

IMPROVING BUSINESS PRACTICES TO INTEGRATE DOE TRANSPORTATION OF LOW-LEVEL AND LOW-LEVEL MIXED RADIOACTIVE WASTE

Grace Plummer
Donette Cappello
Contract Reform and Privatization Project Office, DOE
Judith Holm
National Transportation Program, DOE
Jeanie Loving
Wilda Portner
Science Applications International Corporation
Donna Freedman
Grant Thornton LLP/Jefferson Solutions Team^a

ABSTRACT

The U.S. Department of Energy (DOE) is committed to the cleanup and closure of many of its sites over the next decade. In many cases, these activities will require transportation of low-level and low-level mixed radioactive waste between DOE facilities and, in some cases, to commercial disposal facilities for treatment and disposal, resulting in a marked increase in the number of waste shipments. The Department is evaluating elements of a national strategy to provide best procurement and business practices related to low-level and low-level mixed waste transportation. This paper summarizes the current status of the evaluation and a forecast of strategic elements that DOE could continue to pursue in coming years.

INTRODUCTION

The U.S. Department of Energy's (DOE) environmental management strategy is predicated on an aggressive schedule to clean up and close as many of its sites as possible before the end of this decade. A significant component of that strategy is to safely dispose of wastes that accumulated at DOE sites over the last 50 years as a result of fulfilling the Department's missions in defense and energy research and development. Decommissioning of DOE facilities includes environmental remediation of the land and assets so that they can be turned over to other users. Wastes generated by cleanup activities must be properly transported to authorized sites for treatment and disposal.

In order to meet cleanup and closure objectives, some DOE facilities with large volumes of waste must transport their waste for disposal because they do not have appropriate waste disposal facilities on site. Site schedules project that over the next 10 years low-level and low-level mixed waste will comprise the largest amounts of waste to be transported. Figure I shows the 19 major DOE low-level waste and low-level mixed waste generator sites, their disposal capabilities and the 3 commercial disposal facility locations.

Low-level waste is radioactive waste that is not high-level radioactive waste, transuranic waste, spent nuclear fuel, or by-product material and which the U.S. Nuclear Regulatory Commission

classifies as low-level radioactive waste (reference 10 Code of Federal Regulations, Part 62.2). In general, DOE-generated low-level waste contains relatively low amounts of radioactive material, decays quickly and requires little or no shielding. Low-level mixed waste is low-level waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the Resource Conservation and Recovery Act, respectively. In February 2000, DOE issued a decision (DOE, 2000a) to use its disposal facilities at the Hanford Site in Washington State and the Nevada Test Site for low-level and low-level mixed waste from other DOE sites. DOE facilities at the Idaho National Engineering and Environmental Laboratory, the Los Alamos National Laboratory, the Oak Ridge Reservation, and the Savannah River Site will continue to use existing facilities as appropriate to dispose of low-level waste at the locations where it has been generated. Idaho and Savannah River sites will continue to serve as disposal sites for DOE Naval Nuclear Propulsion Program low-level wastes. Although DOE's policy for these waste types stipulates that sites should use DOE facilities wherever possible, sites may in addition use commercial disposal facilities on a case-by-case exemption basis.

Prior to the issuance of DOE's disposal decision for low-level and low-level mixed waste, waste had been stored on site. The issuance of this decision, coupled with the accelerated cleanup and closure schedules, is expected to result in a substantial increase in shipping for these types of waste compared to previous years. The bulk of the shipments are projected to come from sites which are being closed such as Fernald, in Ohio.

Because of the volumes of these wastes and the potential number of shipments to DOE and commercial disposal facilities necessary to meet site cleanup and closure plans and requirements, DOE is evaluating elements of a national strategy to provide best procurement and business practices that could help create a coherent and integrated approach for transportation of DOE's low-level and low-level mixed waste for treatment and disposal.



Fig. 1. DOE's Major Low-Level and Low-level Mixed Waste Generating/Disposal Sites (Source: Draft Transportation Integration Study for Low-Level and Low-Level Mixed Waste at the U.S. Department of Energy, January 2001 [DOE, 2001])

CURRENT SITUATION

Table I shows currently projected site closures by DOE operations office, based on the spring 2000 update of the *Integrated Planning, Accountability, and Budgeting System Report Module* (IPABS) (DOE, 2000). The table shows that most DOE sites project cleanup and closure dates within the next 10 years. Table II summarizes projected shipping volumes by DOE operations office for low-level waste and low-level mixed waste for the period 2000 to 2010, taken from IPABS (DOE, 2000).

