

Implementation of Benchmarking Transportation Logistics Practices and Future Benchmarking Organizations - 8110

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ABSTRACT

The purpose of the Office of Civilian Radioactive Waste Management's (OCRWM) Logistics Benchmarking Project is to identify established government and industry practices for the safe transportation of hazardous materials which can serve as a yardstick for design and operation of OCRWM's national transportation system for shipping spent nuclear fuel and high-level radioactive waste to the proposed repository at Yucca Mountain, Nevada. The project will present logistics and transportation practices and develop implementation recommendations for adaptation by the national transportation system. This paper will describe the process used to perform the initial benchmarking study, highlight interim findings, and explain how these findings are being implemented. It will also provide an overview of the next phase of benchmarking studies. The benchmarking effort will remain a high-priority activity throughout the planning and operational phases of the transportation system.

The initial phase of the project focused on government transportation programs to identify those practices which are most clearly applicable to OCRWM. These Federal programs have decades of safe transportation experience, strive for excellence in operations, and implement effective stakeholder involvement, all of which parallel OCRWM's transportation mission and vision. The initial benchmarking project focused on four business processes that are critical to OCRWM's mission success, and can be incorporated into OCRWM planning and preparation in the near-term. The processes examined were: transportation business model, contract management/outsourcing, stakeholder relations, and contingency planning. More recently, OCRWM examined logistics operations of AREVA NC's Business Unit Logistics in France.

The next phase of benchmarking will focus on integrated domestic and international commercial radioactive logistic operations. The prospective companies represent large scale shippers and have vast experience in safely and efficiently shipping spent nuclear fuel and other radioactive materials. Additional business processes may be examined in this phase. The findings of these

benchmarking efforts will help determine the organizational structure and requirements of the national transportation system.

INTRODUCTION

The Office of Logistics Management (OLM) benchmarking project began in 2005, and is intended to identify, document, and better understand best practices for logistics enterprises. The results will help the Office of Civilian Radioactive Waste Management (OCRWM) design and implement a system to move spent nuclear fuel (SNF) and high-level radioactive waste (HLW) to the proposed repository at Yucca Mountain for disposal.

In 2006, the National Academy of Sciences (NAS) completed a detailed study performed by a multidisciplinary committee of experts on the transportation of SNF and HLW. The NAS study is a comprehensive assessment of SNF transportation and the logistics challenges OCRWM faces. The committee's final report, *Going the Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States*, included a number of conclusions and recommendations, one of which stated: “[t]he committee strongly encourages the [OCRWM] program to seek expert advice (e.g., using consultants and expert advisory groups) to learn about and incorporate best industry practices for designing and operating this transportation system using an integrated systems approach.”[1] OLM's benchmarking efforts represent an approach toward implementing the NAS recommendation.

The goal for OCRWM is to adopt best practices and create a “Best-in-Class” organization that adheres to internal and external goals, both through continuous process improvement and through an organizational culture committed to excellence. OLM's benchmarking report compared other organizations' processes and lessons learned with its own planned systems to identify critical process elements, plan approaches for achieving objectives, and identify similarities or differences that may affect implementation of logistics practices for OCRWM.

The project team looked at three Federal radioactive material logistics operations and an international commercial organization that are widely viewed to be successful: (1) the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico; (2) the Naval Nuclear Propulsion Program (NNPP) transportation office located at the Pittsburgh Naval Reactors Office; (3) domestic and foreign research reactor (FRR) SNF acceptance programs, located at the Savannah River Site (SRS) in South Carolina and the Idaho National Laboratory (INL); and (4) AREVA NC's Business Unit Logistics (BU-L) in France.

REPORT METHODOLOGY

The benchmarking team followed an adapted best practices study format described by the General Accounting (now “Government Accountability”) Office, entitled *Best Practices Methodology, A New Approach for Improving Government Operations* [2] and the Department of Defense report *How To Prepare For and Conduct a Benchmarking Project*. [3] The team developed a process description and plan for implementing findings and obtained preliminary management support for the analytical approach. A questionnaire for interviewing best practice benchmarking organizations was developed and sent prior to each site visit. The questions were

intended to examine only specific logistics practices. The team then examined existing plans, studies and analyses.

Subject matter experts were identified to assist in research, analysis, and report development. The benchmarking team included individuals with first-hand experience in Federal spent fuel shipping campaigns and experts in logistics, stakeholder relations, and the OCRWM waste management system.

