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## Transport for the Front-End: A Professional's Trade

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Because it involves highly radioactive and/or fissile materials, transport in the back-end of the fuel cycle has come under the very close scrutiny of the industry, the competent authorities and the general public. Such transport is generally carried out using Type B packages, which require appropriate in-depth safety justifications, often backed by extensive testing. Transnucléaire performs more than 800 such operations annually, involving more than 3000 packages, and delivers one heavy cask a month.

Front-end transport is not the focus of public attention because the materials concerned are not felt to be a sensitive issue. Such transport involves packages which meet the same IAEA recommendations as back-end packages. They are mostly of Types IP, A or A-fissile, although some are Type B. The quantities of materials involved are much greater. Transnucléaire performs approximately 500 front-end transports annually, involving more than ten thousand packages.

The nuclear transport industry maintains high quality standards in the front-end. This is reviewed closely by the competent authorities, from the design of the packages to the implementation of transport systems. This includes the overall expectations placed on the transport systems.

The new IAEA ST-1 recommendations affect some front-end packages. The levels of expectation of the users of transport services and of the authorities is placing increased demands on the transport industry for the front-end. The newly developed COGEMA 30B overpack is an example of responding to changing needs. Another example is the way the industry contributes to defining the sound day-to-day implementation of the regulations.

Complying with current regulations is just the first step in the practice of the professional transporter. More than ever, we are expected to anticipate potential crises, to go beyond our basic obligations, in order to supply a superior level of management for all the steps in front-end transport.

Transport is not just transport when it comes to radioactive material. Transport is the lifeblood of the nuclear business. The opponents of this great energy source are ever more aware of this: they can starve or smother nuclear facilities if they can block transport operations. So far, we have staved them off by performing well – not one casualty in half a century of transport operations! This is a record we can be proud of.

### **Transnucléaire and its Transport Systems**

Transnucléaire, a 100% owned COGEMA subsidiary, was created 35 years ago to carry out the transport of radioactive materials. Today it plays a leading

role in this field. Over the years, its experience has expanded into two complementary areas:

- Design of packages adapted to each category of nuclear material.
- Services to power plants for cask operation and waste processing.

Transnucléaire's mission is to ensure the movements of all the materials required for the production of nuclear energy. The company sets a world standard for the transport of radioactive materials, because it is active and creative in all the various types of transport of radioactive materials, from the design of new systems through to the dismantling of obsolete ones. Its involvement is universal from both the geographical point of view and from the technical point of view.

Figure 1 shows the quantities of spent fuel delivered to the La Hague reprocessing plant in Transnucléaire casks. This corresponds to more than 60 000 spent fuel assemblies (PWR and BWR) and millions of transport kilometres by sea, rail and road.

Solutions offered by Transnucléaire consider transport issues as a whole. The design of packages benefits from experience in maintenance and in daily routine operations (see Tables 1 and 2). Transnucléaire can give full access to all the choices at the highest standards, after a careful appraisal of the unique features of a customer's needs. This is shown by the recent development and licensing of new UO<sub>2</sub> packages.

#### *Operation of Terminals*

Transnucléaire is the operator of the Valognes and Orsan road–rail terminals and of the Cherbourg sea–rail terminal. As such, it covers all operations and the associated logistics of multimodal transport operation. In addition, its front-end operations include a permanent team at Pierrelatte, so that logistics and the relationship with transport facilities are as effective as possible.

#### *Road Transport*

Lemaréchal and Célestin are two subsidiaries of Transnucléaire which specialise in road transportation and operation of terminals. Considering all the different classes of radioactive materials, these two companies have logged over 2 million kilometres in 1999.

Célestin, based in south-east France at Laudun, plays an important part in moving UF<sub>4</sub> from the Malvesi plant to Pierrelatte, and in the general implementation of our front-end operations, such as fresh fuel deliveries. Lemaréchal, located near COGEMA's La Hague site, has comprehensive experience in spent fuel transportation, and manages a fleet of 33 trucks carrying out heavy and not-so-heavy shipments.

#### *Sea Transport*

Geography requires that Transnucléaire moves radioactive materials by sea. It does so by being a partner in specialised companies like Pacific Nuclear Transport Ltd (PNTL) (of which COGEMA is a shareholder), by being a party to charters of INF-grade ships, and by working with regular shipping lines.

