RADIOLOGICAL EMERGENCIES

1	ANTICIPATING	161	
1 1 1 1 1 1 1 2	Ensuring licensee accountability On-site and off-site emergency plans Role of ASN in the preparation and monitoring of emergency plans		
1 2 1 2 1 1 2 2	Organising a collective response Local provisions National provisions		
1 3 1 3 1 1 3 2 1 3 3 1 3 4	Protecting the public General protective actions Iodine tablets Care and treatment of radiation accident victims Controlling urban development		
1 4	Understanding the long-term consequences		
2	RESPONDING TO AN EMERGENCY SITUATION	167	
2 1 2 1 1 2 1 2 2 1 3	Assisting the Government ASN's responsibilities in an emergency context The organisation of ASN ASN's emergency response centre		
2 2 2 2 1 2 2 2 2 2 2 2 2 3	Ensuring efficient coordination with international authorities Bilateral relations Multilateral relations International assistance		
3	LEARNING FROM EXPERIENCE	172	
3 1 3 1 1 3 1 2	Carrying out exercises Nuclear alert tests and mobilisation exercises Exercises		
3 2	Assessing with a view to improvement		
4	OUTLOOK	175	CHAPTER

5

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 understood to mean a situation arising from an incident or accident which is liable to lead to the emission of radioactive material or a level of radioactivity liable to jeopardise public health¹. The term "nuclear emergency" applies to events which could lead to a radiological emergency in a basic nuclear installation (BNI) or during transport of radioactive materials.

For activities with a high level of risk, such as BNIs, the emergency arrangements, which can be considered the "ultimate" lines of defence, comprise special organisational arrangements and emergency plans, involving both the licensee and the authorities. These regularly tested and evaluated arrangements are frequently improved to take account of operating experience feedback from exercises and from real situations. Radiological incidents or accidents can also occur outside BNIs, for example in an establishment carrying out a nuclear activity or as the result of a loss of a radioactive source.

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 radionuclides (uranium or thorium) in the recent or more distant past.

1 ANTICIPATING

1 | 1 Ensuring licensee accountability

1 | 1 | 1 On-site and off-site emergency plans

Application of the defence in depth principle entails the inclusion of severe accidents with a very low probability of occurrence when drafting the emergency plans, in order to determine the measures necessary to protect plant staff and the population and to control the accident.

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

The purpose of the emergency plan (off-site emergency plan or ORSEC plan), drafted by the *préfet**, is to protect populations in the short term in the event of an accident 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 alert arrangements and the material and human resources necessary.

1 | 1 | 2 Role of ASN in the preparation and monitoring of emergency plans

The on-site emergency plan

Pursuant to decree 2007-1557 of 2 November 2007, the licensee is required to send ASN a file, including the onsite emergency plan, before commissioning of the installation.

The on-site emergency plan must specify the organisational measures, response methods and necessary resources the licensee implements in the event of an emergency in order to protect its personnel, the public and the environment from ionising radiations and to preserve or restore the safety of the installation.

During 2009, ASN continued to write a draft decision concerning the content of the on-site emergency plan. This work is being done within the more general framework of the creation of the new BNI regime as resulting from the TSN Act.

Participation in drafting the off-site emergency plans Pursuant to the 13 September 2005 orders concerning the off-site emergency plan and the ORSEC plan, the préfet is

^{1.} Article R. 1333-76 of the Public Health Code.

^{*}In a département, representative of the State appointed by the President.

responsible for preparing and approving the plan. ASN assists the préfet in analysing the technical data to be provided by the licensees, in order to determine the nature and scope of the consequences of an accident. This analysis is conducted jointly by ASN with its technical support organisation IRSN, taking account of the most recent available data on severe accidents and radioactive material dispersal phenomena. ASN makes sure that the off-site and on-site emergency plans are consistent.

Definition of the action levels² is based on the most recent international recommendations and, since 2003, has been stipulated in regulatory requirements. The ministerial order of 20 November 2009 approved ASN decision 2009-DC-0153 of 18 August 2009, which modified the action level with regard to the administration of stable iodine.

Following on from the action undertaken since 2004, and together with the Ministry of the Interior, ASN is taking part in the revision of the section of the ORSEC plans relating to the transport of radioactive materials, initiated by the circular sent out to the préfets on 23 January 2004, revising the specialised emergency plans for the transport of radioactive materials.

Population protection actions

Based on the above-mentioned action levels, the off-site emergency plans identify the population protection actions that will limit the consequences of a possible accident. For example, the off-site emergency plans 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.