Benchmarking organizations were identified based on the following criteria:

- Federal organizations with operating, organizational, and financial structures similar to OCRWM;
- Experience transporting SNF or radioactive waste;
- A recognized record of safe transportation;
- Successful stakeholder relations; and
- Ongoing transportation activity.

AREAS OF INVESTIGATION

In conducting the benchmarking site visits, OLM sought answers that covered a range of transportation planning and execution activities. OLM focused on activities critical to the Program's mission success and can be incorporated into transportation planning and preparation in the near term. "Mission success" for this activity is defined as demonstration of national transportation system readiness. These transportation practices were examined in the context of broader supply chain/logistics functions.

For the three site visits with the Federal radioactive logistics organization, OLM focused on four business processes:

- *Transportation Business Model*: the core processes that drive success in moving nuclear waste from sites of origin to an interim storage or disposal site (for example, technology used or management organization);
- *Contract Management/Outsourcing*: the parts of the core business processes that have been successfully executed by contractors, and how excellent performance is ensured;
- *Stakeholder Relations*: how programs work effectively with external parties to prepare for and execute shipments; and
- *Continuity Planning*: how business practices are protected, and how they recover following system disruptions, whether natural or man-made.

OLM's site visit to AREVA NC was broader in scope. The purpose of the site visit to AREVA NC was to observe how world-class commercial radioactive materials logistics organizations manage their assets and conduct their operations. The site visit provided insight on key logistic operations which included procurement, maintenance and use of transportation hardware, the transportation planning and shipment approval process, safety and security, shipment tracking, and emergency response.

BENCHMARKING ORGANIZATIONS OVERVIEW

The functions of each of the logistics operations organizations analyzed are briefly described below and key similarities with the OCRWM Program are highlighted.

Waste Isolation Pilot Plant

The WIPP Program transports transuranic (TRU) waste from various Department of Energy (DOE) sites across the nation to a repository in Carlsbad, New Mexico. Although all WIPP shipments are being made by truck while OCRWM will use mostly rail shipments, WIPP was selected for special focus as an OCRWM benchmarking partner because of similar program demands:

- Stakeholders in the cross-country shipments for WIPP were involved from the beginning phases of transportation planning;
- The host state was recognized in authorizing legislation as having a significant participatory role in planning and oversight of the facility;
- Material to be disposed of at WIPP require special packaging, transportation casks, and (depending on the material) remote handling or special security arrangements, much like SNF; and
- State Regional Groups (SRGs) and other stakeholders that interact with OLM have repeatedly identified WIPP as a model for stakeholder relations.

Naval Nuclear Propulsion Program

The NNPP provides cradle-to-grave nuclear fuel management for the U.S. Navy's nuclear-powered fleet. As part of this mission, NNPP is responsible for shipping SNF from nuclear-powered submarines and aircraft carriers refueled and defueled at naval and commercial shipyards to NNPP's Expanded Core Facility. Similarities in NNPP's shipping program with the OCRWM Program include:

- All shipments for NNPP are done by rail, which will be the mode for most OCRWM shipments; and
- Coordination with external stakeholder relations since inception of the Program has grown and are continuously advancing.

Foreign Research Reactor SNF Acceptance Programs

The National Nuclear Security Administration (NNSA) is responsible for the FRR SNF Acceptance Program. The FRR Program oversees the logistics of accepting spent fuel in foreign countries, and shipping fuel to the SRS and INL. The FRR SNF Acceptance Program business model has useful similarities to OCRWM logistics planning, such as:

- Overland, FRR shipments are primarily by rail to SRS, but also include truck shipments to INL;
- Intense state and local interest shaped the Program’s planning and regulatory framework;
- Acceptance of SNF involves complex contract agreements and cooperation with reactor sites operated by a broad variety of commercial or national entities;
- Loading and shipping activities are usually conducted by commercial logistics companies;
- Shipments are conducted in accordance with the Nuclear Regulatory Commission regulatory standards and governed by internal DOE directives; and
- Most FRR shipments are not “national security” shipments.

AREVA NC Business Unit Logistics

The AREVA family of companies provides nuclear fuel services worldwide. AREVA is a holding company for a suite of operating entities that are arranged in business units. The logistics arm of AREVA, AREVA NC, is a for-profit company that sells transportation hardware and logistics services to a broad client base. AREVA NC’s logistics program is directly applicable to OCRWM’s logistics planning:

- Some shipments require intermodal transport. There are transshipments from truck to rail for power plants that do not have rail access, and for rail back to heavy-haul truck for all shipments to the reprocessing site;
- AREVA NC procures the transportation casks, including the design, certification and fabrication; and
- Total turnaround times for a cask from storage, to the utility, to the reprocessing facility, to unloading and return to storage is expected to be similar.

