

## RADIOLOGICAL EMERGENCIES

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## CHAPTER 8

Protection of the population is one of the primary duties of the government. The exercise of this responsibility involves numerous stakeholders, whose diversity reflects the multitude of risks faced by the population of a modern society: graver consequences of natural phenomena, vulnerability to technological risks and the effects of malicious acts, the need for care provision by the public purse as a result of the gradual erosion of the solidarity inherent in traditional family and community values.

Civil defence is everyone's business. All citizens have a contribution to make through their attitude and behaviour. A true culture of risk and threat preparedness needs to be developed.

The purpose of civil defence is to prevent risks of all types, to inform and alert the population and to protect people, property and the environment against accidents, incidents and disasters through preparation and implementation of appropriate measures and means by the State, local authorities and other public or private individuals.

The law of 13 June 2006 involves the Nuclear Safety Authority (ASN) in the management of radiological emergencies arising from events liable to compromise human health and the environment through exposure to ionising radiation. ASN contributes to all areas of civil defence concerning risks arising from nuclear activities.

Nuclear activities are carried out with the two-fold aim of preventing accidents, but also of mitigating any consequences should they occur. In accordance with the principles of defence in depth, the necessary steps must therefore be taken to deal with a radiological emergency, no matter how improbable. A "radiological emergency" is one resulting from an incident or accident likely to lead to the release of radioactive materials or to a level of radioactivity likely to harm public health, as defined in article R. 1333-76 of the Public Health Code. The term "nuclear emergency" is reserved for events which could lead to a radiological emergency in a basic nuclear installation or a transport of radioactive materials.

For activities with a high level of risk, such as BNIs, the emergency provisions, which can be considered the "ultimate" lines of defence, comprise special organisational arrangements and emergency plans, involving both the licensee and the authorities. This emergency set-up, which is regularly tested and evaluated, is also regularly revised to take account of experience feedback from exercises and from management of real situations.

Radiological accidents can also occur in non-BNI nuclear activities:

- in an establishment carrying out a nuclear activity (hospital, research laboratory, etc.),
- owing to the loss of a radioactive source, or
- by inadvertent or intentional dissemination of radioactive substances into the environment.

ASN takes part in managing the radiation protection aspects of these emergency situations.

Other situations can also trigger a response by the public authorities, for example situations arising from nuclear activities or industrial activities which handled materials containing natural radioelements (uranium or thorium) in the recent or more distant past. These are dealt with in point 43 of chapter 16.



Cover of *Contrôle* number 171 devoted to protecting people during emergency situation

## 1 THE INTERNATIONAL CONTEXT

In the light of the potential repercussions of an accident abroad, it is important for the various countries to be informed and to intervene in as coordinated a way as possible. This is why IAEA and the European Commission offer the member countries tools to help with notification, intervention and assistance. ASN plays an active role in the preparation of these tools.

### 1 | 1

#### Relations in emergency situations

Independently of any bilateral agreements on the exchange of information in the event of an incident or accident with possible radiological consequences, France is committed to applying the Convention on Early Notification of a Nuclear Accident adopted on 26 September 1986 by IAEA and the decision of the Council of European Communities of 14 December 1987 concerning community procedures for an early exchange of information in the event of a radiological emergency. On 26 September 1986, France also signed the convention adopted by IAEA concerning assistance in the event of a nuclear accident or a radiological emergency.

Two government directives of 30 May 2005 and 30 November 2005 specify the procedures for application of these texts in France and instate ASN as the competent national authority. It is up to ASN to notify the event without delay to the international institutions and to the States concerned, to supply relevant information quickly in order to limit the radiological consequences and finally to provide the Ministers concerned with a copy of the notifications and information transmitted.

### 1 | 1 | 1

#### Bilateral relations

Within the framework of the bilateral relations, particularly with its immediate neighbours, ASN in 2006 initiated drafting of a protocol for the exchange of information and assistance in order to deal with radiological emergencies. This draft protocol aims to reorganise the exchanges that have existed for many years, by differentiating between the type of information exchanged, on the one hand with respect to planning and on the other with respect to an actual emergency. It to precisely identify the various stakeholders and entities responsible for and to whom the information is to be sent.

This draft protocol has been discussed at a number of bilateral meetings with the Belgian authorities and it should be possible to finalise it in the next few months. The draft has also been sent to the Swiss and German authorities.

### 1 | 1 | 2

#### Multilateral relations

Population protection measures differ from State to State in terms of regulations and recommendations. The simple recommendations for absorption of iodine tablets vary on either side of the border. Some nuclear power plants are however located in the immediate vicinity of the border (Gravelines, Chooz, Cattenom, Fessenheim, Bugey plants). Similarly, the plants at Tihange (Belgium), Mühleberg, Gösgen and Leibstadt (Switzerland) are located less than 80 km from the border.

In the various international meetings at which France regularly participates, it became apparent that the States needed to make efforts whenever possible to harmonise the population protection recommendations. A working group was therefore set up, involving Belgium, Luxembourg, Germany, Switzerland and France, in order to move towards harmonisation of all iodine recommendations.

During the course of 2006, 3 meetings led to a consensus on issues such as the critical group or dosing of iodine tablets. This work will lead to changes in French policy.

## 1 | 2

### International assistance

The above-mentioned government directive of 30 November 2005 defines the procedures for international assistance when France is called on or when it requires assistance itself. For each Ministry, it contains an obligation to keep an up-to-date inventory of its intervention capability in terms of experts, equipment, materials and medical resources, which must be forwarded to ASN.

During the course of 2006, ASN therefore convened all the stakeholders concerned in order to start work on the creation of a database of national assistance skills for a nuclear accident or radiological emergency.

## 2 RADIOLOGICAL EMERGENCIES

### 2 | 1

#### Response to radiological emergencies

Radiological emergencies can arise:

- during performance of a nuclear activity, whether for medical, research or industrial purposes;
- in the case of intentional or inadvertent dispersal of radioactive substances into the environment;
- or
- if radioactive sources are discovered in places where they are not supposed to be.

It is then necessary to respond, to put an end to any risk of human exposure to ionising radiation.

ASN together with the ministers and stakeholders concerned, drafted circular DGSNR/DHOS/DDSC 2005/1390 of 23 December 2005. This circular defines how the State's services are organised in the case of an event liable to lead to a radiological emergency other than those situations covered by an existing emergency plan.

### 2 | 1 | 1

#### Intervention responsibilities

In these situations, responsibility for the decision and for implementing protective measures lies with:

- the head of the establishment performing a nuclear activity (hospital, research laboratory, etc.) who implements an on-site emergency plan (PUI) as stipulated in article L. 1333-6 of the Public Health Code (if the potential risks from the installation so warrant) or with the site owner concerning human safety on the site;
- the *Mayor or préfet*<sup>1</sup> concerning human safety in areas accessible to the public.

In the case of an accident occurring in a place where there is no clearly identified responsibility, then responsibility for the response lies with the Mayor or with the *préfet* of the *département*<sup>2</sup>.

1. Regional government representative.

2. Administration division.

## 2 | 1 | 2

### Interventions principles

Faced with the number of possible sources of alerts and the corresponding alert channels, there has to be a “one-stop shop” where all alerts arrive and where they are then passed on to the other parties concerned. This one-stop shop is the fire brigade’s central emergency call alert processing unit which can be reached by dialling 15, 17, 18 or 112.

