# RADIOLOGICAL EMERGENCIES



CHAPTER 5

The Fukushima Daiichi nuclear power plant (NPP) disaster confirms that in spite of the precautions taken in the design, construction and operation of nuclear facilities, the possibility of an accident can never be ruled out. To cope with such an accident, however unlikely, it is necessary to provide for and regularly test specific material and organisational measures to manage emergency situations as effectively as possible.

Two types of emergency situations can occur on basic nuclear installations (BNIs):
– emergency situations, arising from an incident or accident which risk leading to an emission of radioactive materials or a level of radioactivity, liable to affect public health[1] and which include:
  • emergency situations occurring on a BNI, also called nuclear emergencies;
  • accidents involving radioactive material transports (RMT);
  • emergency situations occurring in the field of small-scale nuclear activities;
– non-radiological emergency situations (fire, explosion, release of toxic substances).

The emergency requirements comprise specific organisational measures and emergency plans involving both the licensee and the public authorities. These arrangements, which are regularly tested and assessed, are also subject to regular revision to integrate experience feedback from exercises and from the management of real-life situations.

# 1 ANTICIPATING

## 1|1 Looking ahead and planning

### 1|1|1 The emergency plans for basic nuclear installations (BNIs)

The emergency plans relative to accidents occurring at a BNI define the measures necessary to protect the site personnel, the general public and the environment, and to control the accident.

The on-site emergency plan (PUI), prepared by the licensee, is designed to restore the plant to a safe condition and mitigate the consequences of an accident. It defines the organisational actions and the resources to be implemented on the site. It also comprises arrangements for informing the public authorities rapidly.

The off-site emergency plan (PPI) is established by the *Préfet*[2] in application of decree 2005-1158 of 13th September 2005, "to protect the populations, property and the environment, and to cope with the specific risks associated with the existence of structures and facilities whose coverage area is localised and fixed. They implement the orientations of the policy of emergency preparedness and civil protection in terms of mobilisation of resources, information, alert, exercises and training". This decree also precises the characteristics of the facilities or structures for which the *Préfet* is required to define a PPI.

The PPI specifies the initial actions to be taken to protect the general public, the roles of the various services concerned, the systems for giving the alert, and the human and material resources likely to be engaged in order to protect the general public.

The PPI falls within the framework of the ORSEC plan (Disaster and Emergency Response Organisation) that specifies the protective measures implemented in large-scale emergencies. Consequently, beyond the perimeter established by the PPI, the modular and progressive *departemental* or zonal ORSEC plan applies in full.

More broadly, the interministerial directive of 7th April 2005 on the public authorities response in an event leading to a radiological emergency situation sets the framework for the response by the public authorities and the actions they must take if an event could result in a radiological emergency situation leading to activation of the ORSEC or PPI-ORSEC plan, or one of the "PIRATE[3]" plans.

### 1|1|2 The ORSEC-TMR plan

The ORSEC-TMR plan is a specific plan of the ORSEC system designed to deal with an RMT accident.

Faced with the diversity of possible types of transport operation, the ORSEC-TMR plans define the criteria and simple measures enabling the first responders (SDIS - *Départemental* Fire and Emergency Response Department - and services in charge of public security in particular) to initiate the first "reflex" response actions to protect the general public, based on their findings on the site of the accident.

### 1|1|3 Responding to any other radiological emergency situation

Apart from incidents affecting nuclear installations or RMT, radiological emergency situations can also occur:

1. Article R.1333-76 of the Public Health Code.
2. In a *départements*, representative of the State appointed by the President.
3. Plans which are part of a larger system of vigilance, prevention, protection and counter-terrorism.

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

In such cases, intervention is necessary to put an end to any risk of human exposure to ionising radiation.

ASN together with the ministries and stakeholders concerned, drafted government circular DGSNR/DHOS/DDSC 2005/1390 of 23rd December 2005. This supplements the provisions of the directive of 7th April 2005 and defines the organisation of the State services for radiological emergency situations not covered by an ORSEC, PPI-ORSEC or PIRATE-CBRN plan.

ASN is tasked with controlling the actions decided on by the head of the establishment or the owner of the site, with advising the competent police authority with respect to the steps to be taken to prevent or mitigate the effects of ionising radiation on the health of individuals, and with taking part in disseminating information. In the same way as in a normal situation, ASN can call on the expertise of the Institute for Radiation Protection and Nuclear Safety (IRSN) when taking these steps.

Faced with the many possible originators of an alert and the associated alert-raising channels, it was deemed necessary to designate a one-stop shop to centralise all the alerts and then forward them to the other stakeholders. This one-stop shop is the *Départemental* Fire and Emergency Response Operational Centre – Alert Processing Centre (CODIS-CTA) which can be reached by dialling 18 or 112.

## 1|1|4 Role of ASN in the preparation and follow-up of emergency plans

### *The on-site emergency plan (PUI)*

Pursuant to decree 2007-1557 of 2nd November 2007, a BNI licensee is required to send ASN a file containing the PUI before commissioning the installation.

The PUI must specify the organisational measures, response methods and necessary resources the licensee implements in the event of an emergency situation in order to protect its personnel, the public and the environment and to preserve or restore the safety of the installation.

During the course of 2011, ASN helped draft the texts of the regulations in order to clarify new requirements, in particular concerning the management of an emergency situation.

### *Participation in drafting the off-site emergency plans*

Pursuant to the 13 September 2005 orders concerning the PPI and the ORSEC plan, the *Préfet* is responsible for preparing and approving the PPI. ASN assists the *Préfet* by analysing the technical data to be provided by the licensees, with the help of its technical support organisation, IRSN, in order to determine the nature and scope of the consequences of an accident.

ASN and IRSN carry out this analysis taking account of the knowledge acquired from severe accidents and radioactive material dispersion phenomena.

### *Population protective actions*

The off-site emergency plans identify the general public protective actions such as to limit the consequences of any accident. The *Préfet* decides whether or not to deploy these measures on the basis of intervention levels according to the predicted dose that would be received by a person situated in the open air at the time of the accident.

The intervention levels are defined on the basis of the most recent international recommendations and, since 2003, have been included in regulatory requirements. The intervention levels are thus defined by ASN decision 2009-DC-0153 of 18th August 2009, which modified the intervention level with regard to the administration of stable iodine. The intervention levels associated with the implementation of population protective measures in a radiological emergency situation, mentioned in article R. 1333-80 of the public health Code, are therefore as follows:
– an effective dose of 10 mSv for sheltering;
– an effective dose of 50 mSv for evacuation;
– an equivalent dose to the thyroid of 50 mSv for the administration of stable iodine.

The PPI perimeter must protect the general public in the first hours following the accident, without ruling out any subsequent actions to be taken. As the accident situation develops, and depending on the weather conditions on the day of the accident, the disaster and emergency services may implement general public protective actions beyond the PPI perimeter, as required by the ORSEC plan.

For example, the off-site emergency plans defined for the vicinity of a PWR reactor recommends sheltering of the population and the absorption of stable iodine tablets within a 10-kilometre radius, plus evacuation of the population within a 5-kilometre radius.

As of 2012, additions to the PPIs are envisaged, in order to take account of the new post-accident management doctrine (see point 1|5).

## 1|2 Controlling urban development around nuclear sites

Four main principles underpin the protection of the general public against technological risks:
– reducing risks at source;
– implementing off-site emergency plans;
– controlling urban development;
– informing the general public.

