

# **NUCLEAR MATERIAL TRANSPORT: THE FRENCH EXPERIENCE**

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## **1. ABSTRACT**

The purpose of the paper is to present the implementation of French regulations governing the protection and control of nuclear materials during transport. Through the 25 years of experience of managing nuclear transports, many improvements have been made and a great amount of feedback data is available. As the transport security is based on many factors from carrier approval to operational aspects, many areas have to be taken into account when assessing the overall security. This paper's aim is to present some French good practices.

## **2. INTRODUCTION**

This paper will provide highlights about the regulatory environment of nuclear material transport in France and showing how it is applied. In a first step we will briefly describe the international regulations and guidelines concerning transport before diving in the French laws. Then we will take a closer look to the French regulations especially regarding the licensing of operators and means of transport. In this part we will also provide a picture of the different entities involved in the organization and supervision of transports. The third part of the paper will detail the role of the French transport control centre which is the Operational Level of Transport (EOT) of IRSN. Finally we will give some statistics concerning nuclear material transports in France over 20 years.

## **3. INTERNATIONAL REGULATIONS AND GUIDELINES**

At an international level, the Convention on the Physical Protection of Nuclear Material (IAEA INFCIRC/274/Rev. 1) provides the framework for ensuring the physical protection of nuclear material at facilities and during transport. To support the application of the Convention, a set of recommendations was issued by the IAEA as INFCIRC/225/Rev. 4 “The Physical Protection of Nuclear Material and Nuclear Facilities”. A technical document named IAEA-TECDOC-967(Rev. 1) was also released to provide more advice on how to implement the Convention in the field of transport. Among these documents the only legally binding is the Convention that was signed by France on the 3<sup>rd</sup> of March 1980, officially applicable on the 6<sup>th</sup> of October 1991 and was transcribed into the French Law by the law n°89-433 from June 30<sup>th</sup> 1989 and the decree n°92-110 from February 3<sup>rd</sup> 1992.

Beside this international context, it must be outlined that national rules were existing in France since the beginning of the 60s. They were implemented by the French Atomic Energy Commission (CEA), a State Public Body, which was the unique holder of nuclear material existing on French territory. It has taken upon itself, since the beginning of the 60s, a set of rules to ensure under any circumstances the management, the control and the protection of the material that it held. But during the 70's the unsuitability of this situation appeared due to the ever increasing number of private companies which held nuclear material, in the various phases of the civil fuel cycle (conversion, enrichment, nuclear fuel manufacture, nuclear power plants, reprocessing or during transportation). Solid legal guidelines and regulations therefore became necessary to ensure the guarantee of protection against malevolent actions.

A draft law was therefore prepared in 1978 - 1979, with the technical assistance of IRSN. It was submitted for the first time to the Parliament on the 5<sup>th</sup> of January 1979 to be adopted on the 25<sup>th</sup> of June 1980, after three readings in the Parliament and two in the Senate. Its official publication occurred on the 25<sup>th</sup> of July 1980, following the constitutional Council decision dated the 22<sup>nd</sup> of July 1980. It was referenced as “law n° 80-572 of the 25<sup>th</sup> of July 1980”.

In order to simplify the access to a great number of legislative texts concerning national defence, the law n°2005-1550 of the 12<sup>th</sup> of December 2005 created the “Code de la Défense” which gathers among others all regulations concerning protection and control of nuclear material.

#### **4. FRENCH REGULATIONS**

The French laws governing the protection and control of nuclear material in transport can be found in the “Code de la Défense” and especially the articles number L1333-1 to L1333-14. They define the principles that must be implemented to prevent and, should the case arise, to timely detect the missing, loss, theft or diversion of nuclear material during transport. These articles implement a licensing process for private or public companies which intend to transport nuclear material. They also describe the organization of controls done by the public authority and the sanctions that will be applied if necessary.

##### ***4.1. Carrier licensing***

The activity of nuclear material transport is bound by prior license granted by the competent authority (in France, the Ministry for Industry). This license is accompanied by administrative and technical specifications relating to the activity of transport. License may be suspended or revoked in the situation of penal offence or failure to observe the obligations. Measures are to be taken by the authorized physical or legal person to ensure the protection and control of nuclear material.

The request for license presented by the applicant comprises:

- the administrative information (in particular the clear identification of the physical persons who will have the role of designated responsible for ensuring the correct application of the law at the company level),
- the description of planned activities,
- the description of the means of transport,
- the nature and the quantities of material concerned,
- the measures that the applicant proposes to implement to ensure the protection and the control of nuclear material,
- the organization to manage incidents and alerts,
- the training of its people in the field of physical protection,
- the organization to manage and plan transports
- the protection of information concerning transport organization,
- the quality insurance.

