

On-site transport: implementation of the new French regulations

Pierre MALESYS

*AREVA
33 Rue La Fayette
75009 Paris
France*

pierre.malesys@areva.com

Abstract / Introduction

The legal and regulatory requirements governing nuclear activities in France have been extensively revised in recent years. The 13th June 2006 Act on transparency and safety in the nuclear field extensively overhauled the legal regime. It has in particular given this system an “integrated” nature, that is to say that it seeks to prevent the hazards and detrimental effects of any type that nuclear installations could create: accidents, pollution, waste (whether radioactive or not for these three instances), noise, etc.

In addition, the new 7th February 2012 ministerial order, part of the so-called “technical regulations”, gives more details about the requirements which are applicable to the nuclear installations.

On-site transports are necessary to transfer radioactive materials or equipments from one building to another one, during the different phases of a transformation process, or during decommissioning. Since before the new 7th February 2012 ministerial order there were no explicit regulations for on-site transports, the French nuclear operators / licensees had defined internal rules for these operations on each site, which had been approved by the French Nuclear Safety Authority, on a site by site basis, and not for all sites. As another aspect of the integrated nature of the Act which is mentioned earlier, this new order includes explicit requirements for on-site transport of dangerous goods, including radioactive material. This is rather new, compared to the former existing regulations, and makes the regulatory regime more robust than earlier for the on-site transport of radioactive material.

On-site transports are nowadays clearly included in the operations of the nuclear installations. They have to comply with the “general operating rules” which are applicable within the nuclear installations and which are approved by the Nuclear Safety Authority. However, to comply with the regulations applicable in the public domain (based of the IAEA “Regulations for the Safe Transport of Radioactive Material”) is still an acceptable alternative.

The paper presents the details of the new regulations. It explains how the different AREVA sites are implementing the new order, and give examples where it is deemed appropriate to define specific rules for on-site transport (as part of the “general operating rules” of the nuclear installation) or to stick with the off-site transport regulations. Eventually, it presents the nature of these specific rules, how they are established, how safety is assessed in these instances, and how these rules interfere with the “general operating rules” applicable to the core business of the installation.

1. Regulatory regime

1.1 General framework

The legal and regulatory framework governing nuclear activities in France has been extensively revised in recent years. It consists of the Environment Code, the Public Health Code, the Labour Code and the various implementing texts: decrees and ministerial orders and regulatory resolutions (general, legally binding resolutions, issued by ASN (Autorité de Sûreté Nucléaire / Nuclear Safety Authority), the French Competent Authority).

1.2 “TSN Act”

The Environment Code contains the provisions of the “Loi TSN” (Loi n° 2006-686 du 13 juin 2006 relative à la transparence et à la sécurité en matière nucléaire) / “TSN Act” (Act No. 2006-686 of 13 June 2006 on transparency and security in the nuclear field) which extensively overhauled the legal regime.

In this Act:

- “nuclear security comprises nuclear safety, radiation protection, the prevention and fight against malicious act, and also civil security actions in the event of an accident”,
- “nuclear safety is the set of technical provisions and organisational measures (...) which are adopted with a view to preventing accidents or limiting their effects”.

The “Loi TSN” (“TSN Act”) has in particular given this system an “integrated” nature, that is to say that it seeks to prevent the hazards and detrimental effects of any type that nuclear installations could create: accidents, pollution, waste (whether radioactive or not for these three instances), noise, etc.

1.3 “BNI Order”

In addition, the new “BNI Order” (“Arrêté du 7 février 2012 fixant les règles générales relatives aux installations nucléaires de base” / Ministerial “Order of 7 February 2012 setting the general rules concerning basic nuclear installations”), part of the so-called “technical regulations” gives more details about a large number of requirements which are applicable to the nuclear installations [More information on the “BNI / Basic Nuclear Installation” is provided in the section 2.1.1]. As another aspect of the integrated nature of the “TSN Act” which is mentioned earlier, this new order includes explicit requirements for on-site transport of all dangerous goods, including radioactive material. This is rather new, compared to the former existing regulations, and makes the regulatory regime more robust than earlier for the on-site transport of radioactive material.