The aim of controlling urban development is to limit the consequences of a severe accident for the population and property. Since 1987, this type of approach has been implemented around non-nuclear industrial facilities and it has been reinforced since the AZF utility accident that occurred in Toulouse (South of France) in 2001. The TSN Act (now codified in books I and V of the Environment Code by ordinance no.2012-6 of 5th January 2012) now enables the public authorities to control urban development around BNIs, by issuing public protection restrictions limiting or prohibiting any further construction in the vicinity of these facilities.

The urban development control actions entail a division of responsibilities between the licensee, the mayors and the State:
– the licensee is responsible for its activities and the related risks;
– the mayor is responsible for producing the town planning documents and issuing building permits;
– the *Préfet* informs the mayors of the risks that exist and ensures the legality of the acts of the municipalities;
– ASN supplies the technical data in its possession, in order to characterise the risk, and offers the *Préfet* its assistance in the urban development control process.

In recent years, urban development pressure in the vicinity of nuclear sites has increased. It is therefore important to incorporate the control of urban development into the management of the nuclear risk. ASN's current doctrine for controlling activities around nuclear facilities only concerns those facilities requiring a PPI and primarily aims to avoid compromising the feasibility of the protective measures mentioned in the PPI with regard to sheltering and evacuation. It focuses on the "reflex" zones of the PPIs, established in accordance with the circular of 10th March 2000 and in which automatic measures to protect the general public are taken in the event of a rapidly developing accident. Since 2006, ASN has asked to be consulted with regard to building permit applications made in the immediate vicinity of nuclear installations. ASN has so far issued about 15% of reserved or unfavourable opinions on some 300 projects submitted.

A circular from the Ministry of the Environment dated 17th February 2010 has asked the *Préfets* to exercise greater vigilance over urban development near nuclear installations. This circular states that the greatest possible attention must be paid to projects that are sensitive owing to their size, their purpose, or the difficulties they could entail in terms of protection of the general public in the so-called "reflex" zone. This circular tasks ASN and the DGPR (General Directorate for Risk Prevention) with leading a pluralistic working group to determine the ways and means of controlling activities around nuclear installations.

In the years 2010 and 2011, the DGPR and ASN thus chaired a debate with the administrations, elected officials, the National Association of Local Information Commissions and Committees (ANCCLI) and the licensees concerned. These discussions led to the drafting of a guide for controlling activities around BNIs, which presents the general principles applicable to controlling urban development, the main ones being as follows:

Aerial view of the Golfech NPP and its environs

– preserve the operability of the off-site emergency plans;
– favour urban development outside the zone in which the risk could rapidly develop;
– allow controlled development that meets the needs of the resident population.

This guide was extensively opened to public consultation on the Ministry of the Environment and ASN websites, between 17th October and 17th December 2011. The purpose of this guide is to offer a uniform national framework to promote the consideration of risk at the local level.

## 1|3 Organising a collective response

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

Act 2004-811 of 13th August 2004 on the modernisation of civil security, makes provision for an updated inventory of risks, an overhaul of operational planning, performance of exercises involving the general public, information and training of the general public, an operational watching brief and alert procedures. A number of decrees implementing this act were passed during the course of 2005 and include:
– decree 2005-1158 of 13th September 2005 concerning off-site emergency plans (PPI);
– decree 2005-1157 of 13th September 2005 concerning the ORSEC plan;
– decree 2005-1156 of 13th September 2005 concerning the local safeguard plan.

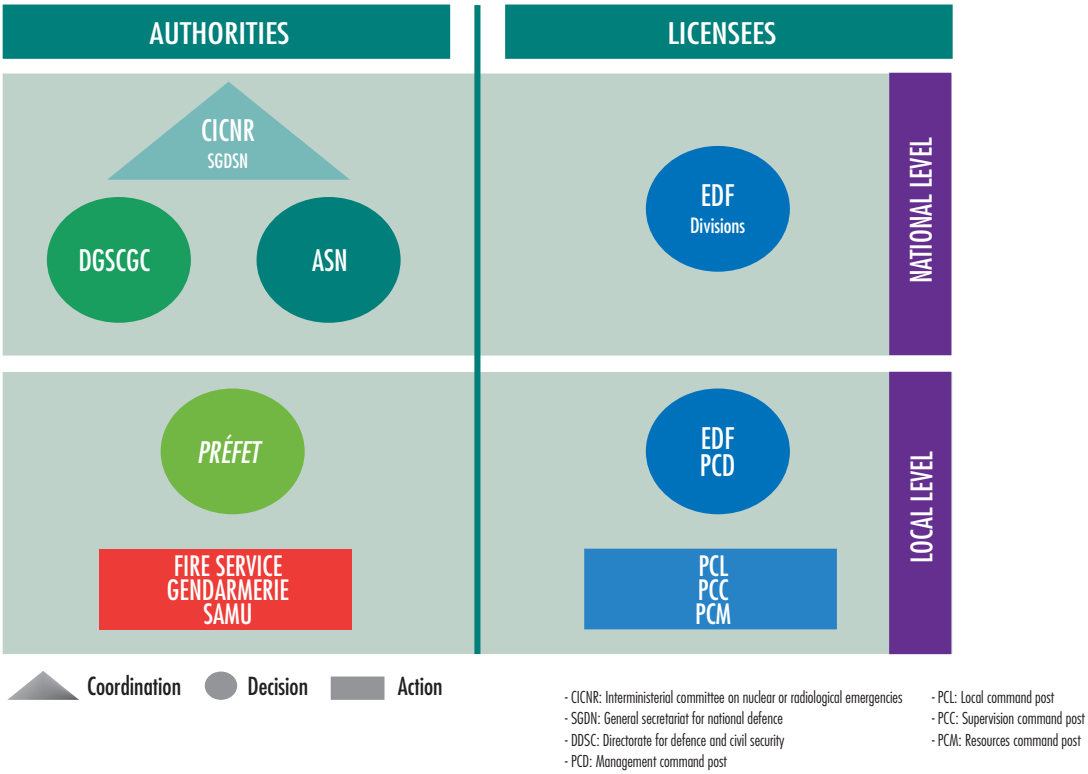
The radiological emergency field is clarified in the government directive of 7th April 2005. The response organisation of the public authorities and that of the licensee are presented in diagram 1.

ASN is participating in all the ongoing national and international work related to the public authorities' response, following the Fukushima Daiichi nuclear accident. At the national level, ASN is thus taking part in the ministerial work on experience feedback with regard to management of a nuclear emergency. At the international level, ASN is taking part in the experience feedback work being done by international bodies such as the International Atomic Energy Agency (IAEA), the Nuclear Energy Agency (NEA), and within authority networks such as HERCA (Heads of the European Radiological Protection Competent Authorities Association).

### 1|3|1 Local response organisation

In an emergency situation, several parties have the authority to take decisions:
– the licensee of the affected nuclear installation, which implements the organisational provisions and the means needed to bring the accident under control, to assess and mitigate its consequences, to protect persons on the site and to alert and regularly inform the authorities. This arrangement is defined beforehand in the licensee's PUI;
– ASN has authority over and controls the actions of the licensee. In an emergency situation, aided by the IRSN's

Diagram 1: emergency organisation in an accident situation affecting a nuclear reactor operated by EDF




assessments, it can at any time ask the licensee to perform assessments and take the necessary actions;
– the *Préfet* of the *département* (Administrative region headed by a *Préfet*) in which the installation is located, who takes the necessary decisions to protect the population, the environment and the property threatened by the accident. He takes action according to the PPI and the ORSEC plans. Hence, he is responsible for ensuring coordination of all the resources engaged by the PPI, whether both public and private, material and human He keeps the population and the mayors informed of events. Through its regional office, ASN assists the *Préfet* in drafting the plans and managing the situation;
– owing to his or her role in the local community, the mayor has an important part to play in anticipating and supporting the protective measures. To this end, the mayor of a town included within the scope of application of an off-site emergency plan must draw up and implement a local safeguard plan to provide for, organise and structure the actions to accompany the *Préfet's* decisions. The mayor also plays a role in passing on information and heightening population awareness during iodine tablet distribution campaigns (see chapter 6).