1 2 Organising a collective response

The response by the authorities to an incident or accident is determined by a number of legal texts concerning



Diagram 1: standard diagram of an emergency response to an accident affecting a nuclear reactor operated by EDF

2. Levels as of which population protection actions are justified.

nuclear safety, radiation protection, public order and civil defence, as well as by the emergency plans.

Act 2004-811 of 13 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 population, information and training of the population, 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 13 September 2005 concerning off-site emergency plans;
- 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 radiological emergency field is clarified in the government directive of 7 April 2005. The response organisation of the authorities and that of the licensee are presented in diagram 1.

1 2 1 Local provisions

In an emergency situation, two parties have the authority to take operational decisions:

- the licensee of the affected nuclear installation, who must implement 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 alert and regularly inform the authorities. This arrangement is defined beforehand in the licensee's on-site emergency plan;
- the préfet of the département* in which the installation is located, who takes the necessary decisions to protect the population, the environment and the property threatened by the accident. His actions are determined by the off-site emergency plan. He is thus responsible for coordination of the plan resources, both public and private, equipment and manpower. He keeps the population and the mayors informed of events. Through its regional division, ASN assists the *préfet* in drafting the plans and managing the situation.

In this area, the ASN response organisation relies on its divisions which, in the event of an emergency, dispatch officers to the site of the accident and to work with the *préfet*.

1 | 2 | 2 National provisions

The relevant ministries and the ASN jointly advise the préfet with regard to the protective measures to be taken.

They offer the *préfet* information and advice to enable him to assess the condition of the installation, the scale of the incident or accident and any potential developments.

The main bodies concerned are as follows:

- Ministry of the Interior: the Directorate for Civil Security (DSC) 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 for Health: responsible for human health protection against the effects of ionising radiations;
- Ministry for Ecology: 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 those responsible for civil security;
- 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 26 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 handles the secretarial functions for the Interministerial Committee for Nuclear and Radiological Emergencies (CICNR). It is responsible for ensuring consistency between 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 convened at the initiative of the Prime Minister. Its role is to coordinate governmental action in the event of a radiological emergency;
- as stated in the TSN Act, ASN is involved in the management of radiological emergencies. 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 responsibilities in an emergency situation are detailed in point 2|1|1.

1|3 Protecting the public

1 3 1 General protective actions

The population protection actions that can be taken during the emergency phase are described in the off-site emergency plan. The steps taken are designed to protect the population and prevent affections attributable to exposure to ionising radiations 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 population:

- 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 affected by the releases of radioactive iodine take the prescribed dose of potassium iodide tablets;
- evacuation: in the event of an imminent threat of largescale 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 radioactive levels have been set for this purpose on foodstuffs. The *préfet* ensures that the population is regularly informed of developments in the situation and its consequences. He may remind people that they must not pick plants or vegetables from their gardens or farms for consumption.

1 | 3 | 2 Iodine tablets

The administration of stable iodine tablets is one of the population protection measures the *préfet* may decide to order in a radiological emergency situation.

In June 2009, the fourth preventive distribution campaign was initiated for the areas surrounding the EDF nuclear

The 4th iodine tablets distribution campaign for the populations in the vicinity of the EDF NPPs

Starting in June 2009, everyone living in the vicinity of a French NPP received a letter from the authorities, asking them to collect a box of stable iodine tablets from a pharmacy, free of charge. This health risk prevention campaign was organised by ASN, the ministries responsible for the interior and health, with the support of EDF, the National Association of Local Information Committees (ANCLI), the National Order of Pharmacists, the retail pharmacy trade unions and the rural pharmacy association.

About 400,000 homes and 2,000 establishments



Box of stable iodine tablets

open to the public (hotels, village halls, etc.) in 500 communes* are concerned by this 4th iodine tablets distribution campaign. The residents of each home within a 10 km radius of one of the 19 NPPs in France received a letter from the authorities, asking them to collect a box of iodine tablets from one of the pharmacies taking part in the operation. This campaign, which started on 15 June 2009, continued for the rest of the year.

The purpose of the iodine tablets distribution campaign is to ensure that each individual has access to stable iodine tablets (potassium iodide) offering protection of the thyroid in the event of an accident in an EDF NPP. Taking stable iodine must be combined with other precautionary measures, such as taking shelter, foodstuff restrictions and evacuation.