One of the current concerns in front-end transport is the markedly increased reluctance shown by many shipping lines to accept radioactive materials

aboard. This is mainly because they overestimate the administrative difficulties with port authorities at the harbours where they call en route.

Another key activity associated with sea transport is making sure that we are represented where international shipping and maritime regulations and conventions are being discussed and agreed. This we do by participating in industry associations like the World Nuclear Transport Institute (WNTI), FORATOM and the Uranium Institute.

In the front-end, Transnucléaire operates at several French harbours, including Sète, Fos, Le Havre and Dunkerque. It also uses the port of Cherbourg, which is a key component in the transportation system set up for the reprocessing of spent fuel at the La Hague plant. Spent fuel casks are unloaded at Cherbourg from dedicated ships using a specially designed bridge crane with a lifting capacity of 140 tonnes.

#### *Maintenance Capability*

As required in the international regulations, and in order to optimise the investment made in them, nuclear materials transport packages have to undergo a very strict maintenance programme. Transnucléaire has entrusted MMT, a joint subsidiary of COGEMA and Transnucléaire, to perform cask maintenance.

MMT runs three facilities dedicated to maintenance of transport packages. These facilities are located at La Hague and at COGEMA's Marcoule site. The 100-tonne class casks (for spent fuel, high level waste and MOX fuel) are maintained at La Hague in AMEC-1. MMT is able to perform 130–140 maintenance operations each year in this facility. AMEC-3 at Marcoule maintains lighter transport systems and front-end equipment.

#### **New Challenges for Front-End Transport**

Front-end transport, already facing strong competitive pressures, is also subject to a slow but significant evolution as regards public acceptance and safety matters. During the last few years the front-end transportation business, which had not been the main focus of regulators, has come under increased scrutiny (as have transport activities in other parts of the fuel cycle) from a more questioning and demanding approach adopted by the international competent authorities.

For instance, the 1996 edition of the IAEA regulations creates the new Type H package category for natural UF<sub>6</sub>. The industry has formed working groups to put forward implementation approaches for consideration by the authorities, but still difficulties are looming, such as the possible requirement for valve protective devices. And again, traditional transport carriers such as large cargo ships and commercial freight trains are increasingly questioning the wisdom, from their standpoint, of continuing to accept nuclear goods aboard.

Transnucléaire, as a member of WNTI, works in a very concrete manner with all nuclear organisations in order to defend the common interest: the first condition for competing is that the business exists!

For enriched UF<sub>6</sub>, some of these issues are now answered by the COGEMA 30B overpack, a B(U)F package (Figure 2). By carefully selecting new fire

protecting foams with only trace halogen content, introducing user-friendly closure devices, eliminating any need for valve protecting devices, and keeping the interface with facilities unchanged, this overpack combines low maintenance costs, easy operation, and affordable procurement price for an extended useful life.

Transnucléaire also has the recently licensed TN UO<sub>2</sub> package, for UO<sub>2</sub> powder and pellets up to 20% enrichment. This new concept reduces the number of transports by around 30% for the same amount of uranium dioxide. It is designed to meet IAEA ST-1 requirements. Investing in development and in removing operational life constraints does yield benefits in terms of operating costs and long-term compliance with evolving regulations.

Rather than reviewing again in detail the technical and public acceptance challenges to which Transnucléaire has risen, we shall rather concentrate on the practical consequences for our customers and for the industry. In the present situation:

- The prices of front-end goods are quite low, and our customers require and obtain very competitive pricing on transport services.
- It is in the best interests of the industry-at-large to anticipate regulatory change, not only at the operating level but also within larger fora such as the International Maritime Organisation (IMO).
- There is a need to develop new equipment that remains compatible with existing receiving and shipping facilities, and their productivity goals.

Given this situation, the real issue is how can a company remain competitive if it does not clearly convey to its customers that the radioactive transport business is a complex, demanding trade that requires a forward-looking approach? It must become clear to all concerned that this need to be forward-looking requires well-oriented resources for the medium term.

Does the nuclear industry want to take the chance of going on with concern for the short term only, despite the relatively low contribution of transport costs to overall costs? This means that competent and effective companies like Transnucléaire which are oriented to the long term will have difficulty operating in the front-end market in the absence of long term commitments. Or does the nuclear industry want to make the investment necessary to ensure continued affordable transport in the front-end?