## 1|3|2 National response organisation

The relevant ministries and the ASN jointly advise the *Préfet* with regard to the protective measures to be taken. They provide the information and advice necessary for the *Préfet* to assess the state of the facility, the seriousness of the incident or accident, its possible developments, and the measures required to protect the general public and the environment.

The main bodies concerned are as follows:
– Ministry of the Interior: the General Directorate for Civil Security and Crisis Management (DGSCGC) houses the Government Emergency Management Operational Centre (COGIC) and the Nuclear Risk Management Support Team (MARN). It provides the *Préfet* with material and human resources for the protection of individuals and property;
– Ministry of Health: responsible for human health protection against the effects of ionising radiation;
– Ministry of the Environment: the Nuclear Safety and Radiation Protection Mission (MSNR) takes part in the State's nuclear safety and radiation protection responsibilities, jointly with the other competent administrations, especially the civil protection services;
– Ministry of Defence: the Defence Nuclear Safety Authority (ASND) is the Competent Authority for regulating the safety of secret basic nuclear installations (INBS), military nuclear systems and defence-related transport operations. A protocol was signed by ASN and the ASND on 26th October 2009 to ensure coordination between these two entities in the event of an accident affecting an activity under the supervision of the ASND, to facilitate the transition from the emergency phase managed by the ASND to the post-accident phase for which ASN is competent;
– General Secretariat for Defence and National Security

(SGDSN:) the SGDSN is tasked with ensuring interministerial consistency of the actions planned in the event of an accident and in scheduling and evaluating exercises. It is in charge of the secretariat for the French Interministerial Committee for Nuclear or Radiological Emergencies (CICNR). The CICNR is 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;
– ASN is involved in the management of radiological emergency situations. It verifies the steps taken by the licensee, assists the Government with all questions within the scope of its competence and informs the general public about the safety of the facility in which the emergency situation originated. ASN's responsibilities in an emergency situation are detailed in point 2 | 1 | 1.

## 1 | 4 Protecting the public

### 1 | 4 | 1 General protective actions

The general public protection actions that can be taken during the emergency phase are described in the PPI. The steps taken are designed to protect the general public and prevent affections attributable to exposure to ionising radiation and to any chemical and toxic 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 general public:
– sheltering and listening: the individuals concerned, alerted by a siren, take shelter at home or in a building, with all openings carefully closed, and wait for instructions from the *Préfet* broadcast by radio;
– administration of stable iodine tablets: when ordered by the *Préfet*, the individuals liable to be exposed to releases of radioactive iodine are urged to take the prescribed dose of potassium iodide tablets;
– evacuation: in the event of an imminent risk of large-scale radioactive releases, the *Préfet* may order evacuation. The populations concerned are asked to prepare a bag of essential personal effects, secure and leave their homes and go to the nearest assembly point.

In the event of effective release of radioactive substances into the environment, the first steps to be decided on for preparation of post-accident phase management for example include the definition of the area zoning to be implemented at the end of the emergency phase. This should comprise:
– a public protection zone (ZPP) within which contamination reduction actions will be rapidly undertaken;
– a tightened surveillance zone (ZSR) within which the consumption and sale of foodstuffs produced will be prohibited, based on the maximum permissible radioactivity levels set by the European Commission;
– if necessary, a population clearing zone (ZEP) within the ZPP if external exposure levels due to deposition so justify.

The *Préfet* ensures that the population is regularly informed of developments in the situation and its consequences.

### 1 | 4 | 2 Iodine tablets

The circular of 27th May 2009 defines the principles governing the responsibilities of a BNI licensee and of the State with regard to the distribution of iodine tablets. The licensee has prime responsibility for the safety of its facilities. The licensee is involved in the measures to protect the members of the public living within the perimeter of the PPI, finances public information campaigns and ensures permanent, free, preventive distribution of stable iodine tablets via the network of pharmacies.

In 2009, in collaboration with other government departments and EDF, ASN coordinated the 4th campaign of iodine tablet distribution to the population located in the vicinity of NPPs, within the zone covered by the off-site emergency plan (PPI). Distribution was organised in three phases: people were first invited to collect their stable iodine tablets from the pharmacy, then boxes of tablets were posted to those households that had not collected them, and lastly the tablets were made permanently available in the pharmacies.

At the end of the first phase of distribution, nearly 50% of the persons concerned nationwide had collected their boxes of tablets from the pharmacy. This low figure underlines a lack of "risk culture" and shows the pressing need for better information and communication (see chapter 6). In early 2010, the boxes were therefore sent by mail to those persons who had not collected them from a pharmacy. After this second phase, the overall coverage of the populations residing near the NPPs was approximately 93%.

The government circular of 27th May 2009 provides for a third phase in which blank withdrawal slips are provided in pharmacies. This system means that stable iodine tablets are available for distribution at all times and free of charge to persons newly arrived in the area, whether as permanent or temporary residents, or in the event of loss or omission.

For the rest of the country outside the zones covered by PPIs, stocks of tablets are held in each *département*. In this respect, the ministries responsible for public health and civil protection drafted a circular dated 11th July 2011, which defines the new procedures for stockpiling potassium iodide tablets and the conditions regarding their distribution to the population outside the zones covered by the PPI. The stocks of iodine tablets are thus created, positioned and managed by the Health emergency preparation and response organisation (EPRUS) and in his own *département*, each *Préfet* organises the distribution of tablets to the population, in particular via the mayors. The Ministry of Health has undertaken to create a new stockpile of 110 million 65 mg tablets, which will be sent to the various zonal platforms managed by the EPRUS.

### 1 | 4 | 3 Care and treatment of contaminated persons

In the event of a nuclear or radiological accident, a significant number of people could be contaminated by radionuclides. This contamination could pose problems for care and treatment by the emergency response teams.

Circular 800/SGDN/PSE/PPS of 18th February 2011 specifies the national doctrine concerning the use of emergency and care resources in the event of a terrorist act involving radioactive

materials. These provisions, which also apply to an accident, aim to implement a unified nationwide methodology for the use of resources, in order to optimise efficiency. They will have to be adapted to the situations encountered by the director of emergency operations (the *Préfet*) and by the commander of emergency operations.

The "Medical intervention following a nuclear or radiological event" guide, coordinated by ASN and published in 2008, accompanies circular DHOS/HFD/DGSNR no.2002/277 of 2nd May 2002 concerning the organisation of medical care in the event of a nuclear or radiological accident, giving all information of use to the medical response teams in charge of collecting and transporting the injured, as well as to the hospital staff admitting them to health care establishments.

**Radioactivity protective measures during an emergency exercise on the Chinon NPP – June 2011**

## 1|5 Understanding the long-term consequences

The post-accident phase deals with the consequences of the event. It covers the handling of varied consequences (economic, health, social), that should be considered in the short, medium or even long term, with a view to returning to an acceptable situation. Pursuant to the interministerial directive of 7th 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".

To produce a doctrine and after testing post-accident management during national and international exercises, ASN convened all the stakeholders around a steering committee responsible for post-accident aspects, the CODIRPA (Steering committee for managing the post-accident phase of a nuclear accident or radiological emergency situation). This committee comprises ASN, as coordinator, and representatives of the various ministerial departments concerned by the subject, health agencies, associations, as well as Local Information Committees (CLIs) and IRSN representatives.

