

OPTIMIZING TRANSURANIC WASTE MANAGEMENT—CHALLENGES AND OPPORTUNITIES

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ABSTRACT

The opening of the Waste Isolation Pilot Plant (WIPP) for disposal of transuranic (TRU) waste in March of 1999, the granting of the Hazardous Waste Facility Permit in November 1999, and over two years of operational experience have demonstrated the Department of Energy's (DOE's) capability in closing the nuclear energy cycle. While these achievements resolved several scientific, engineering, regulatory and political issues, the DOE has identified a new set of challenges that represent opportunities for improving programmatic efficiency, cost-effectiveness, and operational safety in managing the nation's TRU waste.

The DOE has recognized that the complex administrative and regulatory requirements for characterization, transportation and disposal of TRU waste are costly (1). A review by the National Academy of Sciences (NAS) states that these requirements lead to inefficient waste characterization, handling and transportation operations that in turn can lead to unnecessary radiation exposure to workers without a commensurate decrease in risk to the public and the environment (2).

This paper provides an overview of the status of the WIPP repository, explains the principles of the proposed commercial business approach, and describes some of the proposed major enhancements of the TRU waste transportation systems. The DOE is developing a remote-handled (RH) waste program to enable emplacement of RH waste at WIPP. This program includes appropriate facility modifications and regulatory changes (3).

INTRODUCTION

The goal of the National TRU Waste Program is to operate the national TRU waste system safely, in full compliance with applicable regulations and agreements, cost effectively, at full capacity, and in a fully integrated mode. The mission of the National TRU Waste Program is to ensure that all TRU waste is removed from DOE closure sites, all legacy TRU waste from DOE sites with an ongoing nuclear mission is disposed, and all newly generated TRU waste is certified for disposal as it is generated.

The WIPP is fully operational with an exceptional safety record. We have learned from more than two years of operational experience that significant scientific, engineering, regulatory, and political issues and challenges remain to be addressed. These lessons provide a platform for activities that will enhance worker safety, decrease costs, and allow for process improvements to characterization, transportation, and disposal activities.

DISPOSAL OPERATIONS

As of November 2001, more than 12,000 drum equivalents have been placed underground at the WIPP. However, there are approximately 800,000 drum equivalents stored and projected at the TRU waste generator sites. Consequently, the majority of WIPP disposal operations will be in the future.

Safety is the number one priority and most significant achievement as the project begins its third year of disposal operations. Some of the WIPP's safety achievements include:

- WIPP operations are safe—more than two million man-hours without a lost time accident.
- WIPP waste handling operations are safe—12,000 drum equivalents of transuranic waste safely unloaded and emplaced in the WIPP underground.
- The WIPP transportation system is safe—more than 500 shipments transported safely over more than 250,000 miles.

PERFORMANCE-DRIVEN SYTEM

The DOE Order 435.1 "Radioactive Waste Management," delineates the administrative and regulatory requirements for the management of DOE's TRU waste and provides the foundation for a performance-based management system. In general, a performance-driven system focuses on three features that distinguish it from an audit-driven system:

- Results realized rather than resources consumed,
- Accountability as well as compliance, and
- Data quality rather than data-gathering methods

In the context of the National TRU Waste Program, the proposed performance-driven system will be based on accountability, identification, and tracking of performance metrics, i.e., results, to measure progress toward milestones, and feedback for additional system improvement. It will also identify and acquire the necessary and sufficient characterization information to safely manage and dispose of TRU waste at the WIPP. Finally, it focuses on data quality rather than on how data are acquired and documented.

ENHANCEMENTS AND IMPROVEMENTS

The DOE is taking a holistic, comprehensive approach to optimizing the National TRU Waste System and expediting the cleanup and closure of waste generator/storage sites. This approach is graphically depicted in Figure 1.

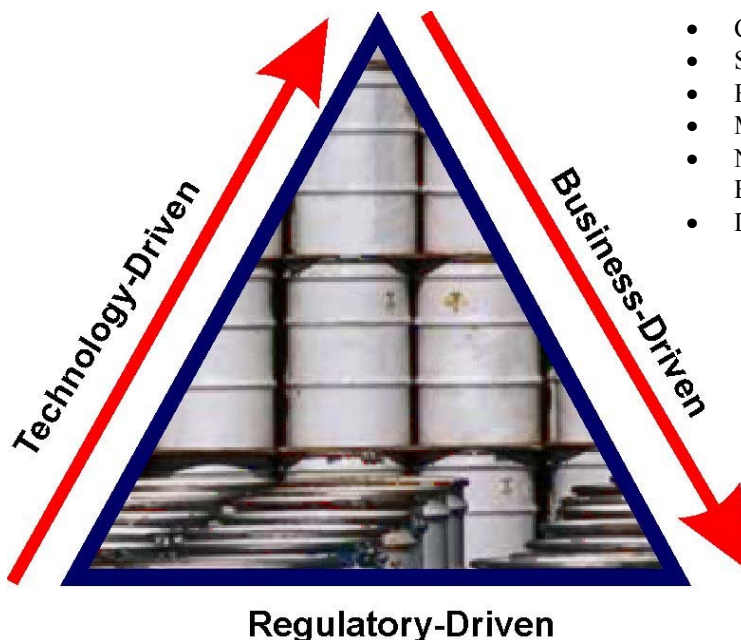
Technology Driven:

Co-Manage TRU and Mixed Waste Focus Area (TMFA)

- Use best available science
- Deployments that are faster, better cheaper

Best Business Practices:

- Corporate Board
- Standardization
- Economy of Scale
- Mobile/Modular
- National Authorization Basis
- Data Automation



Focused on repository performance

Fig. 1 An Optimized TRU Waste System—Triangle

Each of the legs of this triangle, when implemented, will enhance existing capabilities and resolve some of the current challenges for process improvements.

REGULATORY CHANGE

The DOE has proposed and obtained approval for several modifications to the Hazardous Waste Facilities Permit issued by the New Mexico Environment Department (NMED). During this process, NMED, the Attorney General's office, and interested citizens requested that the DOE provide a plan for permit modification submittals and a process designed to better facilitate comment by the public and NMED review. A plan has been developed in response to these concerns. It is a portion of the Optimization Plan (4) and discussed in the National TRU-Waste Management Plan (5).

The DOE, in partnership with its regulators and stakeholders, made several changes to its approach to permit modifications. Short and long term strategies for potential modifications have been shared with interested parties, and include:

- Permit modifications will be submitted in January and July only to facilitate efficient and timely consideration by all parties.

- Pre-submittal discussions of permit modification proposals will be held with NMED and other stakeholders to identify potential problem areas and explore ways of dealing with them.
- All permit modifications will be based on good science and be technically defensible.
- Technology development activities that will enhance the scientific basis for permit modifications will be implemented.

TECHNOLOGY DEVELOPMENT

In July 2000, the DOE's Office of Science and Technology recognizing the significant technology development activities for TRU waste characterization and transportation changed the name of the Mixed Waste Focus Area to the TRU and Mixed Waste Focus Area (TMFA). At the same time, the Carlsbad Field Office (CBFO) was named as the co-manager of the TMFA. The CBFO, working jointly with its TMFA partners, supports the use of appropriate cost-effective technology developments to drive the national TRU waste system to a performance-driven certification system that is based on administrative and operations requirements with a sound safety and/or technology basis. Currently, the CBFO assists with developing TRU waste technologies that have driven regulatory change, enhanced characterization and transportation activities, and contributed to safer and more efficient TRU waste operations. Activities in this area consist of identifying technology needs; selecting the technologies to be pursued; and overseeing the development of operating procedures, personnel training, testing, and startup and operations to ensure that the production operations are functioning correctly to meet the TRU waste certification requirements.

Appropriate technology development can support regulatory change by identifying and prioritizing technology needs in those areas in which technology is the only available solution or in which technology must be deployed if regulatory relief cannot be justified on a safety or legal basis. For example, the Nuclear Regulatory Commission approved Revision 19 to the TRUPACT-II Safety and Analysis Report (SAR). This revision increased the amount of TRU waste that could be shipped from 38% to 74% by providing a technical basis for shipping higher wattage waste than was previously allowed. The dose dependent G-value approach was funded and supported by the TMFA. It allows the waste generator sites to ship higher wattage waste as one of the provisions in Revision 19.

Technological investments for TRU waste activities span the gap from basic science research to deployment/implementation of existing technologies. The CBFO has identified a set of technology development activities that are described in Table I. Table I provides the deployment title and identifies the area that the activity supports, and an estimate of a starting date or a status if the work is currently funded and ongoing is also provided

Table I: High Priority Technology Development Activities

<i>Title</i>	<i>Operation Supported</i>	<i>Potential Start/Status</i>
Automated Data Management	Data Management	Ongoing
Packaging		
ARROW-PAK in a TRUPACT-II	Transportation	ASTD 2001
Mobile System for RH Loading	Transportation	2002
Reduction of Package Inner Layer of Confinement	Transportation	Ongoing
Shielded Package for RH TRU Waste	Transportation	2003
NDE Technology Deployment		
Demonstrate Current RTR Capability on RH Shielded Casks	Real Time Radiography	2002 Start
Configure Equipment for Use in Hot-Cell	Real Time Radiography	2002 Start
NDA Technology Deployment		
NDA Deployment for RH Waste in Hot Cell	Non Destructive Analysis	2002 Start
NDA Deployment for Shielded RH Cask	Non Destructive Analysis	-----
NDA Deployment for Ten Drum Overpack	Non Destructive Analysis	2003 Start
NDA Deployment for Cargo Containers	Non Destructive Analysis	2003
NDA Deployment for TRUPACT III	Non Destructive Analysis	-----
Mobile Unit Deployment		
	Treatment, Headspace Gas Analysis, Non-Destructive Examination, Non-Destructive Analysis, RCRA Metals Measurement & Analysis	2003
Transportation Technology Support		
At-Drum System for Headspace Gas Analysis	Headspace Gas	2002