Feedback from previous stable iodine tablet preventive distribution campaigns showed that public information needed to be intensified, in particular by involving local stakeholders and ensuring that there was long-term continuity of communication. If an accident were to occur, protective measures such as the administration of iodine tablets would be decided on by the préfet acting as the director of emergency operations.

The details of this campaign, including the summary of results, are given in chapter 6.

*Smallest administrative subdivision administered by a mayor and a municipal council.

power plants (NPPs), along with a new doctrine and a new overall system for information of the public concerned (see box). The Government also asked the *préfets* to continue with stockpiling in each *département* in order to cover the entire country.

At the request of the minister for health, ASN drafted a "new iodine doctrine" focused on the most sensitive populations and harmonised with those of the neighbouring countries. The transboundary work done with Belgium, Switzerland, Germany and Luxembourg led to the adoption of a common value of 50 mSv (thyroid equivalent dose) for the intervention level corresponding to the administration of stable iodine. ASN thus proposed lowering the value from 100 mSv to 50 mSv. This new doctrine was presented to the minister who, in a letter of 9 January 2009, gave her approval of these proposals and tasked ASN with implementing these new arrangements.

After obtaining the opinions of IRSN, ASND and the ministry responsible for the interior, ASN issued decision 2009-DC-0153 on 18 August 2009, in which the intervention level was set at 50 mSv for the thyroid equivalent dose for the administration of stable iodine. This decision was approved on 20 November 2009 by the ministry responsible for health.

Summary of the work of the post-accident phase steering committee (CODIRPA) and proposals

In 2005, ASN was asked by the Prime Minister to conduct an overall review of the management of the consequences of a nuclear accident. The topics tackled by a number of working groups within CODIRPA included the following:

- lifting of the order to take shelter and return by the evacuated populations,
- the environmental radioactivity measurements strategy,
- contamination reduction,
- waste management,
- consumption and export restrictions,
- health monitoring of the population,
- compensation,
- public information,
- regulations.

A government meeting on 3 July 2008 concluded that CODIRPA needed to continue its work in order to produce the first operational documents by the end of 2010.

In order to meet this objective, CODIRPA set up a new organisation in 2009, creating two commissions, one to study the transition phase and the other to study the more long-term picture.

In 2009, CODIRPA continued its work in the following areas:

- consolidation of initial doctrine elements,
- discussions with the stakeholders (State regional offices and civil society),
- broadening of the work to take account of other accident scenarios (plutonium scenario and accident abroad).

A process of discussion with the local and national stakeholders is in progress in order to compare the proposals with the actual situation in the field. The first results of these discussions were taken into account, in particular concerning the zoning arrangements proposed by the working groups. This zoning was simplified, proposing two main zones, depending on (?) the objectives for management of the post-accident consequences:

- a population protection zone (ZPP),

- a territory enhanced monitoring zone (ZST).

The first CODIRPA commission produced a national guide on preparing for management of exiting the emergency phase. This operational guide provides the local authorities with elements of use for preparation of their local plan for exiting the emergency phase (action to be taken during the first week of the transition phase, etc.). An initial version of this guide has been available since February 2010. It will be tested in several pilot départements in which NPPs are situated.

In 2009, the first elements of the post-accident doctrine were tested during national nuclear or radiological emergency exercises. The exercise carried out on 26 March 2009 on the Bugey NPP included the issue of whether or not to evacuate the population in the post-accident situation.

An international seminar will be held in early 2011 in order once again to share the CODIRPA work with the French and foreign experts and organisations concerned.

1 | 3 | 3 Care and treatment of radiation accident victims

In the event of a nuclear or radiological accident, a significant percentage of the people involved 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 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 arrangements, which also apply to an accident, are designed to offer guidelines for the services and organisations in charge of planning and managing emergency situations both on the site of the event and in hospitals.

The "Medical response to a nuclear or radiological event" guide, coordinated by ASN and published in 2008, come in addition to circular DHOS/HFD/DGSNR 2002/277 of 2 May 2002 concerning the organisation of medical care in the event 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 risks. This guide collates all information of use for the medical teams in charge of collecting and transporting the injured, as well as for the hospital personnel receiving them in the health care establishments. This guide also acts as a teaching aid for the medical emergency professionals national training programme set up by the ministry responsible for health and the French SAMU emergency medical service.