This request for license can be presented by a consignor, a consignee or a carrier, but in any case the licensee is called a licensed carrier.

For their protection, the regulation in fact categorizes the material into three categories based on the criteria concerning the nature and the quantity of the transported material. For the most sensitive material (plutonium and enriched uranium coming under categories 1 and 2) transported by road, the requested file must be completed by a request for approval of vehicles.

From analysis of the file, carried out by the Ministry for Industry and its technical support IRSN, depends the requested license. This is granted in the form of an Order fixing the conditions and the limits of the authorized activity. To this Order is attached a document designated «listed status», that list all of the correspondence with the licensee, accepted by the Minister and which constitutes the commitments contracted by the licensee.

If the licensed carrier plans to use sub contractors for any part of the transport, those subcontractors shall also be approved by the Ministry for Industry. In any case, the licensee remains the sole responsible of the control of nuclear materials during the transport. Sub contractors shall not only be approved but also have to be informed of, and comply with, all existing regulations concerning physical protection of nuclear materials.

#### ***4.2. Authorizations and transport plans***

The authorization of transport is based on advance notification of the movements, by the carrier, to the Ministry for Industry. Noteworthy is that an authorization is given for every single transport except for category 3 national transports.

In order to deliver this authorization, either for specific or generic transports, the licensed carrier must justify in transport plans (specific or generic) that he is suitably organized to fulfill the state competent authority requirements.

For category 1 international transport, the transport plans must be sent to the competent authority at least 90 days before the planned date of transport. For category 2 international transports this delay goes down to 30 days.

#### ***4.3. Vehicles approval***

For the road transport of category 1 and 2 nuclear material, the mean of transport shall receive a license. This license is based on technical specifications and security objectives which the equipment must comply with to be approved. These prescriptions are laid down in terms of the objectives and the technical requirements to be achieved, the carrier having a choice of the provisions that he intends to propose in order to comply with them.

These technical specifications can be considered as the minimum requirements of physical protection measures that need to be implemented by the carrier in its vehicles. They are based on the threat that needs to be taken into account for protecting nuclear material during transport. The exact nature of the threats that they have to counter must of course be kept closely confidential. It is therefore not possible to describe them in detail. It is however, possible to state that their basic objectives are to:

- provide protection of consignments against attempted theft or diversion, offering resistance for a length of time compatible with response by the law enforcement agencies,
- protect the crew of the vehicle,
- allow monitoring of convoys by the operational level of transport (EOT of IRSN) and, when required, alerting the latter so that it can warn the authorities and take the actions planned to deal with incident and accident situations.

For the vehicles dedicated to the most sensitive categories of nuclear material, the licensee produces a design file to the State competent authority before starting the manufacturing. The competent authority with its technical support body assesses the file and gives an authorization to manufacture. Controls may be done by the competent authority or its technical support during the manufacturing process. At the end of this process, an exhaustive control will be done in any case.

#### ***4.4. Inspections***

The control laid down by the article L1333-2 of the "Code de la Défense" relates to the administrative and technical aspects of the activity of nuclear material transport as well as to the measures destined to prevent the theft or the diversion of material. The licensee is, as the prime head, responsible for this control (first level control).

However, the system set up to ensure the protection and the control of nuclear material is inconceivable without a mechanism for inspection of the way in which the licensees are applying the regulations and observing the commitments they have been contracted to.

The article L1333-5 of the "Code de la Défense" establishes a body of agents that are specialized and sworn to professional secrecy. These agents are empowered as qualified inspectors of nuclear material, by the Ministry for Industry and take an oath before the county court of their place of residence.

The inspection, carried out by the nuclear material inspectors is a second level control. It relates to a compliancy inspection that may lead to a quotation of the differences in relation to the regulations, to the commitments of the licensee, to the requests formulated by the competent authority following analysis of additional files or previous inspections.

For nuclear material transport activity, two types of inspections are performed: during transport and technical controls of vehicles before or after transport.

The inspections during transport can be conducted at any moment of the transport (departure, on the road or at the arrival), and are always unnoticed. They combine administrative controls (authorization, legal documents...) and technical controls (locking systems, surveillance by the driver...).

The technical controls are mainly performed on the road vehicles approved for most sensitive categories of nuclear material. They consist of a technical checking of physical protection devices installed on the vehicle that must comply with the file on which the approval was given.

