question whether all the changes presented in this report are still current.

We have no particular problem with the general policy as discussed on pages 29-33. That is, the following intentions are considered acceptable: the extraction of potash from Zone IV by conventional (not solution) mining techniques; the extraction of hydrocarbons from beneath Zone IV; and the extraction of hydrocarbons from depths > 6,000 feet beneath Zones I - III. There are several comments or questions for clarification:

1. The term on page 32 "unacceptable radiation dose consequences" has never been defined by DOE. Until it is, this phrase is meaningless and should not be used.
2. The statement is made on page 32 that solution mining will not be allowed within the limits of the WIPP site. Does this include Zone IV?
3. The statement on page 33 that there are no crude oil resources beneath the site is inconsistent with Table 2.1 in this report. Reserves would be a more appropriate word here. Also, with the dire predictions of the earth running out of oil in 30-40 years, it is reasonable to believe that currently identified resources will be considered reserves before institutional control is lost.

1.5 Other Alternatives

Another reason reducing the advantages of "fast tracking" the project schedule is that much of cost escalation is not really an economic penalty. Only those costs which escalate at a faster rate than general inflation are truly increases. Furthermore, there is a time value to deferring expenditures and using the money for other things that is perhaps in the 10-12% per year range.

The statement under 1.5.2 says there is still some shielded storage area in the proposed Waste Handling Building design. The statement on pages 20-21 implies there is not.

SECTION 3 - ENVIRONMENTAL CONSEQUENCES (Comments)

3.1 Air Quality

Note comments above about the discrepancy in acres of construction area under the original and reduced designs.

Table 3.1 would be more useful if the percent reductions in airborne emissions were also given.

3.12 Resource Consumption

It is unclear why the diesel fuel consumption of emergency generators would drop from 140 gallons per day to 5 gallons per day.

The stated reduction of 25,000 tons of waste rock because of the elimination of one shaft cannot be checked because shaft diameters are not given.

Estimates should also be made of the consumption of materials and energy during the operation phase, as Table 3.2 does for the construction phase. Also, total noise levels and air emissions during operation should be estimated.

3.16 Occupational Safety

It should be noted that some of the reduced annual rate of occupational accidents expected because of the lower disposal rate would be offset because of the increased number of years it takes to fill the repository. Also, there will be less workers to share the annual risk. The need to quantify accident rates (also mentioned earlier) is necessary so that the net effects of proposed changes can be estimated. For example: (1) fires and accidents from conveyors versus those from diesel trucks; and (2) overhead crane accidents versus air pallets.

3.17 Radiological Releases

What are the alternate handling procedures which will reduce the probability of radioactivity release? Also, these procedures should not be credited to the cost reduction program unless they are not feasible to use under the original design.

We essentially concur with the estimate of 1.4 times the dose at the boundary of Zone III compared to that at the boundary of Zone IV. Use of other meteorological parameters from the FEIS give the following ratios:

	Factor
Long-Term χ/Q	2.3
One-hour, 5% Prob.	1.3
One-hour, 50% Prob.	1.7

Those differences are minor and, considering the low dose rates, are of no consequence.

What does the statement on page 54 "16 hours per day per year" mean?

REFERENCES

1. U. S. Department of Energy. Final Environmental Impact Statement, Waste Isolation Pilot Plant (DOE/EIS-0026), October 1980.

2. U. S. Department of Energy. Waste Isolation Pilot Plant Safety Analysis Report, 5 Volumes, 1980.

APPENDIX A

Review of Environmental Analysis Cost Reduction Proposals For the Waste Isolation Pilot Plant (DOE/WIPP-136, July 1982)

by

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Extent of Review

This review is primarily directed toward changes in plans for mine shafts, underground development, ventilation transportation of salt mined, monitoring system, storage exhaust system, and the power system. The changes proposed, which affect the mining operation and waste storage are included in Section 1.1 through 1.3.12 (pp.1 through 28) of the WIPP report.

Proposed Changes in Existing Design

Waste Storage Rate

The existing facility design was based on providing capability of handling up to 1,200,000 cubic feet of CH waste per year. A reevaluation of amount of waste to be handled at the WIPP site resulted in high values of 381,000 cubic ft./yr. of CH waste. The proposed new design for storage of 500,000 cu.ft./yr. is therefore considered adequate. Reduction of waste storage rate assists in achieving reduction of cost of the project.

Shafts

The major change in mining plans is the reduction of number of shafts from four in the existing plan to three in the proposed plan. The existing plan shows two shafts for waste handling and ventilation. Two others are shown for salt handling and ventilation.

The new plan, in effect, combines return air from the salt mining area and the CH waste storage area in one return, upcast ventilation shaft.

The first shaft sunk on this project as an exploratory shaft will be used as the construction and salt handling shaft. The second shaft sunk was drilled to a 6 foot diameter and is presently used as an upcast ventilation shaft. It will be enlarged to about 19 feet diameter, presumably after the SPDV phase has ended in mid-1983 and decision had been made to continue the project. Plans on method of enlarging the shaft from 6 feet diameter to 19 feet, method of lining, shaft fittings, hoist cage and other equipment are not yet available.