Once the authorities have been alerted, the response generally consists of four main phases: care for the persons involved, confirmation of the radiological nature of the event, securing the zone and reducing the emission and, finally, clean-out.

The Mayor or the *préfet* coordinates the intervention teams and decides on the protection measures for the public.

## 2 | 1 | 3

### The role of ASN

In these situations, in the same way as for accidents occurring in nuclear installations, ASN is responsible - with the support of IRSN (the Institute for Radiation Protection and Nuclear Safety) - for supervising the actions of the head of the establishment or site owner, for advising the relevant police authority with respect to the steps to be taken to prevent or mitigate the direct or indirect effects of ionising radiation on human health, including through damage to the environment, and to take part in dissemination of information.

ASN opened a telephone hot-line in 2003 (toll-free radiological emergency number 0 800 804 135). The purpose of this hot-line is to receive calls from the one-stop shop (see point 2|1|2) notifying incidents involving non-BNI sources of ionising radiation and is open round the clock, 7 days a week. The information given during the call is transmitted to an ASN supervisor who will act accordingly. Depending on the seriousness of the accident, ASN may decide to activate its emergency response centre in Paris.

## 2 | 1 | 4

### Care and treatment of radiation victims

In the case of a nuclear or radiological accident, a significant percentage of those injured could be contaminated by radionuclides, posing specific care and treatment problems for the emergency response teams.

Circular 800 of 23 April 2003 specifies the national policy concerning the use of emergency and care resources in the event of a terrorist act involving radioactive materials. These provisions are designed to act as guidelines for the services and organisations in charge of planning for and handling emergency situations.

Together with the Hospitalisation and Health Care Directorate (DHOS) and the services of the Defence High Official (HFD) of the Ministry for Health, the specialists of the Paris SAMU (emergency medical service), the armed forces radiological protection service (SPRA), IRSN, CEA (the French Atomic Energy Agency), EDF and universities, ASN drew up a collection of primary response sheets called the “Medical response to a nuclear or radiological event”. This document contains all useful information needed by front-line medical personnel responsible for collecting and transporting the injured, as well as by hospital personnel who will be receiving them in the nearby hospital facilities. This guide acts as a teaching aid for the medical emergency professionals national training programme set up by the Ministry for Health and the French SAMU emergency medical service.



**On-site emergency exercise involving assistance to a contaminated victim, carried out at ANDRA's Aube repository, in the presence of the fire brigade and the SAMU ambulance service (inspection of 29 November 2005)**

The “Medical response to a nuclear or radiological event” sheets come in addition to circular DHOS/HFD/DGSNR 2002/277 of 2 May 2002 concerning the organisation of medical care in the case of a nuclear or radiological accident. This circular is supplemented by circular DHOS/HFD 2002/284 of 3 May 2002 concerning the organisation of the hospital system in the event of arrival of large numbers of victims, setting up a departmental plan of hospital capacity provisions and a zone-based organisation for all nuclear and radiological, but also biological and chemical hazards.

In 2006, for the response to a nuclear, radiological, biological and chemical threat (NRBC), ASN organised a post-university theoretical and practical training module and distributed teaching tools to physicians in nuclear medicine departments. To do this, ASN obtained the help of the Paris SAMU, the Assistance publique des Hôpitaux de Paris, the Defence High Official at the Ministry for Health and Solidarity, CEA and a private company. This awareness-raising/training day will be repeated and should greatly benefit the response personnel.

## Response interventions in 2006

In 2006, ASN was contacted via its radiological emergency hot-line, its duty staff, or directly by those in charge of particular dossiers, for events such as triggering of detection portals (customs, technical landfills), the discovery of unidentified sources during inventories (hospitals, schools), crushing of a radioactive source (see box), rumours of a radioactive cloud (see box) or theft of sources. Even if they entail no health risk, these events warrant verification and radioactivity measurements.



### Crushing of a gammadensimeter in Douai (Nord *département*)

On Friday 20 January 2006 at about 1230p.m., ASN was informed of an incident involving a gammadensimeter used on the tramway worksite near the Douai town station. A device used to measure the density of the road surfaces was crushed by site machinery. The CMIR intervened, jointly with ASN, to put an end to any danger.

### Rumours of a radioactive cloud in Lorraine

On the morning of Sunday 18 June 2006, a radioactivity measurement monitor belonging to the Lorraine air quality association (ALQA), located south of Nancy, detected a temporary rise in ambient radioactivity (measurement of gamma radiation dose rate) which was slightly higher than the variations normally observed in the region.

Independently of these measurements in Nancy, an exercise designed to prevent NRBC risks was being carried out at the Metz military hospital on Tuesday 20 June 2006. The deployment in the field of visible NRBC resources and an erroneous interpretation of radioactivity measurements, combined with reporting of the Nancy event by the media, gave birth to a rumour concerning the passage of a radioactive cloud. The use of mobile phones led to this rumour spreading like wildfire outside the hospital, as far as Luxembourg. Spontaneous confinement measures were taken by certain schools in and around the city of Metz, a measure that was reiterated locally by certain elected officials or members of the fire brigade, without any such instructions having been given by the authorities. The *préfecture*<sup>3</sup> and the national authorities, including ASN, were informed after the first confinement measures had been taken and once the rumour was already in wide circulation and they carried out investigations to identify the phenomenon and ensure that there was in fact no radioactivity. The *préfet* of the Moselle *département* underlined these points in the various radio interviews he gave towards the end of the morning. The press release from the *préfecture* broadcast as of 2p.m. and the press conference organised with the participation of the directors of the military hospital and the DRIRE confirmed that the rumour was baseless and put an end to the speculation.

It was seen that when faced with the rumour of a risk, the population decided on its own accord to take confinement measures, particularly in the schools. At the same time, the public services received a large number of calls. For example, more than 2,500 calls were made to the fire brigade's 18 emergency number between midday and 2p.m. It was very hard for the authorities to communicate about this event, mainly because of the speed with which the rumour spread, with no technical justification and amplified by the fact that people were worried. As a result of these events, ASN and ALQA decided to clarify the procedures for informing the authorities in the event of a rise in ambient radioactivity levels.

3. *Préfets* offices

#### Suspicion of contamination with radium salts in Morteau

In the evening of 7 December 2006, ASN was informed that five teachers from a vocational training college in Morteau, in the Doubs *département*, had potentially been contaminated after handling a bottle containing radium salts. On 7 December, these people were admitted to the Besançon university hospital by IRSN, for an initial series of analyses. CEA intervened at the request of the *préfecture* during the night of the 7th of December to locate any traces of contamination on the premises and recover the bottle, before forwarding it to ANDRA (national radioactive waste management agency).

On 8 December, ASN with the support of IRSN carried out an inspection to identify the origin of the bottle and check for any residual contamination on the school premises. This inspection, which corroborated that conducted by the police, led to:

- confirmation that the bottle had been brought into the school in May last by a student who had recovered it from an abandoned former clock-making plant. The bottle, which had been handled by three other college students, was only found again in November by a security guard patrolling the buildings;
- a check on the absence of contamination of the students concerned. The further examinations carried out, jointly with IRSN and the Besançon university hospital, cleared up any doubt concerning the possible ingestion of radium in May 2006;
- no signs of contamination being detected on the school premises in contact with the radioactive bottle.

