TRANSPORT OF RADIOACTIVE MATERIALS

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CHAPTER 11

ASN has since 12 June 1997 been responsible for regulations pertaining to the safe transport of radioactive and fissile materials for civil use and for enforcement. Its role in this field was confirmed by Act 2006-686 of 13 June 2006 on Nuclear Transparency and Security (TSN Act) which instituted the Nuclear Safety Authority (ASN).

The radioactive material transport regulations have two separate objectives:
– security, or physical protection, consists in preventing loss, disappearance, theft and misuse of nuclear materials (usable for weapons), for which the Defence High Official (HFDS) attached to the Minister for Ecology, Energy, Sustainable Development and Spatial Planning is the responsible authority;
– for its part, safety consists in managing the risks of irradiation, contamination, criticality and the prevention of damage caused by the heat present in the transport of radioactive and fissile materials, so that man and the environment are not adversely affected. Monitoring safety is the responsibility of ASN.

Pursuant to decree 2001-592 of 5 July 2001, regulation of the transport of radioactive and fissile materials for national security purposes falls to the Defence Nuclear Safety and Radiation Protection Delegate (DSND).

1 GENERAL INTRODUCTION

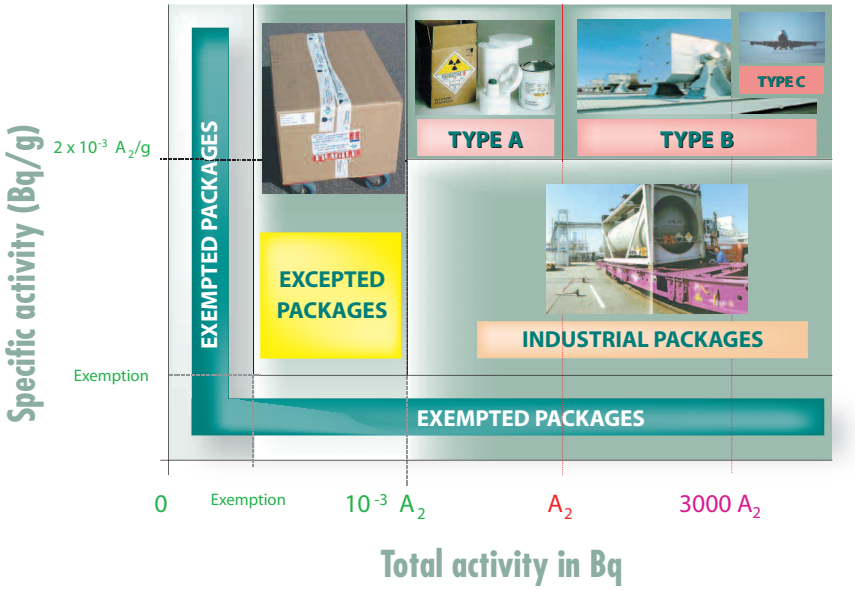
1|1 Packages

The term package designates the container with its radioactive contents ready for transport. The regulations define several types of package, depending on the characteristics of the substance to be transported, such as its total activity, its specific activity, its physical-chemical form and its fissile character where applicable. For each radionuclide, a reference activity level is defined, where the lowest levels correspond to the most noxious products. This value is called A1 for materials in a special form (guaranteeing no dispersion) and A2 in all other cases. For example, for Pu 239, A1 is equal to 10 TBq and A2 is equal to 10^{-3} TBq.

The following diagram shows the different types of packages defined by the regulations.

This package classification only applies to the transport of materials having specific and total activities exceeding the exemption thresholds defined in the relevant transport

Chart 1: illustration of package classification according to total and specific activity



Example of a type A packaging – Radiopharmaceuticals package

Example of a type B packaging – CEGEBOX containing a gamma radiography appliance

regulations. Packages for which the specific or total activity level is below the exemption thresholds are considered to be exempted.

Each type of package has specific safety requirements and test criteria to prove its ability to withstand routine, normal or accident transport conditions (see box below).