Operations Office	Site	Target Date
Albuquerque	Grand Junction	2001
	Los Alamos	2015
	Pantex	2002
	Sandia	2005
Chicago	Argonne-East	2003
	Argonne-West	2001
	Brookhaven	2006
Idaho	Idaho National Engineering and Environmental Laboratory	2050
Nevada	Nevada Test Site	2014
Ohio	Fernald	2006
	Mound	2004
	West Valley	2015
Oakland	ETEC	2007
	General Atomics	2000
	Lawrence Berkeley	2003
	Lawrence Livermore	2007
	LEHR	2004
	Separations Process Research Unit	2014
Oak Ridge	Oak Ridge	2014
	Paducah	2012
	Portsmouth	2013
Rocky Flats	Rocky Flats Environmental Technology Site	2006
Richland	Hanford	2046
Savannah River	Savannah River Site	2038

Table II. Projected Shipment Volumes, 2000 to 2010

Operations Office	LLMW (M3)	LLW (M3)
Albuquerque	5,919	35,324
Chicago	729	7,940
Idaho	6,925	45,063
Nevada	1	0
Ohio	9,978	653,728
Oakland	1,877	27,338
Oak Ridge	61,870	409,424
Rocky Flats	40,000	156,818
Richland	6,080	180
Savannah River	1,917	50,325
Total	135,296	1,386,140

DOE recognizes the need to explore all cost-effective and efficient approaches for safely transporting low-level and low-level mixed waste to appropriate disposal facilities. DOE's Contract Reform and Privatization Project Office, the National Transportation Program and the Senior Executive Transportation Forum have been working together to develop a coherent strategy that would effectively respond to that need. The Contract Reform and Privatization Project Office and the Grant Thornton/Jefferson Solutions Team is conducting a *Transportation Integration Study for Low-Level and Low-Level Mixed Waste at the U.S. Department of Energy (DOE, 2001)* (referred to in this paper as the Low-Level Waste Study [DOE, 2001]), with participation from the National Transportation Program and other DOE personnel, to explore what specific elements of a transportation strategy could best achieve the Department's objectives for low-level and low-level mixed waste management. Figure II compares current and projected shipments of low-level and low-level mixed waste on a DOE-wide basis between 1999 and 2005 based on the DOE National Transportation Program's Baseline Report (DOE, 2000b) and Transportation Baseline Schedule (DOE, 2000c), both dated October 2000.

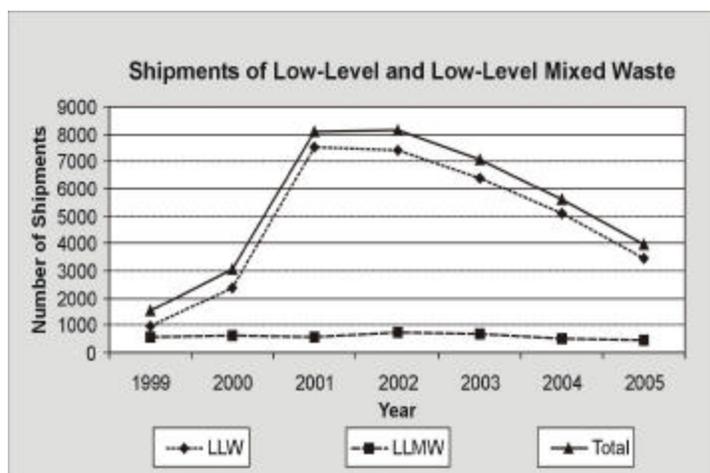


Fig. 2. Current and Projected Shipments
 (Source: Draft Transportation Integration Study for Low-Level and Low-Level Mixed Waste at the U.S. Department of Energy [DOE, 2001])

DATA COLLECTION

In addition to revisiting existing transportation studies and recommendations, the study group has completed over 60 interviews with knowledgeable personnel involved in transportation, emergency preparedness, public information, and program management personnel. These include the Albuquerque Operations Office and Waste Isolation Pilot Plant in New Mexico, the Nevada Test Site and Yucca Mountain Project Office in Nevada, the Oak Ridge Reservation in Tennessee, the Savannah River Site in South Carolina, the DOE Pittsburgh Naval Reactor Office and DOE's Fernald and Mound sites in Ohio. Interviews also included over 15 DOE prime and subcontractors. The study group also conducted interviews with personnel from the National Institutes of Health on their low-level waste shipments and other Federal, utility, carrier, and commercial disposal site personnel. Lines of inquiry include the following topics:

- *Roles and Responsibility:* Roles and responsibilities of those involved in the shipment of low-level and low-level mixed waste.
- *Transportation Safety:* Key components of transportation safety and how they relate to regulation and packaging of low-level and low-level mixed waste, including design and quality assurance standards for containers and vehicles.
- *Notification:* Whether notification process for shipment of low-level and low-level mixed waste is acceptable and under what circumstances States and localities should be provided with shipment information.
- *Packaging:* Experience in the past with transport or packaging problems and the consequences, corrective actions taken, standardization of procedures, and lessons learned regarding improvements in procurement.
- *Intermodal Transport:* Compilation of experience to date in using rail to transport low-level and low-level mixed waste and identification of whether cost efficiencies could be achieved by using combinations of rail and truck.
- *Tracking:* Existence of circumstances, if any, that would require near real-time tracking systems such as the DOE Transportation Communication and Tracking System (TRANSCOM) for shipments of low-level and low-level mixed waste.
- *Procurement Strategies:* Evaluation of whether cost efficiencies can be achieved through multiple DOE-wide omnibus contracts in lieu of site-specific procurement of equipment and services.
- *Private Sector:* Methods for evaluation of core and non-core missions related to constrained resources and budgets, as well as for evaluating and importing private sector practices and financing alternatives.
- *Emergency Preparedness Considerations:* Coordination efforts with State, local and Tribal governments for emergency planning and consideration whether DOE should play a more central role in setting standards for, and coordinating with, those governments for emergency response involving shipments of low-level and low-level mixed waste.
- *Information Dissemination:* How low-level and low-level mixed waste information is disseminated, how stakeholders provide input, and whether information dissemination is sufficient to build confidence in program safety and sound management.
- *Innovative Technologies:* Innovative technologies currently used to support transportation of low-level and low-level mixed waste, key barriers to their deployment and suggestions for eliminating those barriers.

- *Priorities Concerning Legal, Regulatory, Political and Operational Issues:* Prioritization of these issues and reasons why, as well as consideration of who should champion/lead an effort to resolving them.

STRATEGIC ELEMENTS CURRENTLY UNDER REVIEW

Based on the current Low-Level Waste Study (DOE, 2001), which serves as the basis of this paper, and past studies, two areas appear to have potential for achieving cost savings and safety enhancements for shipping low-level and low-level mixed waste: (1) container procurement and quality assurance, and (2) logistics systems.

Container procurement: DOE is continuing to work toward optimum packaging procurement approaches. Aspects of this issue being considered include:

- Emphasis on quality assurance as well as packaging availability;
- Use of performance measures and standards;
- Use of a nationwide approach to qualifying vendors and performing acceptance reviews; and
- Improved economies of scale for unit pricing.

Logistics Systems: DOE is actively considering several aspects of using rail, including the use of intermodal transportation. DOE's Fernald site has already compiled a substantial body of information and experience that could be useful in a pilot project to explore several mechanisms for logistics planning. DOE is considering the use of an experienced site such as Fernald as a central clearinghouse for developing make-up yards for unit trains. This offers a number of advantages, including reduced shipping rates. DOE is also considering the central clearinghouse concept for linking time sequences of shipments such as debris and soil to optimize disposal and carriage rate. In the case of bulk shipments of low level waste, rail is shown to be more cost effective on a per pound basis (\$.04 compared to up to \$.12/lb).

The following section summarizes the Findings and Recommendations from the Low-Level Waste Study (DOE, 2001). The Findings in container procurement are being pursued through DOE's National Transportation Program activities.

Recommendation 1 – Container Procurement and Quality Assurance Certification

The Low-Level Waste Study (DOE, 2001) suggests that DOE implement a central or regional procurement of low-level waste packagings and containers with a coordinated vendor qualification, quality assurance and package acceptance program. The procurement would provide flexibility for sites to select from multiple vendors and from a range of packagings. Standard specifications for a family of containers could be developed on a graded basis, depending on the material to be transported. In order to have site contractor acceptance, it is important to gather data on current packagings so that unique packaging requirements will be considered.

These recommendations parallel Appendix B, D-14, in the *Evaluation of the Container Working Group Long-Term Recommendation Related to Standardization of Waste Containers and Adoption of Transport Packaging Policy*, dated June 1999 (DOE, 1999). That study called for:

- Establishment of a central procurement system to standardize how containers are procured and quality controlled;
- Standard specification design configuration for box containers used to transport the waste; and
- Certification of key operational requirements through performance testing.