Radium is a naturally-occurring radioactive material (NORM), which was in particular used until the 1960s as a key component in the luminescent paint applied to the hands and dials of watches, alarm clocks and compasses. It was also used in certain lightning conductors. These applications are now prohibited.

ASN is examining how to recover the radioactive objects used by the former clock-making industry in the region. This action will be coordinated by ASN's Dijon division, in liaison with the local authorities and ANDRA, as part of this agency's public service mission with regard to the sustainable management of radioactive materials and waste.

In addition, in connection with the Alexandre Litvinenko case, involving poisoning with polonium 210, the Chairman of ASN was asked on 12 December 2006 by the Minister for Health and Solidarity, Xavier Bertrand, to coordinate preventive monitoring of any French nationals who had stayed at the Millennium Hotel in London on 1 November 2006. The British health authorities identified and sent ASN a list of twenty-five French people who had stayed at the Millennium hotel during the period considered to entail a potential risk of radioactive exposure.

As part of this task, ASN:

- at first, personally informed the persons concerned and examined the exposure risks;
- then, if necessary, placed these persons in contact with IRSN so that it could oversee their medical supervision.

Of the 25 French nationals identified by the British authorities as having stayed at the Millennium Hotel in London, at some time between 31 October and 2 November 2006, 19 were contacted by ASN (13), by IRSN (3) or by the national police authorities (3).

In accordance with the protocol established by the British authorities (<http://www.hpa.org.uk/>), these contacts enabled ASN to inform these people about the hypothetical risk of contamination with polonium 210, given the extraordinary circumstances of the death of Mr Alexander Litvinenko. A medical check-up by IRSN was proposed and 4 people contacted the institute for a search for possible contamination in their urine.



In addition to these contacts, 32 people got in touch with ASN or IRSN directly in the following weeks. They had stayed at the Millennium Hotel in early November 2006, and wanted to obtain information about the risk of contamination. A number of them requested a medical check-up. On 8 January 2007, the results of the 17 urine samples analysed by IRSN were all below the detection thresholds.

### 3 NUCLEAR EMERGENCIES AFFECTING BASIC NUCLEAR INSTALLATIONS AND TRANSPORT OF RADIOACTIVE MATERIALS

Since the Chernobyl accident on 26 April 1986, France has continued to perfect its nuclear emergency management system, reinforcing its response measures and its regulatory framework for preventing and mitigating the consequences of a nuclear accident.

If it is to be considered fully operational, the entire response system must be regularly tested. This is the purpose of the nuclear emergency exercises. These exercises, which are defined by an annual circular, involve the licensee, the local and national public authorities - particularly the *préfectures* - ASN and IRSN. They are a means of testing the emergency plans, the response organisation and procedures and help with training the participating staff. The main aims of the exercises are defined at the beginning of the exercise. They are primarily to ensure a correct assessment of the situation, to bring the installation on which the accident occurred to a safe state, to take appropriate measures to protect the population and to ensure satisfactory communication with the media and the populations concerned. At the same time, the exercises are a means of testing the arrangements for alerting the national and international organisations.

Efforts are today continuing into preparing for post-accident situation management. France is a member of the OECD's Nuclear Energy Agency (NEA) working groups on post-accident management and organises INEX international exercises which, after analysis, should lay the foundations for policy definition during the course of 2007.

#### 3 | 1

### General organisation

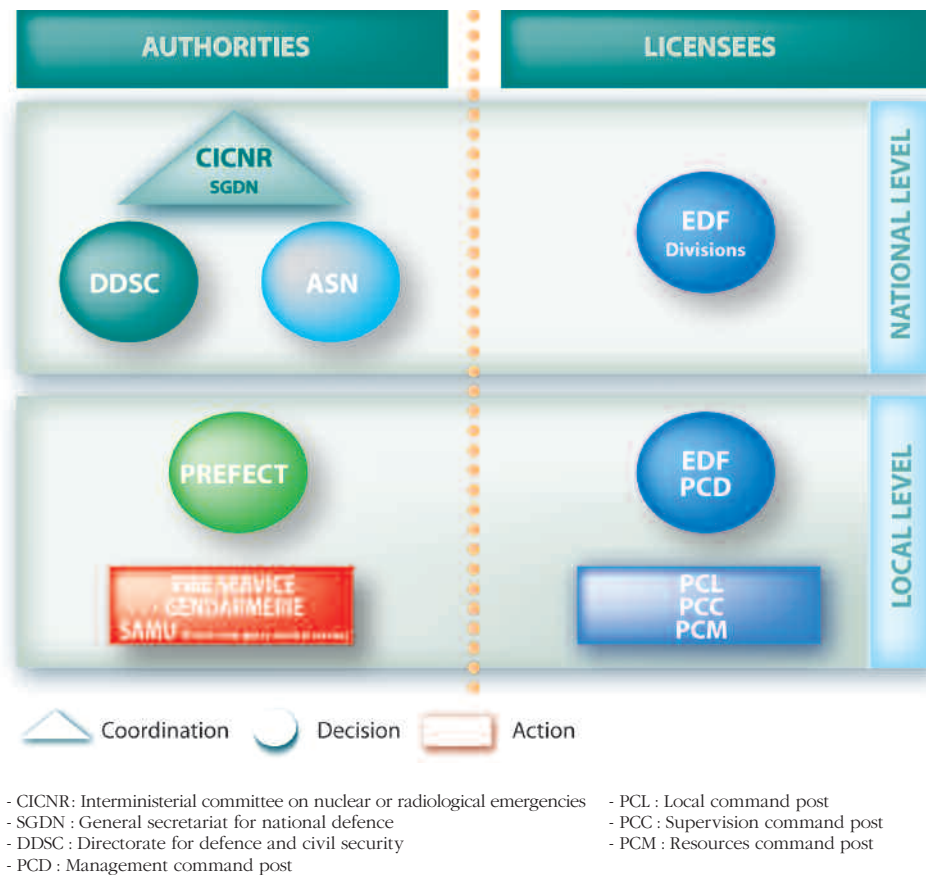
The response by the authorities to an incident or accident is determined by a number of legal texts concerning nuclear safety, radiation protection, public order and civil defence, as well as by the emergency plans.

Law 2004-811 of 13 August 2004 modernising civil defence sets new guidelines. It in particular provides for an up to date inventory of the risks, an overhaul of operational planning, the performance of exercises involving the population, information and training of the population, an operational watch and the alert. A number of decrees implementing this law were passed during the course of 2005, in particular:

- decree 2005-1158 of 13 September 2005 concerning off-site emergency plans (PPIs);
- decree 2005-1157 of 13 September 2005 concerning the ORSEC plan (general plan organising the emergency services if a disaster is declared by the State at departmental, defence zone, or maritime *préfecture* level);
- decree 2005-1156 of 13 September 2005 concerning the local safeguard plan.

The scope of a nuclear emergency and more generally of any radiological emergency, is clarified in the government directives described above. The response organisation of the authorities and of the licensee is presented in the above diagram. This is specifically designed to deal with an accident in an EDF reactor. A similar organisation is put in place when dealing with another nuclear licensee or in the event of an accident involving a radioactive material transport.