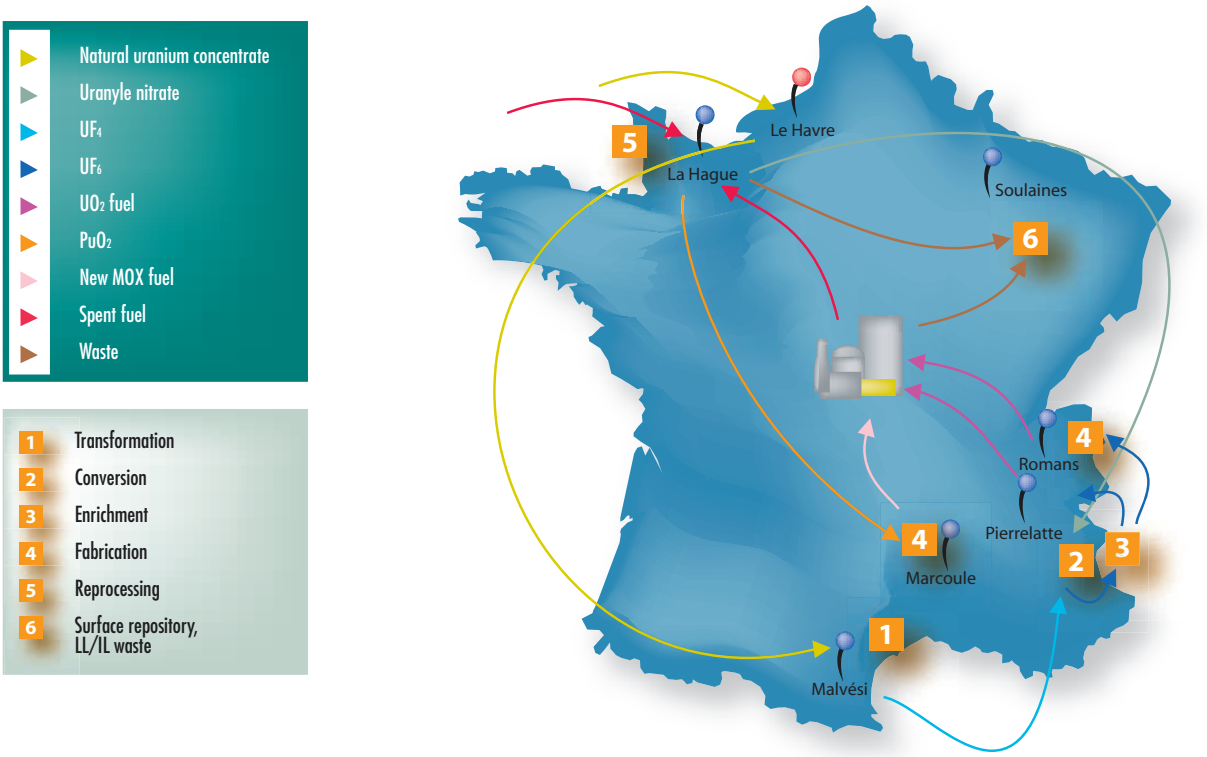
Characteristics of the various types of packages

Excepted packages undergo no qualification testing. They must however comply with a certain number of general specifications, such as a maximum surface dose rate of less than 0.005 mSv/h. Non-fissile industrial or type A packages are not designed to withstand accident situations, although they must be able to withstand certain incidents encountered in handling or storage. They must consequently withstand the following tests:
– exposure to a severe storm (rainfall reaching 5 cm/h for at least 1 hour);
– drop onto a rock target from a height varying according to the weight of the package (maximum 1.20 m);
– compression equivalent to 5 times the weight of the package; and
– penetration by dropping a standard bar onto the package from a height of 1 m.

Following these tests, there should be no loss of material and any damage to the radiological protection should not lead to an increase of more than 20% in the maximum surface radiation intensity.

Fissile or type B packages must be designed so that they continue to fulfil their containment, sub-criticality and radiation shielding functions under accident conditions. These accidents are represented by the following tests:
– a series of three consecutive tests:
• a 9 m drop test onto a rock target,
• a 1 m drop onto a spike,
• encircling fire of at least 800 °C for 30 minutes; and
• immersion in 15 m deep water for 8 h (200 m water depth for spent fuel).

Type C packages must be designed so that they continue to fulfil their containment, sub-criticality and radiation shielding functions under representative air transport accident conditions. These accidents are represented by the following tests:
– a series of three consecutive tests:
• a 9 m drop test onto a rock target,
• a 3 m drop onto a spike,
• encircling fire of at least 800 °C for 60 minutes;
– 90 m/s impact on a rock target; and
– immersion in 200 m deep water for 1 hour.
– burial test.



Transport associated with the fuel cycle in France

1 | 2 Annual traffic

About 900,000 packages of radioactive materials circulate in France every year, representing a few percent of the dangerous goods traffic. Most (two-thirds) consist of radioisotopes for medical, pharmaceutical or industrial use. The diversity of these packages is considerable. Their radioactivity varies by more than twelve orders of magnitude, or from a few thousand becquerels (pharmaceutical packages) to millions of billions of becquerels (spent fuel), and their weight from a few kilograms to about a hundred tons.

The sectors using these packages are also extremely diverse. There is obviously the nuclear sector, but also the medical field, conventional industry and research. These latter sectors account for more than 85% of radioactive material package traffic.

The nuclear power cycle industry gives rise to the transport of many sorts of radioactive materials: uranium concentrates, uranium tetrafluoride, depleted, natural or enriched uranium hexafluoride, fresh or spent fuel assemblies containing uranium oxide or mixed uranium and plutonium oxide (MOX), plutonium oxide, waste from power plants, reprocessing plants, CEA research centres, etc.

The largest consignments concern about 300 shipments per year for fresh fuel, 250 for spent fuel, about 30 for MOX fuel and about 60 for plutonium oxide powder.

Since transport can also be international, France is a transit country for some of these shipments, for instance for spent fuel packages from Switzerland, bound for Sellafield in Great Britain, which are taken on board ship at Dunkirk.

A large number of international shipments are also due to the presence in the country of plants enriching uranium, fabricating or reprocessing nuclear fuels, along with manufacturers of radioisotopes for medical purposes, all of whom have commercial links with foreign organisations.