1.4 ASN Guide

It is expected that ASN will issue a guide for the professionals involved in on-site transport. It should be non-prescriptive and it should be seen mainly as an educational tool, to clarify the regulatory requirements.

2. Requirements for on-site transport

2.1 Definitions

2.1.1 Basic nuclear installation (BNI)

A basic nuclear installation (BNI) is one that, by its very nature or owing to the quantity or activity of the radioactive substances it contains, is subject to specific regulatory arrangements as defined by the “TSN Act” of 13th June 2006. These installations must be authorised by decree issued following a public inquiry and an ASN opinion. Their design, construction, operation, maintenance, decommissioning and dismantling are all regulated.

The following are considered to be BNIs:

- nuclear reactors;
- large installations for the preparation, enrichment, fabrication, treatment or storage of nuclear fuels or the treatment, storage or disposal of radioactive waste;
- large installations containing radioactive or fissile substances;
- large particle accelerators.

Except for nuclear reactors, which are all BNIs, thresholds are set up, for each category, determining the point at which they become subject to the BNI system.

For technical or legal reasons, the concept of a basic nuclear installation can cover a number of different physical situations: for example in a nuclear power plant, each reactor may be considered as a separate BNI, or a given BNI might in fact consist of two reactors. Similarly, a fuel cycle plant can comprise several BNIs. These different configurations do not alter the regulatory conditions in any way.

The following are subject to the BNI system:

- facilities under construction, provided that they are the subject of a creation authorisation decree;
- facilities in operation;
- facilities shut down or undergoing decommissioning, until they are delicensed by ASN.

2.1.2 On-site transport operations

In the “BNI Order”, on-site transport operations are defined as “transports of dangerous goods which are performed within the perimeter of a basic nuclear installation, outside buildings and storage pads and any operation contributing to its safety, including those performed within buildings and storage pads”.

Transports performed within buildings and storage pads are excluded from this definition as all operations performed within buildings and storage pads have to comply with rules which are defined otherwise. These operations performed within buildings or storage pads can be compared to handling operations.

There is a significant similarity with the definition in the IAEA “Regulations for the Safe Transport of Radioactive Material” for off-site transport, as all operations which contributes to the safety of the transport per se must also be considered

Eventually, it can be noticed that this definition includes all dangerous goods, that means radioactive material but also all other dangerous goods (flammable, corrosive, etc.)

2.2 Requirements

The requirements for on-site transport operations are set up in paragraphs 8.2.1 and 8.2.2 of the “BNI Order”.

“Paragraph 8.2.1 – On-site transport operations are carried out taking into account:

- constraints due to co-activity induced by traffic;
- characteristics of the roads which are used and of their environment;
- operational constraints to perform transports;
- organisational and human factors.”

“Paragraph 8.2.2 – On-site transport of dangerous goods operations must comply either with the regulations which are applicable for the transport of dangerous goods on public highways, or with the provisions of the general operating rules (RGE) (*as defined in ...*)”.

The so-called “general operating rules” are those rules which describe the operating conditions, transforming the initial hypotheses and the conclusions of the safety studies taken from the safety analysis report into operating rules. They are subject to ASN approval.

Through the paragraph 8.2.2, it is confirmed that the aspects of “on-site transport” are twofold: one aspect is “on-site” and the other one is “transport”.

2.2.1 First aspect: "On-site"

The first aspect when assessing on-site transport is "on-site". As such, on-site transport can be regulated through the general operating rules of the facility, providing that these rules define a level of safety which is deemed appropriate by the competent authority. And in the above mentioned paragraph 8.2.1, it is recognized that the conditions in which on-site transports are carried out are, or can be, defined and are restricted compared to transport on public highways. Then, and to illustrate the bullets in the paragraph 8.2.1, it is allowed to take into account the following which reduce the risk, when applicable.

- Traffic

On-site traffic depends on the site configuration: some sites allow the use of private cars, while others do not. Furthermore, it is possible to manage the traffic and the co-activity, for example by limiting (i) the access of the roads when a transport of radioactive material is performed or (ii) the slots when it is allowed to transport to those periods outside the peak hours. A more extreme alternative can be to transport radioactive material on dedicated roads. All these conditions reduce the risk of an accident when transporting on-site: they can be specified in the general operating rules and taken into account when defining the performance standards of the packages to be used.