### Standard emergency management arrangement for a nuclear reactor operated by EDF



### 3 | 1 | 1

#### Local provisions

In a emergency situation, only two parties are authorised to take the operational decisions:

- the licensee of the affected nuclear installation, who must implement the organisational provisions and the means provided to bring the accident under control, to assess and mitigate its consequences, to protect site staff and alert and regularly inform the authorities. This arrangement is defined beforehand in the licensee's mandatory PUI;
- the *préfet* of the *département* in which the installation is located, who is responsible for decisions as to the measures required to ensure the protection of both population and property at risk owing to the accident. His actions will be regulated by the PPI specially prepared for the vicinity of the installation concerned. He is thus responsible for co-ordination of the PPI resources, both public and private, equipment and manpower. He keeps the population and the authorities informed of events.

### 3 | 1 | 2

#### National provisions

The ministers concerned, and ASN, take all necessary measures to enable the *préfet* to make the requisite decisions, notably by providing, as does the licensee, all information and recommendations which could assist him in his appraisal of the condition of the installation, the seriousness of the incident or accident and possible subsequent developments.

The main bodies concerned are as follows:

- Ministry of the Interior and Regional Planning: the Directorate for Civil defence and security (DDSC), which has at its disposal the Operational Centre for Interministerial Emergency Provisions (COGIC) and the Nuclear Risk Management Aid Mission (MARN), providing the *préfet* with the human and material reinforcements he requires to safeguard people and property;
- Ministry for Health: which is responsible for human health protection against the effects of ionising radiation;
- Ministries in charge of nuclear safety: the Minister for Industry also coordinates national communications in the event of an incident or accident affecting a nuclear installation under his supervision, or occurring during a radioactive materials transport.
- Ministry of Defence and Ministry for Industry: the Defence Nuclear Safety and Radiation Protection Delegate (DSND) is the competent authority for supervising the safety of secret basic nuclear installations, military nuclear systems and defence-related transport. A protocol was signed by ASN and the DSND on 26 January 2005 to ensure coordination between these two entities in the event of an accident affecting an activity under the supervision of the DSND, to facilitate the transition from the emergency phase managed by the DSND to the post-accident phase for which ASN is competent;
- General Secretariat for National Defence (SGDN): the SGDN handles the secretarial functions for the Interministerial Committee for Nuclear and Radiological Emergencies (CICNR). It is responsible for coordinating the action of the ministries concerned regarding the planned measures in the event of an accident and for ensuring that exercises are scheduled and then assessed. The CICNR is a committee convened at the initiative of the Prime Minister. Its role is to coordinate governmental action in the event of a radiological or nuclear emergency situation. In 2006, the CICNR was convened for the major nuclear emergency exercise carried out at Chinon, on 9 November 2006;
- pursuant to law 2006-686 of 13 June 2006 on Transparency and Security in the Nuclear Field, ASN is involved in managing radiological emergency situations. It assists the government with all questions under its responsibility and informs the public about the safety of the installation in which the emergency situation originated. ASN's duties in an emergency were not modified by the above-mentioned law and are detailed in point 3|2|1 of this chapter. ASN's organisation is in particular based on its emergency centre and its regional divisions.

### 3 | 1 | 3

## Emergency plans

### a) General principle

Application of the defence in depth principle implies inclusion of severe accidents with a very low probability of occurrence in the basic data used to define the emergency plans, in order to determine the countermeasures to be implemented to protect plant staff and populations and bring the affected plant to a safe configuration.

The on-site emergency plan (PUI), prepared by the licensee, is aimed at restoring the plant to a safe condition and mitigating accident consequences. It defines the organisational provisions and the resources to be implemented on the site. It also comprises provisions for rapidly informing the authorities.

In 2006, ASN began drafting an order on "licensee risk management", with the particular aim of clarifying the objectives of the on-site emergency plan, taking account of acquired experience, and transcribing into French law the reference levels adopted by the WENRA association (see chapter 7).

The purpose of the off-site emergency plan (PPI or ORSEC plan), drafted by the *préfet*, is to protect populations in the short term in the event of potential danger and provide the licensee or the party in charge of transport with outside intervention assistance. It defines the tasks assigned to the various services concerned, the warning system utilisation instructions and material and human resources. Following on from the action taken in 2004, and in conjunction with the Ministry for the

Interior, ASN is monitoring the work being done to overhaul the ORSEC plans (PSS-TMR part), initiated by circular NOR/INT/E/00008/C of 23 January 2004 sent out to the *préfets* and revising the PSS-TMR. ASN participated in drafting the circular.

### **b) The technical bases and population protection actions**

The emergency plans must allow an effective response to accidents liable to occur at BNIs. This implies the definition of technical bases, i.e. the adoption of one or more accident scenarios identifying the possible health consequences, with a view to determining the nature and extent of the resources required.

On the basis of the intervention levels defined in the order of 13 October 2003, the PPIs stipulated population protection measures that would seem to be justified in limiting the direct impact of releases. For example, the PPIs defined for the vicinity of a PWR reactor stipulate sheltering of the population and the absorption of stable iodine within a 10 kilometre radius, plus evacuation of the population within a 5 kilometre radius.

## **3 | 2**

### **The role and organisation of ASN**

## **3 | 2 | 1**

#### **ASN's emergency role**

In an emergency situation, ASN - with the support of IRSN - has a four-fold duty:

- ensure that judicious provisions are made by the licensee;
- advise the *préfet*;
- contribute to the circulation of information;
- act as competent authority within the framework of the international conventions.

#### **1) Supervision of licensee actions**

In the same way as in normal operating conditions, licensee actions are supervised by ASN in an emergency situation. In this particular context, ASN must ensure that the licensee fully carries out its duty to control the accident, minimise the consequences and rapidly and regularly inform the authorities, but it will not attempt to replace the licensee in implementing the technical measures to deal with the accident.

#### **2) Advising the *préfet***

The decision by the *préfet* concerning the population protection measures to be taken depends on the actual or foreseeable consequences of the accident around the site. It is up to ASN to notify the *préfet* of its stance on this subject, on the basis of the analysis performed by IRSN. This analysis combines diagnosis (understanding of the situation at the plant concerned) and prognosis (assessment of possible short-term developments, notably radioactive release). This advice also concerns the steps to be taken to protect the health of the public.

### 3) Circulation of information

ASN is involved in information circulation in a number of ways:

- information of the media and the general public: ASN contributes to informing both the media and the general public in different ways (press releases, press conference). It is important that this should be done in close collaboration with the other organisations who are themselves involved in communication (*préfet*, local and national licensee, etc.);
- information of the authorities: ASN keeps the Ministers informed, together with the SGDN, which in turn informs the President of the Republic and the Prime Minister;
- information of foreign safety authorities: without prejudice to application of the international conventions signed by France concerning information exchanges in the event of an incident or accident liable to have radiological consequences, ASN informs foreign safety authorities.

### 4) Function of competent authority as defined by international conventions

Since the publication of decree 2003-865 of 8 September 2003, ASN has been the competent authority under the terms of the above-mentioned international conventions. In this capacity, it collects and summarises the information needed for the notifications, information and requests provided for in these conventions. This information is forwarded to the international organisations (IAEA and European Union).

In 2006, France in particular took part in the international exercises organised by the European Community and IAEA (Convex and Ecurie 3). These exercises in particular test the alert, information transmission and exchange procedures between the national alert contact point (Ministry for Foreign Affairs), the national competent authority (ASN) and the emergency centres of the European Community and IAEA.