1 | 3 Industrial participants

The main participants in transport arrangements are the consignor and the carrier. The consignor is responsible for package safety and accepts its responsibility by way of the dispatch note accompanying the package remitted to the carrier. Other participants are also involved: the package designer, manufacturer and owner and the carriage commission agent (authorised by the consignor to organise the transport operation).

For a radioactive material shipment to be carried out in good safety conditions, a stringent chain of responsibility has to be set up. So, for major transport operations:
– the consignor must be fully aware of the characteristics of the material to be transported, so that it can select the type of container to be used and specify transport conditions accordingly;
– the corresponding container must be designed and sized in accordance with conditions of use and current regulations. In most cases, a prototype is needed to carry out the tests prescribed by the regulations. Following this phase, the safety documents are prepared and submitted to the competent authority, to back up the authorisation application;

In this context, the container owner must set up a maintenance system in conformity with that described in the safety documents and the authorisation certificate:
– the container is sent to the consignor's site, where it will be loaded with the material for transport. The consignor must carry out the inspections for which it is responsible (leaktightness, dose rate, temperature, contamination) on the loaded container prior to entry on a public road or railway track;
– the transport operation itself is organised by the carriage commission agent, who is responsible for obtaining requisite permits and complying with advance notice requirements on behalf of the consignor. He also selects the means of transport, the carrier and the itinerary, in compliance with the above-listed requirements;
– the actual transport is entrusted to specialised firms, having the necessary permits and vehicles. The drivers of road vehicles in particular must be in possession of the training certificate required by the regulations.

1 | 4 Regulation of the safe transport of radioactive materials

In the context of regulation of the safe transport of radioactive and fissile materials, ASN is responsible for:
– defining technical regulations and ensuring their enforcement;
– completing authorisation procedures (approval of packages and organisations);
– organising and implementing inspection procedures;
– proposing and organising public information.

In addition, ASN acts within the context of emergency plans defined by the authorities to deal with an accident.

A decision of 1 December 1998 set up an Advisory Committee of experts (GPE) for radioactive material transport, similar to the other GPEs already in existence for other sectors. The expert assessment by the Institute for Radiation Protection and Nuclear Safety (IRSN), at ASN's request, may thus be supplemented by an Advisory Committee review.

2 PACKAGE MODEL APPROVAL

ASN conducts a critical analysis of the safety documents proposed by the applicants to obtain an approval certificate for their package design.

Certain package designs require the approval of the competent authority before they can be authorised for transport in France:
– radioactive materials in special forms;
– slightly dispersible radioactive materials;
– type B and C packages and all fissile material packages;
– special arrangement shipments (the package fails to comply with all the requisite criteria, but compensatory transport measures have been taken to ensure that transport safety will not be below that of a transport operation involving an approved package).

After technical review of the documents by IRSN, ASN approves the package designs complying with the regulations and validates approvals issued by the competent authorities in other countries for transport in France.

These approvals are usually issued for a period of a few years. At the present time, about 100 applications for approval are submitted annually by the manufacturers to ASN (new package design, extension of the term of validity, validation of a certificate issued by a foreign authority, special arrangement, extension of a certificate to cover contents other than those initially defined in the safety documents).

Generally speaking, approval is issued for package designs and not package by package. This approval however

specifies the manufacturing, operating and maintenance conditions.

This approval is often issued independently of the transport operation strictly speaking, for which no prior notification of ASN is generally required, but which may be subjected to security checks (physical protection of materials under the control of the Defence High Official at the Ministry for Ecology, Energy, Sustainable Development and Spatial Planning).

2|1 Issue of administrative authorisations

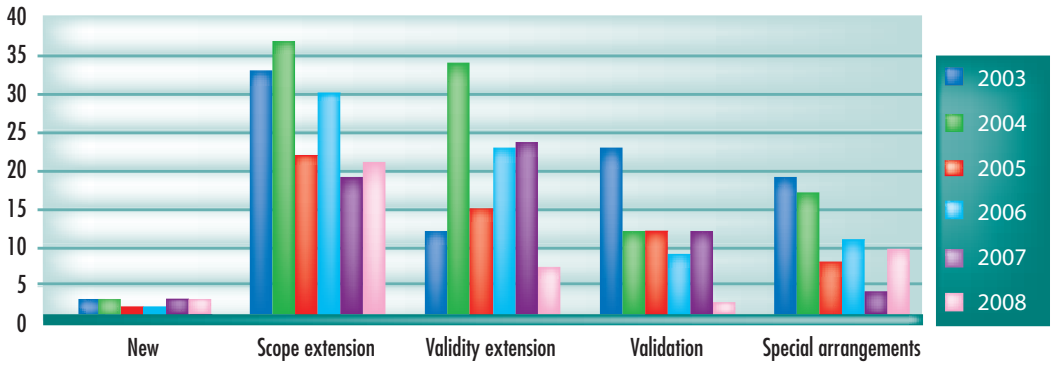
In 2008, ASN issued 44 certificates, broken down as follows according to type (graphs 1 and 2).