#### ***4.5. Sanctions***

Malevolent events affecting nuclear material are set up in criminal offences matched by sanction of 10 years imprisonment and a fine of 7 500 000 Euros. A number of the incriminations appear, in particular the undue appropriation of nuclear material, the exercise without license for the activities covered by the law, the supply of knowingly inaccurate information to obtain license, the obstacle against the exercise of the control and the failure of declaration of the disappearance, loss or diversion or theft of nuclear material.

Lastly, in the frame of the Convention of the Physical Protection of Nuclear Material, the law also sanctions whosoever shall have possessed, used or transported nuclear material outside of the territory of the French Republic without having been authorised to do so by the competent foreign authorities. The regulations passed to this effect institutes the competence of the French repressive courts in order to know of the offences committed abroad as soon as their perpetrator returns to France.

## 5. FRENCH TRANSPORT CONTROL CENTRE (EOT)

Under the terms of the regulations, the operational level of transport (EOT) of the IRSN is responsible, under the authority and on behalf of the Ministry for Industry, for preliminary investigation for authorization of the transport of nuclear material and the control of the corresponding transport.

### 5.1. Control centre role and design

The operational level of transport (EOT), as a national transport control centre, is the focal point for control and communication during transport. All relevant information concerning transports that are planned or in progress are centralized at the EOT, in order for the competent authority to be able to take all appropriate measures in case of any event that could compromise the physical protection of nuclear material.

The EOT is a facility that provides for the continuous monitoring of conveyance location and security status and for communication with the transport conveyances, protective forces, the Competent Authorities, consignor, consignee and carrier.

The EOT is design to continuously and effectively communicate with all organizations involved in the physical protection of nuclear material transport. It is fitted with multiple satellite, radio, cellular, and ground-based communications capabilities integrated into information databases and processing computers capable of assessing alarms, logging notifications, and automatically routing information.

The EOT is also able to monitor, track, and communicate with all vehicles, trains, and ships, transporting nuclear materials, to assess alarm reports to determine the required security response, to initiate a rapid and coordinated response from response forces.

It is designed and physically protected in order to remain operational in presence of the design basis threat (for instance bullet proof windows, and is equipped with strict access control for authorized personnel, and is alarmed with a monitored security system).

All the communications channels used are redundant and designed to be operational in case of complete loss of electrical power or ground-based communication networks.

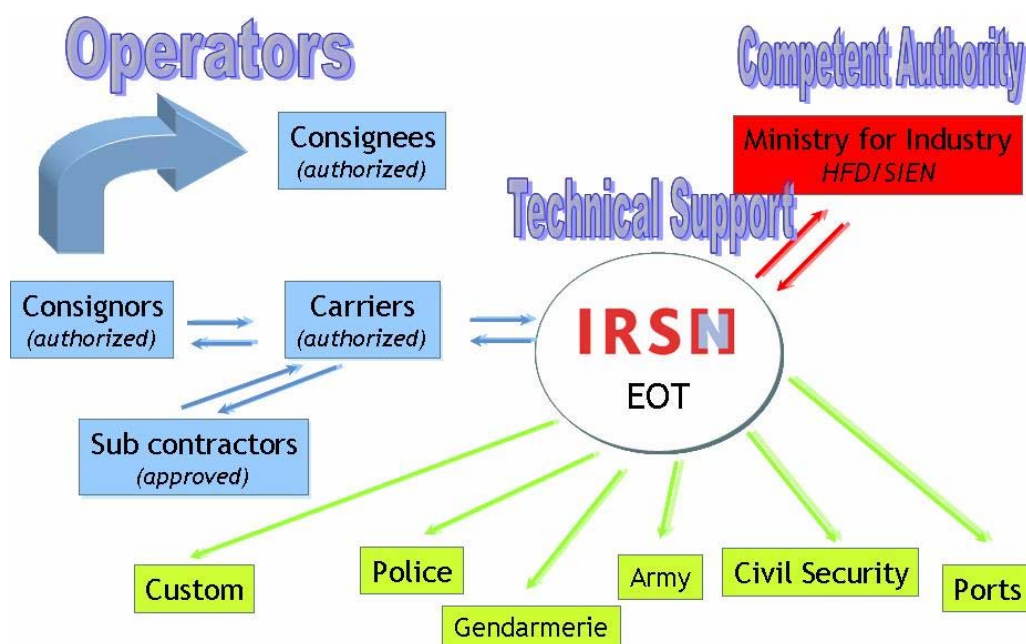


Figure 1. Organizations involved in nuclear material transport.

