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PROJECT-ENHANCING EFFICIENCIES WITHIN THE
NATIONAL TRANSURANIC WASTE PROGRAM

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Mobile/Modular Deployment Project—Enhancing Operational Efficiencies Within the National Transuranic Waste Program

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ABSTRACT

In 1999, the National Transuranic (TRU) Waste Program (NTP) achieved two significant milestones. First, the Waste Isolation Plant (WIPP) opened in March for the permanent disposal of TRU waste generated by, and temporarily stored at, various sites supporting the nation's defense programs. Second, the Hazardous Waste Facility Permit, issued by the New Mexico Environment Department, for WIPP became effective in November. While the opening of WIPP brought to closure a number of scientific, engineering, regulatory, and political challenges, achieving this major milestone led to a new set of challenges—how to achieve the Department of Energy's (DOE's) NTP end-state vision:

- All TRU waste from DOE sites scheduled for closure is removed
- All legacy TRU waste from DOE sites with an ongoing nuclear mission is disposed
- All newly generated TRU waste is disposed as it is generated

The goal is to operate the national TRU waste program safely, cost effectively, in compliance with applicable regulations and agreements, and at full capacity in a fully integrated mode. The existing schedule for TRU waste disposition would achieve the NTP vision in 2034 at an estimated life-cycle cost of \$16B. The DOE's Carlsbad Field Office (CBFO) seeks to achieve this vision early—by at least 10 years—while saving the nation an estimated \$4B to \$6B. CBFO's approach is to optimize, or to make as functional as possible, TRU waste disposition. That is, to remove barriers that impede waste disposition, and increase the rate and cost efficiency of waste disposal at WIPP, while maintaining safety.

The Mobile/Modular Deployment Project (MMDP) is the principal vehicle for implementing DOE's new commercial model of using best business practices of national authorization basis, standardization, and economies of scale to accelerate the completion of WIPP's mission. The MMDP is one of the cornerstones of the National TRU Waste System Optimization Project (1). The objective of the MMDP is to increase TRU waste shipment and disposal rates from currently certified sites as well as to provide a means to remove TRU waste from sites that have no characterization capability.

INTRODUCTION

The CBFO is taking a holistic, comprehensive approach, involving three integrated management tools, to optimize the national TRU waste system operations to accelerate, by at least 10 years, achievement of the NTP strategic vision. The first tool is the National TRU Waste Management Plan that describes the current TRU waste management system's operating baseline. It includes the use of performance metrics to monitor progress. The second tool is the National TRU Waste System Optimization Project (1) which is the CBFO project responsible for identifying, initiating, and managing those activities necessary to direct the national TRU waste system to an optimized performance-driven end state. The third tool is the National TRU Waste Corporate Board. Its function is to integrate the independently managed DOE TRU waste generator sites into a single corporate entity to achieve, through consensus, best business practices of economy of scale, standardization, establishment of a national authorization basis, data automation, and the appropriate use of mobile/modular systems. This will minimize costs, optimize transportation logistics, and implement new policies or requirements. Through the MMDP, CBFO will deploy fully standardized and integrated modular characterization and certification systems on mobile platforms to optimize the flexibility and efficiency of TRU waste characterization and certification.

The largest cost savings resulting from the Optimization Project are projected to come from the MMDP, the development and deployment of standardized, mobile/modular, characterization systems for TRU waste at the TRU waste generator sites. These deployments will:

1. Provide a means to remove TRU waste from waste generator sites that have no characterization capability. Approximately 18,000 drums of contact-handled (CH) TRU wastes stored at 17 Small Quantity Sites (SQSs) need to be characterized and shipped to WIPP. These sites would have to build fixed waste characterization and certification facilities and implement the associated audit processes to ship their TRU wastes. Studies have shown that building fixed facilities, establishing the associated infrastructure, and implementing audit processes to maintain waste certification at the SQSs would not be cost effective on a per drum basis
2. Accelerate TRU waste shipping schedules to expedite completion of planned TRU waste disposal activities at reduced costs. Characterization capabilities and throughputs at some large quantity sites need to be supplemented to meet site compliance and legal agreements and site closure plans to expedite TRU waste disposition.

BACKGROUND

Before shipping TRU wastes for disposal at WIPP, sites must certify that the wastes meet all requirements for shipment to and disposal at WIPP. Sites with significant quantities of TRU wastes plan to use existing or new fixed facilities to characterize (determine chemical, radiological, and physical attributes), treat, certify, and load TRU waste. However, they may need additional capabilities to meet closure schedules and agreements.

