NON-MEDICAL USES OF IONISING RADIATIONS

CHAPTER 10

Industry, research, but also a large number of other sectors have for a long time been using sources of ionising radiations for a wide variety of applications and in a large number of locations. The issue for the radiation protection regulations is to verify that, despite this great diversity, the safety of workers, the public and the environment is correctly assured. This safety includes source management, supervision of the conditions in which sources are held, used and disposed of, from fabrication to the end of their lives. It also involves increasing the oversight of the main stakeholders, the source manufacturers and suppliers, and enhancing their accountability.

The radiation sources used are either radionuclides, primarily artificial, in sealed or unsealed sources, or electrical devices generating ionising radiations. The applications presented in this chapter concern non-medical activities (presented in chapter 9) and activities which are not carried out in basic nuclear installations (presented in chapters 12, 13 and 14). However, all the other applications are concerned. The main activity sectors are presented below.

1 PRESENTATION OF NON-MEDICAL ACTIVITIES USING IONISING RADIATIONS

1 | 1 Sealed radioactive sources

The main uses of sealed radioactive sources (sources whose structure or packaging, in normal use, prevents any dispersal of radioactive materials into the environment) include the following.

1 | 1 | 1 Industrial irradiation

This is used for sterilising medical equipment, pharmaceutical or cosmetic products and for conservation of foodstuffs.

At low doses, irradiation inhibits germination (potatoes, onions, garlic, ginger), kills insects and parasites in cereals, leguminous plants, fresh and dried fruits, fish and meat, and slows down the physiological process of decomposition of fresh fruits and vegetables.

At medium doses, ionisation by irradiation prolongs the shelf-life of fresh fish and strawberries, eliminates deterioration agents and pathogenic micro-organisms in shellfish and meat (fresh or frozen), and technically improves foodstuffs, for example by increasing juice production from grapes or reducing the cooking time of dehydrated vegetables.

At high doses, ionisation offers industrial sterilisation of meat and seafood, of ready-to-eat foods, of hospital meals and decontamination of certain food additives and ingredients such as spices, gums, and enzyme preparations.

Irradiation is also a means of voluntarily modifying the properties of materials, for example to harden polymers.

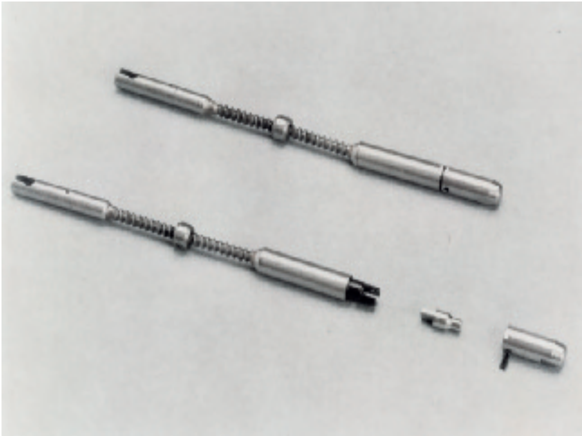
These consumer product irradiation techniques may be authorised because once the products are treated, they show no signs of added artificial radioactivity. Industrial irradiators use cobalt 60 sources, the total activity of which can exceed 250,000 TBq. Some of these installations are classified as BNIs.

1 | 1 | 2 Non-destructive testing

One of the non-destructive testing techniques uses radioactive sources: gamma radiography. It is used to assess homogeneity defects in metal, particularly in weld beads. This technique primarily uses sources of iridium 192, cobalt 60 and, more recently, selenium 75, the activity level of which does not exceed about twenty terabecquerels. Gamma radiography is usually performed using a mobile device which can be moved from one worksite to another and consists primarily of:

– a radioactive source inserted into a source-holder.
– a source applicator, used as a storage container when the source is not in use;

Gamma radiography device – CEGELEC – and its accessories (remote control, ejector tube, irradiation end-piece)



Source and source-holder assembly contained in a gamma radiography device – CEGELEC

– an ejector tube, end-piece and remote-control for moving the source between the applicator and the object to be inspected, while protecting the operator who can thus remain at a distance from the source.

1 | 1 | 3 Verification of physical parameters

The operating principle of these devices is the attenuation of the signal emitted: the difference between the emitted signal and the received signal can be used to assess the information looked for.

The radionuclides most frequently employed are krypton 85, caesium 137, americium 241, cobalt 60 and prometheum 147. The source activity levels are between a few kilo becquerels and a few giga becquerels.

These sources are used for the following purposes:
– atmospheric dust measurement; the air is permanently filtered through a tape running at a controlled speed, placed between source and detector. The intensity of radiation received by the detector depends on the amount of dust on the filter, which enables this amount to be determined. The most commonly used sources are carbon 14 (activity level: 3.5 MBq) or prometheum 147 (activity level: 9 MBq). These measurements are particularly used for air quality monitoring by verifying the dust content of discharges from plants;
– basis weight measurement: a beta radiation beam passes through the paper and is then received by a detector. The signal attenuation on this detector gives the paper density and thus the basis weight. The sources used are generally krypton 85, prometheum 147 and americium 241 with activity levels lower than 3 GBq;
– liquid level measurement: a beam of gamma radiation passes through the container filled with a liquid. It is received by a detector positioned opposite. The signal attenuation on this detector provides the level of filling of the container and automatically triggers certain operations (stop/continue filling, alarm, etc.). The radionuclides used depend on the characteristics of the

Lead detection in paint

Saturnism is a disease caused by lead poisoning. This poisoning usually results from ingestion or inhalation of dust from paint containing lead salts. This paint is to be found in older homes (built before 1 January 1949), as the use of lead as an additive was subsequently prohibited.

A legislative framework aimed at combating social exclusion makes provision for action to prevent child saturnism by requiring that the concentration of lead in paint be controlled in the event of certain transactions. Article 3 of the order of 12 July 1999 concerning diagnosis of the risk of intoxication from the lead contained in paint, implementing Article R. 32-2 of the Public Health Code, states that "the lead will preferably be measured using a portable X-ray fluorescence device". This non-destructive analysis method allows instantaneous detection of lead in a coating.

As the decree and supplementary orders concerning the fight against saturnism and published in the Official Gazette of 26 April 2006 (decree 2006-474 of 25 April and 4 orders of 25 April) laid down the use of detection devices "capable of analysing the K line of the fluorescence response spectrum emitted by lead" (article 2 and appendix 2 of the order of 25 April 2006 concerning the determination of the risk of exposure to lead (CREP)), the licences for use of electrical X-ray generators for this application were not renewed as they are unable to comply with the objective set by the regulations.

The portable devices used today contain sources of cadmium 109 (half-life 464 days) or cobalt 57 (half-life of 270 days). The activity of these sources can range from 400 MBq to 1500 MBq.

Box of gamma sources manufactured in the LEA. The radionuclides proposed are Am241, Cd109, Cel39, Co57, Cr51, Cs137, Mn54, Sn113, Sr85, Zn65

Gaseous phase chromatography – PERICHROM – Ni63 source

container and the content. As applicable, americium 241 (activity level: 1.7 GBq), caesium 137 - barium 137m (activity level: 37 MBq) are generally used;
– density measurement and weighing: the principle is the same as for the above two measurements. The sources used are generally americium 241 (activity level: 2 GBq), caesium 137-barium 137m (activity level: 100 MBq) or cobalt 60 (30 GBq);
– soil density and humidity measurement (gammadensimetry) in particular in agriculture and public works. These devices operate with a pair of americium-beryllium sources and a caesium 137 source;
– logging, which enables the geological properties of the sub-soil to be examined by inserting a measurement probe comprising a source of cobalt 60, caesium 137, americium 141-beryllium or californium 252.

1 | 1 | 4 Other common applications

Sealed sources can also be used for:
– eliminating static electricity;
– calibrating radioactivity measurement devices (radiation metrology);
– practical teaching work concerning radioactivity phenomena;
– electron capture detectors using sources of nickel 63 in gaseous phase chromatographs. This technique can be used to detect and dose various elements;
– ion mobility spectrometry used in devices that are often portable and used to detect explosives, drugs or toxic products;
– detection using X-ray fluorescence devices. This technique is particularly useful in detecting lead in paint (see box).

Diagram 1 specifies the number of facilities authorised to use sealed radioactive sources for the applications identified. It illustrates the diversity of these applications and how they evolved from 2006 to 2009.

It should be noted that a given facility may carry out several activities and therefore appears in diagram 1 and the following diagrams for each one.

1 | 2 Unsealed radioactive sources

The main radionuclides used in the form of unsealed sources are phosphorus 32 or 33, carbon 14, sulphur 35, chromium 51, iodine 125 and tritium. They are used as tracers for calibration and teaching. Using radioactive tracers incorporated into molecules is common practice in biological research. They are thus a powerful investigative tool in cellular and molecular biology. Unsealed sources are also used as tracers for measuring wear, searching for leaks, for friction research, for building hydrodynamic models and in hydrology.