The types of transport concerned by these certificates are as follows:

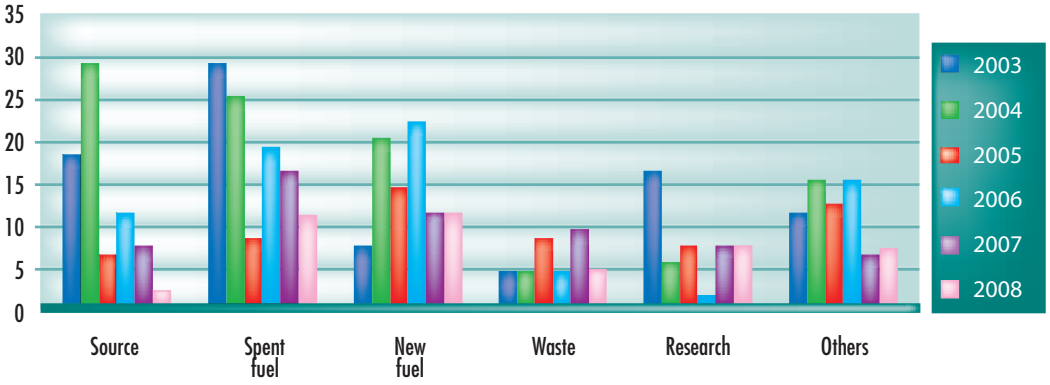
As a result of its 2008 examinations, ASN issued approval certificate F/396/B(U)F-96 (Aa) for the new TN 112 package model, designed to replace older concepts. This new package model was developed by TN International for transport of PWR-type uranium or MOX fuel assemblies.

New TN112 packaging

Graph 1: breakdown of approvals according to type



Graph 2: breakdown of approvals according to content



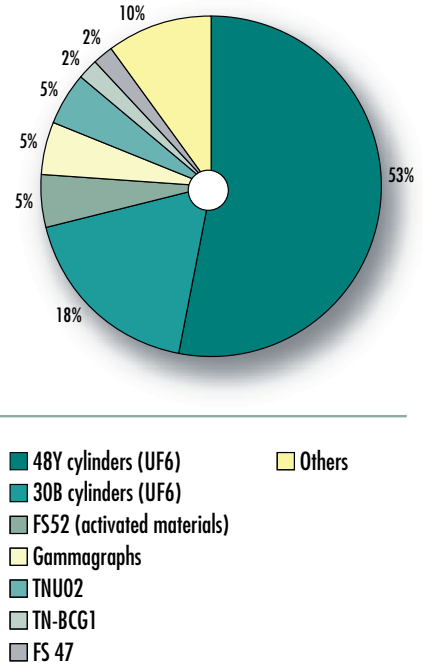
Review of this file led to a meeting of the Advisory Committee for transport on 4 June 2008.

2|2 Inventory of approved containers

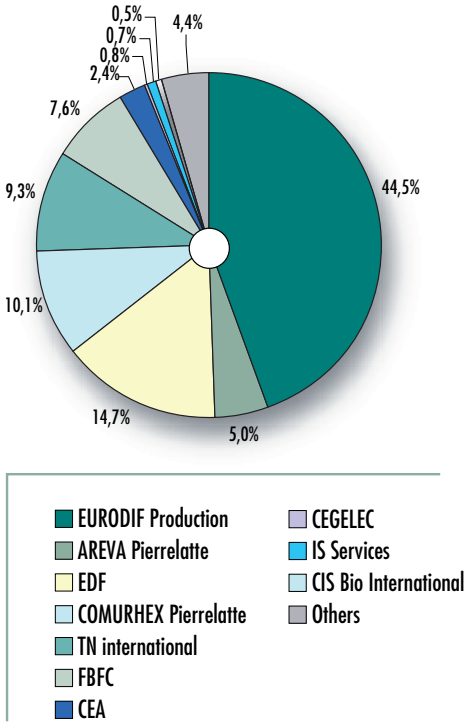
Since 1999, every French owner of type B or fissile packages or packages transported by special arrangement has had to update a record sheet for each package concerned, indicating the date of entry into service, modifications undergone, date of last maintenance operation, use to which it has been put, etc.

The collected package record sheets have provided ASN with a clearer picture of the overall French package situation. The results produced in 2008 reveal that 13,420 packagings were notified, including 7,154 used for transport, as compared with 11,551 in the previous set of results. The packagings are divided into 88 package models (no change). The most common packages are the 48Y cylinders used to transport natural uranium hexafluoride, which account for almost 53% of all French packages (7,049 packages, 4,966 of which are the property of a single owner, Eurodif Production). In addition, more than 84% of all type B package owners, representing about 5.7% of all French packages, possess a gamma radiography appliance (GAM 80-120 transported in CEEBOX 80-120, GAM 400, GMA 2500 and GR 30-50).

Graph 3:
breakdown according to package model



Graph 4:
number of packagings per owner



3 REGULATING THE TRANSPORT OF RADIOACTIVE MATERIALS

From both the regulatory and practical standpoints, it is important to ensure good cohesion with other supervisory authorities responsible, notably, for the inspection of transport vehicles, for conventional safety inspection in the transport sector or for the protection of nuclear materials. ASN has therefore either already signed protocols with the General Directorate for Infrastructures, Transports and Maritime Affairs (DGITM), the General Directorate for the Prevention of Risks (DGPR) and the General Directorate for Civil Aviation (DGAC), or will soon be signing them. The TSN Act also reinforced the powers of ASN inspectors, in particular with regard to ascertaining violations and imposing penalties.

