

Benefits of Integrated Logistics Models for Radioactive and Nuclear Materials- 11170

**Catherine Anne Shelton
AREVA, Columbia, MD 21045**

ABSTRACT

Transport continues to be the Achilles Heel of our Industry. Safe, secure, timely and price efficient transports are a key element for the future success of our industry and the nuclear renaissance.

Transport of radioactive and nuclear materials require diverse sets of unique skills and staff expertise for package design, licensing, fabrication, logistics, regulatory watch, security, emergency response, public acceptance and communication. It is important to have a solid and reliable transport organization to perform radioactive and nuclear transports. However, over the years we have been facing additional constraints and difficulties. Package licensing efforts are more expensive and competent authority review times continue to grow. Denial of service for Class 7 shipments by commercial carriers have also increased. The security environment has significantly changed as a result of 9/11 and remain subject to change at any time should other dramatic events occur.

Licensed package availability and open routes are two critical components for the success of nuclear facilities supply/deliveries. The AREVA Logistics Business Unit manages and executes the various types of shipments for the entire fuel cycle (mines, conversion, enrichment, fuel, recycling, mox and waste) on behalf of AREVA's other business units as well as for external customers. AREVA's Logistics Business Unit has developed and implements integrated logistic models starting with package fleet strategy and sizing all the way through to transport and final delivery to the consignee. This presentation will describe three examples of successful integrated logistics models – one for spent fuel and one for fresh fuel. It will also demonstrate the benefits of these integrated logistics models.

INTRODUCTION

The AREVA Logistics Business Unit (LBU) is responsible for radioactive and nuclear shipments in support of all AREVA Business Units and other external customers.

The LBU has had international transportation know-how for more than 45 years. This includes six legal entities on three different continents with an international team of more than 1,200 people. LBU staff has extensive expertise in the different required fields ranging from specialized engineers, public acceptance experts, transport analysts, cask operators, truck drivers, etc.

Anticipation, preparation and reliability of the supply chain are critical factors for the success of our industry. Integrated logistic models have been the key to our success in meeting customer

needs and performing safe and secure transports. This presentation will describe the models implemented by the LBU for back end and front end transports.

WHAT IS AN INTEGRATED MODEL?

Radioactive transport services are comprised of two main types of activities

- Package supply with design, licensing and manufacturing activities
- Transportation services using different modes of transport

These two main activities are performed in a highly regulated environment. Additionally, performance of these activities in the international arena invokes additional challenges to meet the various competent authority and regulatory requirements. Our successful logistics models integrate these two main activities internationally to ensure a safe, secure and cost efficient supply chain.

The model is typically comprised of three chronological phases:

1. Phase 1: The initial phase (10 years) to establish long term strategy based on site production contracts (Fresh fuel, spent fuel, etc.) and also prospects. During this step a preliminary evaluation of resources, including designs for any required new or updated packaging solutions, are performed. Long term fleet sizing requirements are estimated as well.
2. Phase 2; This intermediate phase (3 to 5 years) corresponding to mid-term actions for definition and implementation of resources such as design, licensing and manufacturing of package, transport means, route availability, IT tools, labor and other resources as needed . Selection of logistical solutions and the decision to design and acquire new packages are consolidated at the BUL level to ensure standardization and globalization of the logistics activities. Regional offices participate to further assist in the definition of needs.
3. Phase 3: The final phase corresponding to yearly and short term activities such package maintenance and operations, performance of transports are managed directly at the regional level.

Communication is a critical element to an integrated logistic model as well as an integrated IT tool. Steps 1 and 2 described above are typically consolidated at the BUL level and at the customer level (consolidated of inputs scheduled and outputs resources evaluation). However, regional levels must also be involved in step 1 and 2 to ensure that all needed inputs are included in the evaluation. Activities related to step 3 are typically performed by a regional office.