Further, the Container Working Group report states that implementation of these recommendations would both enhance safety and achieve savings. The study estimates that the first two recommendations will achieve 10-year savings of \$18 million. Although the third recommendation involves costs offsetting some of those savings, its implementation would significantly increase container safety, a major intangible benefit.

The Low-Level Waste Study (DOE, 2001) suggested establishment of a pilot project at a designated site to develop and administer a central or regional system for the procurement, quality assurance and package acceptance program. The designated site, in collaboration with representatives of major generating and disposal facilities and program and procurement offices would develop standard specifications for a family of containers. It would also develop a model contract for central or regional procurement with multiple vendor awards of low-level waste containers, allowing each site to obtain containers on a just-in-time basis. It was recommended that the DOE working group currently engaged in examining container procurement and quality control should be heavily involved in this pilot in order to take advantage of their expertise and experience.

The Low-Level Waste Study (DOE, 2001) indicated that the results could be improved quality, better partnerships with vendors, and lower cost packagings and inspections.

Recommendation 2 – Transport Economies and Efficiencies

The second recommendation was for DOE to optimize rail and truck transport by improving its logistics planning and coordination across programs. The DOE Office of Environmental Management (EM) has begun advanced planning of shipments, as noted in the *2000 Transportation Baseline Report* (DOE, 2000b), to use as a planning and communication tool. A similar integrated planning effort could be coordinate across the Department's programs for all low-level and low-level mixed waste shipments and would include the examination of the possibilities for consolidating shipments to disposal sites on a corporate basis. For example, the Low-Level Waste Study (DOE, 2001) found that a limited number of coordinated shipments to Envirocare has resulted in better disposal rates for some materials, such as debris, when coordinated with shipment of contaminated soils.

The Low-Level Waste Study (DOE, 2001) also suggests that DOE should explore the expanded use of rail transport, especially for long distance, high volume shipments. This would include:

- Identifying the criteria by which business decisions lead to rail use;
- Pursuing the establishment of rail rates to benefit all DOE programs, similar to rates established for trucks; and
- Examining the feasibility of a corporate schedule for expanded use of rail service.

By making up trains in a central location, smaller shipping sites could benefit by reduced rates for larger loads. This option is somewhat problematic, given the potential stakeholder concerns and prior DOE State compliance agreements about bringing waste into a particular site for consolidation, even though States do allow off-site wastes to be brought in for treatment. Issues such as transfer of liability between contractors, cost-benefits, regulatory issues and State agreements that could impact the viability of train makeup were stated as needing further analysis. However, in light of the large increases in waste shipments anticipated over the next 5 years, a consolidation strategy may proved to be both workable and cost-effective.

If large bulk shipments could be better coordinated, some benefits could be gained by providing incentives for the Envirocare site to invest in a second “rollover” machine for disposal of bulk waste. DOE may need to assess whether it would be in its interest to make long-term commitments on delivery to Envirocare, which would allow the site to invest in the new equipment, railbed, and other support materials for more efficient operations.

The Low-Level Waste Study (DOE, 2001) also suggested that better coordination between generator and disposal sites on a corporate basis could lead to cost savings. Lessons learned from site experiences were thought to also be potential lessons for others to follow in terms of utilizing best business practices. Fernald’s logistics planning and Nevada’s corporate planning and scheduling for disposal at both Hanford and Nevada are cases that provide these lessons.

To implement and extend these best business practices, the Low-Level Waste Study (DOE, 2001) recommended DOE conduct a cost-benefit analysis in order to optimize transportation services and improve logistics planning. Based on the recommendations of the analysis, pilot project may be initiated. While the pilot projects may deal with only one or two site, they should consider the potential for Department-wide benefits, if adopted. Specific actions to be explored include:

- Identifying criteria by which business decisions are made and establishing rail rates across DOE programs;
- Coordinating shipping plans across the complex to effect economies of scale and consolidating shipments to disposal sites to obtain discounts;
- Analyzing the feasibility of consolidating railcars from various sites to make up unit trains to achieve transportation economies of scale; and
- Assessing the efficiencies to be gained by creating an incentive for Envirocare to invest in a second “rollover” machine and ancillary equipment.