## 3 | 2 | 2

### Provisions concerning nuclear safety

#### Les différents pôles d'action

In the event of an incident or accident occurring in a BNI, ASN, with the technical support of IRSN, sets up the following organisation:

- at national level:

• an emergency centre comprising:

- a decision-making body or command centre (called PCD), located in ASN's emergency management centre in Paris. This body is managed by the Head of ASN or his representative. Its role is to adopt a stance or make decisions to advise the *préfet* in charge of running the emergency operations;

- a communication level supported by an information unit located close to ASN's PCD, run by an ASN representative. ASN Chairman or his representative acts as the spokesperson, a role that is distinct from that of the head of the PCD.

• an emergency response analysis team, led by IRSN's Director General or his representative. This team is resident at IRSN's technical emergency centre, located in the nuclear research centre at Fontenay-aux-Roses.

- at local level:

• a local team at the *préfectures*, consisting mainly of staff from ASN's regional offices, whose purpose is to assist the *préfet* in making his decisions and implementing his communication actions by providing explanations enabling understanding of the technical aspects involved, in close collaboration with ASN's PCD;



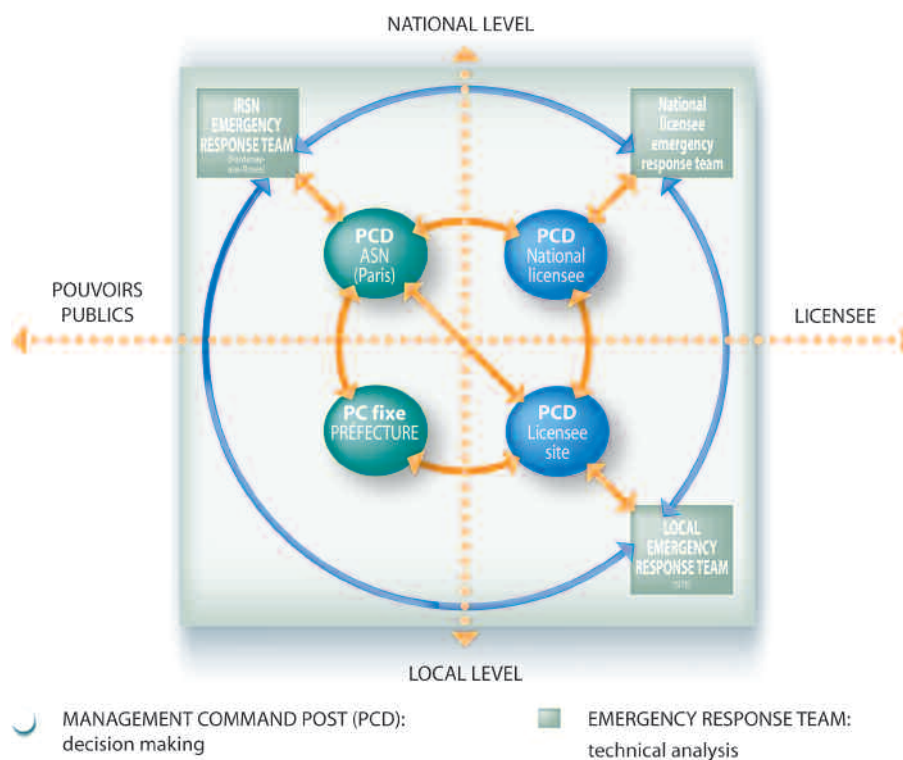
Visit by the Minister Delegate for Industry during the large-scale exercise at Chinon on 9 November 2006

- a local team at the affected plant site, consisting of ASN staff, working in close liaison with the site PCD head.

ASN, its technical support organisation IRSN, and the main nuclear licensees have signed protocols covering emergency response planning. These protocols designate those who will be responsible in the event of an emergency and define their respective roles and the communication methods to be employed.

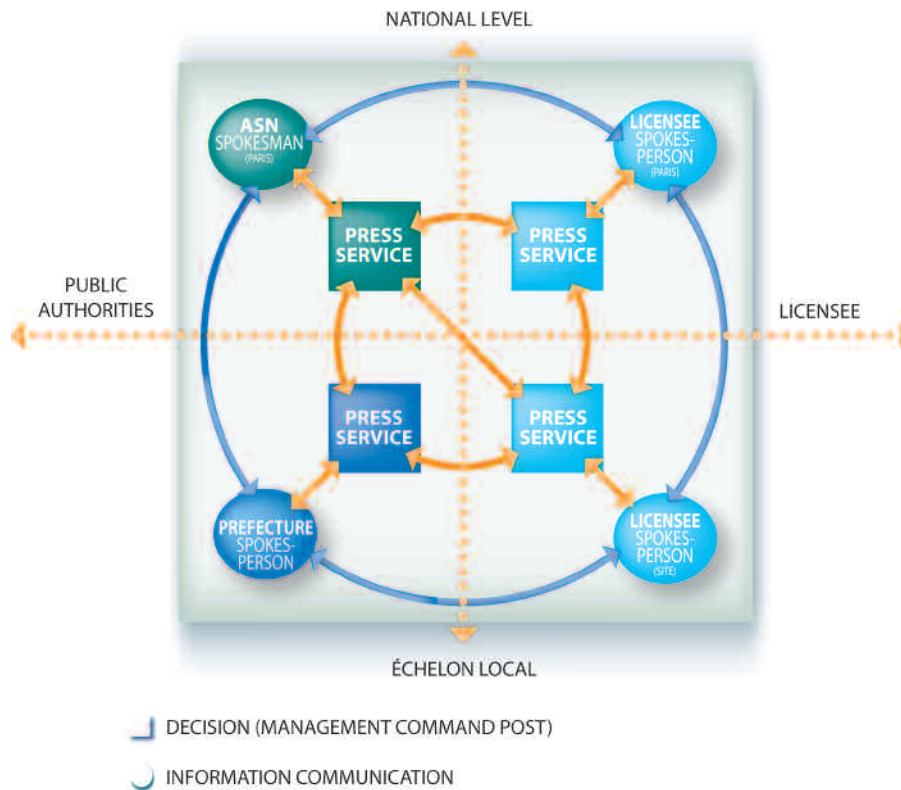
The diagram below presents the overall emergency response structures set up, in collaboration with the préfet and the operator.

### Safety organisation



The diagram below shows the structures set up between the communication units and the PCD spokespersons with a view to allowing the necessary consultation ensuring consistency of the information issued to the public and the media.