The third shaft proposed is the exhaust shaft for handling all exhaust air with diameter to be determined by ventilation requirements. Method of sinking and type of lining are not included in available plans.

Availability of details of future plans is not required at this time to reach a decision on number of shafts.

Potash mines are initially developed and operated with two shafts. Additional shafts are sunk at some properties to provide additional ventilation after the mine has expanded. Such shafts are usually equipped with hoists so that travel time underground can be reduced.

Three shafts will be sufficient for the WIPP project as planned.

Hoisting Equipment

The hoist in service on the 10 foot diameter construction and salt handling shaft (present Development Shaft) is furnished by the contractor, but DOE has the option of purchase so it may be the final hoist on the shaft. It is a 1924 Nordberg double drum hoist being operated with rope on only one drum hoisting an 8 ton load of salt in an unbalanced skip. The total load when hoisting salt is $\pm$ 16 tons. Apparently a new double drum hoist was planned initially as reference to the hoist was mentioned on page 14 under 1.3.3.2, Proposed Change: "A single drum, lower capacity hoist would be used instead of a double drum hoist."

The construction shaft has been equipped with a storage pocket and skip loader. The 8 ton skip has a cage for men or supplies in combination with it. This arrangement is widely used in mining operations. Safety regulations require, however, that personnel should not be lowered or hoisted if the skip is loaded with material which, in this case, is salt.

The waste shaft hoist is not described but the shaft would be equipped with a cage which will accommodate RH and CH waste containers plus transporting waste handling personnel, materials and equipment underground.

Again, personnel would not be allowed on the cage with waste, heavy equipment or supplies.

Ventilation

The present ventilation plan consists of using four shafts. One pair of shafts would be used with independent underground entries to establish a ventilation system for the construction and salt handling system and also providing air for shops and experimental rooms.

The other pair of shafts provided a separate ventilation system for the waste handling and storage.

The cost reduction proposal design utilizes a single exhaust shaft. Since operations are reduced, one shift will be utilized for mining and handling salt and most of the downcast air in the salt handling shaft would be routed through the construction area, with a small amount through the waste storage area.

Waste handling and storage would be done by another crew on another shift, during which most of the air would be routed through the waste storage area.

Air doors would be used to change flow of air from one split to the other. The construction and salt handling shaft would be downcast and would provide all the fresh air flow. The system proposed requires that each oncoming shift adjust air doors in the vicinity of the shaft to direct main flow to the split on which they will be working. This should pose no problems. However, it would be helpful if the revised airflow (Figure 1-5) was shown with more detail (perhaps on separate diagrams) as to which doors, airlocks or regulators would be changed to divert the air from one split to the other.

On page 7, air flow reversal during an emergency is outlined. Under the proposed change on page 13, it is stated "In the event of a fire emergency in the construction area, the direction of the air flow could be reversed." A separate diagram showing flow of air in case of reversal would be helpful with detail as to effect on underground booster fan and leakage to the waste storage split. Mine safety codes require provision for reversal of fans usually for gassy mines. The New Mexico Safety Code for all mines requires that all main surface fans and main underground fans be so arranged that the ventilating current can be reversed quickly. Each underground operation differs from others and safety precautions in case of fire have to fit the operation. The Federal 30CFR 55, 56, and 57 Pocket Edition 1979 and 30CFR 1980 contain a provision 57.4--61A that ventilation doors be installed at or near shaft stations on intake shafts. These doors can be closed to prevent spread of smoke or fire. Figure 1-5 page 12 of the Cost Reduction Proposal shows such a door.

Shops and storage areas are not shown on Fig. 1-5. These should be provided with a fire door which can be closed in case of fire and where smoke or fumes could circulate to contaminate working areas.

Undoubtedly the personnel preparing plans are cognizant of all requirements and will provide for them. The plan shown may be further revised if the construction and waste storage are located south of the waste shaft instead of north.

Total volume of air is apparently 100,000 cfm (p. 23).

The Exhaust Filter Building is being located adjacent to the proposed Exhaust shaft. Fan type is being changed from axial flow to centrifugal. The arrangement of flow diverter valves and filter isolation valves would be fail safe in case of power failure.

Salt handling System

Initial design consisted of mining salt with a continuous miner with an LHD unit (Load-Haul-Dump), diesel powered, for transportation of salt to a crushing plant about 400 feet from the face. The crushing plant was designed to separate undersize salt for backfill, estimated at 10% of the total. The oversize material and excess undersize would be discharged on a conveyor system to the shaft surge bin of 600 ton capacity.

Since the waste storage rate was reduced, the mining rate was also reduced. No figures are given for mining rate but only one continuous miner is mentioned. A high capacity conveyor system was not required. Diesel powered trucks can be used as a substitute for conveyor haulage. Either method is feasible.

Potash mines usually employ conveyor systems. Rail haulage, initially used in several mines, was replaced by conveyors. Distance from shaft pocket to face can range up to five miles or more.

Maximum haulage distance in the plan shown would be approximately 4600 feet and average distance would be substantially less. This falls in the range of haulage distance of some uranium and copper operations where diesel trucks are used.