Checks were therefore carried out in particular on the consignors and carriers. At a more general level, inspections also took place at the manufacturers and on the maintenance sites.

A total of 81 inspections were carried out in 2008 in the field of radioactive material transport.

Among the observations or findings formulated further to the inspections, the most frequent concern quality assurance, documentation, the responsibilities of the various parties involved, or compliance with procedures and established practice as indicated in the approval certificates, safety cases or, more generally, regulatory texts.

As regards quality assurance, the observations most frequently encountered concern the following:
– organisation;
– quality plan, procedures, established practice;
– traceability of checking operations;
– handling of deviations;
– supplier audits.

With regard to the other fields, the observations mainly concern:
– the training programme for all those involved in transport operations;
– the work of the safety adviser, in particular the annual report;
– procedures for declaring events and incidents.

ASN also carries out inspections during the manufacture of packagings requiring approval. This was in particular the case in 2008 for the R72, MX6 packagings or cylinders loaded with uranium hexafluoride.

In 2008, the radioactive material transport inspection duties, performed by ASN's inspectors, were based around two key topics:
– quality assurance;
– the work of the transport safety adviser.

Finally, and in coordination with the DSND (Delegate for Nuclear Safety and Radiation Protection for National Defence Installations and Activities), ASN decided to strengthen regulation of the transport of dangerous goods on nuclear sites.

At the request of ASN, some sites defined technical rules applicable for this type of transport as early as 2003. This is for example the case with the CEA centres or AREVA's La Hague site.

These internal transport rules are a set of operational and organisational rules to a large extent inspired by the public highway transport regulations (ADR order and ADR[1]) while taking account of certain aspects specific to on-site transport.

Transport inspection – Charles-de-Gaulle Airport – 2008

Inspection of transport packaging manufacture – Romania – 2008

1. ADR is the European agreement concerning the international carriage of dangerous goods by road. The ADR order aims to make the European agreement applicable in French law.

A working group was set up in 2008, jointly with the DSND, in order to:

– overhaul these on-site transport rules in order to take account of initial operating experience feedback and broaden them to all BNIs, in particular EDF reactors;
– align the rules applicable to on-site transport with the new regulations applicable to BNIs.

Quality assurance

In accordance with the regulations, quality assurance programmes have to be drawn up and implemented in order to cover all operations involved in radioactive material movements. A quality assurance guide applicable to radioactive materials transport (DGSNR/SD1/TMR/AQ Revision 0 of July 2005) produced in order to explain quality assurance requirements as applicable to the transport of radioactive materials, was distributed to all licensees and made available on the ASN website.

The wave of inspections carried out in 2008 on this topic aimed to verify these requirements. All the companies had a correctly detailed and implemented quality assurance programme for their radioactive material transport activities. The organisation, training and regulation of transport operations and the management of nonconformities appeared to be correctly covered by quality assurance management and sufficiently documented. Nonetheless, surveillance of the subcontractors and procurement methods needs to be improved. Shortcomings were also observed regarding controls and traceability. These points will be given particular attention during the next inspections.

Safety adviser duties

The second priority topic was to review the duties of the transport safety adviser.

The safety adviser is required by the ADR order (Article 11 bis, order of 1 June 2001 as amended). The contractors responsible for transporting radioactive materials (except for a limited number of cases specified in the above-mentioned order) are required to appoint an in-house safety adviser. The safety adviser must hold a professional qualification certificate issued after successfully passing an examination approved by the competent ministry.

The safety adviser ensures compliance with the rules concerning the transport of dangerous materials and advises his company on their implementation. If, despite the precautions taken, an accident were to occur, he drafts a report describing the circumstances of the accident, the sequence of events and the consequences. He is also responsible for producing an annual report on the activities of the company for which he is the adviser. He proposes steps to improve safety.

The companies inspected all have a declared and duly qualified safety adviser. His duties are on the whole correctly performed within the companies. His advisory function would appear to be well-accepted, although on some sites, he is not sufficiently involved in the field inspections.

ASN sent out a letter summarising the duties of the adviser. It recalled that the safety adviser must be given the time and resources needed to perform all his duties, in accordance with the regulations in force, and underlined the checks to be carried out in accordance with the specific activities of each company.

4 INCIDENTS AND ACCIDENTS

The guide associated with the letter of 24 October 2005, sent out by ASN to all consignors and transporters, redefines the incident and accident declaration criteria initially sent out in the circular of 7 May 1999 (see chapter 4, point 1|2|2). It also reuses the incident report template proposed in the ADR and RID orders.

All transport deviations are thus to be declared to ASN. Apart from this declaration, a detailed incident report must be sent to ASN within two months. Events concerning regulatory nonconformities but which do not impair the safety functions are not concerned by this report. In the case of contamination, an analysis report is to be sent to ASN within two months.