As at 31 December 2009, the number of facilities authorised to use unsealed sources stood at 987.

Diagram 2 specifies the number of facilities authorised to use unsealed radioactive sources in the applications identified from 2006 to 2009 (some may appear twice).

Diagram 1: use of sealed radioactive sources

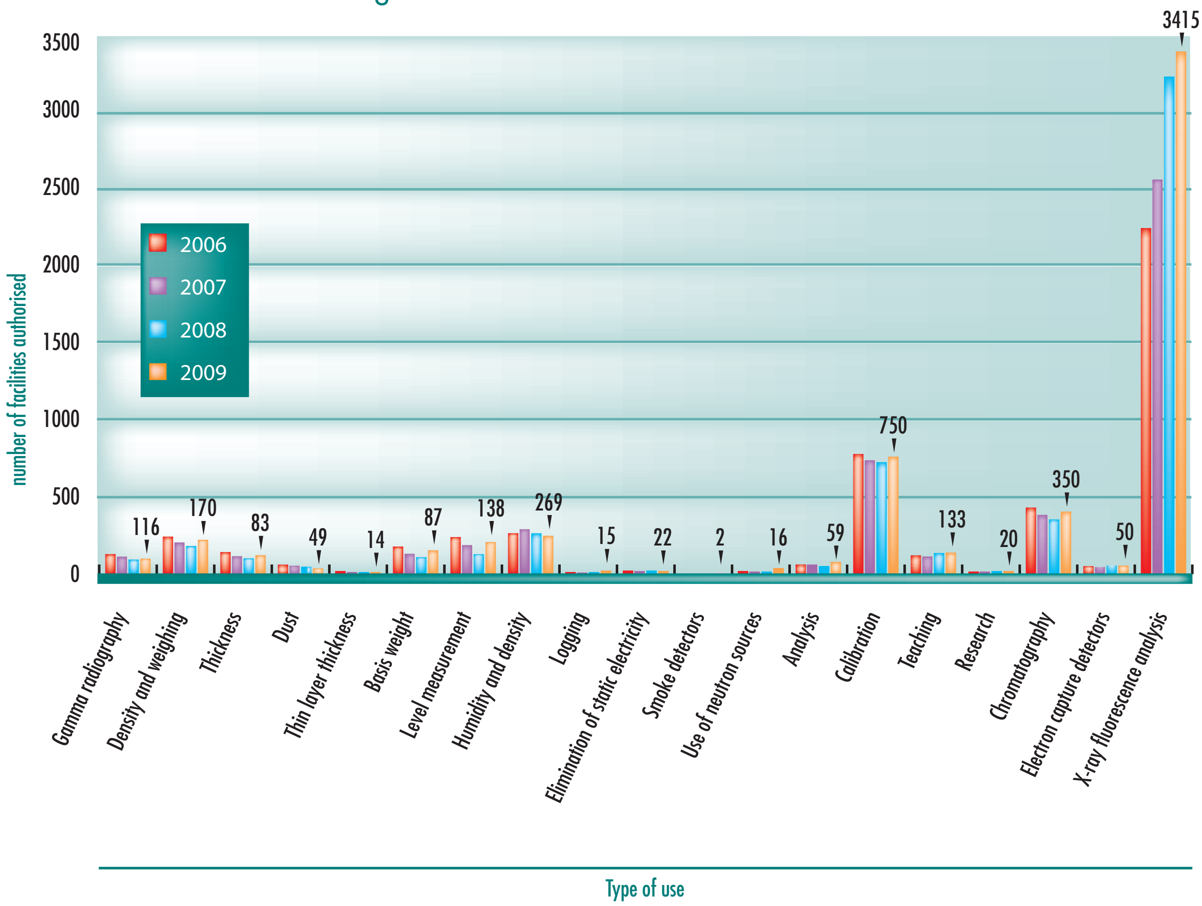
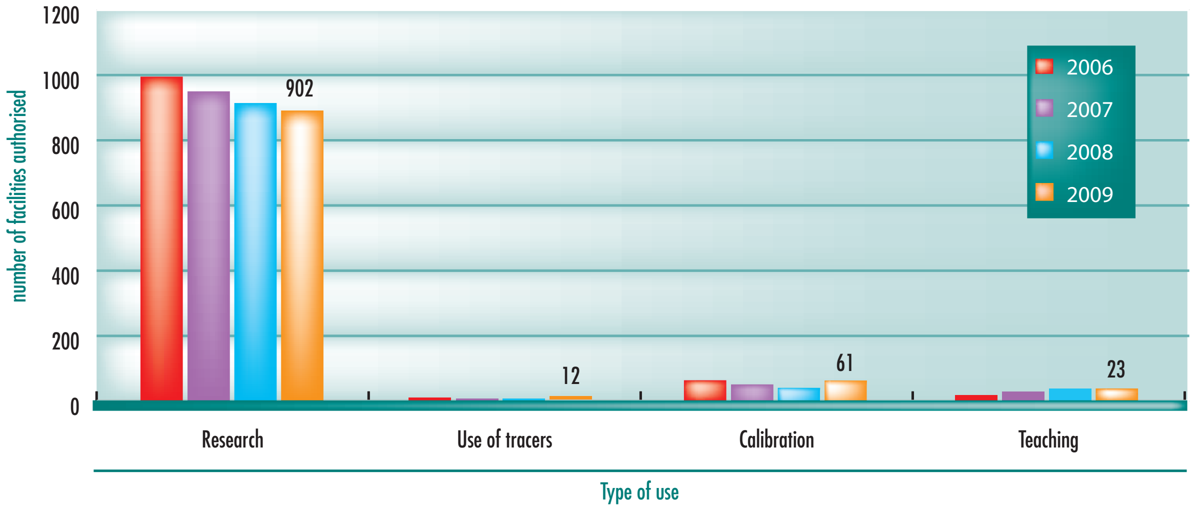


Diagram 2: use of unsealed radioactive sources



1 | 3 Electrical devices emitting ionising radiations

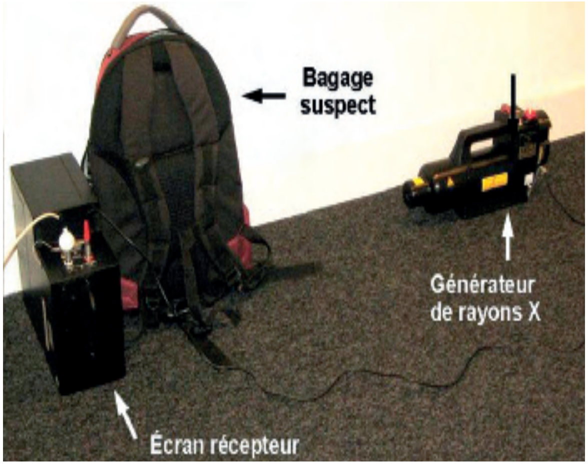
Electrical devices emitting ionising radiations are mainly X-ray generators intended for use in industry for non-destructive structural analyses (tomography, diffractometry, etc.), checks on weld bead quality, or material fatigue inspections (mainly in the aerospace sector).

The applications of these devices, which work using the principle of X-ray attenuation, include use as industrial gauges (measurement of drum filling, thickness measurement, etc.), inspection of goods containers or luggage and also the detection of foreign bodies in foodstuffs. There are also more specific uses, such as radiography for restoration of musical instruments or paintings, archaeological study of mummies or analysis of fossils.

Veterinary surgeons also use these devices for normal radio-diagnostic purposes. More recently, tomography devices have become more common in veterinary applications.

Unlike electrical generators used for medical applications, there is no CE marking obligation for these devices.

Diagram 3 specifies the number of facilities authorised to use electrical generators of ionising radiations in the listed applications. It illustrates the diversity of these applications and how they evolved from 2005 to 2009. This evolution is closely related to the regulatory changes introduced in 2002 and later in 2007, which created a new licensing or notification regime for use of these devices. The professionals concerned are currently in the process of regularising their situation in a large number of sectors, as shown in diagram 3, but many users have still not taken any steps to do so (see section 3 of this chapter).



X-ray inspection equipment

1 | 4 Particle accelerators

The Public Health Code defines an accelerator as a device or installation in which particles undergo acceleration, emitting ionising radiations at an energy level in excess of 1 megaelectronvolt (MeV).