The CODIRPA has addressed a large number of subjects, such as the lifting of population sheltering orders and the return of evacuated populations, the strategy for measuring environmental radioactivity, contamination reduction, waste management, restrictions on the consumption and export of foodstuffs, water, population health monitoring, persons intervening in situations of lasting exposure and compensation. It has also addressed cross-disciplinary subjects such as the organisation of the public authorities, governance and public information, and examined - where applicable - regulatory questions specific to them. Reports on all these subjects have been drawn up jointly with the stakeholders and published on the ASN website.

CODIRPA set up a new organisation in 2009, creating two commissions, one to study the transition phase and one to study the longer-term picture.

The first CODIRPA commission has prepared a guide on the management plans for exiting the emergency phase. This operational guide provides the local authorities with useful elements for preparing their local plan for exiting the emergency phase (action to be taken during the first week). A first draft of this guide has been trialled in a number of pilot *départements* which are home to an NPP, but also in a number of communes[4] involved in preparing the radiological part of the local safeguard plan. This commission has also prepared guidelines for management of the transition phase (which can range from a few weeks to a few months after the accident).

The second commission has prepared guidelines for the management of the transition phase and the long-term phase, integrating the international work carried out in Belarus (CORE[5], COREX[6]) after the Chernobyl accident.

In 2010 and 2011, the first elements of the post-accident doctrine were tested during national nuclear or radiological emergency exercises. For example, the exercise held on 18th October 2011 in the Cruas NPP, was able to test some of the post-accident measures contained in the guide for exiting the emergency phase.

Post-nuclear accident management doctrine which, in a single document, combines the specific recommendations for exiting the emergency phase and guidelines for the transition and long-term phases, should be approved by the CODIRPA in early 2012. This doctrine should be incorporated into the PPIs as of 2012.

ASN will also be continuing the work started on the post-accident phase, to take account of experience feedback from the Fukushima Daiichi NPP accident.

4. Smallest administrative subdivision administered by a mayor and a municipal council
5. Cooperation for rehabilitation of living conditions in the contaminated Belarus territories.
6. Follow-up to the CORE programme; analysis of experience feedback from actions taken in Belarus by the French teams.

TO BE NOTED IN 2011

CODIRPA seminar – May 2011

### CODIRPA seminar on 5th and 6th May 2011

*On 5th and 6th May 2011, the post-nuclear accident seminar organised by ASN was attended in the premises of the French National Assembly by 300 national emergency bodies and experts from 20 foreign countries. It was preceded by a public presentation before the Parliamentary mission chaired by the OPECST (Parliamentary Office for the Evaluation of Scientific and Technological Choices).*

*The seminar was an opportunity to review progress in French doctrine, for which the first baseline requirements should be published in 2012:*
*1. the guide for exiting the emergency phase ;*
*2. guidelines for the transition and long-term phases.*

*To conclude, the ASN Chairman called for initiatives from the European Commission and HERCA, the association of Heads of European radiological protection competent Authorities, for improved European coordination and harmonisation of post-accident zoning, exports from a "European country in which an accident has occurred", sharing of radioactivity measurements and compensation.*

## 2 RESPONDING TO AN EMERGENCY SITUATION

### 2|1 Assisting the Government

#### 2|1|1 ASN's duties in emergency situations

In an emergency situation, the responsibilities of ASN, with the support of IRSN, are as follows:

1) to ensure that judicious provisions are made by the licensee;
2) to advise the Government;
3) to contribute to the dissemination of information;
4) to act as Competent Authority within the framework of the international Conventions on early notification and assistance.

*Overseeing of actions taken by the licensee*

As in a normal situation, ASN exercises its roles as the authority controlling the licensee of an accident-stricken facility. In this particular context, ASN ensures that the licensee exercises in full its responsibility for keeping the accident under control, mitigating the consequences, and rapidly and regularly informing the authorities. On the basis of IRSN's assessments, ASN can at any time ask the licensee to perform assessments and take the necessary actions, without substituting itself for the licensee in the technical operations carried out to cope with the accident.

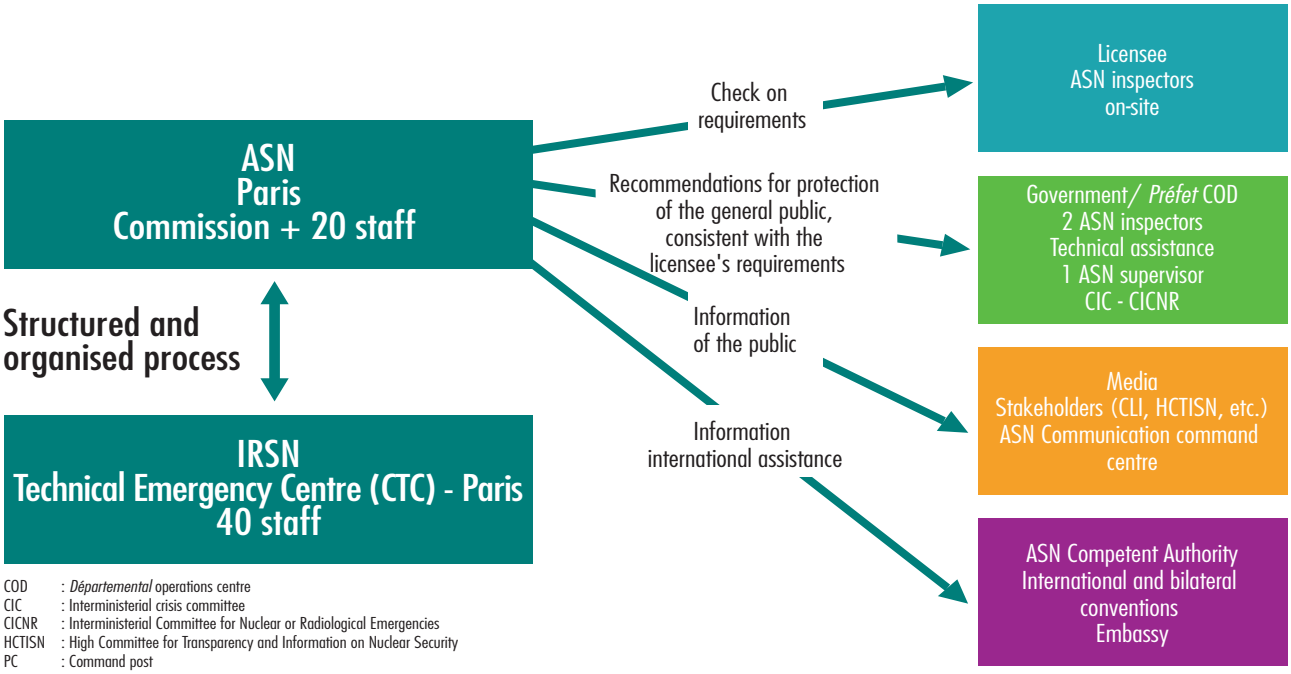
*Advising the Government*

The decision by the *Préfet* concerning the general public protective mesaures to be taken depends on the actual or foreseeable consequences of the accident around the site. It is the role of ASN to make recommendations to the Government or the *Préfet* in this respect, integrating the IRSN's analysis. This analysis combines diagnosis (understanding of the situation at the installation concerned) and prognosis (assessment of possible short-term developments, notably radioactive releases). This advice also concerns the steps to be taken to protect the health of the general public.