LOGISTICS PROCESS OVERVIEW

Benchmarking organizations view transportation functions as part of a comprehensive transportation logistics enterprise and are not systematically separated from supporting equipment management, or from activities at the originating sites, the destination sites, transfer points or operations management centers. Figure 1 illustrates the planned OCRWM logistics function.



Figure 1: OCRWM Logistics Chain

COMMON ELEMENTS OF A RADIOACTIVE WASTE LOGISTICS ENTERPRISE

The elements of the logistics enterprise at radioactive waste management benchmarking organizations and at OCRWM are identified by common terminology, as described below.

Operations Planning

Operations planning includes development of a comprehensive system plan and protocols covering activities at origin and destination sites, routes, characterizing material to be shipped, regulatory requirements, equipment, vehicles, maintenance, and long-term scheduling. These comprehensive plans are updated regularly, from annually to every 3 years.

Each organization also develops plans for specific shipping campaigns. These plans focus on the regulatory certifications, procedural authorizations, stakeholder interactions, route confirmation, equipment and carrier availability, and site readiness required for safe completion of shipments. Plans may include very specific operational activities.

Waste Acceptance

Part of the logistics chain includes responsibility for contractual and regulatory compliance and Quality Assurance aspects of taking possession of SNF. Acceptance includes procedures to establish the characteristics of the radioactive material being received and its status in its container. Characterization is essential to compliance with technical packaging requirements, and to successful receipt of the material at the destination site.

Stakeholder Relations

Management of relationships with “stakeholders” is a primary component of operations safety, reliability, and gaining and maintaining public acceptance. Stakeholders include the states, tribes, and local governments along potential shipping routes that provide essential police, emergency response, and road condition monitoring services. Planning, routing, notification, training and other operations involve stakeholders, carriers, and interest groups. Stakeholders also include public and nongovernmental organizations.

Equipment Management

In transportation logistics processes, critical components include shipping casks, cars or trailers for rail or highway shipping, cranes and other large-scale equipment at loading and unloading sites and ancillary equipment to manage cask operations. These items are expensive and customized to accommodate the very heavy weight, radiological protection, security, and multiple-use requirements of the system. Procurement and maintenance of these items is a driver of management processes and scheduling.

Maintenance of critical system equipment includes decontamination, repair, safety certification, and tracking. Equipment scheduling includes testing and inspections, maintenance and

turnaround time. If equipment or maintenance facilities are not dedicated to the organization's own transportation needs, availability involves working around the demands of other organizations. These issues affect the cost-benefit analyses for ownership or contracting for key system equipment.

Carriers

Commercial carriers provide trucks, ships, locomotives, and drivers or crews. Carrier management involves establishing a shipper/carrier business relationship with trucking companies, railroads, and ocean or barge carriers. These carriers may provide some of the critical equipment and may carry out safety procedures. Carriers inevitably form part of the system interface with regulators and stakeholders. Carriers may also form extended companies offering integrated logistics management, inventory warehousing, equipment, and equipment maintenance.

Site Management

Origin and destination sites have primary missions for which transportation of SNF and HLW is a support function or an ancillary responsibility; however, preparation for and completion of SNF or HLW loading and unloading is a safety-related and resource-intensive activity. Regulatory compliance, contingency planning, scheduling, and transportation system interface require trained personnel who are part of the system logistics team. Either origin or destination sites may be command-and-control centers for the transportation logistics system.

Origin and Destination Sites

An originating site may be the location where SNF or HLW is generated, a place where it has been in storage, or a place where it has been unloaded for intermodal transfer. A destination site is the terminating site for a specific shipping campaign.

Tracking

A distinct component of transportation logistics is shipment tracking, including a feedback loop of information supporting site readiness and equipment management. For hazardous materials, this often includes real-time communications with carriers and sites.

FINDINGS – BUSINESS MODEL AND ORGANIZATION

The project team attempted to identify common elements of the logistics organizations and, where appropriate, to recognize general management practices that appear relevant for OLM planning. The business model analysis suggests areas of common success and concern, both of which can provide insights for transportation planning and future studies. Areas of focus include:

- Extend logistics teams to include origin and destination sites;
- Build multidisciplinary matrix teams;
- Keep logistics management hands-on and delegation chains short;

- Extensively pilot-test and refine plans, equipment and operations;
- Develop and manage to comprehensive transportation plans; and
- Integrate new developments in tracking and emergency technology.