1 3 4 Controlling urban development

Controlling urban development is one of the mainstays of risk management policies. It primarily aims to limit the consequences of a severe accident on both population and property. This approach concerns natural and industrial risks. The TSN Act enables the authorities to create land use restrictions on urban development in the vicinity of BNIs. The "BNI regime" decree supplemented these provisions by defining the relevant administrative procedures. 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. Current ASN doctrine regarding the control of urban development around nuclear installations concerns those installations requiring an off-site emergency plan. It primarily aims to guarantee the practical implementation of the actions stipulated in the plan regarding sheltering and evacuation and focuses on the "reflex" zones specified in the circular of 10 March 2000.

In 2009, work was initiated jointly with the ministry responsible for the environment, with the aim of issuing a circular letter to the *préfets* asking them to exercise increased vigilance with regard to the development of activities in the vicinity of nuclear installations.

1 | 4 Understanding the long-term consequences

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 in order to restore a situation felt to be acceptable. 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".

To produce a doctrine and having tested post-accident management during national and international exercises, ASN convened all the stakeholders around a steering committee responsible for the post-accident aspects, CODIRPA. This committee consists of ASN, as coordinator, and representatives of the various ministerial departments concerned by the subject, health agencies, associations, and CLI and IRSN representatives.

2 **RESPONDING TO AN EMERGENCY SITUATION**

2 | 1 Assisting the Governement

2 | 1 | 1 ASN's responsibilities in an emergency context

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 circulation of information;

4) to act as competent authority within the framework of the international conventions.

Oversight of actions taken by the licensee

In the same way as in normal operating conditions, licensee actions are regulated by ASN in an emergency situation. 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. It does not take the place of the licensee in the technical steps taken to deal with the accident.

Advising the Government

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 inform the *préfet* of its position on this subject, taking account of the analysis conducted by IRSN. This analysis combines diagnosis (understanding of the situation at the plant 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 public.

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 conferences). It is important that this should be done in close collaboration with the other entities who are themselves involved in communication (*préfet*, licensee, etc.);
- institutional information: ASN keeps the Government informed, along with the SGDSN responsible for informing the President of the Republic and the Prime Minister.

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 international conventions. It therefore collates and summarises information for the purposes of notifications and for transmission of the information required by these conventions to the international organisations (IAEA and European Union) and to the countries concerned by the possible consequences on their own territory.

2 | 1 | 2 The organisation of ASN

To organise 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 the following organisation:

- at the national level, an emergency response centre comprising:
 - a decision-making level or strategic management command post (called PCD), located in ASN's emergency management centre in Paris. This centre is headed by the ASN Chairman 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. The ASN Chairman or his representative acts as the spokesperson, a role that is distinct from that of the head of the PCD;
- at local level, one delegation sent to work with the *préfet* and one sent to the site on which the accident happened, with the respective roles of helping the *préfet* reach his decisions and carry out communication, and ensure that the decisions taken by the licensee are justified.

ASN is supported by an IRSN analysis team working out of IRSN's Technical Emergency Centre (CTC). ASN and its technical support organisation have signed protocols with the main nuclear licensees 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.

Diagram 2 presents the overall safety organisation set up, in collaboration with the *préfet* and the licensee.

Diagram 3 shows the structures set up between the communication units and the PCD spokespersons with a view to allowing the necessary consultation to ensure consistency of the information issued to the public and the media.



Diagram 2: planned safety response

Diagram 3: planned communication response



Responding to any other radiological emergency situation

Apart from incidents affecting nuclear installations which have an emergency plan, radiological emergencies can also occur:

- 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;
- 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 radiations.

ASN together with the ministries and stakeholders concerned, drafted government circular DGSNR/DHOS/DDSC 2005/1390 of 23 December 2005. This circular defines how the State departments 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.

With the support of IRSN, ASN is responsible for overseeing the actions of the facility heads or site owners, for advising the competent police authority with regard to the steps to be taken to prevent or mitigate the direct or indirect effects of ionising radiation on human health, including through environmental hazards, and for taking part in dissemination of information.

Faced with the number of possible sources of alerts and the corresponding alert channels, there has to be a "onestop shop" where all alerts arrive and where they are then passed on to all the stakeholders. This one-stop shop is the Departmental Fire and Emergency Response Operations Centre – Alert Processing Centre which can be reached by dialling 18 or 112.

ASN opened a telephone hotline in 2003 (toll-free radiological emergency number 0 800 804 135). The purpose of this hotline is to receive calls notifying incidents involving non-BNI sources of ionising radiations and is open round the clock, 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 and treatment of the individuals involved, confirmation of the radiological nature of the event, securing the zone, reducing the emission and, finally, clean-out.

The mayor or the *préfet* coordinates the intervention teams on the basis of their technical competence and decides on the protection measures for the public.