The main events that occurred this year are detailed below according to category. These events may be of several types:
– package handling events
– incidents or accidents during actual transport, particularly a stowage fault.
– nonconformity with the regulations laid down in the orders concerning each mode and in the package model approval certificates, in particular the checks required prior to departure (deviations concerning labelling, signalling, signage, transport documents and exceeding the contamination thresholds).

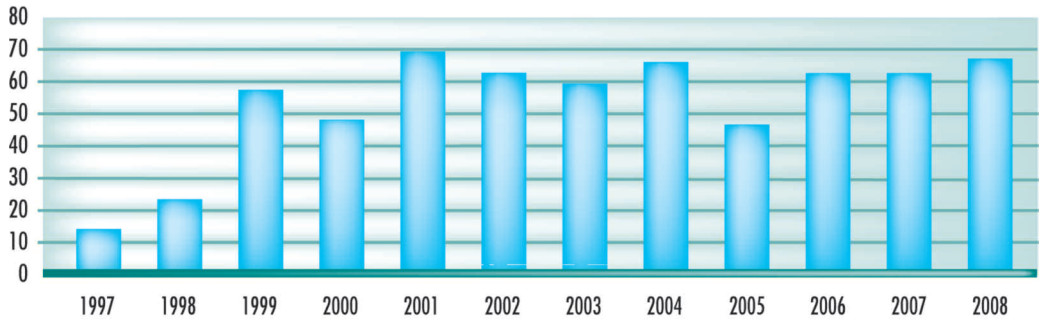
The trend in the number of incidents/accidents reported during the last ten years is illustrated below.

Graph 5 shows a rise in the number of incidents notified, reflecting the creation of the notification system, followed by a phase of relative stability. The events notified since 1 October 1999 were rated on the INES scale, which ASN has decided to apply to transport operations.

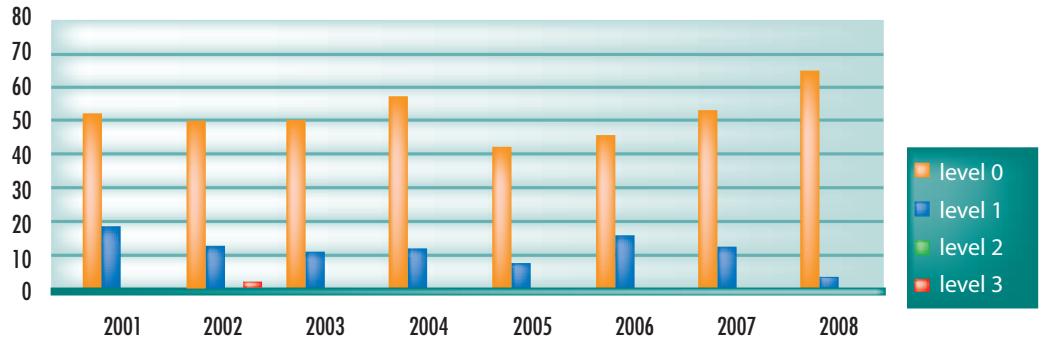
In 2008, 65 incidents were rated at level 0, and 3 at level 1. Graph 6 shows the trends since 2001.

The medical, conventional industry and research sectors are the origin of about 53% of the transport-related events. However, this number must be treated with precaution. It is in fact striking that most of the deviations notified to ASN in the medical, conventional industry or research sectors are events which cannot be hidden, such

Graph 5: changes in the number of radioactive material transport incidents or accidents notified between 1997 and 2008

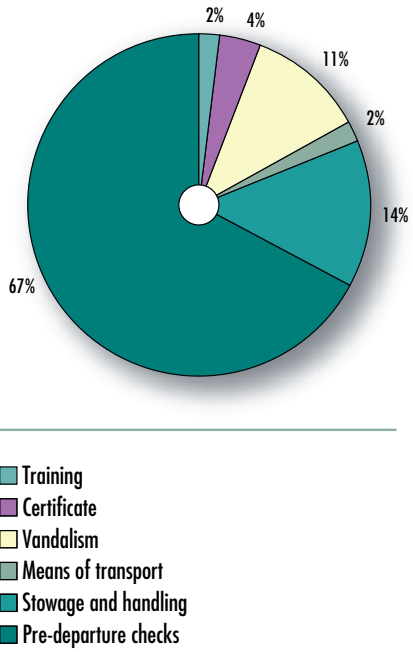


Graph 6: changes in INES rated events since 2001

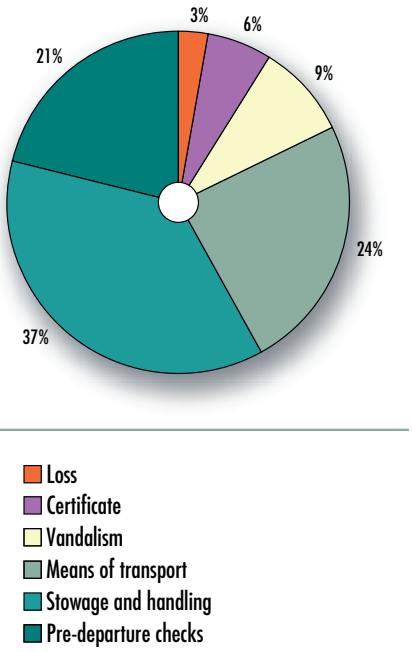


Graphs 7 and 8: breakdown of events in BNIs and the small-scale nuclear field

BNI



Off INB



as package damage, theft or loss, or even road accidents. However, as shown on graph 7, those which concern breaches of the regulations or for which the direct safety consequences are minor represent a far smaller share than in the nuclear sector. This is without doubt due to failure to submit notifications by the professionals in the small-scale nuclear activities.