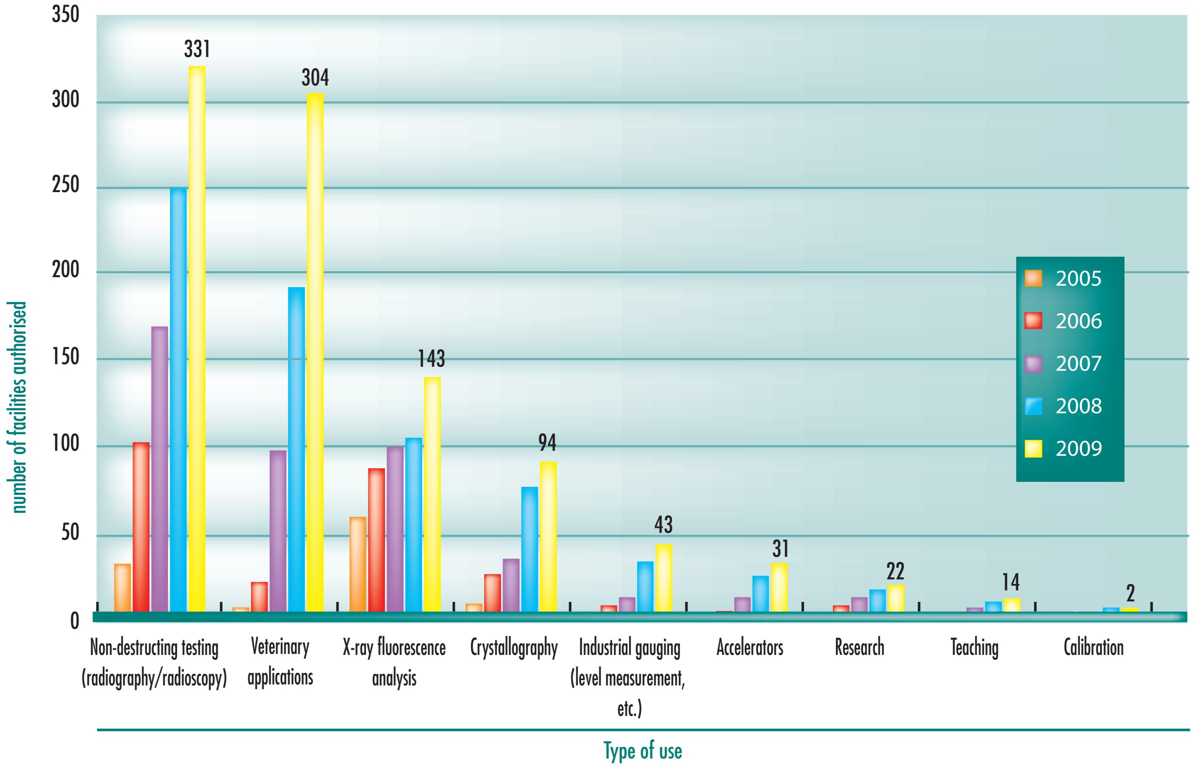
Use of this type of device is subject to the notification or licensing regime specified in Articles L.1333-4 and R.1333-17 of the Public Health Code. When they meet the characteristics specified in Article 3 of decree 2007-830 of 11 May 2007 concerning the list of BNIs, these facilities are listed as BNIs.

Certain applications require the use of particle accelerators which, as applicable, produce photon or electron

Veterinary radiography room for horses

Horse radiography

Diagram 3: use of electrical devices generating ionising radiations



beams. The inventory of particle accelerators in France, whether linear (linacs) or circular (cyclotrons and synchrotrons), comprises about 50 identified installations (except for BNIs) which can be used in a wide variety of fields, as presented in table 1.

In the field of research, a number of synchrotron radiation production installations must be mentioned: the ESRF (European synchrotron radiation facility) in Grenoble (Isère *département*) and the SOLEIL synchrotron in Saint Aubin (Essonne *département*).

More recently, particle accelerator imaging systems have been used in France to combat fraud and large-scale international trafficking.

This technology, which is felt by the operators to be effective, must however be used under certain conditions, in order to comply with the radiation protection rules applicable to workers and the public, in particular:

– a ban on activation of construction products, consumer goods and foodstuffs as specified by Article R.1333-4 of the Public Health Code, ensuring that the maximum energy of the particles emitted by the accelerators used rules out all risk of activation of the materials being verified,

– a ban on the use of ionising radiations on the human body for purposes other than medical.

On this latter point, initial operating experience feedback indicates that the safety measures taken meet these objectives and rule out all risk of exposure of individuals, especially workers operating the accelerator, and any members of the public driving the heavy goods vehicle or accompanying the driver.

With regard to illegal immigrants, the prior verifications run to detect these individuals before the trucks or containers go through the radioscopy installation are effective, but not infallible, and ASN has been notified of a number of incidents.

Mobile accelerators used to verify loads

Table 1: scope of use of particle accelerators

Industries	Processes	Products
Chemistry Petrochemistry	Cross-linking Depolymerisation Covalent bonding – Polymerisation	Polyethylene, polypropylene, copolymers, lubricants, alcohol
Coatings Adhesives	Vulcanisation Covalent bonding Polymerisation	Adhesive tapes, coated paper products, ply panels, heat shields, wood-plastic and glass-plastic composites
Electricity	Cross-linking Thermal memory Modification of semi-conductors	Constructions, instruments, telephone wires, power cables, insulating tape, shielded cable splices, Zener diodes, etc.
Foods	Disinfection – Pasteurisation Conservation – Sterilisation	Animal feedstuffs, grains, cereals, flour, vegetables, fruit, poultry, meat, fish, shellfish
Health Pharmacy	Sterilisation Modification of polymers	Disposable material, powders, drugs, membranes
Plastics Polymers	Cross-linking Manufacture of foam Thermal memory	Heat-shrink food wrapping, gymnastics apparatus, pipes and ducts, moulded packaging, flexible laminate packaging
Environment	Disinfection – Precipitation Organic detoxification Fermentation inhibition DeSOx/DeNOx	Sludges for spreading, emission of smoke, gas, solvents, water and various effluents, nutrients from sludges or waste
Paper pulp Textiles	Depolymerisation Covalent bonding	Polyethylene, polypropylene, copolymers, lubricants, alcohol

1 | 5 Worker dosimetry

According to the most recent data collected by IRSN concerning external occupational exposure in 2008, more than 80,000 people working outside BNIs and the medical sector are subject to exposure monitoring.

Of these workers, 95% received an effective dose of less than 1 mSv over a one-year period. This proportion has remained unchanged since 2006. Similarly, the percentages of individuals monitored who received an effective dose over a one-year period of between 1 and 6 mSv (≈ 4%), between 6 and 20 mSv (≈ 1%) and higher than 20 mSv (≈ 0.01%) have remained stable over the past three years.

The average dose received by these workers is 160 µSv, a figure that has been halved since 2005.

Diagram of the inspection zone

2 REGULATING NON-MEDICAL ACTIVITIES

The requirements of the Public Health Code specifically concerning non-medical applications, as introduced by decree 2002-460 of 4 April 2002 and modified by decree 2007-1582 of 7 November 2007, are summarised below.

2|1 Licensing frameworks for ionising radiation sources used for non-medical purposes

ASN is not the only authority regulating the possession, utilisation and manufacture of radioactive sources. The requirements of the Public Health Code concerning sources of ionising radiations are contained in licences covered by the Mining Code, the system applicable to BNIs or to installations classified on environmental protection grounds (ICPEs).

The *préfet*[1]* and the Delegate for Nuclear Safety and Radiation Protection for National Defence Installations and Activities (DSND) thus regulate these aspects, with the first dealing with facilities covered by ICPE regulations and the Mining Code, and the second being responsible for activities and installations defined by the Defence Code as "defence-related nuclear activities and installations" (in other words primarily those linked to naval propulsion and the nuclear deterrent force).

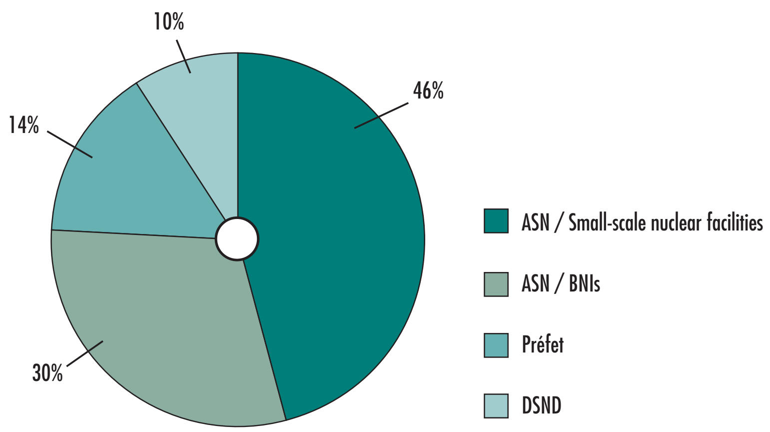
Diagram 4 gives a breakdown of the sealed radioactive sources held on French territory according to the authorities regulating this possession.

Table 2 gives a breakdown of the licensing and inspection competence for industrial or research purposes, including veterinary activities.

Nuclear materials are not included in this table in that the licence for import, export, production, possession, transfer, utilisation and transport, covered by Article L. 1333-2 of the Defence Code, is issued by the Minister of Defence with regard to nuclear materials intended for defence purposes and by the minister responsible for energy for materials intended for all other purposes.