## ***5.2. Notifications***

For each movement, the carrier licensed under the law must send to the EOT notice of transport 15 days before the planned date of transport, attached to which is a special request for authorization if it relates to international transport. This notice describes the material to be transported (nature, quantity, physical chemical form) and the conditions for carrying out the movement (time, route, place of frontier passage, means of transport used, name of the shipping company or airline if necessary, etc).

It is the carrier's responsibility to keep the EOT informed of any modification to the information contained in the notice. In any case, he must confirm to the EOT the planned operation at the latest 3 days prior to the date of transport. Under this procedure, the EOT notifies the carrier of the agreement to carry out the transport if the transport relates to category 1 or 2, and if necessary grants the special authorization.

Prior to and during transport, the authorities may modify the conditions of transport or even suspend it if the circumstances demand it; they are in this case generally considerations relating to public order, weather or road traffic conditions.

To these general rules are added special constraints depending on the category of which the transport comes under, constraints defined depending on the nature and the quantity of nuclear material transported. By way of example, with regard to category 1 type transport :

- the carrier is obliged to code the information that he mentions on the transport notice in relation to the particular sensitivity of this category. In addition he must attach to this notice a detailed transport plan in the case of an international movement;
- they do not travel during the night and are parked up in a locked establishment guarded and approved by decision from the competent authority.

## ***5.3. Tracking***

During transport, it is the responsibility of the carrier to inform the EOT of any accident, incident or event likely to delay or to compromise the transport. For road transport, the vehicle must remain under continuous surveillance of their transport crew and, in the case of a night stop, to park up in a locked location.

For all transports of category 1 and 2 nuclear material, a real time remote tracking and control is performed directly by EOT. This tracking includes in conjunction with the geographical position of the vehicle the status of different sensors and alarms which give information concerning the security status of the shipment.

For international shipments of spent fuels or high level waste by rail, a real time tracking by EOT is also required by the competent authority.

It is very important for the Control Centre to follow the state of the art technologies available in order to enhance for instance the precision of the tracking (for example by using of the European Wide Area Augmentation System EGNOS in the near future) or to make it possible to have video remote monitoring (by using UMTS or HSDPA networks) and to reduce the cost for the licensed carrier.

## ***5.4. Incident management and exercises***

Incident management is in a first place the responsibility of the licensed carrier who must put in place written procedures for handling the different possible types of emergencies, whether it is an attack, an accident or a natural disaster involving the transport operation.

During transport, it is the responsibility of the carrier to inform the EOT of any accident, incident or event likely to delay or to compromise the transport.

The team of the Control Centre is specially trained to cope with emergency situations and have specific procedures for each type of incident that can occur. It is vital to maintain the capacity of the team to correctly respond to an event by setting up exercises.

For those transports that are remotely monitored, the early detection of incident or accident directly by the team of the Control Centre allows a more efficient assessment and response.

**6. Statistics**

**6.1. Number of transports**

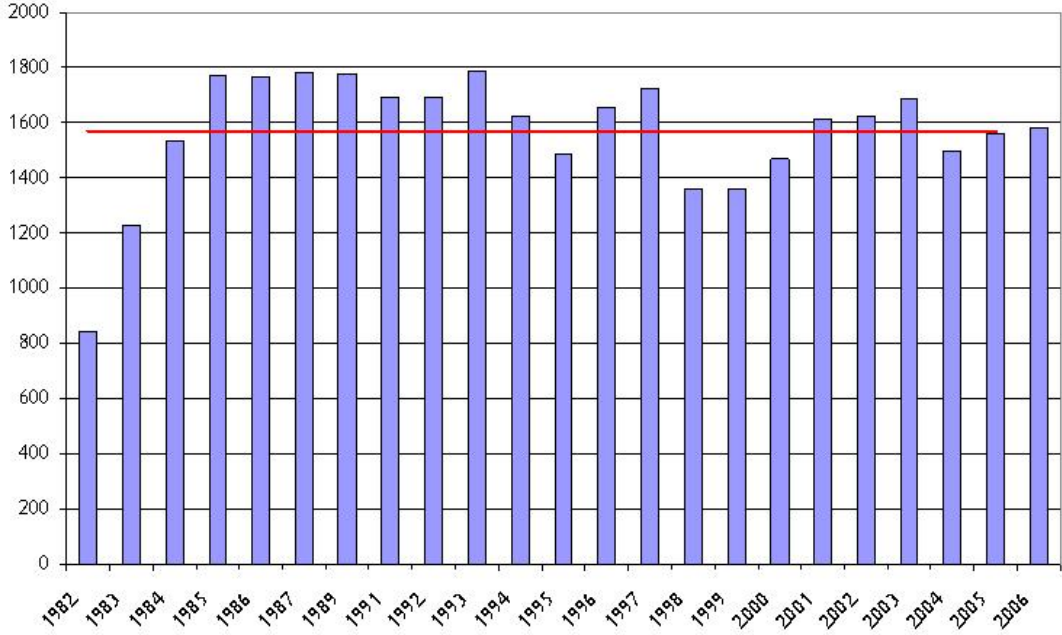


Figure 2. Number of transports since 1982.