MAIN STEPS OF AN INTEGRATED LOGISTIC MODEL

Phase 1

About 10 years prior to transport operations and corresponds to long-term fuel production and transport planning activities. Requirements for any major fleet design, renewal and sizing investments are identified at this level. Customer and BUL must work closely together.

The steps below are typically activities to be conducted in a time period of 5 to 10 years prior to shipping needs.

- Analysis of 10 years of customer production schedules (contracts, prospects, strategic goals) based on regulatory and technical watch and identification of potential new designs, fleet size adjustment, fleet decommissioning, etc. The 10-year provisional schedule is reviewed annually to identify major deviations and is adjusted as needed.
- Identify need for major long term fleet sizing investments based on demand planning:
 - o increase existing package fleet
 - o design new package
 - o decommission old packages
 - o identification of transport conveyance as needed (specialized)
- Discuss with customer to define all package and transport conveyance interfaces and bounding product information
- Prepare capital expenditure approval
- Prepare new package and or other specialized equipment design inputs specification as needed
- Launch investment (new package or specialized equipment) and perform all purchasing and procurement tasks for manufacture and propose quantities required

Phase 2

This phase corresponds to mid-term transport organization (starting 3 to 5 years before the transport). A schedule allocating transport packages, transport equipment and maintenance requirements is established. In parallel, licensing and manufacturing activities are performed based on transport flows.

- Prepare 3-year schedule with equipment allocation
- Prepare 3-year maintenance schedule based on equipment allocation.
- Verify qualified and trained human resources are adequate to support shipping needs and adjust as necessary
- Verify availability of transport routes
- Perform package licensing activities as needed (renewal, validation, etc.)
- Perform manufacturing activities as needed
- Design transport vehicle tie down systems and implement
- Select and qualify transport suppliers based on technical and assurance quality specifications
- Ensure that emergency response procedures are in place. Perform drills.

Phase 3

Yearly to Daily Activities: As we approach actual transport operations, the schedules allocating package and transport equipment are used by regional logistics office to perform operational activities prior to shipment release.

- Verify allocation of packages and transport equipment and prepare yearly schedule (detailed allocation of equipment)
- Place purchase orders for maintenance and transport operations using qualified suppliers
- Ensure detailed shipping procedures are in place in accordance with quality assurance program, prepare and/or revised as necessary.
- Perform fleet management (tracking)
- Perform all regulatory notifications prior to shipment
- Prepare and verify shipping documentation
- Verify shipment conformity prior to release
- Monitor shipment while en-route

BENEFITS

Vision

Evaluation of both mid and long term needs is the prerequisite to a successful integrated model. Package supply services are the most time constraining. The process for design, licensing and manufacturing of a new package will take from 3 to 5 years depending of the model type. Based on this constraint, the logistics models need to include a package fleet strategy and sizing approach with a 5 year minimum vision. Moreover, package designs should be integrated with the design of both existing and new facilities to avoid complex and cost prohibitive interface modifications.

In addition, even if less time constraining, availability of transport routes is required especially considering the international nature of the nuclear industry:

- Mines in Canada, Niger, Australia, Namibia, Kazakhstan, etc.
- Conversion facilities in US, Canada, France
- Enrichment facilities in US, France, UK, Germany, Netherlands etc.
- Fuel manufacturing facilities in US, Germany, France, Belgium, etc.

Accessibility to some of these countries is challenging in light of the increase in denials of radioactive cargo by maritime and air companies. Anticipation and evaluation of available and open routes is another important element of integrated logistics models.

Standardization

Standardization is another key element of integrated models. Standardization should apply to package supply activities and nuclear facility interfaces, as well as to transportation services activities:

- Licensing costs for packages have significantly increased over the years. Time required to obtain a license has also been significantly extended. In the past, many nuclear facility operators owned their fleet of packages for specific products and/or one specific transport flow. This approach is not very cost efficient or viable in today's international business environment. Standardization of the package fleet is a challenging but needed effort.
- Every effort should be made to coordinate with the various nuclear facility designers, owners and operators to provide similar interfaces for each of the facility and package types.
- Standardization of domestic and international transport processes will provide more secure and reliable shipments and result in cost savings.