With the aim of coordinating public authorities, ASN in 2009 sought to forge new ties and maintain existing links with the State's various departments involved in radioactive source monitoring and oversight duties. ASN therefore initiated exchanges with the General Directorate of Customs and Excise (DGDDI) and the General Directorate for Competition Policy, Consumer Affairs and Fraud Control (DGCCRF), with a view to signing collaborative agreements in areas of common interest.

Diagram 4: breakdown of the sealed radioactive sources held on French territory according to the authorities regulating their possession



1. The Minister of Defence takes the place of the *préfet* for ICPEs located on military sites. ASN also exercises the duty of the *préfet* for ICPEs locaded within the perimeter of a BNI.
*In a *département*, representative of the State appointed by the President.

Table 2: procedures applicable to nuclear activities for industrial or research purposes

Nature of the nuclear activity	Procedure and competent authority	Observations
Fabrication of radionuclides or products or devices containing them	ASN licence, except: – if nuclear activity in licensed ICPE: authorisation by the *préfet*(1); – if activity in a BNI: authorisation by decree and then ASN requirements(3)	Exemption possible if criteria set in article R.1333-18 of the CSP are met(2)
Use or possession of radionuclides or products or devices containing them		
Irradiation of products, including food products		
Use or possession of electrical generators, including particle accelerators	ASN licence or if activity within a BNI: authorisation by decree then ASN requirements(3)	Exemption possible if criteria set in article R.1333-18 of the CSP are met(2)
Import or export of radionuclides or products or devices containing them		
Distribution of radionuclides or products or devices containing them or electrical devices generating ionising radiations		

(1) The provisions of the Public Health Code are incorporated into the licences issued under the Mining Code or the licensing system applicable to BNIs.

(2) The criteria for exemption from the licensing procedures apply:
– to radionuclides, if the total quantities involved or their concentration per unit of mass are below the thresholds set in the appendix to the Public Health Code (provided that the masses of materials involved do not exceed one ton);
– to electrical generators of ionising radiations which, in normal operation, do not at any point located at a distance of 0.1 m from their accessible surface, create an equivalent dose rate in excess of 1 μSv/h, if the devices operate with a potential difference of 30 kV or less.

(3) This simplification only applies to the sources required for operation of BNIs and for activities linked to BNI operations, provided that the licensee's safety requirements include specifications concerning radiation protection and the management of radioactive sources. The other sources in their possession or the other nuclear activities carried out remain subject to licensing pursuant to R.1333-17 of the Public Health Code.

2 | 2 Licensing procedures

For each nuclear activity requiring a licence issued by ASN, the corresponding application must be submitted by the person in charge of the nuclear activity, jointly with the head of the establishment or his delegate. This dossier is to be drawn up on the basis of a form available from the www.asn.fr website, in the "formulaire" (form) section and returned to ASN, accompanied by all other documents required. This website also contains explanatory notices to help applicants prepare their dossiers.

The dossier should establish that radiation protection guarantees are in place and effective and that they were defined taking account of the justification, optimisation and limitation principles specified in Article L. 1333-1 of the Public Health Code. This dossier should therefore comprise elements concerning:
– the justification for the application;
– the conditions of possession and use of the sources;
– the presence of a person with competence in radiation protection;
– the characteristics and performance of devices containing the sources held and used;
– radiation protection provisions;
– drafting of safety instructions;
– the precautions taken against the risks of theft or fire.

In 2009, ASN continued and completed its actions to promote processing of licensing by its regional divisions. The task of reviewing the applications for possession and use of sources of ionising radiations was therefore entirely entrusted to ASN's regional divisions. Responsibility for review of supplier licences was retained at the national level.

The revision of all forms and notices, a process that was started in 2008 with a view to simplification, graduation of risks and harmonisation, continued in 2009 and will lead to a number of approved ASN decisions defining the contents of the dossiers to be enclosed with the licensing applications. A first ASN technical decision published in 2008 clarified the contents of the application dossiers for licences issued by ASN to source suppliers. Other decisions are stipulated by the Public Health Code and are currently under production. They include decisions on the detailed contents of the information to be enclosed with applications for a licence to use radionuclides or electrical devices emitting ionising radiations. Decisions specifying the elements on which the licence requirements are based are another example.

Following on from the approach initiated in 2007 with the modifications made to the Public Health Code and allowing greater balance between the scope of the activities

subject to notification or to licensing and thus closer tailoring of the level of regulatory requirements to the radiation protection issues, ASN continued its work to implement a system of notifications in the non-medical field. This led to the publication of several approved decisions (see chapter 3) defining on the one hand the scope of application of this new system and on the other, its implementation procedures. The following are concerned:
– veterinary radiodiagnostic devices (fixed only) meeting one of the following conditions:
– the emission beam is directional and vertical, except for all tomography devices;
– the device is used for oral radiography purposes;
– electrical devices emitting ionising radiations, for which the equivalent dose rate at 10 cm from all accessible surfaces in normal conditions of use and as a result of their design, is less than 10 $\mu Sv.h^{-1}$.

2 | 3 Radionuclide source management rules

These rules, already presented in chapter 3, are of course also applicable to the fields of industry and research. It should be remembered that these rules concern:
– the obligation to obtain a licence prior to any transfer or acquisition of sources;
– preliminary registration of all source movements with IRSN;
– the obligation on the licensee to keep detailed accounts of the sources in its possession and their movements;
– immediate notification to the *préfet* and ASN of any loss or theft of radioactive sources;
– return by the user to its suppliers - who are then obliged to take them – of sealed sources that have expired, are damaged or are no longer needed.

A number of conditions for use previously determined by the Interministerial Commission for Artificial Radionuclides (CIREA) also apply. CIREA, which was responsible for issues concerning artificial radionuclides until 2002, had laid down special utilisation conditions (CPE) to inform the future licensee of the conditions for implementation of the regulations in its field of activity. Pending the publication of approved ASN decisions superseding or abrogating them, the CPE are still in force in accordance with decree 2002-460.

2 | 4 Revocation of unjustified or prohibited activities

The Public Health Code (CSP) stipulates that "A nuclear activity or intervention may only be undertaken or carried out if justified by the advantages it procures, particularly in health, social, economic or scientific terms, with respect to the risks inherent in the exposure to ionising radiations to which the individuals are likely to be subjected". It also states that "No intentional addition of radionuclides in consumer goods and construction products is authorised" (articles R. 1333-2 and 3 of the Public Health Code).

Top of a radioactive lightning conductor

In the case of sources used for industrial and research purposes, the justification decision is entrusted to ASN by Act 2006-686 of 13 June 2006 on nuclear transparency and security.

Assessment of the expected benefit of a nuclear activity and the corresponding health drawbacks may lead to prohibition of an activity for which the benefit would not seem to outweigh the risk. This prohibition is either generic (for example: ban on the intentional addition of radioactive materials in consumer goods), or the licence required with regard to radiation protection will not be renewed.

This ban on the intentional addition of radionuclides in consumer goods and construction products includes the prohibition of the trade in irradiated gemstones, accessories containing tritium sources such as key-chains, hunting equipment (sighting systems) navigation equipment (compasses) or river fishing equipment (floats).

For existing activities, justification will be reassessed if current know-how and technology so warrants. This is the case with smoke detection systems (see box) and various other activities that are disappearing, in particular owing to technological changes: dew point determination, level measurement and density measurement, for which X-ray or ultrasound techniques are tending to replace those using radionuclides, or snow height measurement and cable car gondola positioning systems using a radioactive source fixed in the support cable splices.

On this subject of justification, ASN has initiated discussions with its European counterparts concerning the issues involved in implementing this principle arising from directive 96/29 of 13 May 1996. The particular aim is to minimise discrepancies with the other member countries, while preserving the way France applies the justification principle.

Smoke detection

The aim is to signal an outbreak of fire as early as possible, by detecting the smoke produced. The devices used to date comprise two ionisation chambers, including one reference chamber being tight to the ambient gas, while the other lets combustion gases enter. The intensity of the current passing through the reference chamber is compared with that of the current passing through the measurement chamber. When the difference in intensity is higher than a preset threshold, an alarm is triggered. The gases contained in the reference chamber are ionised by emission of radiation from a sealed source. Although several types of radionuclides used to be utilised (americium 241, plutonium 238, nickel 63, krypton 85), at present only americium is marketed, with an activity level not in excess of 37 kBq for the most recent systems.

Radioactive smoke detector

However, if just a few years ago this situation could be justified owing to the human safety advantages of this technique, this is no longer the case given that new detection techniques using alternative technologies have been developed and can comply with fire detection regulations and standards.

Pursuant to Article L.1333-1 of the Public Health Code, this change puts an end to the existing waiver arrangements allowing the addition of radionuclides to a construction product and requires that existing facilities be monitored with a view to replacing their ion detectors by an alternative technology. To implement this measure, ASN is currently drafting a government decree and two decisions proposing and regulating gradual replacement. These projects were submitted for consultation to various groups and entities representative of the stakeholders involved. They were also reviewed by the Advisory Committee for radiation protection.