*Circulation of information*

ASN is involved in information circulation in a number of ways:
– informing the media and the public: ASN contributes to informing both the media and the general public in different ways (press releases, press conferences). It is important that this should be done in close collaboration with the other entities which are themselves involved in communication (*Préfet*, local and national licensee, etc.);

Diagram 2: the role of ASN in a nuclear emergency situation




COD : *Départemental* operations centre
CIC : Interministerial crisis committee
CICNR : Interministerial Committee for Nuclear or Radiological Emergencies
HCTISN : High Committee for Transparency and Information on Nuclear Security
PC : Command post

– institutional information: ASN keeps the Government informed, along with the SGDSN, which is responsible for informing the President of the Republic and the Prime Minister.
– informing foreign nuclear safety authorities.

### *Function of Competent Authority as defined by international conventions*

The TSN Act provides for ASN to fulfil the role of Competent Authority under the international Conventions on early notification and assistance. As such it collates and summarises information for the purpose of sending or receiving notifications and for transmitting the information required by these conventions to the international organisations (IAEA and European Union) and to the countries possibly affected by radiological consequences on their own territory.

## 2|1|2 Organisation of ASN

### *Organising the response to accidents occurring on BNIs*

In the event of an incident or accident occurring in a BNI, ASN, with the help of its technical support organisation IRSN, sets up an organisation comprising the following:
– at the national level:
  • a decision-making level or strategic management command post (PCD), located in the ASN response emergency centre in Paris and in constant contact with the ASN Commission. Its role is to adopt a stance or make decisions to advise the *Préfet*, who acts as the director of emergency operations;
  • a communication level supported by a communication unit located near the ASN's PCD, run by an ASN representative. The ASN Chairman or his representative acts as spokesperson, a role which is distinct from that of the head of the PCD;
– at the local level:
  • ASN representatives working with and advising the *Préfet* in his decisions and communications;
  • ASN inspectors on the damaged site, forwarding the positions adopted at the national level and controlling the decisions taken by the licensee.

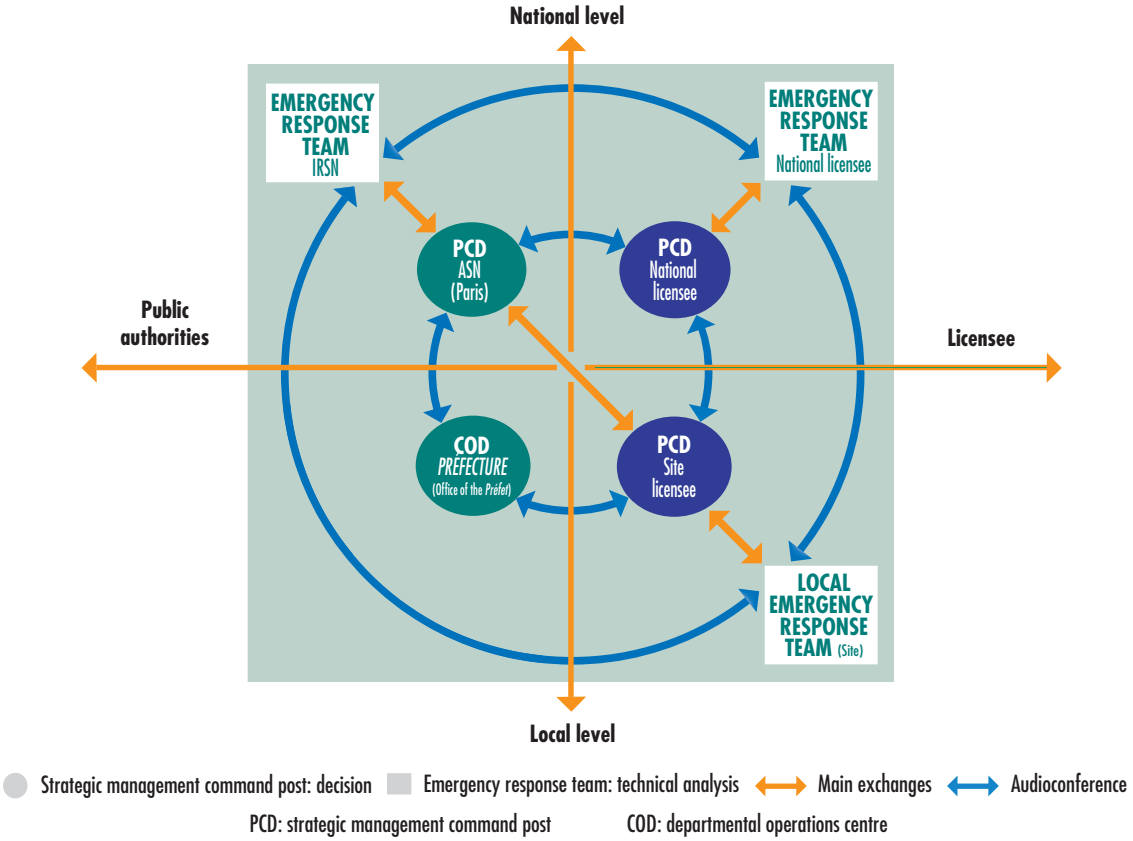
ASN is supported by an analysis team working at the IRSN's Technical Emergency Centre (CTC). ASN and IRSN have signed draft agreements with the main nuclear licensees regarding the organisational setup in an emergency situation. These protocols designate those who will be responsible in the event of an emergency and define their respective roles and the communication methods to be employed.

Diagram 2 summarises the role of ASN in a radiological emergency situation

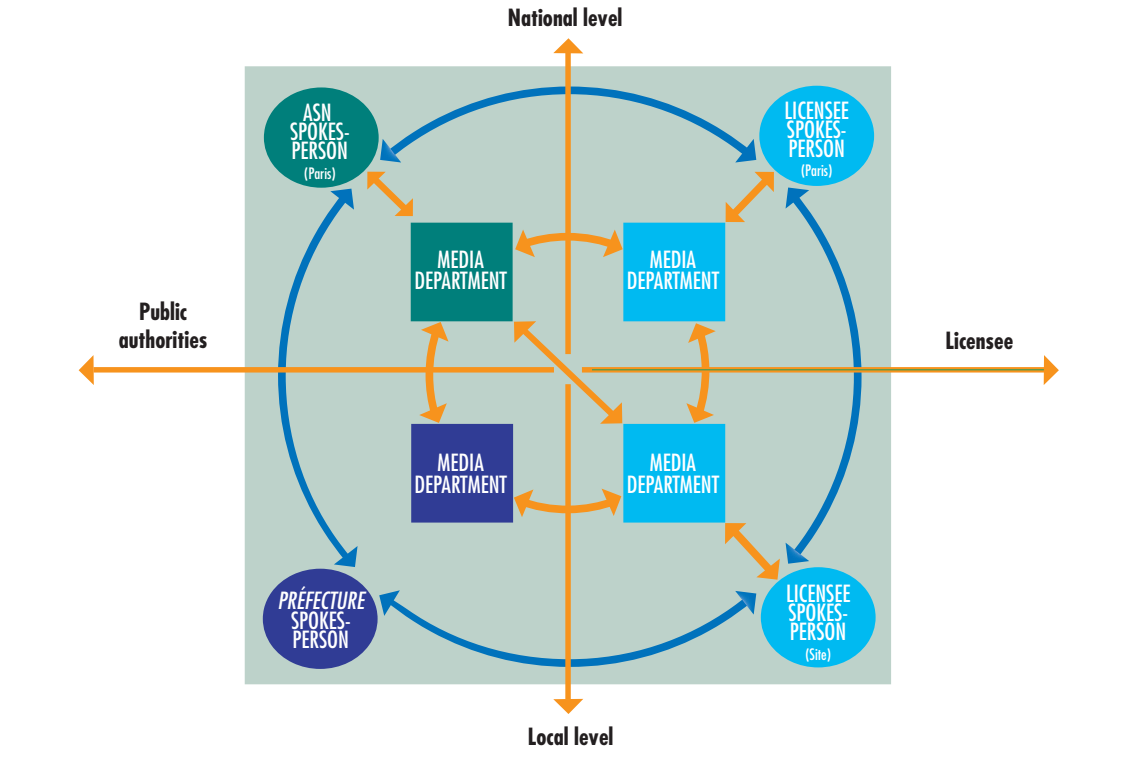
The following two diagrams show the relations between the public authorities, the Government and ASN, the licensees and the technical experts in a radiological emergency situation. Diagram 3 presents the exchanges leading to decisions and orientations concerning the safety of the facility and the protection of the general public.