The SQSs generally lack the fixed-facilities, and it would be prohibitively expensive to build fixed facilities at each of these small sites. Also, transportation requirements would have to be met if the SQSs wanted to transport their TRU waste to a larger site.

The use of mobile characterization systems is not a new concept to the DOE/CBFO. Evaluation of the use of mobile waste characterization has been ongoing for at least seven years. In 1996, a study was published by the NTP entitled "*Mobile Waste Characterization System Analysis Report*," (2). It discussed considerations for a phased deployment of mobile and/or portable TRU waste characterization systems. The report envisioned that these systems would provide supplemental support to the major TRU waste sites that had limited fixed-system capability and would provide total support for sites (SQSs) that had little or no waste characterization capabilities. Another study published in 1996, "*Mobile Systems Capability Plan: Expediting the Work of Preparing TRU Waste for Disposal*," (3) focused on contact-handled (CH) TRU waste characterization for the first ten years of the WIPP's operation. This study suggested that the major challenge in deploying mobile characterization units was to match site characterization needs with capabilities in a cost-effective manner.

What is new is the current concept of independent standardized units that can be customized and assembled into a suite of units (a system) to meet a particular site's needs. In addition, the container in which the characterization equipment is housed will be a Type 7A container in which surface-contaminated objects can be transported between sites.

DESCRIPTION

There are two existing privately owned mobile characterizations systems currently deployed, working under contract to the WIPP M&O. One is at the Savannah River Site (SRS) where it is characterizing Pu-239 waste as part of an agreement between the Mound Site, SRS, and the WIPP for transporting Mound Site CH TRU waste out of the State of Ohio. This system is expected to remain at the SRS to expedite SRS waste characterization. The second system is deployed at the Argonne National Laboratory-East (ANL-E) where it is scheduled to have all the legacy waste characterized for shipment to the WIPP by the end of Fiscal Year 2002. This system is to be subsequently deployed to the Nevada Test Site when the work is completed at ANL-E.

The scope of the MMDP is to deploy four additional mobile CH TRU debris waste characterization systems. The MMDP will augment existing TRU waste characterization operations at large quantity sites (LQSs) to increase TRU waste shipment rates. It will provide sufficient mobile CH TRU waste characterization capacity to the NTP to accommodate 24,000 CH TRU debris waste drums/year to the WIPP over a 10-year period. Each system will contain an integrated, yet flexible, suite of standardized equipment and components configured in a site-specific modular arrangement that will be capable of characterizing, certifying, and loading CH TRU debris waste. See Table I for the estimated drum equivalents to be characterized by the MMDP.

Table I. Estimated CH TRU Drum Equivalents to be Characterized by Mobile Systems*

Small-Quantity Sites'	Drums	24,382 DRUMS	
ANL-E	1,183		
B&W-NES	88		
BCL	21		
BAPL	85		
ETEC	11		
GE-VNC	44		
KAPL-NFS	1,025		
LLNL	7,284		
LRRI	97		
MURR	7		
MOUND	1,188		
NTS	3,462		
ORNL	7,131		
PGDP	57		
SNL-NM	425		
SPRU	2,261		
USAMC	13		
Large-Quantity Sites			215,618 DRUMS
SRS			
INEEL			
Hanford			
LANL			

* Estimated from National TRU Waste Management Plan, Rev. 2 (DOE/NTP-96-1204), p. 67.

† Please see Appendix A for definitions of site abbreviations and acronyms.

Preliminary assumptions for the MMDP are:

- There will be four stand-alone characterization systems
- Each unit will:
 - Have the capability to process 30 CH TRU waste drums in 24 hours (10 drums per 8-hour shift)
 - Operate at 75% efficiency
 - Provide automated data validation and verification
 - Contain components for the following characterization requirements:
 - Nondestructive Examination (NDE)
 - Nondestructive Assay (NDA)
 - Headspace Gas Sampling and Analysis (HGS)
 - Visual Examination (VE)

See Table II for components for the mobile/modular systems.