EXAMPLES

Integrated logistic models have been implemented by the LBU for different types of radioactive and nuclear transport flows. Some of these models were implemented many years ago - especially for the more highly sensitive materials. Modeling has now been implemented for the balance of our transportations flows, in particular for front end products.

Spent Fuel and Vitrified Waste

Shipments of spent fuel were initially delivered to AREVA's la Hague recycling facility in the 1970's and continue today. About 250 spent fuel packages are delivered every year. During this time period, shipments have originated from many different countries including France, Japan, Germany, Belgium, Switzerland, Italy, and others. As a result of recycling and governmental requirements, vitrified high level wastes have also been returned from France to the countries of origin. Spent fuel and vitrified waste shipments are complex as they require type B(U)F packages with weights typically exceeding 100 tons. The overarching success of these shipment campaigns has been achieved as a direct result of an integrated transport model.

Different types of packages have been designed and manufactured due to the different characteristics of nuclear material as well as the interface requirements at the nuclear facilities. However, package compatibility with the carriers' equipment (truck, rail and vessel) and handling equipment (shipper, maritime terminal, railway terminal and receiver) have largely resulted in an optimized logistic chain. Vitrified waste packages have been designed to allow the use of existing transport and handling equipment. This standardization is the result of an internationally integrated team.

MOX

MOX transports are also managed by AREVA's LBU. A significant constraint with MOX shipments is related to the stringent security requirements. The transport conveyance is a key element for the security as its design includes numerous security features. The LBU has designed, licensed and manufactured the transport conveyance in accordance with the physical protection requirements applicable in France and other European countries. Although inspection and approval was initially performed by the competent authorities, the transport conveyance is now operated and maintained by the LBU.

The LBU also designed and supplied the package for MOX transport. Consolidation of the responsibility for the design of the transport conveyance and the transport package resulted in the efficient integration of the transport system as well as an optimization of the capacity of the overall transport system (transport conveyance and package). Since the security and safety requirements for both the conveyance and the package have continued to evolve since inception, the integrated transport model decision made up front continues to enhance the transportation system for MOX shipments.

Front End – Fuel/UO2

Based upon the long standing success of using integrated logistics models for other types of nuclear material shipments, AREVA has recently decided to apply this strategy to the front end market. AREVA's LBU is now implementing an integrated logistic model with shipping activities related to fresh fuel (UO2 products). AREVA operates numerous fuel facilities in Europe (Germany, Belgium, and France) and in the United States. Until recently, logistics activities were performed by small teams of transport experts from each facility worldwide. Due to this fragmentation of activities vision was limited to the short term, multiple package designs were used for a limited number of products, and transportation activities were performed in a non-standardized manner. In a diverse globalized market, this type of business model is not cost efficient and cannot be implemented in a consistent manner.

AREVA's Fuel Business Unit and the LBU have worked together to develop an integrated and sustainable logistics model. A package working group composed of representatives of both business units from Germany, France and the US has been created to work on package strategy and transportation strategies. Numerous international projects have been identified to meet the future package needs and standardize the fleet. Similarly, the LBU will continue to work with AREVA's external front end clients to gather the information necessary to satisfy their needs in the logistics model as well.

All of AREVA's front end packaging and transport activities are the responsibility of and are being implemented by the AREVA Logistics Business Unit. This includes both the existing internal AREVA front end business unit needs, as well as all of AREVA's front end clients around the globe.

CONCLUSION

Historical and continuing success of AREVA's back end logistics business is due in large part to the utilization of integrated logistic models. Consequently, all front end transportation activities have recently been consolidated within the LBU and an integrated logistics model has been developed in conjunction with AREVA's internal and external front end customers. AREVA continues to realize significant improvements and benefits related to fleet design and licensing, transportation management, safe and secure shipment operations and on-time deliveries in the global nuclear marketplace.