We believe that the solution to this paradox lies in creating stronger partnerships between nuclear plant operators and transport companies. The partnerships can take several different guises, including:

- Entering into long term contracts on given routes, so as to capitalise on the transporter's know-how and dedicated ships while assuring the necessary level of payload. For example, Transnucléaire is taking steps to be able to meet customer needs by chartering ships rather than relying on regular shipping lines. However, it is also working to ensure that operations on regular lines can continue on the basis of longer term traffic commitments, by providing information and education to those involved so that the perceived risks can be brought back down to the level of reality. Nuclear plant operators and utilities will find themselves reaping significant benefits by simply investing ahead of time to secure more consistent approaches.

- Integrating transport issues very early in the contractual process for nuclear fuel business, to avoid developments which will be potentially disruptive for all. What Transnucléaire advocates is the affordable, reliable and secure transport which will be obtained by front-end operators through making it part of the overall business they negotiate with utilities. Therefore, Transnucléaire is ready to contribute to that process by committing early to transport solutions for a given deal; this is already happening in some instances.
- Taking into account the long term benefit of forward-looking work to avoid dead ends and crises in transport operations. Transnucléaire has implemented its Transport Quality Charter, which gives outstanding peace of mind to a would-be consignor of radioactive materials. Is it not fair and right that the consignor contributes to the work underlying the charter's implementation? Similarly, we are in a position to locate convoys by satellite real-time tracking, which will be immeasurably valuable in the case of an accident, either real or media-related. The additional cost included in our prices is thus well worth the protection it gives.
- Contributing through separate R&D contracts to the development of transport systems for the new millennium.

Granted the spirit of partnership we advocate, how then not to jeopardise the competitiveness of consignor and transport company? Here are some approaches:

- Eliminating redundancy by contracting to a transport company all the transport operations of a given facility (i.e. outsourcing). Transnucléaire is working on some such schemes with customers, whereby the customer not only reduces its staffing, but also makes sure that its legal responsibilities as consignor are fully met. We believe this is one of the practical ways to achieve the principle set above that transport should be integrated as early as possible in the contractual process between front-end operators and utilities. In fact this allows the end customer to see very early on the full extent of its costs and commitments.
- Setting the standard for the nuclear transport profession. When there is a change of transport mode (e.g. ship to train), the Transnucléaire Transport Quality Charter guarantees the availability of competent personnel to cater to any mishap. This, we know from experience, is well worth the expense. Should the nuclear industry not make this its own standard rather than waiting for a media-amplified incident? Moreover, if the industry does not work on improving its standards, it may then be faced with the imposition of stringent standards by others.
- Making sure that newly developed packages are user-friendly, have low maintenance and operation costs. The TN UO<sub>2</sub>, which needs no tools for opening or closure, nor any paint touch up, and the COGEMA 30B overpack, which is easy to stack, and can be opened without having to clear the overpack closest to it, are good examples of this kind of benefit.

These approaches show that newer and better do not necessarily mean more expensive, when anticipation and partnership are the name of the game!

## Conclusion

I will conclude by reiterating:

- Transport issues play a major part in the front-end of the fuel cycle and the nuclear industry in general.

- Any disruption of material flows would affect the overall nuclear industry.
- The transport business is more an evolution than a revolution.
- The designs of packages and associated equipment need continual updating.
- The nuclear industry must propose to the relevant authorities a reasonable time schedule to update designs and the packages. The industry must be the leader, not the authorities. The aim is to reach a good level of internationally-agreed practice.

To quote Richard Meserve, the new chairman of the US Nuclear Regulatory Commission, talking to the Nuclear Energy Institute: “We would certainly be the victims of change, rather than its master, without research.” The apparent contradiction of increased demands in a depressed market can be overcome by a professional approach using dedicated logistics solutions that guarantee control and safety. This involves quite reasonable economics, stemming from taking the longer view in setting up partnerships as early as possible in process.

Recent examples show that facts are stronger than prejudice. Keeping in mind that uranium producers and nuclear fuel companies are all struggling to remain competitive, one should understand that there is a time for looking at the bottom line, but that there is also a time for investing and preparing tomorrow’s bottom line. That is what Transnucléaire is about!