<i>Title</i>	<i>Operation Supported</i>	<i>Potential Start/Status</i>
	Analysis	
Site Waste Management Support		
Standardized Methods for Segregating TRU and Low-Level Waste	All Functions	TBD

AN INTEGRATED CORPORATE BUSINESS MODEL

The issues and barriers created by a decentralized National TRU Waste management system became apparent once the WIPP was opened for disposal operations. The interdependency of the various TRU waste generator programs and the WIPP became more apparent as the varied waste generator sites began to ship waste to the WIPP. In an effort to more closely coordinate and more efficiently manage all characterization, transportation, and disposal activities, the CBFO has begun to implement an integrated corporate business model. The CBFO is beginning to implement activities that are aimed at maximizing TRU waste shipments to the WIPP while ensuring that the waste generator/storage sites comply with the Waste Analysis Plan (WAP), the WIPP Waste Acceptance Criteria (WAC), and all other regulatory requirements.

Corporate Board

In May 2001, the CBFO, in coordination with DOE Headquarters, instituted a Corporate Board. This Board consists principally of senior DOE and contractor representatives from those sites that are actively shipping TRU waste to the WIPP. Organized much like a private sector corporate board, this Board discusses major issues or concerns to the TRU waste complex and makes consensus recommendations for improvements to operational efficiencies. As described in the Board's By-Laws (3), the mission of the Board is:

“The National TRU Program Corporate Board will serve as a consensus-building body to oversee an integrated DOE TRU Waste System. The Corporate Board will integrate the independently managed DOE sites into a single corporate entity to achieve, through consensus, best business practices, economy of scale, standardization, the appropriate use of Mobile/Modular systems and the use of Best Business Practices to minimize costs, optimize transportation logistics, and implement new policies or requirements.”

Mobile/Modular Deployment Project

The mobile/modular deployment project (MMDP) is the principal vehicle for implementing the Carlsbad Field Office's commercial business model of using best business practices of national authorization basis, standardization, and economies of scale to accelerate shipments while maintaining safety. Approximately 18,000 drums of contact-handled TRU waste are stored at 17 small quantity sites (SQSs) throughout the nation. These SQSs lack the capability (infrastructure and facilities) to perform the necessary waste characterization to meet WIPP disposal requirements. Therefore, these sites would have to build expensive fixed waste characterization

facilities and implement the associated audit processes to certify their waste for shipment and disposal at the WIPP. In addition, some large quantity sites may need to supplement their existing capabilities to meet site compliance and legal agreements. The MMDP provides these supplemental capabilities for both, the SQSs and the large quantity sites.

Each mobile/modular system will contain an integrated, yet flexible, suite of standardized equipment and components configured in a modular arrangement that will be capable of characterizing and loading of contact-handled TRU waste. The vision is to have fully integrated waste characterization process lines with a national authorization basis.

Initial deployments of the mobile/modular approach with existing equipment have already occurred at the Savannah River Site, Argonne-East, and the Nevada Test Site. To take full advantage of the implementation of the corporate business model of standardization and economy of scale, the MMDP must be implemented complex-wide. These business practices take advantage of the efforts of the Central Characterization Project to assist SQSs. Centralized purchase of standardized equipment achieves cost savings. The CBFO has already implemented some standardization for the purchase of standard waste boxes and related equipment. The fully integrated MMDP provides the following benefits:

- An estimated savings of \$1.6B in operational costs over the 35-year lifetime of the WIPP's mission,
- Cost avoidance for construction, maintenance, and eventual decontamination / decommissioning of new, redundant, fixed, waste characterization facilities,
- Lower audit costs for standardized operating procedures
- Use of economies of scale and standardized equipment;
- Reduced costs for implementation of a standardized National Authorization Basis.

Automated Data Management

Data management is a major cost element in the characterization and certification of TRU waste for disposal at the WIPP. For example, certification cost estimates can run as high as \$4,000 per drum at the Rocky Flats Environmental Technology Site. An automated data review and validation capability can be performed more efficiently and accurately than a review performed by one person with a spreadsheet, which is the current practice at most sites.

Accordingly, an electronic data reporting system that will generate WIPP-compliant characterization data packages and automatically review, verify, validate, and reconcile the data quality objectives, quality assurance objectives, quality control criteria, and calibration requirements is an important component of the corporate business model. Deployment of such a system will significantly reduce both the time and cost of generating data packages and allow sites to ship waste at higher rates.

The Corporate Board recently developed a set of recommendations for the Central Characterization Project to implement automated data management techniques as mobile systems are deployed at SQSs.

CONCLUSIONS

As the WIPP enters its third year of waste operations, many milestones have been met and yet many more are to be achieved. The WIPP has grown from an experiment to an operating facility. The implementation of a corporate business model using best business practices is the next step as the WIPP project matures. The MMDP is an important component in providing characterization capabilities cost effectively to TRU waste generator or storage sites. Implementing appropriate regulatory change and development of technologies to support an integrated system will further enhance the operational efficiency of characterization, transportation, and disposal activities. All of this will continue to be based on the prime mission of safety and in compliance with all regulatory requirements.

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