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 on-site emergency plan specified in Article L. 1333-6 of the Public Health Code (if the risks inherent in the installation so justify) or the owner of the site with regard to the safety of the individuals 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, activation of this centre offers ASN all the necessary technical management and communication resources.

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 makes use of IT equipment adapted to its assignments, including for information exchanges with the European Commission and the Member States (ECURIE system). Since 2005, the PCD has had access to the dose rate values permanently measured by IRSN's Téléray network of probes.

This emergency centre was in fact activated to deal with the incidents that occurred in the Nogent-sur-Seine and Le Blayais nuclear power plants in 2005. In 2007, the emergency centre was activated on 5 April to deal with the transport accident that occurred in the *commune* of Fère-Champenoise (Marne *département*) and on the night of 9 April, when electrical power to the Dampierre-en-Burly NPP was lost. In 2009, it was activated on five occasions for the following reasons:

- on two occasions, severe weather conditions threatened the Le Blayais NPP;
- a fire threatened the Cadarache nuclear installations;
- loss of heat sink occurred in the Cruas and Fessenheim NPPs.

As demonstrated by these events, ASN's alert system allows swift mobilisation of ASN and IRSN staff. This



ASN emergency centre in Paris during a radioactive material transport nuclear emergency exercise – June 2009

automatic system sends out an alert signal to all staff carrying radiopagers 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 DSC, the SGDSN and Météo-France. This system is regularly tested during exercises or when actual emergencies arise.

In 2009, ASN continued to work on setting up an on-call system among its staff, work that was delayed by legal issues raised by the Government. This stand-by duty system will complete the current arrangements which involve all the ASN inspectors being alerted by radiopager.

2 | 2 Ensuring efficient coordination with international authorities

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.

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 therefore 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 or received.

Within IAEA's National Competent Authorities' Coordinating Group (NCACG), ASN has been designated to chair the competent authorities for western Europe in 2005. In 2009, the work of this group focused on reviewing the results of implementation of the IAEA 2004-2009 action plan and the feedback from the Convex3 international exercise which took place in July 2008.

2 | 2 | 1 Bilateral relations

Within the framework of bilateral relations, particularly with neighbouring countries, ASN in 2009 continued with drafting of protocols for the exchange of information and assistance in order to deal with radiological emergencies. These protocols aim to structure the exchanges which have existed for many years. They differentiate between the nature of the information exchanged, on the one hand with regard to planning and on the other in response to an emergency. They aim to identify precisely the various stakeholders and entities responsible for and to whom the information is to be sent. A new protocol was



NRC emergency centre - April 2009

signed with Spain in 2009 and a protocol project initiated with Italy.

2 | **2** | **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 French nuclear power plants are however located in the immediate vicinity of the border (Bugey, Cattenom, Chooz, Fessenheim, Graveline plants). 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 Assistance Response Network (RANET). ASN is also working with NEA to define a strategy for carrying out international exercises.

Within the Heads of European Radiation Control Authorities group (HERCA, see chapter 7), ASN continued in 2009 to take part in meetings of the group responsible for proposing harmonised pan-European population protection actions. The work in progress highlighted the various international approaches to the intervention thresholds or the messages addressed to the populations in an emergency. The group presented an interim report identifying and quantifying the differences in these approaches and proposed joint intervention procedures.

2 2 3 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.

SGDSN and ASN thus requested that all stakeholders forward the data needed for compilation of a database of national competences for assistance in the event of a nuclear accident or radiological emergency. In 2008, France forwarded its assistance capability data to 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, 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 objectives are defined ahead 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 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.

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 Exercises

As in previous years, ASN prepared a programme of national nuclear and radiological emergency exercises for 2009, announced to the *préfets* in the circular of 12 January 2009, signed jointly by ASN, ASND, DSC and SGDSN. For 2009, the circular proposed new national objectives to the *préfets* of the *départements*, including for testing the interface between the nuclear security and safety aspects, or testing of elements of the post-accident management doctrine. This circular also comprises 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 technical scenario;
- exercises targeting "civil defence" involving actual and large-scale application of population protection measures as specified in the off-site emergency plans (alert, sheltering, evacuation), based on a scenario built around population protection actions.

During most of these exercises, simulated media pressure is placed on the main parties concerned, in order to test their ability to communicate. The following table describes the key characteristics of the national exercises conducted in 2009.

In 2009, France took part in the international exercises organised by the European Community and IAEA. These tests were an opportunity to check the alert, transmission and information exchange procedures between the competent national authority (ASN) and the emergency centres of the European Community and IAEA.