FINDINGS – CONTRACT MANAGEMENT AND OUTSOURCING

OCRWM plans to use private industry to the fullest extent possible in transporting shipments to the proposed Yucca Mountain repository. Since some responsibilities remain primarily Federal, determining essential Federal activities is an important benchmarking objective. However, outsourcing of certain functions does not absolve Federal programs from performance accountability. Effective Federal logistics programs use performance requirements and evaluation tools for its contractors, which can also serve as benchmarking objectives. Opportunities to effectively manage contracts and optimize outsourcing include:

- Consider Federal experience in tailoring outsourcing strategies; and
- Maintain strong control of mission-critical assets and functions.

FINDINGS – STAKEHOLDER RELATIONS

The team looked closely at DOE programs which have adapted their communications processes to meet the needs of their stakeholders and the public. OCRWM's goal is to identify successful best practices stakeholder communications programs and incorporate the best principles, techniques, and tools they use. The key objective is to establish a mutually beneficial relationship with stakeholders – particularly with state, tribal, and local governments – to advance reliable, safe operations. A foundation of these relationships is trust, which the benchmarked activities are intended to promote. Areas to build and maintain stakeholder relationships include:

- Focus on safety as the basis for relationships;
- Ensure stakeholder participation in transportation planning;
- Build relationships using training, demonstrations, and exercises;
- Work through well-established stakeholder networks;
- Integrate stakeholder relations and technical operations; and
- Manage commitments to planning partners.

FINDINGS – CONTINUITY PLANNING

Continuity planning ensures that in the event of an emergency that impacts the system, normal business operations will be protected. Continuity planning is distinguished from vehicle-specific enroute emergency incidents and accidents. DOE and the Department of Homeland Security directives provide the foundation for continuity planning, and program-specific guidance has also been developed. The key opportunity to ensure continuity planning is to integrate back-up plans and communications.

IMPLEMENTING BENCHMARKING FINDINGS

Benchmarking and identifying best practices are process tools for continuous improvement. This is especially true in a field like logistics, where competition and technology innovations drive constant change. Findings from the recent benchmarking studies have identified recommendations that can be incorporated into current transportation planning efforts and activities that are more suitable for implementation further down the road as transportation planning progresses and the operations phase begins.

Integration of Recommendations in Current Transportation Activities

OLM has begun to incorporate recommendations focused around transportation planning activities. Lessons learned analyses from past shipping campaigns emphasize important roles played in stakeholder relations planning. Building strong working relationships with states and tribes ensures strong partnerships on agreements and commitments to make safe, secure shipments. The Federal shipping programs in this study emphasized the importance of accurately recording and tracking commitments so all participants remember them.

Transportation planning has been done in conjunction with stakeholders through a collaborative planning process since the creation of the transportation office, OLM. OCRWM has been interacting with key stakeholders including SRGs, tribes, and industry through the sponsorship of the Transportation External Coordination Working Group meetings, vendor meetings, and the issuance of notices and requests for further information. Examples of areas in which stakeholders have provided input include the dedicated train decision, the planned use of Association of American Railroads S-2043 rail cars, and the revised proposed Section 180(c) policy.

Integration of Recommendations in Future Transportation Activities

A primary recommendation for training was to coordinate with existing Federal emergency response training to avoid inconsistency or duplication. DOE stakeholder programs have benefited from integration with WIPP programs. Over time, WIPP and other DOE programs, such as the Transportation Emergency Preparedness Program, have worked to make training content and delivery more consistent and, where appropriate, incorporate them into states' hazardous materials response training programs. WIPP recommends training and updating applicable stakeholders in the technical execution of the Program to the extent needed to act as ambassadors and negotiators for the Program. OLM plans to use existing training material to the extent practicable and to base any additional or future training requirements on established training programs.

Benchmarking organizations encouraged OLM to develop a demonstration program including prototype casks for stakeholder interactions, emergency response preparedness, public education, and testing. Demonstrating equipment capabilities through "road shows," using an actual (unloaded) shipping cask to show stakeholders what the cask looks like and how it functions as a robust system, helps communicate and reinforce the transportation safety message.

In addition, accident exercises are another tool to inform stakeholders. These exercises have been well attended by representatives from state and local governments and emergency response

organizations. The objectives are to familiarize attendees with the shipping cask characteristics and shipping practices, and allow evaluation of simulated accident responses by government agency representatives, and exercise accident communications links. A consistent stakeholder observation from these exercises has been the inherent safety of radioactive material/spent nuclear fuel transportation shipping casks. An understanding is gained that SNF transportation is not unusually risky and can be accomplished safely. OLM was advised to perform extensive operational readiness reviews with utility sites as part of the readiness review process.