ASN considers this situation to be unsatisfactory, because a poor design or incorrect use of these packages can lead to the workers or public receiving doses higher than the regulation limits, especially in the event of leakage of the contents.

4|1 Package handling events

Events during package handling are considered to be transport-related incidents. In the eyes of the regulations, handling is part of transport because transport encompasses all operations and conditions associated with the movement of radioactive materials, such as container design, manufacture, maintenance and repair, preparation, dispatch, loading, routing (including interim storage in transit), unloading and reception at the final destination of the shipments of radioactive materials.

These events are among those that ASN follows most closely, because their potential impact on workers, whether or not radiological, justifies extreme vigilance. The events that are of the greatest concern to ASN include those occurring in airports.

Events in airports

The events that occur in airports are generally radioactive material package handling incidents.

Radioactive material transport package involved in a handling incident at Roissy-Charles-de-Gaulle Airport

Plutonium transport between Sellafield and La Hague

On 21 May 2008, British plutonium intended for the fabrication of fuel assemblies reached French territory. This shipment, between Sellafield (United Kingdom) and La Hague, was covered by a British approval certificate and the corresponding French validation, issued under the memorandum of understanding for the mutual recognition of approval certificates for the safe transport of radioactive materials for civil uses, signed on 24 February 2006 by France and the United Kingdom (see §5).

Over and above the terms of this MoU, ASN nonetheless takes the initiative to regularly have additional checks performed on certain shipments and have its technical support organisation, the Institute for Radiation Protection and Nuclear Safety (IRSN), carry out subsequent analysis of the safety case on which the approval application was based.

ASN thus observed that the transport conditions described in the safety case were not representative of the actual conditions of the shipment made on 21 May 2008, in particular with regard to the thermal aspects. However, the competent British authority was not notified of the elements concerning heat control for its review of the approval application.

Following ASN's findings, TN-International, responsible for road transport in France and England, submitted the corresponding safety analyses to ASN. After review of these analyses, it would appear that the safety of the transport was at no time compromised.

The British authority with competence for the transport of radioactive materials, the Department for Transport (DfT), was informed by ASN of these findings and immediately initiated checks at the consigner, responsible for transport safety.

Further to these checks, the DfT served a Prohibition Notice on the Sellafield site. This does not call into question the certificate itself, but does prohibit any further shipment of plutonium from Sellafield in the same transport conditions as before. The British applicant is now considering submitting a new file.

In 2008, 23 incidents of this type were recorded in Roissy-Charles-de-Gaulle and Orly airports. These incidents concerned type A packages or excepted type packages, which were damaged to varying extents, although with no breach of the containment.

In 2008, 3 mislaid packages were also declared. These were packages badly routed on departure from or arrival at the airport and which were located in the next few days following declaration of loss. These incidents were rated level 0 on the INES scale.

Jointly with the DGAC (civil aviation authority) and the air transport police, ASN carried out a number of air cargo inspections. The carriers were reminded of the need to implement a radiation protection programme appropriate to the transport activities, to correctly secure the packages and make the personnel aware of the ionising radiation risks.

4|2 Incidents and accidents during actual transport

Transport-related events are generally caused by ordinary road accidents. For this type of event, ASN particularly closely examines not only the consequences for workers, but also for the public and the environment. No serious incident of this type occurred in 2008.

4|3 Nonconformity of container or content

These events are often rooted in non-compliance with the package approval certificate or the package user's guide. These events include the contamination of spent fuel packages. There are usually no consequences for the workers, the public or the environment, however ASN examines these events meticulously given the media and public attention they attract. About 64% of the incidents in this category concern non-approved packages. Most contamination incidents therefore no longer concern spent fuel shipments, as at the end of the 1990s, but rather non-approved packages.

5 INTERNATIONAL ACTION

The international nature of radioactive material transport gave rise to regulations, drafted under the supervision of IAEA, ensuring that a very high level of safety is guaranteed. These regulations were drafted and are implemented as a result of fruitful exchanges between countries. ASN considers these exchanges to be a contributing factor in the constant improvement in the safety of radioactive material transport.

Regulations

ASN is a member of the Transport Safety Standards Committee (TRANSSC) which, under the watchful eye of IAEA, brings together experts from all countries in the field of radioactive material transport. It took part in the corresponding meetings from 3 to 7 March and from 7 to 10 October in Vienna.

Working groups were set up to prepare the forthcoming revision of the radioactive materials transport regulations. They in particular covered the drop tests, the fissile material exceptions, uranium hexafluoride, package contamination and interim transitional provisions.