### Communication organisation



## 3 | 2 | 3

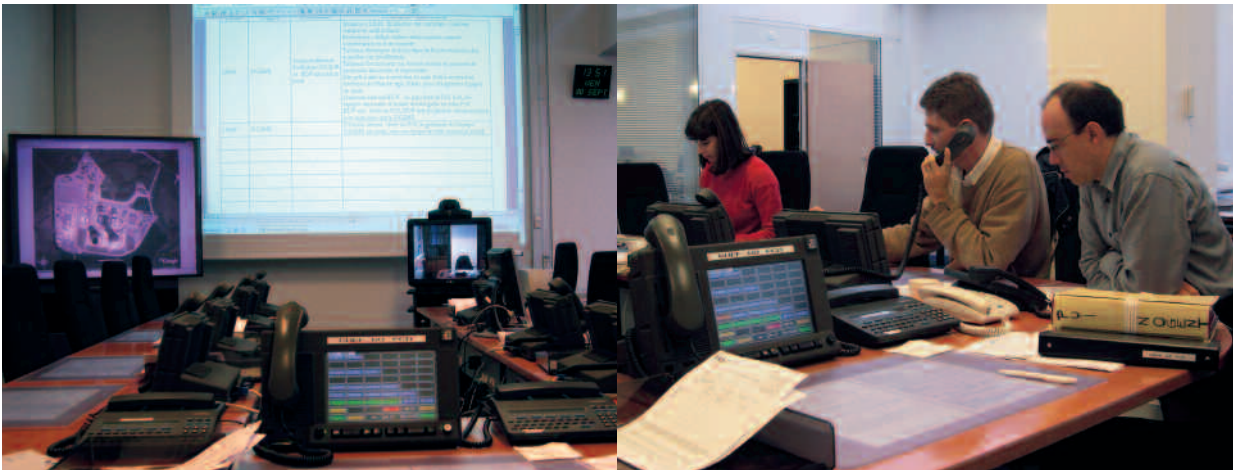
### ASN's emergency response centre

In order to be able to carry out these assignments, ASN has its own emergency response centre, equipped with communication and data processing facilities enabling:

- swift mobilisation of ASN staff;
- reliable exchange of information between the many partners concerned.

This emergency response centre was activated in a real situation for the first time on 12 May 1998 when an incident occurred in the Civaux plant, and on 28 and 29 December 1999 to deal with the incident in the Le Blayais nuclear power plant, following the severe storm of 27 December 1999. It was used again on 2 and 3 December 2003 during the violent storms in the Rhone valley, which caused the Cruas nuclear power plant to trigger its on-site emergency plan and alert ASN.

In 2005, the emergency response centre was activated on 30 September, when an incident occurred on one of the reactors in the Nogent-sur-Seine plant after water was sprayed onto the reactor's electrical control cubicles. In the night of 27 October 2005, it was again called into service after a pressure rise in the core cooling system of a reactor in the Le Blayais nuclear power plant. In 2006, the emergency response centre was only activated during nuclear emergency exercises.



ASN emergency centre for the incident that occurred at the Nogent-sur-Seine plant on 30 September 2005

As demonstrated by these events, ASN's alert system allows rapid mobilisation of ASN staff and the IRSN engineer on call. This automatic system sends out an alert signal to all staff carrying radio-pagers or mobile phones, as soon as the alert is triggered remotely by the licensee of the nuclear installation in which the alert originated. It also sends out the alert to the staff of the DDSC, the SGDN and Météo-France. This system is regularly tested during about ten exercises a year, as well as when actual emergencies occur.

In addition to the public telephone network, the emergency response centre is connected to several restricted access networks providing secure direct or dedicated lines to the main nuclear sites. ASN's PCD also has a video-conferencing system which is the preferred means of contact with IRSN's CTC. The PCD also makes use of IT equipment adapted to its assignments, in particular for information exchanges with the European Commission and the Member States.

Since 2005, the PCD has had access to the dose rate values permanently measured by IRSN's Téléray network of probes.

### 3 | 2 | 4

## Role of ASN in the preparation and monitoring of emergency plans

### a) On-site plan (PUI) approval and supervision of application

Since January 1990, and in the same way as the safety analysis report and the general operating rules, the PUI is among the safety documents which have to be submitted to ASN by the licensee at least six months before the installation of radioactive materials in a BNI. In this context, the PUI is assessed by IRSN and the relevant Advisory Committee of experts expresses its opinion on it.

ASN monitors correct application of the on-site emergency plans (PUI), in particular through inspections (see chapter 4).



On-site emergency plan exercise during an ASN inspection on the Tricastin site in February 2006



## b) Participation in off-site plan (PPI) preparation

Under application of the 13 September 2005 orders concerning the PPI and the ORSEC plan, the *préfet* is responsible for preparing and approving the PPI. He is assisted by ASN, which supplies the basic technical elements, as derived from IRSN's assessment, taking account of the most recent available data on serious accidents and dispersion of radioactive or chemical materials and ensuring consistency in this respect between the PPI and the PUI.

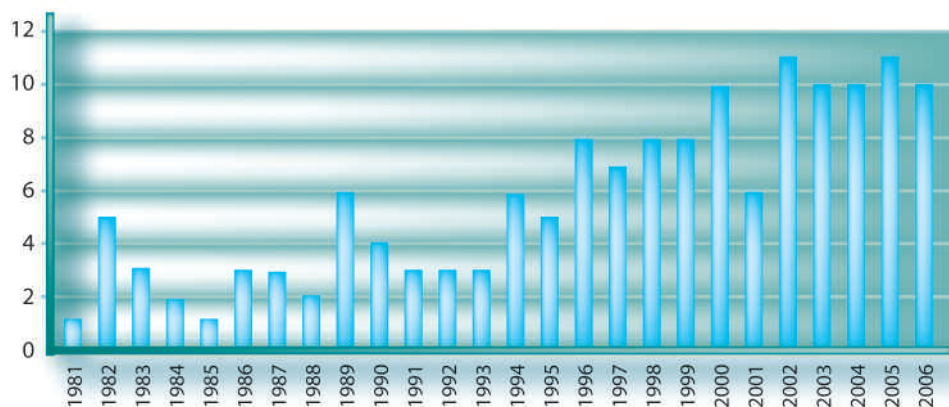
Definition of the response levels is based on the most recent international recommendations and, since 2003, has been stipulated in regulatory requirements.

## 3 | 3

### Accident simulation exercises

It is important not to wait for a significant accident to actually occur in France before testing the emergency response provisions described, under real conditions. Exercises are periodically organised as training for emergency teams and to test resources and organisational structures with a view to identifying any weak points. In addition to the exercises organised by the licensees to test their in-house organisation, a national emergency exercise held every three years on each site with a BNI would seem to be a fair compromise between staff training and the time needed to effect organisational changes. Since the 1980s, therefore, the number of national exercises has risen significantly, with 10 performed in 2006, as shown on the following graph:

Number of emergency exercises (1981-2006)



The number and scope of the national exercises are considered to be considerably greater than is the case abroad. They enable ASN staff and national stakeholders to accumulate a wealth of knowledge and experience in managing emergency situations. These exercises are also an opportunity to train field personnel, with about 300 staff being involved in each exercise.

Review meetings are organised in each emergency command post immediately after each exercise. Along with the other participants in the emergency exercise, ASN aims to identify the good and bad practices highlighted during the experience feedback meetings in order to improve the response organisation as a whole.

One major benefit of the emergency exercises has been to improve procedures and policies. For example, to avoid exposure of the personnel in charge of distributing iodine tablets during the release phase, the authorities decided on preventive distribution of iodine tablets within a 10 km radius around nuclear power plants. Furthermore, to take account of rapidly evolving accidents in which the authorities do not have time to react, the decision was taken to incorporate a reflex phase

in the PPIs asking the populations to take shelter by alerting them through a network of sirens or other means of telephone-based alert.

In 2006, the systematic use of decision-making audio-conferences led to greater consistency in the steps taken to protect workers and the population as decided on by the licensee and the public authorities.

### 3 | 3 | 1

## Exercise sessions involving ASN

### a) Nuclear alert tests and mobilisation exercises

ASN periodically carries out tests to check the correct functioning of the system for alerting its staff. The system is also used for the exercises described below and undergoes unannounced tests.