- Characteristics of the roads

The roads which are used for on-site transport are, by nature, limited to the roads which exist within the facility. Then, they are not so many and their characteristics are well known. This allows, for instance, to identify precisely the potential drops due to the traffic. The conditions of the roads to be used can be regularly checked, even as necessary just before the most sensitive shipments (shipments with an activity above a pre-defined threshold), and the roads can be properly maintained. And the drivers are well aware of the topography of the site. Again, this can be taken into account when defining the performance standards of the packages to be used.

- Operational constraints to perform transports

The speed of the conveyance has an influence on the probability of occurrence of an accident, as well as on the consequences of an accident, should an accident occur. The vehicles used on-site often have their speed self limited, sometime down to walk speed. This can also be specified in the general operating rules and taken into account when defining the performance standards of the packages to be used.

Another important parameter is the emergency and rescue means. Most of the facilities have their own emergency and rescue teams on-site. Should an event occur, they can be on the field within a few minutes. If a transport is deemed particularly sensitive, they can be informed about the time schedule of this transport and be specifically prepared to intervene as necessary. They can even escort the conveyance during the transport. Specifying requirements about the emergency and rescue teams in the general operating rules can also allow to reduce the performance standards of the packages to be used for on-site transport compared to off-site transport.

- Organisational and human factors

While a transport in the public domain can involve a large number of organizations and persons due to its length and the change in the modes of transport, an on-site transport is carried out by a very limited number of organizations and persons. Typically, there is no handling during an on-site transport, there is no transfer from one vehicle to another one, the length of the transport ranges between a few dozen of meters and a few kilometres, the duration of the transport ranges between a few minutes and a few hours. Then, for instance, due to the short distance and short duration, the weather conditions can be precisely taken into account and the transport can be postponed if the situation is deemed inappropriate for performing the transport in a safe manner.

All these conditions allow a better control of on-site transport: training of the personnel can be dedicated and enhanced to the specific tasks to be performed for this job, procedures can be more precise, etc. Compared to an off-site transport, for which – for instance – handling companies in a port or an airport have to deal with thousands of packages, most of which are not loaded with dangerous goods and – a fortiori – radioactive material, many additional measures can be taken to optimize both the organization and the human performance of the on-site transport.

2.2.2 Second aspect: “Transport”

The second aspect when assessing on-site transport is “transport”. The on-site transport of dangerous goods presents risks which are similar to those induced by the transport of dangerous goods on the public highway. The transport regulations on public highways remain the basic standard, even for on-site transport. It is expected that the same level of safety is reached for on-site transport as for transport on public highway.

3. Implementation of the new regulations within AREVA sites

The above mentioned “BNI order” leaves the room to two possibilities:

- either to comply with the regulations which are applicable for the transport of dangerous goods on public highways, or
- to comply with the provisions of the general operating rules, which have to be approved by the competent authority.

Within AREVA sites and depending of the material to be transported, both possibilities are considered.

3.1 Regulations applicable for the transport of dangerous goods on public highways

On-site transport will be performed in strict compliance with the regulations for the transport of dangerous goods on public highways in some instances.

It is particularly the case for goods which are delivered from the supplier to a centralized storage facility within the site, in large quantities but in a number of small packages. Then, these goods can be dispatched to the on-site end users, gradually according to their need, with the same packages as long they fit with the need.

In fact, this will happen more for dangerous goods other than radioactive material than for radioactive material.

However, in most instances, it is impracticable to fully comply with the regulations which are applicable to the transport of dangerous goods on public highways. In a simplistic manner, the transport regulations can be reduced to packaging requirements and to administrative requirements, including labelling of the packages.

Regarding, the packaging requirements, many packages which are used for on-site transport cannot meet the IAEA “Regulations for the Safe Transport of Radioactive Material” for different reasons:

- compliance with the IAEA Regulations package performance standards would induce over-design compared to the risk when transporting on-site, and it is preferred to adapt the IAEA Regulations tests, or
- some transport systems have been designed with a set of constraints which makes them definitely incompatible with the IAEA Regulations package performance standards (see following section 3.2.1).