3 EQUIPMENT INVENTORY AND ENSURING COMPLIANCE WITH THE REGULATIONS

3 | 1 Equipment inventory

In 2009, ASN continued a process initiated in 2007, which was to search the country for any unauthorised suppliers distributing products in France. This process, which aims to cover all radioactive sources, is particularly effective with regard to the distributors of electrical devices generating ionising radiations. More than 10 companies were identified and received an information letter recalling the regulations applicable in France.

Inspections were carried out at trade fairs, leading to the identification of new suppliers. Devices not authorised for sale in France were also sometimes discovered at these fairs.

ASN also scans the Internet, looking for any advertising or offers of radioactive sources on on-line commercial sites.

With regard to the efforts devoted to information, ASN's participation in a large number of events organised by the professional trade unions or organisations (order and union of veterinarians, GESI, GIMELEC, ports and airports, security firms, armed forces, fire brigade, etc.) should be highlighted.

The measures taken in the national defence sector led the entities concerned in 2009 to begin to inventory the radioactive sources, primarily tritium, present in their equipment. As a result of this inventory, which is difficult owing to the characteristics of tritium, with radiation that cannot be directly read with a measuring instrument, ASN discovered unauthorised suppliers, including in the aeronautical industry. All the players made a commitment to ASN to regularise their licensing situation.

3 | 2 Ensuring compliance with the regulations

In 2009 and in addition to drafting regulations, ASN continued with its more general work to improve familiarity with and understanding of the regulations and to promote compliance with them, both nationally and locally, through its regional divisions.

This enables ASN to recall the requirements of the regulations, to specify what it expects and to obtain direct feedback from the users concerning the constraints and problems they encounter.

Selenium 75 in the GAM 80/120 applicator: gamma radiography with optimised radiation protection

Gamma radiography

In this sector, with its high radiation protection stakes and in which incorrect use of devices is liable to lead to serious health consequences very rapidly, these actions are being closely monitored and given high priority. As early as July 2005, ASN took steps to encourage the professionals to define guides of good practice in order to incorporate radiation protection into their activities, and suggested to COFREND that it produce a document describing in detail the good practices to be followed, both by the clients and by the gamma radiography contractors, and that it take a fresh look at the justification for gamma radiography.

This action led in January 2008 to a national radiographic inspection safety day, organised by the SFRP. At the same time, regional programmes to draw up good practice charters for industrial radiography were initiated as of 2006, including in the Provence-Alpes-Côte d'Azur, Haute-Normandie and Rhône-Alpes regions and more recently in Nord-Pas de Calais and Bretagne/Pays de Loire. To ensure that these charters are consistent, a monitoring committee was created by the Ministry for Labour and ASN. This Committee is also responsible for assessing the health and safety impact of the actions taken and to ensure that they are implemented, in particular in the light of technical and regulatory changes. Its first meeting was on 12 March 2009 at the ASN premises in Paris.

More recently, work on the justification of gamma radiography was undertaken by COFREND and various stakeholders. This includes the ALTER'X association project, which started in 2006 and was coordinated by the Institut de Soudure and comprised EDF, GRTgaz, TECHNIP and TOTAL. At the end of 2009, it published a guide offering solutions to industrial firms looking for an alternative to gamma radiography of piping welds using Iridium 192. This guide was drafted with a view to reducing operator dosimetry and public exposure and contains aspects regarding both optimisation (Selenium 75, X-rays) and justification (alternative techniques not involving ionising radiations).

COFREND is finalising a study which aims to explain the principle of gamma radiography justification in non-destructive testing. The purpose of this document, which will contain functional tools such as a flowchart identifying the conditions in which gamma radiography can be replaced, and tables describing the tests and their purpose, is to promote the use of alternative methods.

Electrical devices emitting ionising radiations

ASN is continuing with its information programmes in order to explain the regulations concerning electrical devices emitting ionising radiations (GERI). In this field, the regulatory requirements changed in 2002. One of the main developments was to implement a licensing procedure for use of these devices.

In 2009, ASN continued to meet many suppliers of these devices (manufacturers, purchasing groups, etc.) in order to explain the current regulations and the future orientations, with the creation of a system of manufacturing and distribution licences for electrical devices.

The change made to the Public Health Code by decree 2007-1582 of 7 November 2007 now requires licensing for distribution of these devices, in the same way as the system set up for the suppliers of radioactive sources. This new provision will eventually enable ASN to gain a clearer picture of the situation and better regulate the devices in use and available on the French market.

However, for this equipment category, there is no technical reference system recognised by all stakeholders. ASN notes that for devices used for non-medical purposes, there is no counterpart to the medical CE marking confirming conformity with several European standards, covering a variety of fields, including radiation protection.

Initial operating experience feedback also shows that a large number of devices carry no certificate of conformity with the standards applicable in France, even though this has been mandatory for many years, but which have become in part obsolete, owing to the absence of recent revisions.

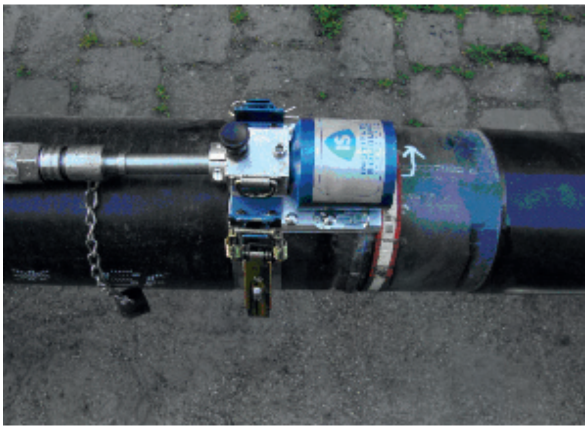
ASN therefore made contact with the Ministry for Labour and the Laboratoire central des industries électriques (LCIE - electrical certification and testing entity for Bureau Veritas) and urged the UTE (Union technique de l'électricité) to undertake a revision of these standards. The UTE initiated a revision of the NF-C 15-160 standards and the associated specific installation standards. With regard to equipment design, ASN in conjunction with the Laboratoire Central des Industries Électriques and the French Atomic Energy Commission (CEA) initiated a review in 2007 of the radiation protection appraisals required in support of the licensing applications.

Electrical generators of ionising radiations offer an alternative to the use of devices containing radioactive sources and are widely used, including in industrial radiography. The advantages of this technology are significant with regard to radiation protection, given the total absence of ionising radiations when the equipment is not in use.

Sources of ionising radiations used in BNIs

To avoid a multitude of administrative procedures for a given company already subject to a particular licensing regime, Article L.1333-4 of the Public Health Code makes provision for administrative simplifications.

The γ-prox (collimator) device developed by the Institut de Soudure and complementing existing gamma radiography devices, is used to optimise radiation protection



The γ-prox (collimator) on a site

Article R. 1333-17 of the Public Health Code states that the licence (creation authorisation decree) issued for a BNI is equivalent to a licence to possess and use ionising radiation sources as required by article L.1333-4. This simplification only applies to the sources necessary for operation of the BNIs and for activities relative to their operation, provided that the licensee's safety requirements include provisions concerning radiation protection and radioactive source management. The other sources held and the other nuclear activities carried out remain subject to licensing as required by R.1333-17 of the Public Health Code.

The administrative simplification introduced by article R.1333-17 is intended to avoid the multiplication of the licences needed for the performance of a particular nuclear activity. The beneficiary is in no way exempted from the need to comply with the requirements of the Public Health Code, in particular those concerning the acquisition and transfer of sources.

Through meetings with the main licensees and inspections, ASN frequently recalls the main regulatory requirements applicable and clarifies the scope of the administrative simplification process, in order to make for smoother implementation.

ASN also reminded all the licensees who use contractors that if these contractors have to use sources of ionising radiations, including if supplied to them by the licensees, they must hold a licence issued by ASN pursuant to Articles R. 1333-17 and following of the Public Health Code.

These actions led to the drafting of a guide by the licensees, intended for their contractors, to help them in their relationships with ASN.

Veterinary

The veterinary profession comprises about 6,000 structures, more than half of which are single-person entities (the veterinary surgeon himself). There are about 14,900 practitioners in the profession (63% self-employed, 36% employees) and 10,500 veterinary specialist auxiliaries (ASV).

Veterinary radiography device

Veterinary radiography surgery

The veterinary radiodiagnostic activities mainly concern pets (78%), referred to as the canine sector.

In 2002, ASN sent a letter to the High Council of the Order of Veterinarians, drawing its attention to the regulatory changes concerning the use of generators of ionising radiations and the consequences of these changes on the activities related to veterinary radiodiagnostic procedures. Regular contacts now take place between the profession and ASN.

These frequent and constructive exchanges led to significant improvements in radiation protection in this sector, today taking the following form:
– the creation of a commission within the national organisations, specifically to improve communication and provide the professionals with support;
– certification of "person with competence for radiation protection" (PCR) instructors for the profession;
– the creation of initial PCR training in the veterinary schools;
– training of more than 3,000 PCR;
– the production of standard documents and good practice guides for the practitioners;
– the implementation of dosimetry in the surgeries.