**6.2. Type and mode of transport**

Type of transport average over 20 years

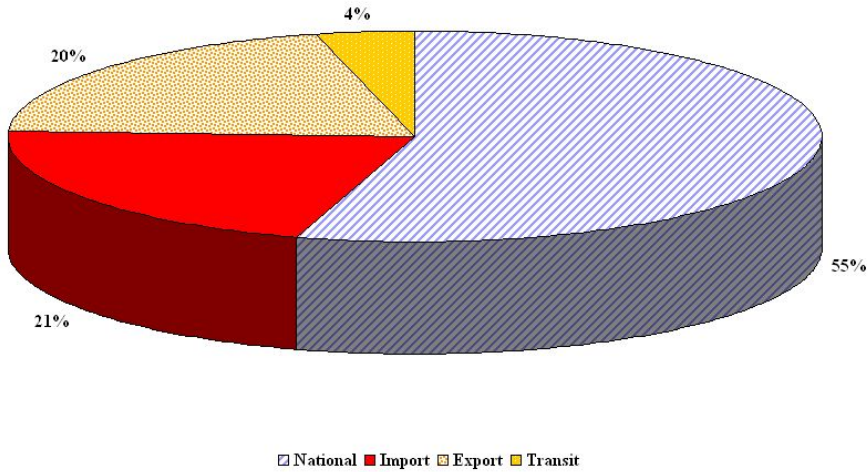


Figure 3. Type of transport since 1982.

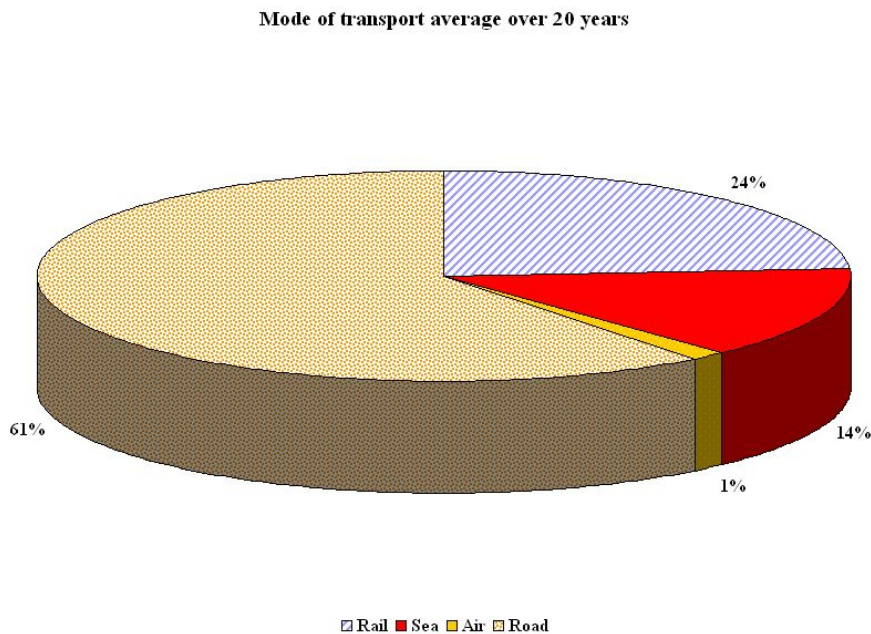


Figure 4. Mode of transport since 1982.

## 7. Conclusion

We have described in this paper the international context and the French regulations concerning nuclear material transport which are based on the following principles:

- Licensing of the operators,
- Approval of the vehicles for category 1 and 2 transports,
- Authorization of transport based either on the operator's license and the vehicle approval or on a transport plan in the case of international category 1 and 2 transports,
- Inspections with technical and during transport controls,
- Sanctions.

We have also described the role of the Operational Level of Transport which is the French control centre operated by IRSN on behalf of the Ministry for Industry and responsible for :

- Managing the notifications send by the licensed carriers,
- Tracking the transports,
- Alerting the competent authority in case of an accident or an incident.

The statistics given in the last part shows that the number of transports is stable since 20 years with around 1600 transports per year.