

SAFETY IN SALT: THE WIPP OPERATOR'S VIEWPOINT

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ABSTRACT

The Waste Isolation Pilot Plant (WIPP) is arguably the world's safest deep geologic isolation facility. Its safety springs from careful planning, robust engineering and construction, and intense scientific and public scrutiny. The WIPP is the world's first permanent repository for long-lived alpha-emitting radioactive and mixed waste.

Its owner, the U.S. Department of Energy (DOE), and its long-term management and operating contractor, Westinghouse Government Services Company, set the standard of excellence for the disposal of transuranic (TRU) waste by putting safety first. The U.S. Environmental Protection Agency (EPA) recognized this achievement on May 13, 1998, when it certified that the WIPP meets the radioactive waste disposal standards for protecting public health and the environment. The WIPP is ready to safely isolate TRU waste.

Significant milestones on the road to WIPP readiness included:

- A review of all applicable standards and regulatory requirements and their implementation;
- A rigorous self-assessment of people, procedures, and processes;
- An integrated checkout of simulated facility operations;
- A performance dry run of receiving and handling simulated waste;
- An operational readiness review by a team of independent contractors; and
- A final readiness review by the DOE.

Reviewers observed routine operations, abnormal operations, and emergency drills. They interviewed personnel, reviewed documentation, and verified that everybody and everything is ready for waste disposal operations.

The WIPP is now ready and certified to receive TRU waste only. Before the facility can accept TRU "mixed" waste (containing both radiotoxic and chemotoxic contaminants), the state of New Mexico must issue a separate certification, affirming that the facility complies with the standards for chemically hazardous waste. The state issued a proposed certification on May 15, 1998. Final certification, allowing full-scale WIPP operations, is now expected before the end of this year.

INTRODUCTION

In the 1950s, the United States National Academy of Sciences recommended radioactive waste disposal in stable geologic formations. The scientists concluded that salt can be an excellent medium for nuclear waste isolation. This was – and is – sound science: most salt deposits are

found in stable geological areas with very little earthquake activity. Next, ancient salt deposits demonstrate the absence of flowing fresh water that would have dissolved the salt long ago. Rock salt also heals temporary fractures because of its viscoplastic response to stress. That same quality makes salt formations move in slowly and progressively to fill mined areas and safely seal waste from the environment. Moreover, the deposits are relatively easy to mine and provide radiation shielding similar to concrete.

Accordingly, beginning in the 1960s, U.S. scientists began searching for appropriate nuclear waste sites. In the 1970s, their search concentrated on southeastern New Mexico. Their studies of the area eventually led Congress, in 1979, to authorize construction of the Waste Isolation Pilot Plant (WIPP) 40 kilometers miles east of Carlsbad, New Mexico.

It is a most appropriate location.

About 250 million years ago, evaporation of the Permian Sea laid down thick salt deposits at what is now the WIPP site. The salt is about 610 meters thick, beginning 260 meters below the surface. At this depth, the salt will slowly encapsulate the buried waste. The salt's 250 million-year history offers assurance that the site will remain sound for the comparatively short 250,000 years it will take the TRU waste the WIPP will contain to decay to natural background radiation levels.

TRU waste comes from the DOE's nuclear weapons production, dismantling, and research and development activities. This waste consists primarily of clothing, tools, rags, debris, residues and other solid disposable items contaminated with trace amounts of radioactive isotopes – mostly plutonium.

In early 1998, following a comprehensive, rigorous, and disciplined series of technical reviews, the DOE declared the WIPP ready to begin operations. Westinghouse Government Services Company's Waste Isolation Division (WID), the WIPP's management and operating contractor, achieved this milestone through careful planning, flexible scheduling and thorough execution.

The achievement required nearly two years of operational readiness preparation. The WID needed to resolve about 650 pre- and post-start issues. Successful issue resolution helped set the stage for the U. S. Environmental Protection Agency (EPA) to follow the DOE's operational readiness declaration with its own certification that the project complies with all nuclear standards to protect public health and the environment.