In both instances, it is necessary to consider the actual conditions which prevail for the on-site transports (see above section 2.2.1)

And then, even if it is feasible to comply with the packaging requirements, as in the above mentioned example, it is very difficult, and quite often not desirable, to meet all the administrative requirements included in the regulations for the transport of dangerous goods on public highways. For instance, the transport documents may be not adapted for on-site transport. More significantly, it may be inappropriate to use the same labelling for on-site and off-site transports: to use different labels will reduce the probability that material, which has to be shipped on-site, be inadvertently shipped out of the site.

These are reasons why most on-site transports will be performed on the basis of specific provisions of the general operating rules.

3.2 Specific provisions of the general operating rules

As explained before, in most instances, on-site transport will be performed in compliance with specific provisions included in the so-called “general operating rules” of the facility. In most instances, these provisions will be rather similar to those which exist in the regulations for transport on public highways.

3.2.1 Features to be taken into account in the general operating rules

During the last few years, the three major French nuclear operators (AREVA, CEA and EDF) have set up a working group whose terms of reference included the drafting of a common reference for on-site transport rules <1>. Now, these rules will be used as a basis by all the operators, on each site, to establish the specific provisions for on-site transport to be included in the general operating rules.

These provisions will be site-specific to accommodate all the local characteristics of the site, as explained in section 2.2.1.

They will also be dependent of the transports which are considered. There is a wide range of transports which are performed. The means of transport are numerous:

- standard vehicles such as cars or trucks,
- handling systems, such as cranes or fork-lift trucks,
- individuals (walking transports, for light sources for instance).

The packages which can be found vary also extensively:

- packages which are used on the public highway, and which are used on-site in the same conditions,
- packagings which are used on the public highway, but which are used on-site in different conditions (for instance: no shock absorbing covers, no protective overpack, different contents),
- packagings which are only used on-site and which are designed against performance standards similar to those included in the IAEA “Regulations for the Safe Transport of Radioactive Material”, but less demanding (for instance: lower height for the drop tests, shorter duration for the fire test) and optimized to take into account the local characteristics of the site and operating conditions (see section 2.2.1).

And then, there are hybrid systems, which are a mix of a conveyance and of a packaging, and are dedicated to some facilities: the packaging is almost integral to the conveyance and the system has been specifically designed to interface with (a few) facilities. These transport systems have been optimized to transfer (and not really to transport) the radioactive material from one facility to another one. They are designed with a holistic approach, whose goal is to minimize the workers dose uptake during the full operating cycle: loading, preparation, transport, unloading. This is offset by a design which, at the end, does not fit with the philosophy of the IAEA Regulations.

The provisions in the general operating rules have to consider all these situations. De facto, for each family of on-site transports, there will be rules and associated safety assessments.

3.2.2 Contents of the general operating rules

Typically, the general operating rules include the following items:

- Presentation of the on-site transport systems (*general rules for classification, packagings description, conveyances description, radioactive contents, transports description, operating instructions*)
- Organisation (*roles and missions of the entities which are involved in the on-site transports*)
- Quality management for operations
- General operating requirements (*radioactive contents, labelling and marking, conveyance, provisions for loading and unloading*)
- General safety requirements (*fire, handling, stowage, weather conditions*)
- General criticality-safety requirements
- General radiation protection requirements (*classification of the workers, radiation level limits, contamination limits*)
- Instructions for abnormal situations and mishaps
- Controls, periodic testing and maintenance

3.2.3 Differences between the general operating rules and the off-site transport regulations

The provisions in the general operating rules and also in the safety analysis report may differ from those included in the IAEA “Regulations for the Safe Transport of Radioactive”. Differences which are expected are as follows.