The profession also undertook to draft good practice guides and a file to help with drawing up licensing applications for veterinarians. The licensing application guide has been finalised for the canine sector. An initial version of the radiodiagnostic good practice sheets is already available in the equine sector, which comprises the highest radiation protection stakes.

4 REGULATION OF RADIATION SOURCES

4|1 Licenses issued by ASN

Suppliers
ASN monitoring of suppliers of radionuclide sources or devices containing them and used for non-medical purposes is crucial. These companies have considerable responsibility for the safety of source movements, their traceability, the recovery and the disposal of used or unwanted sources. It is therefore important that their situation with regard to radiation protection rules be satisfactory and that their activities be duly covered by the licence specified in article R. 1333-17 of the Public Health Code.

In 2009, 44 licences were issued to suppliers. Several dozen files are also being investigated by ASN.

It should be underlined that since 2003, more than 260 authorisation or renewal files have been reviewed and 35 cancelled. The complete initial review of this type of file and their update can take a relatively long time, owing to the combination of a number of negative factors (the problem of getting in touch with the right people, then of obtaining relevant information about the sources and devices, the complexity of the analyses linked to the radiation protection of devices and radionuclide sources, the problems with obtaining precise guarantees for actual recovery of used or end-of-life sealed sources.

This initial preparatory work makes for easier subsequent review when the licences are renewed or if applications are made to modify them.

Diagram 5 presents the licences issued or cancelled in 2009 and trends in this area between 2005 and 2009.

Users
In 2009, the review by ASN of more than 2,000 application files for possession and use of radionuclides led to 350 new licences being notified and 166 licences being revoked. About 1,100 files dealing with an industrial or research activity are currently being reviewed by ASN. Diagram 6 shows the licences issued or cancelled in 2009 and trends in this area between 2004 and 2009.

Once the licence is obtained, the licensee may procure sources. To do this, it collects supply request forms from IRSN, enabling the institute to verify that the orders are in accordance with the licences of both user and supplier, it being one of the institute's duties to update the inventory of ionising radiation sources. If the order is correct, the movement is then recorded by IRSN, which notifies the interested parties that delivery may take place. In the event of any difficulty, the matter is referred to ASN.

Electrical generators of ionising radiations
ASN is continuing to gradually examine the applications for a licence to possess and use electrical generators, a regulatory constraint that was introduced with the publication of decree 2002-460 amending the Public Health Code.

A number of difficulties were raised during this examination process (see point 3|2 of this chapter). X-ray generators are in particular defined as working equipment by the Labour Code and therefore have to comply with a number of design and installation standards.

In 2009, ASN granted 207 licences and 140 licence renewals for the use of electrical generators of X rays. 907 licences have been granted since the publication of decree 2002-460.

4 | 2 Regulation by ASN

Regulation of radiation sources depends on the nature of the source and the stage of production and use reached. It is presented in chapter 4.

In the industrial field, ASN pays particularly close attention to the use of gamma radiography devices and

Diagram 5: trends in licences issued to radioactive source suppliers

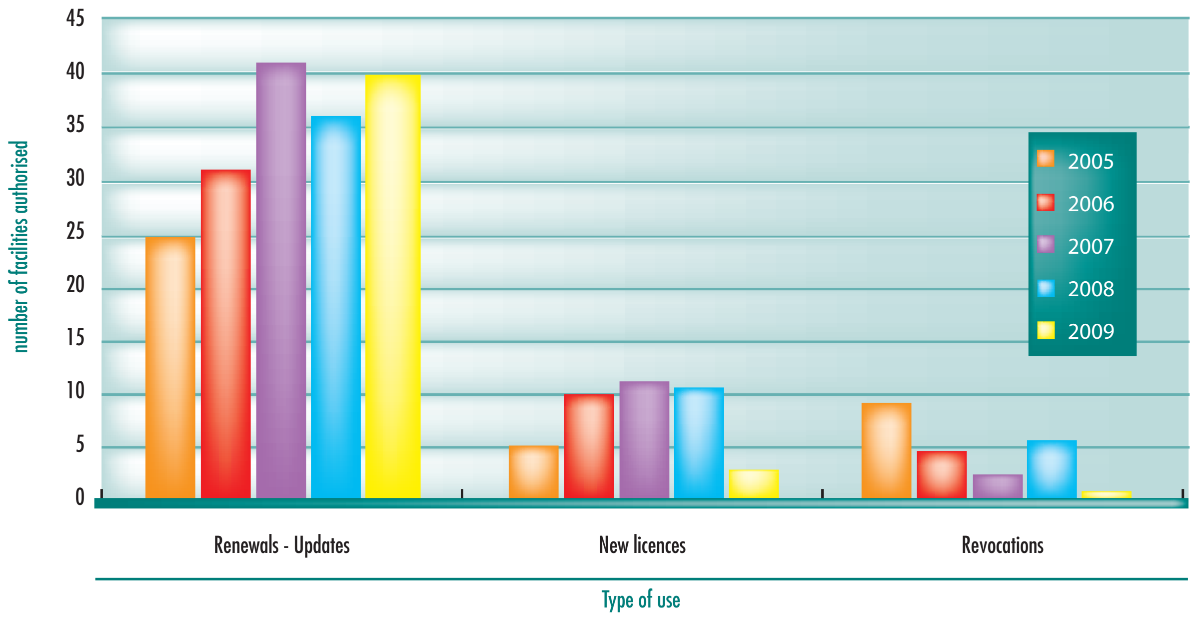
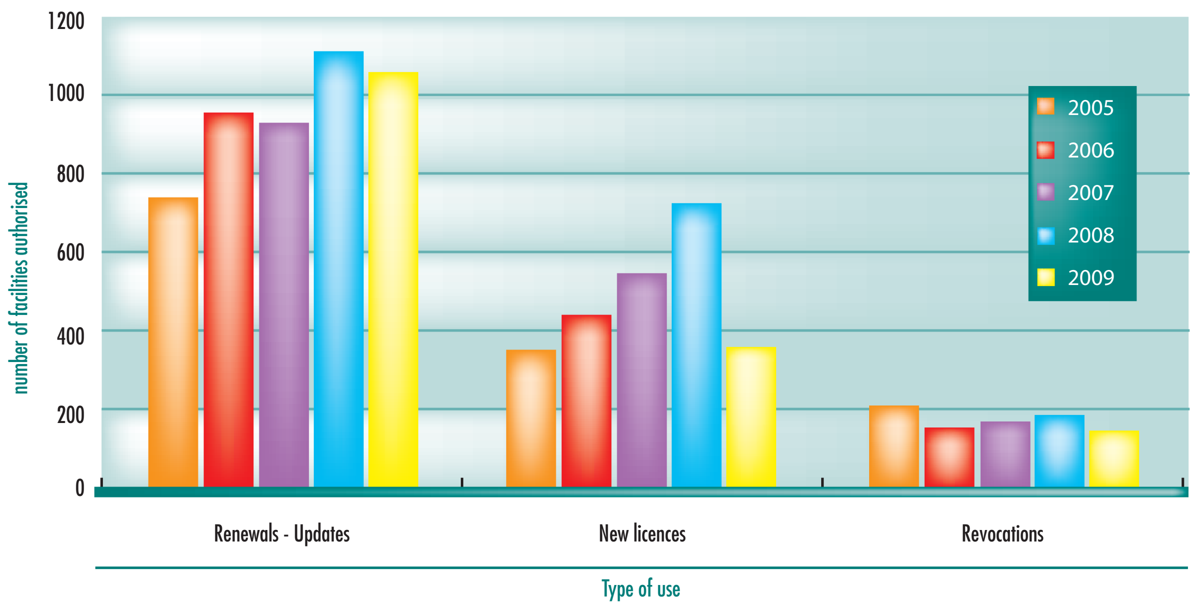


Diagram 6: trends in licences issued to radioactive source users



accelerators. ASN has made inspection of establishments using gamma radiography devices one of its priority inspection topics since 2004. In 2009, this topic was once again a priority, with particular attention focused on application of the "zoning" order of 15 May 2006 to industrial radiography activities. The main inadequacies identified concern prior evaluation and optimisation of doses, as well as the conditions for carrying out gamma radiography operations on the worksites. This last point will lead to intensified verifications in 2010.

While setting up its industrial inspection programme, ASN identified other topics with high stakes, in particular source suppliers and users of high-level sealed sources.

4 | 3 The main incidents and accidents in 2009

ASN also controls the handling of the incidents notified to it. These primarily concern loss or theft of radioactive sources or portable devices containing them (lead detection, etc.), inappropriate use, or total or partial accidental destruction of a radionuclide source, in addition to accidental irradiation of individuals.