RESULTS OF OPERATIONAL READINESS REVIEW

In tandem with the EPA's certification deliberations, the DOE's Carlsbad Area Office (CAO) asked an independent team of experts to conduct a final systematic inquiry into the WIPP's ability to safely start disposal operations. The team featured 15 experts from DOE branches outside the CAO and from private companies. This Operational Readiness Review (ORR) found that all required programs are in place and effective. It determined that the WIPP staff demonstrated the knowledge, attitude and inquisitiveness required to ensure disciplined safe operations. The review also concluded that the material condition and readiness of plant

equipment and systems are reliable, and that radiological controls ensure safe radioactive waste handling operations.

The ORR team identified the following strengths:

- A strong safety culture is in place;
- The management team responds quickly and exhibits strong leadership characteristics;
- WIPP personnel demonstrate disciplined waste handling operations and an above-average knowledge level;
- The plant is in above-average material condition;
- The CAO observation program is extensive; and
- CAO oversight is effective

Significantly, the independent review team identified no general programmatic weaknesses. While it did uncover a few minor specific weaknesses, the WID has addressed and corrected them. After the six pre-start findings were resolved, the ORR team concluded that contact-handled TRU and mixed TRU waste handling operations could start safely.

KEY STEPS TO DECLARATION OF READINESS

The WIPP's comprehensive readiness assessment proceeded in a series of sequenced steps to the final ORR. These steps included a review of all legal and regulatory requirements, the readiness status of personnel, procedures, and processes, and the appropriate integration of key programs.

Line Management Assessment

The WID's initial Line Management Assessment (LMA) established specific criteria to verify compliance and readiness for each core requirement listed in the DOE's ORR order and all associated standards. The WID then subdivided these by department and section. This allowed each group with a criterion compliance role to conduct its own separate assessment. In total, the WID completed 1,195 lines of inquiry into all aspects of operational readiness.

Individuals responsible for each line of inquiry reviewed compliance, documenting any deficiencies on an associated affidavit. The individuals' managers reviewed and concurred with each affidavit, noting any additional deficiencies. The WID organization with overall lead ownership for each criterion next reviewed all affidavits falling under its purview. This review process ensured criteria assessment consistency between many different groups.

Each department then validated its affidavits. Department manager concurrence ensured that conclusions and findings were documented properly. The department managers also evaluated each finding to determine whether it required pre- or post-start resolution. This approach uncovered 447 pre-start and 191 post-start findings. All have been resolved.

Finally, the WID quality and regulatory assurance organization conducted its own independent assessment of the management assessment plan, the document governing the LMA. It concluded

that “Overall, the Management Assessment Plan was effectively implemented to prepare for the scheduled Operational Readiness Review....”

Integrated Facility Checkout

The LMA included an Integrated Facility Checkout (IFC) that evaluated the facility as if it were fully operational. This step documented the performance and proficiency of all aspects of waste receipt and handling. An initial 30-day IFC phase was followed by a six-week period to incorporate and apply lessons learned. A final 30-day IFC phase confirmed the success of the exercise. This approach allowed the WID to verify that waste receipt, waste handling (unloading, transporting, and final emplacement), and emergency response processes are functioning efficiently and safely. It also demonstrated acceptable compliance to technical safety requirements and radiological controls, as well as timely completion of maintenance activities.

Performance Dry Run

As the crowning LMA step, the WID conducted a Performance Dry Run (PDR) to demonstrate its ability to fully manage a waste shipment from a generator site to final underground emplacement. Simulated waste shipped from Idaho was treated as if it were actual waste, including involvement of the various transit states. Upon arrival at the WIPP, the containers were inspected, handled and emplaced underground following all applicable procedures. Three exercise drills demonstrated the project’s ability to respond to anomalies and postulated accidents. The entire demonstration was extremely successful.

Contractor Operational Readiness Review

In December 1997, the WID’s General Manager announced that the LMA (including the IFC and the PDR) had successfully prepared the WID for an outside evaluation of its operational readiness. A team of independent contractors conducted this evaluation, called the Contractor Operational Readiness Review (ORR). Sixteen experts observed simulated normal, abnormal and emergency operations. They interviewed numerous operators and reviewed relevant documents and records to ensure that the WID operates the WIPP in compliance with all requirements. The Contractor ORR team found the following strengths:

- WID personnel at all levels demonstrate a positive attitude and adherence to procedures.
- Management pays attention and provides support to plant operations.
- Waste handling and facility operators deliver acceptable performance.
- The programs for maintenance, environmental protection, and quality and regulatory assurance are implemented effectively.