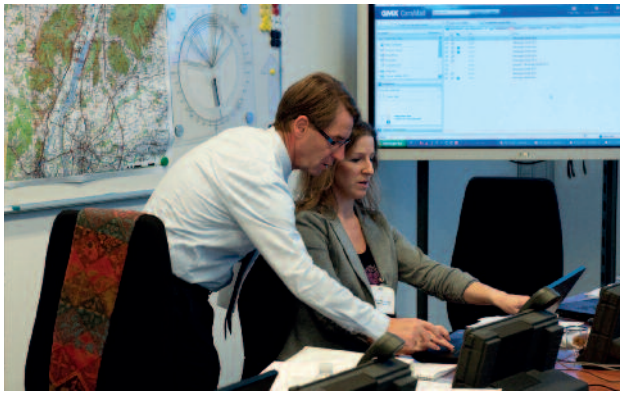
Diagram 4 describes the relations between the communication committees and the strategic management command post spokespersons, who are responsible for ensuring that the information sent out to the public and the media is consistent.

## Diagram 3: planned safety response




## Diagram 4: planned communication response





ASN emergency response centre during an emergency exercise – October 2011

*Organising a response to any other radiological emergency situation*

A dedicated hotline enables ASN to receive calls notifying incidents involving non-BNI or non-RMT sources of ionising radiation 24 hours a day, 7 days a week. The information given during the call is transmitted to an ASN official who will act accordingly. Depending on the seriousness of the accident, ASN may decide to activate its emergency response centre in Paris.

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

The *Préfet* or the mayor coordinates the intervention response teams, taking account of their technical competence, and decides on the protective measures to be taken, on the basis of the plans they have drawn up (ORSEC and PPI for the *Préfets*, local safeguard plans for the mayors). At the local level, the mayors can also call on the mobile radiological intervention units of the fire and emergency services (CMIR).

In these situations, responsibility for the decision and for implementing protective measures lies with:
- the head of the establishment carrying out a nuclear activity (hospital, research laboratory, etc.) who implements the PUI specified in Article L. 1333-6 of the Public Health Code (if the risks inherent to the installation so justify) or the owner of the site, with regard to the safety of the persons on the site;
- the mayor or *Préfet* concerning public safety outside nuclear installations.

### 2|1|3 ASN's emergency response centre

In order to be able to carry out its responsibilities, ASN has its own emergency response centre, equipped with communication and data processing tools enabling:
- swift mobilisation of ASN staff;
- reliable exchange of information between the many stakeholders concerned.

The fact of activating the emergency response centre in no way constitutes a judgement of the gravity of the situation. In the event of an alert, activating this centre provides ASN with technical management and communication resources readily accessible to all the players.

This emergency response centre has been activated in real-life situations in the event of incidents or accidents. In 2011, it was activated for one month during the nuclear accident that struck the Fukushima Daiichi NPP in Japan in March, for the 12th September 2011 accident on the CENTRACO facility (Gard) and on 16th December 2011 owing to the meteorological phenomena that were threatening the Le Blayais NPP (Gironde). The CENTRACO event is described in greater detail in chapter 16.

ASN's alert system allows swift mobilisation of ASN and IRSN staff. 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 staff of the DGSCGC, the SGDSN and Météo-France. This system is regularly tested during exercises or when real-life emergency situations arise.

In addition to the public telephone network, the emergency response centre is connected to several autonomous 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 uses dedicated computer systems for alerts and information exchanges with the European Commission, the IAEA and the member states (ECURIE[7], USIE[8]).

## 2|2 Ensuring efficient coordination with international authorities

Considering the potential repercussions that an accident can induce in other countries, it is important for the various

7. The ECURIE system, created in 1987, enables the Member States of the European union to inform their counterparts of any nuclear event taking place on their territory and liable to entail radioactive releases, so that they can if necessary take steps to protect their populations.
8. USIE (Unified System for Information Exchange in Incidents and Emergencies) is a tool proposed by the IAEA to the member states for notification of a nuclear event occurring in their territory.

### ASN mobilisation for one month during the accident at Fukushima Daiichi NPP

*Starting on 11th March, and for a period of one month, ASN activated its emergency response centre and its Commission sat daily, as would have been the case if the event had occurred in France. ASN adapted its response organisation to the exceptional context of this accident - exceptional in its remoteness, its scale, the concatenation of events and the considerable social and media interest that came with it.*

*The essential mission of ASN was to regularly inform the Government, the media and the French population, and to advise the Government and the French embassy in Tokyo on the population protective measures to be taken (protection of French citizens in Japan, screening of imported goods for contamination, etc.).*

*ASN was rapidly alerted of the accident, as Competent Authority under the international agreements on notification and assistance of 26th September 1986, and pursuant to the Euratom decision of 14th December 1987. It then regularly monitored the situation in Japan on the basis of information provided firstly by the IAEA's USIE tool, and secondly by daily audioconferences on the one hand with the French embassy in Japan and on the other with the American, Canadian and British nuclear safety authorities. ASN also used the European Commission's ECURIE network, in liaison with the NEA, to communicate with other countries and obtain an overall view of the decisions they were taking.*

*In terms of international assistance, ASN was approached by Japan (requests for information on certain specific tools that could be provided) and by the IAEA (requests for additional experts to man the IAEA emergency response centre and requests for satellite maps).*

*Nearly 200 ASN employees volunteered their services and were mobilised to perform duties at the emergency response centre. Their monitoring work and analyses helped understand and predict the development of the condition of the Fukushima Daiichi NPP reactors. This technical information was then reviewed and verified before being issued to the administrations, the media and the public.*

*ASN thus held 17 press briefings and issued more than 30 press releases, thereby providing regular information on the development of the accident and the nature of the risks involved.*

*ASN is now involved in analysing experience feedback on the organisation it deployed to respond to the numerous demands brought about by the management of this accident. What emerges in particular is that the long-term management of a large-scale nuclear emergency is particularly demanding in terms of deployment of human resources.*

The media unit handling calls from journalists during the Fukushima emergency – March 2011

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 made an active contribution to the preparation of these tools, in particular IAEA's new tool, USIE, which is present in the ASN emergency response centre.

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 26th September 1986 by IAEA and the Euratom decision of 14th December 1987 concerning community procedures for an early exchange of information in the event of a radiological emergency. On 26th September 1986, France also signed the convention adopted by IAEA concerning assistance in the event of a nuclear accident or a radiological emergency situation.

Two interministerial directives of 30th May 2005 and 30th November 2005 specify the procedures for application of these texts in France and instate ASN as the competent national authority. It is therefore up to ASN to notify the event without delay to the international institutions and to the member States, 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 or received.

## 2|2|1 Bilateral relations

Maintaining and strengthening bilateral relations with neighbouring countries is one of ASN's major priorities.