Recommendation 3 – Optimization of Public/Private Investments

This recommendation is the longest-term for implementation, but could accelerate cleanup. The Low-Level Waste Study (DOE, 2001) recommended that DOE explore possible benefits of new

construction to expand intermodal transfer site capabilities and identify private sector, as well as public sector, sources of funding to finance infrastructure, if required. Some potential options for funding might include:

- Authorities in the Transportation Infrastructure Finance and Innovation Act (TIFIA);
- Other sources of private capital and resources in parallel with TIFIA; and
- TIFIA-type authority for DOE projects not tied to U.S. Department of Transportation (DOT) regulations.

The DOT TIFIA program is designed to assist major surface transportation projects by providing a limited Federal investment to encourage private sector participation.

Further analysis on intermodal infrastructure financing and identification of possible intermodal sites was indicated in order to assure a reasonable level of project risk existed to make intermodal options viable. It was also recommended that DOE conduct formal studies on intermodal candidate sites to focus on additional opportunities for transportation efficiencies for DOE to consider lessons learned from the Fernald efforts in exploring intermodal pilot studies.

With respect to building transfer stations, the authors of the Low-Level Waste Study (DOE, 2001) indicated that additional investigations should be conducted to determine if the projected number of shipments would support the economic case for building such a facility. Research shows that several organizations and other agencies are considering the use of private sector funding or joint public/private investments in infrastructure, particularly related to intermodal opportunities. The U.S. Department of Defense (DOE), DOT, and States have studied the link between economic development and transportation. These studies can be used as models for DOE to follow.

Currently, the Nevada Test Site does not receive materials in sufficient volume or with sufficient regularity to sustain, by itself, an economic case for building a rail line. Hence, the apparent need for DOE to consider alternative and private sector opportunities to build a transfer station that could have the effect of reducing costs and risks. This was described in the *Life-Cycle Cost and Risk Analysis of Alternative Configurations for Shipping Low-Level Radioactive Waste to the Nevada Test Site*, published by Pacific Northwest Laboratory in December 1999 (Daling, Ross and Biwer, 1999).

The Low-Level Waste Study (DOE, 2001) recommended a detailed formal analysis of the feasibility of public and private sector financing of possible intermodal transfer stations sites, making use of authorities in the TIFIA or other sources of private capital. In addition, the analysis should examine opportunities for DOE to partner with States, other Federal agencies, and the private sector to further leverage its resources.

CONCLUSION

If DOE accepts the recommendations made in the Low-Level Waste Study (DOE-2001), the next step in the process would be to initiate one or more pilot projects to obtain more comprehensive cost data and to test the effectiveness of national and corporate logistics for low-level and low-

level mixed waste shipments. The pilots themselves could result in detailed estimates of potential financial savings. They could be implemented in collaboration with major generation and disposal facilities, and DOE program and procurement offices. A systematic approach and thorough analysis could provide DOE with a strong foundation for meeting its low-level and low-level mixed radioactive waste transportation challenges.

FOOTNOTE

^aOther members of the Grant Thornton LLP/Jefferson Solutions Team include: Allan Burman, Jefferson Solutions and Steve Sorett, Reed Smith Team.

REFERENCES

1. Daling, P.M., Ross, S.B., and Biwer, B., 1999. *Life-Cycle Cost and Risk Analysis of Alternative Configurations for Shipping Low-Level Radioactive Waste to the Nevada Test Site*, PNNL-13100, December.
2. DOE (U.S. Department of Energy), 2001, *Draft Transportation Integration Study for Low-Level and Low-Level Mixed Waste at the U.S. Department of Energy*, Washington, DC, January.
3. DOE (U.S. Department of Energy), 2000, *Integrated Planning, Accountability, and Budgeting System Report Module*, Washington, DC.
4. DOE (U.S. Department of Energy), 2000a, *Record of Decision for the Department of Energy's Waste Management Program: Treatment of Low-Level Waste and Mixed Low-Level Waste; Amendment of the Record of Decision for the Nevada Test Site*, Washington, DC, February.
5. DOE (U.S. Department of Energy), 2000b, *2000 Transportation Baseline Report*, DOE/ID-10754(00), prepared for the Idaho Operations Office by the Idaho National Engineering & Environmental Laboratory, Idaho Falls, Idaho, October.
6. DOE (U.S. Department of Energy), 2000c, *2000 Transportation Baseline Schedule*, DOE/ID-10756(00), prepared for the Idaho Operations Office by the Idaho National Engineering & Environmental Laboratory, Idaho Falls, Idaho, October.
7. DOE (U.S. Department of Energy), 1999, *Evaluation of the Container Working Group Long-Term Recommendation Related to Standardization of Waste Containers and Adoption of Transport Packaging Policy*, Washington, DC, June.