The benchmarking organizations suggested objectives for OCRWM to meet when performing demonstration projects which include:

- Demonstrate the operational readiness of the OCRWM procedures;
- Demonstrate the readiness of the carriers;
- Participate in readiness exercises with the states and tribes;
- Verify the training of the state, tribal, and local emergency responders; and
- Demonstrate to the elected officials and public the robustness of the system components.

OLM has included demonstration, operational readiness reviews, and pilot projects in its transportation planning activities. These activities will be addressed in the OLM *National Transportation Plan* that is currently being developed. Transportation planning will incorporate tabletop exercises as well as demonstration projects to test the entire transportation system in collaboration with key stakeholders. OLM plans to perform operational readiness reviews to validate procedures and planned responses to confirm that plans actually work and communication channels are open and accessible. Readiness reviews may involve origin sites, the proposed repository, and state, tribal, local and Federal agency officials. Operational readiness reviews may encompass tabletops, practice runs and operational exercises.

OCRWM plans to conduct pilot projects to test the new system before larger scale investments are made and the full-scale rollout begins. OCRWM anticipates that it will test its transportation system operations to validate that shipments can be conducted safely and securely. Pilot projects would include training in cask handling for the logistics operator, repository personnel and shipping sites. These pilot projects would use non-radioactive and non-contaminated cask systems. Other pilot projects may involve shipment of empty casks using contracted carriers and selected routes. Involving carriers, state, tribal and local officials in OCRWM shipment operations before loaded casks are shipped is part of the gradual and collaborative development of the transportation system that will add to the safety of shipments when they begin. In addition, subject to available funding a pilot program funding a limited number of states and tribes is expected to be used to test the grants application process for implementation of Section 180(c) of the Nuclear Waste Policy Act.

Although Federal funding is always subject to changes and uncertainty through the appropriations process, Federal programs found it helpful to demonstrate to states that the Program was committed to trying to provide stable funding from one year to another for preparedness programs. Fluctuations in funding can make it difficult for states to plan and prepare, and this can lead to delays in emergency preparedness. OLM aims to meet Section

180(c) funding requirements that are currently being established in collaboration with stakeholders, though this funding is highly subject to Congressional appropriations.

OLM was strongly encouraged to establish clear lines of authority and responsibility and to ensure that responsible managers partner and collaborate to optimize the entire spent fuel shipment transportation logistics network. As planning progresses and OLM begins to establish contracts to outsource logistics functions, OLM will incorporate this recommendation.

Lastly, the findings suggested OLM should focus on optimizing loading and unloading at sites, as having a logistics presence at loading sites is key to managing the quality of shipping package preparation. OLM will take this recommendation into consideration when developing the campaign plans for individual shipments.

Overview of next phase of benchmarking

The next phase of benchmarking will focus on integrated domestic and international commercial radioactive logistics operations. The prospective companies represent large scale shippers and have vast experience in safely and efficiently shipping SNF and other radioactive materials. Additional business processes may be examined in this phase. The findings of these benchmarking efforts will help determine the organizational structure and requirements of the national transportation system.

OLM is actively implementing the next phase of benchmarking. The commercial shipping companies have been identified and the benchmarking team has been established. The questionnaire has been modified to focus on commercial logistics enterprises. OLM plans to begin conducting interviews in the spring or summer of 2008.

CONCLUSIONS

The benchmarking effort remains a high-priority activity for OLM and will continue through transportation operations. Many of the findings are activities that the logistics team is incorporating into existing planning efforts. The benchmarking team's research and analysis also resulted in findings that are currently being implemented on a programmatic level. Below are additional activities, that have yet to be addressed, to expand the benchmarking effort:

- Identify logistics enterprises unrelated to SNF transportation (particularly other hazardous materials);
- Work with Federal benchmarked organizations to consider more detailed analysis of additional logistics components/factors, such as:
 - Load and shipment planning and dynamic routing and consolidation to optimize loading efficiency, asset utilization, and carrier availability;
 - Asset tracking, communications, and security network technology;
 - Onsite loading and unloading process improvement; and
 - Carrier, equipment management, and equipment maintenance contracting.
- Examine and recommend developing tailored outsourcing solutions where specialized markets or market limitations exist;

- Develop specific recommendations for OCRWM planning timelines based on experience in acquisition and operations;
- Develop and implement tools such as surveys to objectively measure public trust and confidence, and use them to assess current stakeholder involvement programs.

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