Cost savings are not specified. Equipment cost would be less but labor cost would probably be higher.

Disadvantage is use of diesel powered equipment. However, this type of equipment is widely used underground in the mining industry. Scubbers have been improved and as long as equipment is maintained properly, no problems are introduced. Ventilation requirements would not be increased by the use of one or two trucks.

The conveyor system on the surface from the salt handling shaft to the surface disposal area is being eliminated in the Cost Reduction Proposal. In this case, much larger trucks can be used on the surface than underground. Conveyors on the surface usually require covers and in high winds spills can be caused. Stacking equipment requires moving. Truck haulage is more flexible and probably cheaper. Hazard consists of normal degree for surface truck haulage.

Simplifying Power System

The existing design consists of electrical power provided by a utility transmission line and substation for normal operations on the surface and underground. In case of failure of this system, emergency power is provided by two diesel generators on emergency busses. These units will start automatically upon sensing a loss of off-site power. One feeder cable from the emergency buss will descend through the ventilation supply shaft and the other through the construction exhaust and salt handling shaft. Loads would be automatically energized undergound except for mining equipment.

The feeder cable system would be the same basically under the proposed system with one installed in the waste shaft and one in the construction and salt handling shaft.

Proposal is to change from two diesel generators to one with manual instead of automatic starting. There would be some delay, as mentioned, in starting the emergency diesel manually. Ventilation fans would be inoperable until power was restored. This is no great problem as personnel underground would have sufficient air. Natural ventilation in most mines is quite substantial, depending on atmospheric conditions and temperature differentials. It would be advisable to be sure that natural ventilation, during power failure, would not reverse flow, particularly through the waste storage area. This could be prevented by doors underground to cut off ventilation temporarily.

The diesel generator would be located inside a weather protection enclosure not built to DBE/DBT requirements. Power outage is often caused by heavy storms and winds can exceed 80 mph. Tornados are infrequently reported but are possible. The emergency power, including switch gear, should be well protected. On page 27, the proposed plan provides for operation of the waste hoist to hoist personnel out of the mine on power provided by the diesel unit. During that time power would not be available for mine ventilation.

The type of hoist and hoisting equipment are not described. The hoist and shaft are shown enclosed by the Waste Handling Building. Presumably a Koeppe type hoist is being considered with drive motor and drum mounted in a tower or headframe over the shaft. This provides for two cages in balance with a tail rope. This type of hoist would require much less power. The other hoist is hoisting an unbalanced load of approximately 8 tons. However, the emergency hoist now on the site, would presumably be available as a last resort. The emergency hoist is a diesel-hydraulic unit with a small cage.

Vital instrument loads will be connected to an emergency bus with uninterruptible power supplied by battery-rectifier-inverter devices.

Central Monitoring System

The existing design was for a central monitoring and control system. Proposal is to relocate the system in the Support Building and use only one computer for monitoring and control would be limited to HEPA filter diversion and isolation valves in the Exhaust Filter Building. It would be expected that any action required in the underground operations, such as change of ventilation doors, could be handled manually.

Summary

The Environmental Analysis Cost Reduction Proposals consists of a condensed description of plans and proposed changes to be made.

Shafts

Three shafts, as described in the plans should be ample to provide access to underground operations and for ventilation of salt removal and waste storage areas on alternate shifts. Actual diameter of the third shaft is not specified but would be determined by ventilation requirements.

Details of hoisting equipment are not available but will be included in later plans.

There should be no problems in use of a shaft for hoisting salt or lowering waste and transporting personnel so long as personnel are lowered when there is no other load on the hoist or conveyance.

Ventilation System

Combining of return air from construction area and waste storage area is feasible.

Sufficient air should be available with two shafts used for ventilation of working areas and one for handling waste.

Diversion of most of the air to one split on one shift and to the other on an alternate shift is feasible and provides for maximum air available in either split. In the event of fire, ventilation can be reversed in the construction and salt handling shaft.

However, a separate diagram of air flow under each condition with explanation of settings of doors and regulators would be helpful.

Procedure in case of complete power outage for an hour or more with respect to ventilation method and effect of natural ventilation should be established.

Salt Handling System

Truck haulage is feasible. Fire hazard is probably no greater than with electrically driven conveyor system underground. With proper precautions, either should be reasonably safe.

Simplifying Power System

When using standby power for hoisting, ventilation system and changes should be described since there apparently will not be enough power to operate a ventilation fan or fans while operating hoist.

The DBE, DBT protection could possibly be provided in the waste storage building for the diesel generator. Presumably, it would have to be isolated in a separate bay or room and this might not be considered safe or practical. This emergency unit and switch gear should be well protected in case of storms and high winds.

If emergency power is not available for hoisting, the diesel hydraulic unit now available for emergencies, should still be available. It is quite limited in capacity.

Central Monitoring System

The monitoring control system provides for fail-safe routing of return air from waste storage through the HEPA filters.

It would seem that all other necessary action during emergencies could be handled by employees provided that communication systems are well protected and could be dependable during storm conditions when problems are most likely to occur.