In 2011, ASN thus continued its regular exchanges with its Swiss, Belgian, Luxembourg and German counterparts, to examine emergency management aspects and clarify the transboundary alert and information exchange mechanisms in the event of an emergency situation. ASN representatives took part in inspections and in an emergency exercise in Great Britain, while representatives from the British Authority took part in a similar exercise in France. Finally, ASN was invited to an experience feedback seminar organised by Spain, to examine the Fukushima Daiichi NPP accident. During a bilateral meeting, the French and Spanish regulatory authorities agreed to hold a joint radiological emergency exercise.

## 2|2|2 Multilateral relations

ASN takes part in the IAEA's work to improve notification and information exchanges in radiological emergency situations. ASN is helping to define the strategy concerning international assistance requirements and resources and to set up the Assistance Response Network (RANET). Further to the Fukushima Daiichi NPP accident, ASN was asked to take part in an international think tank to consider whether it would be appropriate to amend the conventions relative to notification and assistance.

ASN is a member of the IAEA's National Competent Authorities' Coordinating Group (NCACG) and has represented the competent authorities of Western Europe since 2005. In this capacity, ASN hosted a meeting of the NCACG in its premises in early March 2011.

ASN also works with the NEA and participates in the Working Party on Nuclear Emergency Matters (WPNEM). Further to the Fukushima Daiichi NPP accident, ASN has been participating in and coordinating an expert group on aspects relating to the radiological protection of the general public.

Within HERCA association, ASN is participating in the new Working Group Emergencies. This group was tasked with proposing harmonised European actions to protect the general public, on the one hand in the event of an accident in Europe and, on the other, in the event of a more remote accident, in the light of the lessons learned from the Fukushima Daiichi NPP accident.

Finally, ASN coordinated French participation in the INEX 4[9] exercise, held in France on 17th November 2011 (see point 3|1|3). An international seminar to share experience feedback from this exercise, conducted in all the NEA member states, will be organised in 2012.


NCACG meeting in the ASN premises – March 2011

## 2|2|3 International assistance

The interministerial directive of 30th November 2005 defines the procedures for international assistance when France is called on or when it requires assistance itself in the event of a radiological emergency situation. 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. As coordinator of the national assistance resources (RANET[10] database), ASN takes part in the IAEA's work on the operational implementation of international assistance.

France has been called upon several times since 2008 to assist a foreign country in a radiological emergency situation. For example, in 2011, in its capacity as Competent Authority, ASN was approached by Bulgaria with a request for assistance following a radiological accident involving five workers accidentally exposed to a gammagraphy device radioactive source. An IRSN medical expert went to Bulgaria to examine the irradiated workers. The Percy hospital in Clamart then took charge of the irradiated workers so that they could be given appropriate treatment.

The international assistance procedures are currently being revised in the light of experience feedback from the Fukushima Daiichi NPP accident.

9. International Nuclear Emergency eXercice (run in particular by the NEA)

10. Response Assistance NETwork (network for responding to requests for assistance in the event of a radiological emergency - IAEA).

# 3 LEARNING FROM EXPERIENCE

## 3|1 Carrying out exercises

In order to be fully operational, the entire response system and organisation must be regularly tested. This is the purpose of the nuclear and radiological emergency exercises. These exercises, specified by an annual circular, involve the licensee, ministries, Prefectures, ASN and IRSN. They are a means of testing the off-site emergency plans, the response organisation and procedures and of helping with training the participating staff. The main objectives 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 condition, to take appropriate measures to protect the general public 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.

### 3|1|1 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.

### 3|1|2 National nuclear and radiological emergency exercises

In the same way as in previous years, and together with the SGDSN, the DGSCGC and the ASND, ASN has prepared a programme of national nuclear and radiological emergency exercises for 2011, concerning BNIs and RMT operations. This programme was announced to the *Préfets* in the circular of 7th October 2010. In this context, ASN coordinates the meetings to discuss good practices and possible areas for improvement. These meetings establish various objectives that are common to the national stakeholders.

These exercises are an opportunity to test the decision-making circuits at the highest level and most of these exercises include simulated media pressure on the main players, to test their communication skills and capabilities. The following table describes the key characteristics of the national exercises conducted in 2011.

Apart from the national exercises, the *Préfets* are asked to conduct local exercises with the sites that concern them, in order to improve preparations for a nuclear or radiological emergency situation, including testing of the time needed to mobilise all the parties concerned.

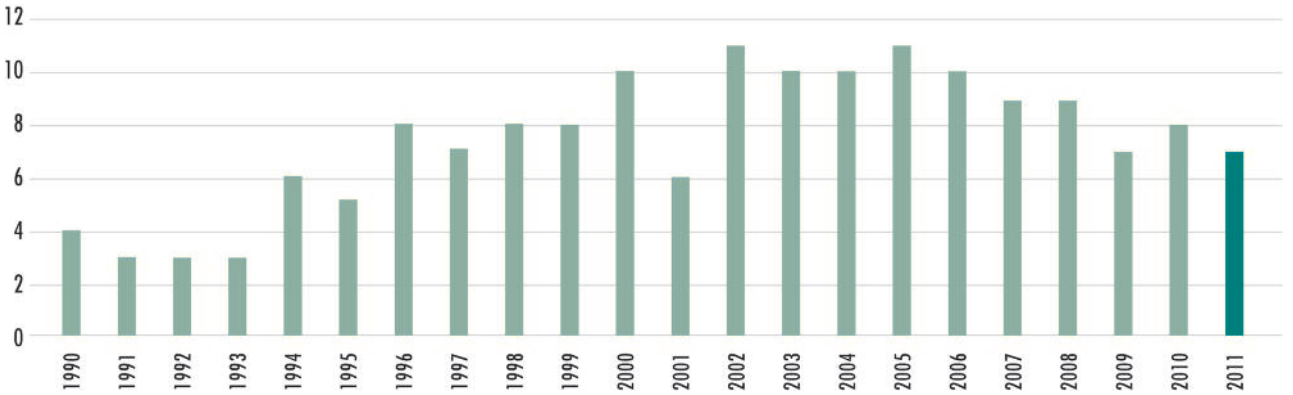
Carrying out a national nuclear and radiological emergency exercise every 3 to 5 years, depending on the complexity of the nuclear sites concerned, would seem to be a fair compromise between staff training and the time it takes for organisations to implement changes.

The number and scale of national exercises in France is high compared with foreign practices, as was underlined by the international audit conducted in 2006 by the IAEA's Integrated Regulatory Review Service (IRRS) mission, and the follow-up mission in 2009. This exercise programme enabled 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.

**Table 1: national civil nuclear and radiological emergency exercises conducted in 2011**

| Nuclear site | Date of exercice | Dominante of exercice | Main objectives of the exercice |
|---|---|---|---|
| Gravelines NPP | 18th January 2011 | Emergency preparedness and civil protection | Actual evacuation of a zone, ensuring neighbouring companies take account of the nuclear risk, testing of the alert system with the Belgian and British Authorities. |
| FBFC Romans | 10th February 2011 | Nuclear safety | Alert and regular information of the general public, implementation of the PPI, communication in an emergency situation. |
| Belleville-sur-Loire NPP | 17th May 2011 | | Unannounced exercise. |
| Chinon NPP | 30th June 2011 | Nuclear safety | Minor accident, testing of the alert system, testing of the organisation and operation of the command structures, drafting of a plan for measurement of environmental radioactivity. |
| Paluel NPP | 29th September 2011 | Nuclear safety | Major fire, testing of alert and information systems. |
| Cruas NPP | 18th October 2011 | Emergency preparedness and civil protection | Evacuation and sheltering of a part of the population within the 2 and 5 km, perimeters, testing of inter-*département* zone communications, post-accident aspects. |
| AREVA / La Hague | 8th December 2011 | Emergency preparedness and civil protection | Testing of mobile alert resources, testing of radioactivity measurement devices; inclusion of a general public communication component. |

Graph 1: number of national civil emergency exercises conducted from 1990 to 2011




For 2012, the objectives chosen in the annual circular of 20th December 2011 concerning the national nuclear or radiological emergency exercises are:
– to perform an exercise with safety and security components;
– to test certain elements of the emergency phase exit guide;
– widespread use of radioactivity measurement experiments;
– interfacing between the PPI and the other ORSEC plans;
– unannounced testing of activation aspects such as the operational command post and the *départemental* operations centre (COD);
– to simulate an accident affecting several facilities on the same site;
– to activate international links.