### b) National nuclear accident simulation exercises

As in previous years, ASN prepared a programme of national nuclear emergency exercises for 2006, announced by the *préfets* in a circular signed jointly by ASN, the DSND, DDSC and SGDN. This circular of 28 December 2005 in particular provides for two different types of exercises:

- exercises targeting “nuclear safety”, involving no actual population actions and mainly aimed at testing the decision process on the basis of a freely established technical scenario;
- exercises targeting “civil defence” involving actual and large-scale application of population protection measures as specified in the PPIs (alert, sheltering, evacuation), based on a scenario built around the role to be played by population.

During most of these exercises, simulated media pressure is placed on the main parties concerned, in order to test their ability to communicate. The previous table describes the key characteristics of the national exercises conducted in 2006.

#### National civil nuclear emergency exercises conducted in 2006

NUCLEAR SITE	DATE OF EXERCISE	EXERCISE TARGET	PARTICULAR CHARACTERISTICS
Cadarache	26 January 2006	Nuclear safety	Carried over from 2005
Civaux (EDF)	21 March 2006	Civil defence	Implementation of local safeguard plans
CEA Saclay	13 June 2006	Civil defence	Health aspect with several contamination victims
Chooz (EDF)	22 June 2006	Civil defence	Belgian and Canadian observers
Paluel (EDF)	19 September 2006	Civil defence	Zone sealed off with evacuation of EDF staff
Cruas (EDF)	5 October 2006	Nuclear safety	
Transport	16 October 2006	Civil defence	
Chinon (EDF)	9 November 2006	Civil defence	Major exercise involving the Minister for Industry and the ministerial offices
Bugey (EDF)	23 November 2006	Civil defence	Inter-département coordination tested between Ain and Isère
Cattenom (EDF)	7 December 2006	Civil defence	Alert of German and Luxembourg authorities

Apart from the national exercises, the *préfets* are asked to conduct local exercises with the sites concerning them, in order to improve preparations for an emergency situation and in particular test the time needed to mobilise all the parties concerned.

### c) International exercise sessions and cooperation

ASN maintains international relations to exchange good practices observed during exercises carried out abroad. In 2006, ASN therefore:

- took part in an INEX 3 type international exercise seminar, organised in Paris by the NEA, on the subject of post-accident management;
- received foreign delegations as observers of the exercises organised by France (Canadian, Belgian and observers during the IRRS (integrated regulatory review service) audit).

#### Visit by a Canadian delegation

In June 2006, ASN welcomed a 5-member Canadian delegation primarily from the Ministry for Health and Social Services and the Health and Social Services Agency of La Mauricie region and central Quebec. There were in particular able to observe a nuclear emergency exercise held at the Chooz nuclear power plant on 22 June 2006.

In the report submitted to the French authorities, they underlined:

- the importance of ASN's role in the first few hours of the emergency;
- the lack of opportunities for discussion within the PCDs;
- the importance of involving neighbouring countries in an exercise.

These remarks were duly taken into consideration and led to reorganisation of the decision-making audio-conferences for better exchanges within each command centre. ASN will also make sure that foreign countries are systematically involved in the exercises concerning nuclear power plants located close to the borders.

ASN took part in IAEA's work to implement an action plan by the competent authorities to improve international exchanges of information in the event of a radiological emergency. For this action plan, ASN is helping to define the strategy concerning international assistance requirements and resources and to set up the emergency assistance response network (ERNET). ASN is also working with NEA to define a strategy for carrying out international exercises.

Work is also in progress with respect to international assistance in the event of an accident or radiological emergency, which in particular includes creation of a data bank listing the technical and human resources available and defining a protocol for the exchange of information with foreign safety authorities.

## 3 | 3 | 2

### Lessons learned from the exercise sessions

The emergency exercise scenarios generally involve a simulated release of radioactivity outside the installation in which the accident occurs. This enables the entire national emergency response organisation, particularly the local emergency response services, to practice dealing with the risks and consequences of radioactive contamination of the population, their homes, the food chain and the environment. The first protective steps taken are generally based on highly conservative estimates and calculations. However, in the longer term, radioactivity measurements from around the installation are vital in being able to define the authorities' response to the events.

Experience feedback from the exercises shows that the measurement results were only reaching the experts and decision-makers after a lengthy delay. In the light of these findings, the national stakeholders worked to improve the response organisation and procedures. This led to drafting of the above-mentioned government directive of 29 November 2005. This directive now needs to be implemented in the emergency plans, if local measurement programmes are to be tailored to the individual installations.

Every three years, each nuclear installation is required to take part in a national emergency exercise, involving the entire national emergency response organisation. The various *préfectures* involved in these exercises have been seen to be constantly progressing. To ensure that this constant improvement continues, the exercise scenarios are made increasingly complex and include increasing numbers of parameters and players. The exercises are also a means of improving existing procedures:

- the scenarios increasingly frequently include a health component, involving treatment of the injured (sometimes contaminated), who have to be given care and be evacuated in a potentially or actually hazardous environment;
- the various emergency command post procedures now include joint audio-conferences when necessary, in order to improve the understanding of sometimes complex situations.

Experience feedback from these emergency exercises also brings to light those actions or procedures which need to be improved. All the stakeholders take these points on board and actively look for solutions. In this respect, ASN calls all participants together twice a year to review good practices, but also to identify areas for improvement.

### 3 | 4

## Nuclear emergency management

As in any other nuclear safety field, emergency response structures have to develop on the basis of experience. The main sources of experience in France are the exercises and exchanges with other countries, as well as any significant events in France or abroad (Tokai-Mura accident on 30 September 1999).

### 3 | 4 | 1

## Population protection measures

In the event of a nuclear accident, a distinction must be made between the threat phase, the emergency phase and the post-accident phase. The population protection measures in particular take account of the scale and speed of development of the event.

- threat phase: period linked to an event preceding any emission of radioactive material, during which preventive measures can be taken;
- emergency phase: phase characterised by an emission, during which steps are urgently taken to mitigate the consequences of an event;
- post-accident phase: phase dealing with the consequences of the event.

The population protection actions that can be taken during the emergency phase are described in the emergency plan, which for a BNI is the off-site emergency plan. The steps taken are designed to protect the population and prevent hazards attributable to exposure to ionising radiation and to any toxic chemical substances present in the releases.

In the event of a serious accident, a number of preventive measures can be envisaged by the *préfet* in order to protect the population:

- sheltering and listening: the persons concerned, alerted by a siren, take shelter in a solidly constructed building, with all openings carefully closed, and wait for instructions from the *préfet*,



Extract from the public information sheet published by ASN

- *administration* of stable iodine tablets: when ordered by the *préfet*, the persons liable to be affected by the releases take the prescribed dose of potassium iodide tablets;
- *evacuation*: in the event of an imminent threat of large-scale radioactive releases, the *préfet* may order evacuation. The population is then asked to prepare a bag, secure the home, leave it and go to the nearest muster point.

Furthermore, in order to minimise contamination by ingestion, a ban on the consumption of contaminated foodstuffs may be ordered as a precaution during the emergency phase. Maximum allowable levels have been set for this purpose on foodstuffs. The *préfet* must ensure regular information of the population as the situation develops and concerning its consequences. He may remind people that they must not pick vegetables from their gardens or farms for consumption during the sheltering period.