European guide to package model safety cases

In 2007, ASN took part in a European working group tasked, on behalf of the European authorities with competence for radioactive material transport, with drafting a guide for the production of safety cases for package models intended for the transport of radioactive materials. The aim was to harmonise international practices by proposing a common safety case structure. This is also an opportunity to share feedback concerning the points raised during the reviews. This guide was adopted by France and applicants must now follow it.

Creation of a club of European authorities with competence for transport

A club of European authorities with competence for transport was created in December 2008. ASN is a member. Within this framework it will work towards more harmonious implementation of the regulations concerning radioactive materials and exchange operating experience feedback with the various member countries.

Bilateral relations

ASN devotes considerable effort to maintaining close ties with the competent authorities of the countries concerned by the numerous shipments to and from France. These in particular include Belgium, the United Kingdom and Germany. Relations with the competent authorities in these two countries are both frequent and fruitful.

Belgium

For its production of electricity from nuclear power, Belgium uses French designed containers for fuel cycle shipment. In order to harmonise practices and achieve progress in the safety of these shipments, ASN and the competent Belgium authority (Belgian Federal Nuclear Regulating Agency - AFCN) regularly exchange know-how and experiences.

Since 2005, an annual exchange meeting is held by ASN and AFCN, in order to take a closer look at the safety cases for the French package models validated in Belgium. The meeting of 30 May 2008 reviewed the various package models used in France and Belgium.

United Kingdom

France and the United Kingdom use radioactive materials for similar civil applications such as the production of nuclear generated electricity, reprocessing and use of radioactive materials for medical purposes, and both authorities therefore have a similar level of expertise. Both France and the United Kingdom also apply the same regulations covering radioactive material transport. Both countries also underwent a review coordinated by the International Atomic Energy Agency (IAEA), demonstrating the high level of competence of the two authorities with regard to radioactive material transport, thus enhancing their mutual trust and confidence.

Against this backdrop, ASN signed a memorandum of understanding on 24 February 2006, for the mutual recognition of the approval certificates confirming the safety of radioactive material transport. The approval certificates issued by the United Kingdom's competent authority (DfT, Department for Transport) in accordance with the applicable rules are recognised by ASN, and vice-versa. This MoU eases the procedural burden between the two countries and enables the two Authorities to devote more time to important issues. This arrangement also increases the level of competence through sharing of know-how and experience.

Having successfully cooperated on the Memorandum of Understanding signed in February 2006, ASN and the DfT extended their cooperation on the following subjects, through an agreement concluded on 27 February 2008:

– licensing procedures;
– inspections;
– emergency procedures;
– guides for domestic and international transport of radioactive materials;
– radioactive material transport standards;
– quality assurance systems.

Germany
The French and German authorities have decided to meet regularly to discuss certain technical matters and there is indeed no shortage of subjects of common interest. A large number of shipments cross the Franco-German border, so implementation of a mutual approval recognition protocol similar to that ASN concluded with the British authority is being considered.

6 OUTLOOK

In 2009, ASN will continue with its programme of inspections at the designers, manufacturers, users, carriers and consignors of radioactive material containers.

The inspections carried out in 2008 show that progress has been made, in particular in drafting the radiation protection programmes that have been mandatory since 2001, but that there is still room for improvement. In particular for packages that do not require approval by the competent authority, ASN considers the situation to be unsatisfactory. Whether through regulations conformity demonstrations or checks prior to shipment, the inspections brought a large number of shortcomings to light. This situation is all the more worrying as these packages are the source of a large percentage of the incidents that occurred in 2008.

Consequently, ASN will reinforce its control of non-approved packages, particularly in the medical, conventional industry and research sectors, taking advantage of the radiation protection inspections it already carries out in these fields. As of 2009, ASN will carry out reconnaissance to gain a clearer picture of the situation. Unannounced spot-checks will also be made on the carriers and consignors of non-approved packages and the conclusions published on the ASN website.

In 2009, ASN will continue to test its response organisation designed to deal with an accident involving a transport of radioactive materials. It considers that emergency exercises in the transport field are of particular importance. Given that an accident can take place anywhere, especially in those *départements*[2] in which there are no basic nuclear installations, the local stakeholders are liable to be inadequately prepared to deal with such an event. These national exercises, in association with local exercises, make a contribution to training and educating the protagonists. In 2009, ASN will aim to harmonise and strengthen the emergency plans for dealing with transport accidents through the working group which it set up in 2008, involving representatives from the industrial nuclear world.

ASN is also looking to improve the regulation of the transport of dangerous goods within nuclear sites and will in 2009 be proposing supplements to the regulations applicable to nuclear installations on this point.

Finally, ASN will be continuing the technical background work prior to issue of approval certificates: periodic safety reviews of existing package models and the approval of new models incorporating innovative design features contribute to the overall upgrading of transport safety.

ASN also believes that the framework for its actions in this field is an international one. ASN intends to intervene as far upstream as possible in the drafting of IAEA's recommendations. As, by their very nature, the regulations concerning the transport of radioactive materials are the subject of international exchanges, harmonised interpretation must be a major objective for ASN. This was the background to the MoU for mutual recognition of the certificates issued by each of the authorities, signed with the British authority in February 2006, which was extended in 2008. A similar approach could be adopted in the next few years with the German authority.

2. Administrative region headed by a *Préfet*.