The experience feedback from the Fukushima Daiichi NPP accident was also taken into account in this circular, and thus led to the scheduling of exercises simulating accidents affecting several facilities simultaneously on a given site.

Simulated evacuation of a contaminated worker in an emergency exercise at Cadarache (CEA – Centre - South of France) – January 2012

## 3|1|3 Other emergency exercises

ASN is also heavily involved in the preparation and performance of other emergency exercises that have a nuclear safety component and are organised by other players such as:
– its counterparts for nuclear security (HFDS - Defence and Security High Official) or for the defence-related facilities (ASND);
– the international bodies (IAEA, European Commission, NEA);
– the ministries (Health, Interior, etc.).

The EPEES[11] nuclear security exercises are periodically held by the services of the HFDS on nuclear sites, in particular to test the interface between nuclear safety and security. ASN plays a full role in these exercises and carries out its duty of advising the *Préfet*. The last EPEES exercise took place in 2010 on the site of the French Alternative Energies and Atomic Energy Commission (CEA) in Saclay (Paris region).

During the course of 2011, three exercises run by the ASND were organised in accordance with the interministerial circular on nuclear and radiological emergency exercises. Pursuant to the ASN/ASND protocol of 26th October 2009, ASN takes part in these exercises:
– at the ASND national emergency centre: an ASN representative goes to the ASND's PCD to act as the interface between ASN and the ASND, to advise the ASND on aspects relating to the environmental impact of releases, and to prepare for post-accident management of the emergency by ASN;
– at the Prefecture: a representative of the ASN division concerned goes to the Prefecture to advise the *Préfet* pending the arrival of the ASND's representative.

INEX tabletop exercises are organised by NEA, together with the member States. ASN prepared and coordinated French participation in the INEX 4 exercise, held in at the ASN premises on 17th November 2011. The purpose of this exercise was to test the transition phase following the explosion of a "dirty" bomb in an urban environment. This exercise was an

11. Exercises related to protection and evaluation of security.

opportunity to identify good practices and the points to be improved in the French emergency management system.

ASN also takes part in exercises with a significant medical component, such as that held in October 2004 in the Necker hospital in Paris (exercise R53). This exercise was organised by the general directorate of Paris hospitals (AP-HP) and the Paris SAMU emergency services (French Emergency Medical Service), with the Paris police authorities, the DGSNR[12] and the IRSN.

The ASN personnel draws on the experience acquired during these numerous exercises in order to respond more effectively in real-life emergency situations.

## 3|2 Assessing with a view to improvement

Assessment meetings are organised in each emergency command centre immediately after each exercise. ASN, along with the other players in the emergency exercises, endeavours to identify the good practices and the areas for improvement brought to light during these exercises. These same feedback meetings are organised in order to learn the lessons from any real-life situations that have occurred.

ASN moreover brings together all the players twice a year to review the results of the good practices and areas for improvement identified at the debriefings organised following the exercises.

The exercises have, for example, enabled the following to be improved:
– procedures and doctrines: preventive distribution of iodine tablets in a radius of 10 km around the NPPs, to avoid having to expose those tasked with distributing them, sheltering in the "reflex" phase in the event of rapidly developing accidents;
– the decision channels: since 2007, the systematic use of audioconferences ensures the consistency of the workers and general public protective measures decided by the licensee and the public authorities;
– the general public alert system: the deployment around the NPPs of the "SAPPRE" telephone alerting system by EDF supplements the existing system of sirens;
– the environmental radioactivity measurement estimates: the circular of 12th October 2010 from the Minister of the Interior provides for the development of a measurements master programme to be appended to the PPI.

Finally, the real-life situations that occurred thus demonstrated the importance of communication in an emergency situation, in particular to inform the public sufficiently early and avoid the spread of rumours that could lead to panic among the general public. The accident of 12th September 2011 in the furnace of the Centraco facility on the Marcoule site provided a sharp reminder of the need to inform the neighbouring population, even if the PPI has not been initiated.

12. Former name of ASN.

# 4 OUTLOOK

The accident that struck the Fukushima Daiichi NPP raised a certain number of questions concerning the emergency response, both in Japan and more generally around the world:
– what should be the level of involvement and decision-making by the public authorities in the management of the emergency?
– are the various bodies involved in the emergency – licensees, public authorities, technical support organisations – sufficiently prepared for such extreme situations?
– are the protection and intervention perimeters around the sites extensive enough? Are all the populations concerned well-informed and prepared? Are the general public protective measures adequately identified and sufficiently well prepared?
– are the arrangements and the material resources necessary for checking the contamination of goods and persons appropriate to large-scale emergencies and available in sufficient numbers?
– what help could be provided by foreign countries or international organisations in the management of the technical and media emergency?
– etc.

ASN considers that these questions concern essential aspects of emergency management, in particular the organisation and training of the parties involved, the role of the safety regulator and the expertise, emergency planning, post-accident doctrine, notification and international assistance processes.

In accordance with the important nuclear emergency roles entrusted to it by the TSN Act, ASN will make a full contribution to the ongoing work being done by the public authorities, in close collaboration with the SGDSN, to integrate the experience feedback from the Fukushima Daiichi NPP accident.

In 2011, ASN identified some areas for internal improvements to its response to emergency situations. In 2012, ASN will deploy these improvements and will continue to work on the processes involved in the run-up to activating on-call arrangements. The change in ASN head offices will be an opportunity to modify the ASN emergency response centre, bringing it into line with the latest international standards.

ASN will also ensure that the annual programme of nuclear emergency exercises takes account of the initial lessons learned from the Fukushima Daiichi NPP accident. ASN considers that it would be advisable for these exercises to be able to closely involve the licensee and public authorities at the highest level and allow testing of the interface between the ORSEC and PPI plans.

ASN will clarify and reinforce its doctrine with respect to controlling urban development around the BNIs. ASN will take account of the observations arising from the public consultation and will finalise the nuclear risk information and communication support guide. With the help of the Ministry of the Environment, this guide will be transmitted to the Prefectures in order to provide a uniform overall framework for initiating discussions at the local level. ASN wants to better inform the local authorities of the risk generated by nuclear facilities so that this is considered to a greater extent in the development strategy adopted by the municipalities. This information will be provided coherently and systematically for all facilities with an PPI. In the longer term, ASN wishes to apply public protection restrictions to limit urban development and therefore the consequences of an accident affecting a facility.

In the field of post-accident situation management, ASN will continue the important work carried out over the past five years by the CODIRPA, supplementing it with feedback from the Fukushima Daiichi NPP accident. Jointly with the Ministry of the Interior, ASN will send elements of doctrine to the Prefectures so that they are taken into account and integrated into the PPIs.

Finally, at the international level, ASN will take part in the work being done by IAEA to revise the international conventions on assistance and early notification of a nuclear event. ASN will support the European initiatives taken with a view to transboundary harmonisation of actions to protect individuals in an emergency situation and to develop a coordinated response by the safety and radiation protection Authorities in the event of a near or remote accident.