In 2009, there were 73 radiation protection incidents in the non-medical and non-BNI field, some of which were recurring:
– 24 incidents leading to exposure of individuals (including 23 by irradiation and 1 by external contamination);
– 22 sources were discovered;
– 10 sources were lost;
– 4 sources were stolen (mainly contained in devices for detecting lead in paint);
– 6 sites were contaminated;
– 5 breaches in defence (such as damage to devices containing a source, disposal of waste in an inappropriate route or delivery not in conformity with the licence);
– 2 atmospheric releases.

In 2009 one incident was rated level 2 on the INES scale (HORUS incident), 27 incidents were rated level 1 (anomaly), 40 level 0 (deviation) and 5 are currently in the process of being rated.

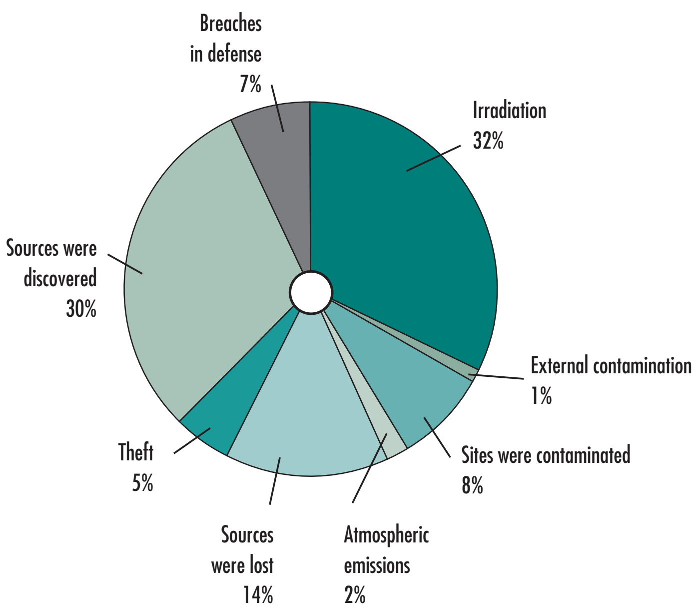
The main two event categories are exposure of individuals and the discovery, loss or theft of sources.

Losses usually concern calibration sources, especially those used to calibrate or verify measuring instruments.

Thefts mainly concern devices for detecting lead in paint which are kept in attache-cases or in strongboxes. They are sometimes found a short time after the theft.

Discoveries concern a wide variety of objects, mainly detected by the gates at BNI exits or at the entrances to landfills and scrap yards. These sources can come from private individuals, they can be found in establishments which had forgotten they had them, or can be left on the street, for example in front of a police station. Events concerning contaminated metals are also considered to be source discoveries. In 2009, 4 French companies received parts from India that were contaminated with cobalt 60 (see box) and one notification of consumer goods containing natural radionuclides was received by ASN.

Diagram 7: typology of incidents notified in 2009



Exposure of individuals is mainly due to irradiation (only one occurrence of contamination was notified). This year, once again, the most significant case was attributable to industrial gamma radiography. Non-compliance with procedures led in a single operation to a dose of close to one quarter the annual limit being received for a category A worker (see box). A new type of generic event is the involuntary irradiation of individuals by tomography devices during verifications by the authorities to detect illegal items in containers or lorries. The other events which may have led to irradiation of individuals primarily concern inappropriate disposal, radiation leaks, or even failure to shield the source. ASN is surprised by the small number of contamination events that are actually notified.

Imports of items contaminated by Cobalt 60 – Radioactivity detection

In January 2009, ASN was informed of several imports from India of industrial parts contaminated by radioactive Cobalt 60 (industrial valves).

The importing companies were directly warned by their Indian supplier of the possible cobalt 60 contamination of some of the parts shipped.

At their own initiative, they immediately called in specialists to carry out radioactivity measurements, which confirmed the presence of parts contaminated by cobalt 60 with dose rate values on contact with the parts of 1.5 to 5 micro-sieverts per hour.

The dose assessments for the workers with regard to handling of contaminated objects confirm that none of the workers were exposed in excess of the annual limit set by the regulations for the public at 1 millisievert per year.

The contaminated parts and waste were isolated and will be recovered by ANDRA. Any subcontractors and customers to whom the contaminated parts could have been delivered were informed.

The companies and ASN are ensuring that the other suspect deliveries which were to have been sent to France will be correctly identified and isolated. Jointly with the foreign regulatory authorities, ASN is attempting to find out whether other French companies may be concerned by similar deliveries.

Although ASN has observed an improvement in the management of this type of incident by the companies, it can only be concerned by their increasing numbers. These recent events show that when radioactive materials are not specifically labelled as such, they can be sent to France or other countries with no specific and systematic checks at the borders. At present, the French regulations concerning the transport of goods at the French borders do not provide for specific checks to search for radioactive materials.

Another event of the same type occurred in February 2007, when a handbag triggered the radioactivity detection gate alarm at the Laue-Langevin Institute in Grenoble. There again, Cobalt 60 was present in a metal loop on the handbag, with a specific activity level about 5 times higher than the limit set by the Public Health Code for a radioactive source licence application.

More recently, in October 2008, the "lift buttons" affair made the headlines. This concerned the OTIS and MAFELEC companies, which had used metal from an Indian factory, where a Cobalt 60 source had probably been melted down.

Even more recently, in January and February 2009, no fewer than four similar events were declared in the Calvados, Dordogne, Vienne and Mayenne départements; all four concerned metals from India contaminated by Cobalt 60 (see above).*

ASN thus drew the attention of the ministries concerned to the worrying rise in the number of these events, the health and economic consequences of which can be considerable, and it proposed deploying radioactivity detection systems at strategic points around the country (ports, road hubs, airports).

Deployment of these systems for detecting radioactivity in French imports will only be truly effective with the help of all member States of the European Union. This implies the definition of a coherent strategy for monitoring of imported products at the very least at the level of the member States (see paragraph 5 of this chapter).

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*Administrative region headed by a *préfet*.

2. The device used is a gamma radiography device containing a high-level radioactive source of iridium 192 (1.73 TBq). For a radiographic inspection, the source is remotely ejected from the device, using a manual remote-control, before being returned to its protective housing. At the end of the inspection, once the source is back in the safety position, a technician enters the operating zone to remove the film placed behind the inspected part for analysis.

4 | 4 End-of-life sealed sources

The requirements of the Public Health Code (Articles L.1333-7 and R.1333-52 et 53) define the obligations binding on the suppliers and users of sealed sources once they expire (more than 10 years old) or are no longer needed. The supplier is required to recover any sealed source it has distributed, unconditionally and whenever requested, including when this source is damaged or is contained in a device or product. It must also inform ASN and IRSN of any sealed source which has not been returned within the allotted time.

The supplier must also be able to present financial guarantees ensuring the availability of funds, should it default, to cover the cost of recovery and disposal of end-of-life sources by another organisation or by the French National Agency for Radioactive Waste Management (ANDRA).

This guarantee can take the form of a bank bond, an insurance policy, a sum deposited with ANDRA or a subscription with a mutual guarantee organisation.

The guarantee deposited with ANDRA corresponds to the total cost of recovery of each source estimated at the date of deposit of the guarantee. This sum is returned once the source has been recovered by the supplier. This system involves very large sums and is chosen when a small number of sources is concerned.

The mutual guarantee system is handled by the non-profit Ressources association, created in 1996. This association, which currently comprises the majority of suppliers, pools the risk of defaulting by one of them. Their subscriptions go to the fund designed to cover this defaulting.

Orphan sources are recovered by ANDRA as part of its public service duty.

Irradiation of a worker of the ABC company (HORUS EIG) during a gamma radiography weld inspection, event rated level 2 on the INES scale

ASN gave a level 2 rating on the INES scale to the accidental irradiation of an ABC company worker on 29 September 2009 during a gamma radiography weld inspection[2]. This worker was present in the operation zone[3] for several seconds, having ignored the zone access rules and entered before the high-level radioactive source had been returned to its safety position.

This gamma radiography inspection was performed in the EDF Flamanville NPP (reactor n° 1, Manche département) which rapidly informed ASN. A significant event notification was sent to ASN by the ABC company on 16 October 2009.

The dose received during the incident was estimated at 5 millisieverts on the basis of the worker's dosimetry readings, or one quarter of the annual limit of 20 millisieverts set by the regulations for a person liable to be exposed to ionising radiations during the course of their professional activities.

This accidental irradiation is due to a failure to follow essential radiation protection procedures. Owing to his incorrect interpretation of the sequence of steps performed by the person in charge of operating the radioactive source of the gamma radiography device, the worker, who was observing the procedure from a distance, believed the inspection to be finished. He then entered the operating zone[3] without waiting for final confirmation of the end of operations and return of the radioactive source to its safety position.

An inspection of the ABC company was carried out jointly by ASN's Dijon division and the conventional safety inspectorate on 29 October 2009. The non-compliance with radiation protection rules which caused the incident were confirmed. The remedial actions taken by the ABC company and the HORUS group were considered to be satisfactory. ASN will be following up these actions, and it also requested an analysis of the situation, with respect to the human and organisational factors, from its technical expert, IRSN.