While the Contractor ORR team identified 15 pre-start findings, the WID took immediate and decisive action to resolve all issues before the final DOE ORR team’s review.

TRANSPORTATION SYSTEM READINESS

The WID designed and tested an integrated system to safely move 38,000 or more waste shipments to the WIPP over a 35-year period. This system incorporates carefully integrated components and equipment, highly qualified drivers and thoroughly trained emergency response personnel. Vigilant practice and evaluation of both equipment and personnel buttress overall

safety. The system meets or exceeds all statutory and regulatory safety standards, resulting in more than adequate protection against radiotoxic and chemotoxic hazards.

The WIPP conducted 19 integrated transportation accident exercises, in cooperation with transit states and communities, over a seven-year period. In response to a growing number of states' requests, such exercises are now scheduled at a rate of two per year per route, plus two more in New Mexico.

The WIPP waste transportation system constitutes a complete circle of safety. All its elements support each other, providing backup and substitution in case of need. The system's outstanding performance led the National Academy of Sciences to declare: "The system proposed for transportation of TRU waste to the WIPP is safer than that employed for any other hazardous material in the United States today and will reduce risk to very low levels."

REGULATORY APPROVALS

On May 13, 1998, the EPA certified that the WIPP is in compliance with all applicable health and safety standards for managing and disposing TRU waste. This marked the culmination of five and one-half years of reviews, public meetings, hearings, and consultation with scientists and technical experts to ensure facility safety. Before final certification, the EPA considered about 1,400 written and oral public comments. On the same day the EPA issued its certification, the Secretary of Energy notified Congress that waste emplacement at the WIPP could begin after a statutory 30-day waiting period. Only judicial challenges could delay receipt of radiotoxic waste any further.

At this writing (February 1999), the DOE has postponed TRU waste shipment to the WIPP pending the resolution of legal challenges filed in 1991 and 1998 by New Mexico's former Attorney General and activist groups. The state's new attorney general has met with the activists and scientists and technical experts from DOE, the National Academy of Scientists and other government agencies. DOE expects the issues will be resolved and the WIPP can begin receiving TRU waste by the end of the first quarter of 1999.

Before disposing of "mixed" TRU waste containing both chemotoxic and radiotoxic materials, the DOE must obtain a permit from the state of New Mexico for the chemotoxic waste portion. Until then, the WIPP is certified for radiotoxic waste only. On May 15, 1998, the state issued for public comment a draft permit on chemotoxic waste management at the WIPP. The New Mexico Environmental Department expects to issue its final Resource Conservation and Recovery Act (RCRA) permit by the end of this year. In the meantime, the Environmental Department has determined that the first shipment of non-mixed waste to arrive at the WIPP from the DOE's Los Alamos Laboratory does not contain hazardous substances subject to RCRA.

CONCLUSION

The DOE and the EPA are now in agreement: the WIPP complies with all standards for the permanent isolation of TRU waste and is ready to start actual disposal operations. This view is shared by other agencies that provide independent oversight and analysis of WIPP activities, including the Defense Nuclear Facilities Safety Board, the National Academy of Sciences and the

U.S. Interior Department's Mine Safety and Health Administration. Moreover, New Mexico's independent WIPP oversight agency, the Environmental Evaluation Group, agrees that the WIPP is safe.

Operating the WIPP will allow the United States to complete an essential step toward the safe and environmentally sound cleanup of its former nuclear weapons sites. Secretary of Energy Bill Richardson, writing in the January 17, 1999 *Albuquerque Journal*, said:

"...After years of review by EPA and other independent organizations and more than 20 years of solid engineering and sound science, I see no reason to further delay opening WIPP. I believe we are ready to open and to operate WIPP safely – and to take a major step forward in meeting our national commitment to a safe and healthy environment."