Table 1. Transnucléaire transport operations in 1998.

<b>Materials</b>	<b>No of transports</b>	<b>No of packages</b>
Concentrates	28	7 380
UF <sub>6</sub> (depleted/enriched)	172	1 909
Fresh fuel assemblies (UO <sub>2</sub> )	151	872
Uranyl nitrate	120	239
<b>Front-end Total</b>	<b>471</b>	<b>10 400</b>
French spent fuel	135	135
Overseas spent fuel	23	23
Residues/waste	302	622
Fissile materials	158	1 295
Site transfers	210	1 298
<b>Back-end/recycling Total</b>	<b>828</b>	<b>3 373</b>
<b>Research/sources</b>	<b>401</b>	<b>2 530</b>

Table 2. High level waste shipments by Transnucléaire.

<b>COGEMA La Hague to JNFL Rokkasho-Mura (Japan)</b>		
February 1995	1 TN 28 VT	28 canisters
January 1997	2 TN 28 VT	40 canisters
January 1998	3 TN 28 VT	60 canisters
February 1999	2 TN 28 VT	40 canisters
December 1999	4 TN 28 VT	104 canisters
<b>COGEMA La Hague to BLG Gorleben (Germany)</b>		
April 1996	1 TS 28 V	28 canisters
February 1997	2 Castor HAW	56 canisters
<b>COGEMA La Hague to ONDRAF Dessel (Belgium)</b>		
April 2000	1 TN 28 VT	28 canisters

Figure 1. LWR spent fuel delivered to COGEMA's La Hague reprocessing plant in Transnucléaire flasks (tHM).

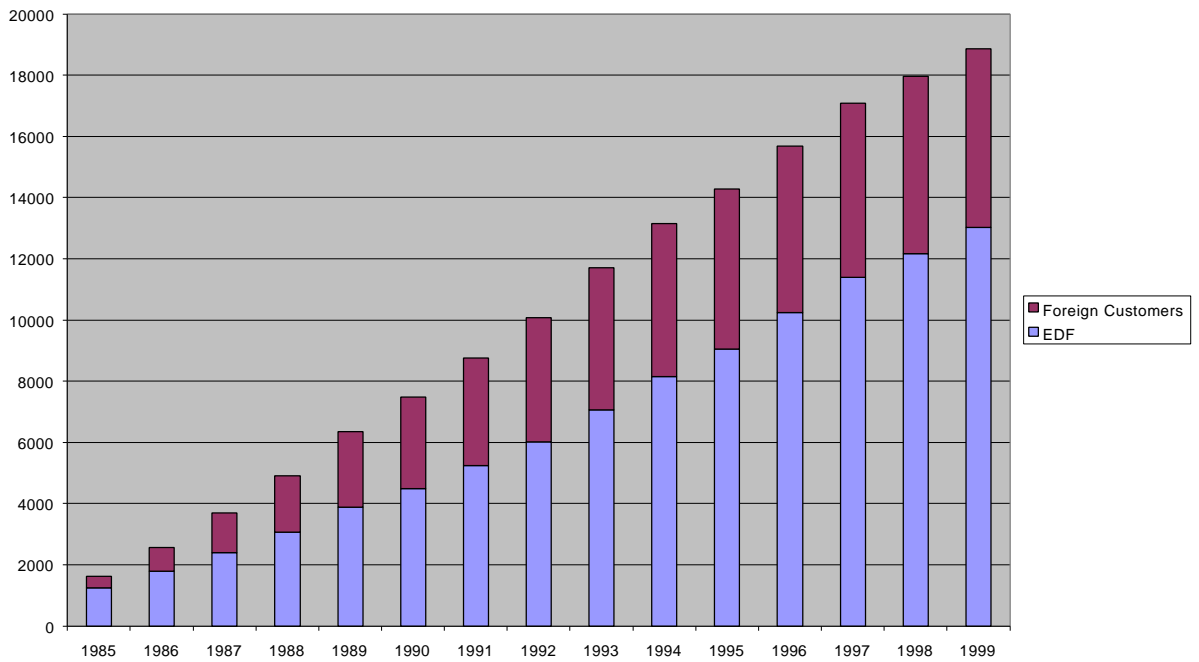


Figure 2. The COGEMA 30B overpack.