Owing to failure to comply with all rules regarding entry into the operation zone, which led to significant exposure of a worker, ASN rated this incident level 2 on the international nuclear event scale (INES October 2008 version) which comprises 8 levels, from 0 to 7.

3. Specially marked out zone to which access is strictly reserved for workers as and when necessary, in order to limit the risk of exposure to ionising radiations.

The recovery organisation must give the user a certificate of source recovery which relieves it of its responsibility as attached to use of this source. On the basis of this document, the source is removed from the user's list on the national inventory of sources managed by IRSN.

This inventory is consulted by ASN when reviewing the user's licence renewal applications, if it transfers its activity or during spot checks, during inspections for example, in order to verify the situation and the fate of the sealed sources in the possession of each user.

French regulations require that the end supplier, in other words the supplier who distributes the source to a user, provide the financial guarantee. Other European countries have chosen to require this financial guarantee from the user, or may only require it for high-level sources.

In order to draft the government decree required by Article R.1333-54-2 concerning the procedures for calculating and implementing the financial guarantee, the current system should be revised in order to replace the Special Utilisation Conditions (CPE) stipulated by CIREA in 1990 and still in force. At present, a scale produced by ANDRA defines the amount for the recovery of sealed sources depending on the radionuclides they contain and their utilisation.

There are no such obligations on the supply of unsealed sources. Once they have reached the end of their service lives, management of these sources is the entire responsibility of the user. Depending on the radionuclides used, there are two possible options: either transfer to a radioactive waste management facility (ANDRA), or management of radioactive decay prior to disposal in conventional waste treatment facilities.

5 COORDINATION WITH FOREIGN AUTHORITIES

In the field of international coordination, ASN either initiated or responded to requests for bilateral and multilateral consultations, took part in conferences and was involved in international working groups, including those looking at ways of reinforcing international and community harmonisation.

More especially, with regard to implementation of the Code of Conduct on the Safety and Security of Radioactive Sources and the corresponding supplementary guidance on import and export, ASN continued to take part in the periodic exchanges between States organised by IAEA. The purpose of these exchanges was to examine the long-term strategies for management of sealed sources (recycling, reuse), in particular when these sources reach the end of their lives or when orphan sources are detected at the border of a country or during transport.

In 2007, ASN was audited by IAEA and then again in 2009 by the IRRS (Integrated Regulatory Review Service) mission, with the subjects covered including radioactive sources and implementation of the Code of Conduct on the Safety and Security of Radioactive Sources. It took part in a similar review of the Lebanese regulator in 2009.

With a view to harmonisation of practices, ASN also took part in a European meeting in Germany, called at the initiative of the Federal Office for Radiation Protection (BfS-Germany) attended by 20 experts from 9 countries, and representatives of both the European Commission and IAEA. The goals of the meeting included the exchange of experience in implementing a national registry of high-level sources and identification of areas in which harmonisation of these files could be recommended for specific exchanges of information between the countries.

ASN also took part in international conferences on aspects such as the control of scrap contaminated by radioactive products or human exposure to ionising radiations for non-medical purposes.

The conference in Tarragona (Spain) on the control of contaminated scrap was an opportunity to debate the various initiatives taken nationally and internationally, from the viewpoint of a variety of participants: international organisations (IAEA, NEA, EU-UN, European Commission), authorities and industries, with a total of 73 countries represented. ASN presented its experience at the conference. The participants all agreed that although recycling of metals does have clear economic and environmental benefits, it nonetheless remains necessary to adopt surveillance measures either to avoid or, failing which, to detect and manage the presence of radioactive material in scrap.

Faced with the recurring emergence of safety issues, ASN took part in a conference in Dublin on human exposure for non-medical purposes, organised by the European Commission.

At a bilateral meeting, once more against the backdrop of the discovery of contaminated metals in France and ASN's ongoing examination of the contaminated materials detection issue, ASN met the Belgian regulator (Federal Agency for Nuclear Control - AFCN) which has precise regulations and recognised experience in this field.

ASN, together with IRSN, responded to a request from the Chinese regulatory body to organise a technical meeting to deal with sources of ionising radiations. This request followed on from the Chinese NRSC's recent takeover of the function of competent authority in this field and led to a visit by a delegation of the Chinese central (NRSC) and regional regulatory bodies. This second meeting (a first bilateral meeting on this subject took place in 2008) reflects China's clear desire to set up a robust system, with personnel competent in radiation protection and source monitoring.

Similarly, Japan this year asked ASN to organise a bilateral meeting during which the viewpoints of both regulators were presented and debates covered a range of topics including medical and industrial sources. The Japanese were particularly interested in ASN's organisation and the regulatory requirements concerning radioactive sources.

6 MONITORING OF RADIOACTIVE SOURCE PROTECTION AGAINST MALICIOUS ACTS

Even if the safety and radiation protection measures specified by the regulations do provide a certain level of protection against the risk of malicious acts, they cannot be considered sufficient. Strengthening the monitoring of protection against malicious acts (a notion often referred to as "security" as opposed to "safety") concerning the most hazardous sealed radioactive sources was thus strongly encouraged by IAEA, which published a Code of Conduct on the Safety and Security of Radioactive Sources (approved by the Board of Governors on 8 September 2003) along with supplementary guidance on the import and export of radioactive sources (published in 2005). The G8 supported this approach, including at the Evian summit (June 2003) and France sent IAEA confirmation that it was working on implementation of the guidance stipulated in the Code of Conduct (undertaking by the Governor for France on 7 January 2004). The general aim of the Code is to obtain a high level of safety and security for those radioactive sources which can constitute a significant risk for individuals, society and the environment.

In 2008, the Principal Private Secretary of the Prime Minister asked ASN to submit a report to the Government, in close coordination with the administrations concerned, regarding monitoring of the security of radioactive sources. This report proposed that ASN take charge of this monitoring, for which no other administration is currently responsible, in close liaison with the Defence and Security High Official (HFDS) at the Ministry for Ecology, Energy, Sustainable Development and Marine Affairs (MEEDDM) and the Government. They would be responsible for drafting the general regulations.

There is extensive synergy between source monitoring for radiation protection and safety reasons and that for protection against malicious acts. ASN also has local knowledge of the sources concerned, as they are regularly inspected by its regional divisions. More generally, this synergy between safety and security concerning both radioactive sources and installations, is widely used by our foreign counterparts. This is why most of the nuclear regulators around the world are tasked with both of these responsibilities.

ASN would be ready to take on the duty of monitoring the protection of radioactive sources against malicious acts, provided that:
– it is given the human and material resources enabling it to assume this responsibility;
– it is allowed to continue its policy of transparency, while respecting the confidentiality that is inevitably linked to protecting security.

In late 2008, the HFDS at the MEEDDM set up a working group, which included ASN, in order to draft the regulations for this new monitoring process.

The work done on preparing the legislative and regulatory texts is now more or less completed. ASN also received a positive response to its request for transparency, although it would need to adapt its communication to take account of the inevitable confidentiality involved in protecting security. The precise security objectives are still to be defined and could be clarified by orders and ASN decisions. Finally, the human and material resources ASN needs must be allocated to it so that it can take on a responsibility such as this.

7 OUTLOOK

In the field of regulating applications of ionising radiations in the non-medical sector, ASN's aim is to work to ensure that the operators take full account of the risks involved in the use of ionising radiations. This problem is accentuated by the diversity and numbers of the parties involved. Recent incidents in France and serious accidents abroad, for example in the field of gamma radiography, demonstrate once again the need for scrupulous implementation of the regulations and stringent operations. In this field, as in 2009, ASN is continuing with its priority measures through optimum use of its resources:

– the central level will in 2010 continue with supplier regulation, both through review of the authorisation dossiers and through inspections within the organisations concerned;
– the regional levels, responsible for monitoring the users of radioactive sources or electrical devices emitting ionising radiations, will continue with surveillance and verifications at the users.

During the course of its regulatory activities, ASN must remain vigilant and determined concerning any deviations that could lead to events with serious consequences for workers or for the public. Following the incidents related to gamma radiography sources, it initiated specific, targeted monitoring actions on high-level sources. ASN also considers that the public needs to be more precisely informed of its regulation and inspection activities. The principle of the publication of ASN inspection follow-up letters will thus be expanded in 2010 to take in the non-medical sector.

The other actions initiated in previous years will be continued and supplemented in 2010 through:

– continuation of the work to revise the licences issued to the manufacturers and suppliers of radioactive sources and the actions undertaken concerning the research sector;
– extension of the licensing system for suppliers of electrical generators of ionising radiations used in the non-medical sector;
– inspections carried out, particularly with those using and in possession of gamma radiography devices and high-level sources.

ASN aims to maintain closer ties with all industrial and research stakeholders and organisations, one aspect of this being, when issuing its licences, to intensify its verifications on the extent to which the decision to use radioactivity is justified.