- Activity limits and classification – While basic radionuclide values set up in the IAEA “Regulations for the Safe Transport of Radioactive Material” (A₁, A₂, Activity concentration limit for exempt material, Activity limit for an exempt consignment) remain the basis for the classification, the classification of packages may use multiplication factors which are different from those defined in the IAEA Regulations.
- Radiation level and contamination limits – These limits can be adapted to the operating conditions which exist on-site, taking into account that the people on-site are not part of the general public, even if all of them are not classified as workers occupationally exposed to radiation. Furthermore, the implementation of the rules can be simplified: for instance, compliance with the radiation level limits can be ensured with limited means if significant experience with the same batch of material in the same packaging design is available (each shipment of Low Specific Activity (LSA) material of the same nature transported in Industrial Packages of the same family might need neither measurement, nor calculation, if experience have demonstrated that margins are available).
- Marking, labelling and placarding – This has to be adapted to the need of on-site transport, which are less than for an off-site transport, in order to eliminate undue radiation exposure, on the one hand, and to avoid any confusion with a package which is authorized to be shipped on the public highway. In addition, as many people are aware of the contents to be transported and can provide the relevant information should a mishap occur, there may be no need for labelling when :
 - o the packages are loaded just before transport,
 - o the carriage is planned to last a few minutes,
 - o there is no stop between departure and arrival,
 - o the packages are unloaded just after transport.

- Package performance standards – They may differ significantly from the standards specified in the IAEA Regulations, as they can be optimized to take into account the local characteristics of the site and operating conditions (see section 2.2.1), and eventually less stringent (for instance: lower height for the drop tests, shorter duration for the fire test).
- Approval of the package design – As the packages are not used in the public domain, no package design has to be approved by the competent authority in charge of transport. However, the general operating rules, and any modifications of these rules, have to be approved by the safety authority. A balance has to be found regarding the level of details of the information included in the general operating rules, in order to allow the operator to modify the transport operations with packages containing a limited quantity of radioactive material without the need for a formal approval by the safety authority. The general operating rules need to include provisions defining the conditions in which on-site transport of small quantity of radioactive material can be self-certified, similarly to the transport of Type A packages or Industrial Packages in the public domain which do not require an approval by the competent authority. In the recent years, the competent authority had recognized that packages with an activity less than 100 A₂ and containing non-fissile material could be self-certified by the licensee for on-site transport.

As regards, the above mentioned transport systems, which are a mix of a conveyance and of a packaging, and do not look like what is commonly seen as a transport packaging, they need specific safety assessments: the nature of the safety assessments is closer to the safety assessment which is performed for the facility than to a package design safety analysis report. However, the assessment is quite challenging, as the transport system cannot benefit from the protection which is brought by any building as it is outdoor. It is necessary to really take into account all the positive aspects of the actual conditions of the on-site transport in order to demonstrate that an appropriate level of safety is reached.

Conclusion

A new regulatory framework has been set up in France for on-site transport of dangerous goods, including radioactive material, and makes the regulatory regime more robust than earlier for these on-site transports.

While the goal of this new regulatory framework is not directly to impose additional constraints to these operations, it is an opportunity to confirm that there is no gap in their definitions and specifications, on the one hand, and in their safety assessment, on the other hand.

However, the implementation of the new “BNI order” for the on-site transport operation induces a lot of work to have all the documents available in due course. Significant resources have to be made available for this task, both within the industry and the safety authority. In addition, two communities which are not very used to working together have now to do so: the community in charge of the safety of transport and their counterpart in charge of the safety of the facilities.

The challenge is intensified for large sites like La Hague or Tricastin, which include multiple basic nuclear installations (regulated nuclear facilities) and multiple licensees as well. These sites are governed by several operating general rules, one or more per basic nuclear installations. Rules could potentially become specific to each facility, while – in many instances – on-site transports are between two different facilities. A unified view of this activity should be maintained across the site to avoid useless differences or sources of confusion for operators.

It is expected that the guide to be issued by the safety authority will contribute to a smooth implementation of the new regulations for on-site transport.

References

<1> Laurent HANSEL (AREVA), Yves CHANZY (AREVA), Emmanuel RIGAUT (CEA), Thierry MIQUEL (EDF) – *On site transport regulations: how to adapt international regulations* – PATRAM 2010, London (2010)