Table II. Mobile System Components and Equipment

Characterization/Operation	Technique/Equipment	Quantity/System	Quantity/ 4 Systems
Nondestructive Examination	Digital Radiography/ Computed Tomography (DR/CT)	1	4
Visual Examination/ Repackaging	Glovebox	1	4
Nondestructive Assay	Segmented Gamma Scanner (SGS)	2	8
	Tomographic Gamma Scanner (TGS)	2	8
	High-efficiency Neutron Counter (HENC)	2	8
Headspace Gas Analysis	Gas Chromatography/Mass Spectrometry (GC/MS)	2	8
	Gas Sampler	2	8
TRUPACT-II Loading	Mobile Loader	1	4
Modular Transportable Containers (Trailers)		6	24

Planned deployments for the four new mobile/modular systems include:

1. System #1—deployed to the Idaho National Engineering and Environmental Laboratory to augment capability to meet the milestone to dispose of 3,100 m³ or 15,000 drum equivalents at WIPP prior to the end of December 2002.
2. System #2—Deployed to the Lawrence Livermore National Laboratory
3. System #3—Deployed to SQS as prioritized by the Corporate Board
4. System #4—Deployed at Hanford to augment existing capability

COST ESTIMATES

Preliminary capital cost estimates to develop and deliver for deployment four mobile/modular TRU waste characterization systems include the cost for four TRUPACT-II mobile loaders and 24 transportable containers (trailers). The total estimated cost for four complete systems is approximately \$40M. Estimated start-up costs of \$24M for these four systems include activities associated with developing a standardized national authorization basis, system training, site setup, cold and hot testing, and systems certification. The total estimated cost for the four complete systems is approximately \$64M. See Table III.

Table III. Preliminary Capital and Start-up Cost Estimates for Four Mobile Characterization Systems (1)

Capital Equipment	Cost (k\$)	
DR/CT	8,000	<p><i>Total Capital Cost for 4 Systems (24,000 Drums/Year):</i></p> <p>\$40.4M</p>
VE Glovebox	2,000	
SGS	400	
TGS	6,000	
HENC	6,000	
GC/MS	2,400	
Gas Sampler	1,600	
Mobile Loader	8,000	
Transportable Containers	6,000	
Start-Up Activity	Cost (k\$)	
Authorization Basis	2,000	<p><i>Total start-up Cost for 4 Systems (24,000 Drums/Year):</i></p> <p>\$24.0M</p>
Training	5,000	
Set-up at Sites	5,000	
Start-up Testing	9,000	
Systems Certification	3,000	
<p><i>Total Development and Deployment Cost for 4 Systems:</i></p> <p>\$64.4M</p>		

BENEFITS

Deployment of these integrated and standardized modular systems on mobile platforms provides a number of major benefits (DOE/CBFO-DRAFT-3201, September 2001) to the NTP, including the following:

- An estimated savings of \$1.6B in operational costs over the 35-year lifetime of WIPP's current planned mission. These savings would be achieved through:
 - Cost avoidance for construction, maintenance, and decontamination and decommissioning (D&D) of new duplicative fixed waste characterization facilities
 - Lower audit costs for standardized operating procedures
 - Use of economies of scale and standardized equipment
 - Reduced cost for implementation of a standardized National Authorization Basis
- An estimated savings of \$1.7B in mortgage and facility infrastructure costs resulting from an estimated 10-year early completion of the WIPP mission (redundant to first sentence under "Benefits" above.) through:
 - Higher waste characterization throughputs at numerous large quantity sites
 - More rapid removal of TRU waste from SQSs
 - Shorter time required to field mobile systems than for constructing new fixed Characterization facilities

SUMMARY

An optimized national TRU waste system calls for accelerated characterization and shipping schedules to achieve early mission completion. Additional waste characterization capacity is required for the TRU waste system in order to meet the goal of at least a 10-year accelerated shipping schedule. CH TRU waste characterization capabilities and throughputs at some LQSs need to be supplemented in order to meet site compliance and legal agreements, e.g., Idaho's Settlement Agreement, and Site Closure Plans.

Deployment of four additional mobile characterization systems will:

1. Enable the TRU waste generator sites to meet their agreements and Site Closure Plans
2. Expedite TRU waste characterization operations at the TRU waste generator sites
3. Allow for early completion of the WIPP mission
4. Provide for standardization of the NTP through the use of standardized equipment and a national authorization basis.

REFERENCES

1. National TRU Waste System Optimization Plan, DOE/CBFO-Draft-3201, September 16, 2001
2. Mobile Waste Characterization System Analysis Report, NTWP/WID-96-2163, January (1996)
3. Mobile Systems Capability Plan: Expediting the Work of Preparing TRU Waste for Disposal, DOE/NTWP-96-1202, September (1996)