### 3 | 4 | 2

## Iodine tablets

The third preventive distribution campaign took place on all nuclear power plant sites in 2005 and 2006 (circulars of 8 February 2005 and 11 August 2005 concerning preventive distribution of stable iodine tablets). During the course of this campaign, ASN sent out a folder to about 500,000 homes, presenting nuclear safety and radiation protection supervision.

The government also asked the *préfets* to make plans for stockpiling in each *département* in order to cover the entire country. A circular dated 23 December 2002 provides the *préfets* with a guide for drawing up stable iodine tablet stock management plans. These plans are currently being drawn up by the *préfectures*.

Finally, on the basis of work already started, ASN was authorised by the Minister for Health and Solidarity to draft a new iodine policy, which in particular consists in targeting the stable iodine tablets strategy on the most exposed populations, especially the under-eighteens and by extension pregnant women, in accordance with the recommendations issued by the French High Public Health Council (CSHPF) on 7 October 1998 and 7 December 2004. The aim is to produce a new iodine policy which will also incorporate the results of the harmonisation work conducted in parallel with neighbouring countries during the course of June 2007.

**Results of the iodine pre-distribution campaign in 2006**

The purpose of the campaign was to achieve a high level of coverage and enable anyone moving into the PPI zone during the 5-year tablet validity period to be able to find a local distribution point easily.

The method adopted consisted in launching an initial phase involving distribution of boxes of tablets around the nuclear power plants operated by EDF. This was based on a system of personal, nominative letters sent out on official headed notepaper, signed by the DDSC, ASN and the French Order of Pharmacists. A nominative exchange voucher was enclosed with the letter, for presentation at one of the pharmacies listed on the back of the letter. A total of 377,444 letters was sent and a specific support programme was organised locally (information of pharmacists, communication with local stakeholders and local population). After this initial phase, the average distribution rate was estimated at about 54%.

During a second phase, to improve the coverage in the PPI zones concerned, additional distribution took place, with direct mailing of boxes of tablets to the homes which did not come to collect theirs. In the end, 408,993 boxes were distributed in either the first or second phases.

This method was a way of better controlling distribution because those who actually received boxes were precisely identified. In this way, the final coverage was close to 100%. It also enabled a strong partnership to be forged with the pharmacists, providing identical, clearly identified points of contact in all areas, for the tablet 5-year validity period. To guarantee this service on a long-term basis, a stock of boxes will be available in each pharmacy in the area via the pharmaceutical distribution channel.

**3 | 4 | 3**

**Post-accident management**

The post-accident phase concerns how to deal with the consequences of the event, which are of widely differing natures (economic, health, social) and which have to be resolved in the short, medium and indeed long term if a situation felt to be acceptable is to be restored. Pursuant to the government directive of 7 April 2005, ASN, in association with the ministerial departments concerned, is responsible for “establishing the framework, for defining, preparing and implementing the steps necessary to deal with the post-accident situation”.

In order to draft a post-accident policy, ASN first of all focused on developing the post-accident aspect when carrying out national and international exercises (such as INEX3) and initiating a more general debate by bringing together all the stakeholders in a steering committee (CODIR-PA) in charge of the post-accident aspect. ASN set itself a time-frame of 2 years for reaching agreement on a post-accident phase policy. The 9 November 2006 exercise around the Chinon nuclear power plant was an opportunity to examine the lifting of sheltering measures and the decontamination of buildings.

**4 OUTLOOK**

2005 and 2006 saw extensive work done to update the legislation and regulatory texts concerning the organisation required in the event of a radiological emergency. Law 2006-686 of 13 June 2006 on Transparency and Security in the Nuclear Field, confirmed ASN's duties in an emergency. During 2006, ASN strove to harmonise its practices, improve information, regulate and progress in the management of emergency situations. A number of situations, which could be qualified as radiological

emergencies, also required action on the part of ASN this year (rumoured atmospheric pollution, radiotherapy accident, gamma radiography accident, etc.).

In 2007, in the light of these events, ASN intends to make its mark as an independent authority, by looking at how to organise itself to ensure the success of its own roles and confirm its position as a key player in the national emergency organisation, through the experience it has acquired in identifying risks and managing emergency exercises. Together with the Ministry for the Interior, it will look at the various components of civil defence as applied to the nuclear field, taking account of the international context: risk prevention, population information and alert, protection of individuals, property and the environment. It will focus on preparing, implementing and evaluating measures and means.

ASN considers that it is important to maintain and pursue international relations with countries along France's borders, in order to improve exchanges liable to lead to harmonisation of the population protection provisions. In 2006, these exchanges in particular enabled cross-border harmonisation work to begin on drafting a common policy for iodine and defining an information exchange protocol between the safety authorities and the technical support organisations, in particular detailing the participants and the type and nature of the information exchanged in an emergency. ASN hopes to finalise this work in 2007. In order to make it easier to respond to any requests for assistance from foreign countries, ASN will be starting work on creating a database of national nuclear accident or radiological emergency assistance skills.

Following on from the work begun in 2006, ASN aims to finalise an order on risk management by the licensees. This order will clarify the objectives of the on-site emergency plan, taking account of acquired experience, and will transcribe into French law the reference levels recommended by the WENRA association. ASN considers that this regulatory work will further improve internal management of emergencies by the licensees.

ASN was contacted by the Minister for Health to ensure that the policy for protection of the population against iodine releases will be updated by June 2007 and it will continue the work carried out both nationally and with the neighbouring countries into harmonisation of practices. It then envisages preparing an information campaign for local players and populations on what to do in the event of a nuclear or radiological accident.

ASN also hopes to improve the information and training of those involved in dealing with emergency situations. ASN has therefore produced a collection of primary response sheets entitled "Medical response to a nuclear or radiological event", intended for the medical professions. This guide is a teaching aid for the national training programme aimed at medical emergency professionals. In 2006, together with the Assistance publique - Hôpitaux de Paris, ASN organised a theoretical and practical training module and sent out teaching tools to nuclear physicians in the relevant departments in order to ensure dissemination of the information as widely as possible to the response personnel. In 2007, ASN will provide information on the protective measures they must take.

2006 was devoted to intense work by the post-accident steering committee set up by ASN in 2005. The purpose of this committee is to ensure that the initial policy elements on the subject are available in 2007. Up until now, the public authorities had focused their efforts on preparing for the emergency phase, so it is important to specify the provisions designed to resolve complex problems such as management of the health of the population, the economic consequences and rehabilitation of contaminated zones. ASN intends to organise a seminar at the end of 2007 to present and discuss the work of the committee.

In collaboration with the administrations and public institutions concerned, ASN drafted the circular of 11 January 2007 regarding exercises in 2007, ensuring that precise and factual goals can be defined sufficiently early. Defining these goals, which take account of experience feedback, should allow better preparation of the specifications and a better appreciation of how well the exercise was performed. In an emergency situation, the population must be rapidly informed of the protective measures to be taken. These measures must be simple, comprehensible and quick. During the experience

feedback meetings after each exercise, ASN therefore focuses on identifying the actions or procedures that need to be improved. Finally, ASN intends to organise in 2007 an exercise to test the implementation of an emergency response organisation appropriate to radiological emergency situations that could arise outside nuclear installations.