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

Carrying out a national nuclear and radiological emergency exercise every 2 to 5 years, depending on the complexity of the nuclear sites concerned, would seem to be a



Contamination check during a nuclear emergency exercise in Nantes - October 2007

A major nuclear emergency exercise: SECNUC 09

A major exercise, organised by the General Secretariat for Defence and National Security (SGDSN) was held on 21 October 2009. It tested the reaction of the national emergency response organisation to a nuclear accident in a foreign State but with consequences in France. The exercise tested the following objectives:

At the central level:

- credible and coordinated government communication to the elected officials, the population and the media;
- anticipation of the socio-economic, health and environmental consequences of the radioactive plume passing over the country.

At the regional level:

- application of the decisions and guidelines from the central level;
- communication that is coherent with that of the central level and appropriate to regional specificities.

At ministerial level, this exercise involved a large number of players and tested the planned response organisation. ASN observed that the organisation of the public authorities could benefit from drawing more on that which already exists for managing radiological emergencies, which is regularly tested during national exercises. It was also felt to be necessary that the ministries be more frequently involved in the national exercises at a high hierarchical level.

Table 1: national civil nuclear and radiological emergency exercises conducted in 2009

Nuclear site	Date of exercise	Target of the exercise	Particular characteristics	
Belleville nuclear power plant	29 January 2009	Civil defence	Communication and information of the media and the population	
Bugey nuclear power plant	26 March 2009	Nuclear safety	Population alert by off-site emergency plan sirens and the SAPPRE ¹ system, post-accident aspects concerning whether or not to evacuate the population	
CEA/Cadarache	2 June 2009		Combined civil and defence exercise; accident in an INBS affecting a BNI	
Radioactive material transport (Vosges département)	9 June 2009	Civil defence	Emergency management coordination between <i>département</i> and national levels, simulated media pressure, organisation of the measurement unit	
CEA/Saday	17 September 2009	Civil defence	Test of measurement master plan, test of local safeguard, sheltering and stable iodine administration (dummy run) plans, communication	
SECNUC 09 major exercise	21 October 2009	Nuclear safety	Management of consequences in France of a nuclear accident in another country	
Tricastin NPP	26 November 2009	Nuclear safety and security	Coordination between <i>départements</i> and between licensees concerning an event resulting from a malicious act	





1. SAPPRE: Reflex phase population alert system.

fair compromise between staff training and the time it takes for organisations to implement changes. At the end of 2009, the extra work load on the offices of the *préfet* owing to the H1N1 flu vaccination campaigns, led to three exercises initially scheduled for 2009 (Chooz, Cattenom and Penly) being postponed to 2010. To avoid overloading 2010, the overall multi-year schedule was reviewed by ASN, ASND, DSC and SGDSN.

Therefore, 7 national exercises were carried out in 2009.

The number and scale of the national exercises are considerable when compared with practices abroad. The IAEA international review mission in 2006 (IRRS mission) and the follow-up mission in 2009 (see chapter 7) underlined the importance of this programme of exercises. 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.

3 2 Assessing with a view to improvement

Assessment 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 operating experience feedback meetings in order to improve the response organisation as a whole. These same feedback meetings are organised in order to learn the lessons from any real situations that have occurred.

The real situations that occurred thus demonstrated the importance of communication in an emergency, in particular to inform the public sufficiently early and avoid the spread of rumours that could lead to panic among the population. The draft international protocols were modified and aim to inform foreign authorities as early as possible. In certain cases, the licensee is required to send information about an incident directly to the foreign authorities.

Specific alert criteria will also be sent out to the air quality monitoring associations.

The emergency exercises have, among other things, led to improvements in procedures and doctrines. 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 off-site emergency plans asking the populations to take shelter by alerting them through a network of sirens or other means of telephone-based alert.

Since 2007, the systematic use of decision-making audioconferences has led to greater consistency in the steps taken to protect workers and the population as decided on by the licensee and the public authorities.

The purpose of the emergency response organisation is to prevent, inform and protect the public. During the exercises, it became clear that the siren system triggered by the licensees to alert the population did not cover the entire intervention perimeter in all cases. In these conditions, EDF undertook to complement the existing siren system with a system of telephone alerts, called "SAPPRE". This new additional procedure automatically calls the landlines of the individuals concerned. This experimental system was tested on numerous occasions during the national exercises conducted since 2007. Similar systems are currently being deployed by all the licensees concerned.

In a post-accident situation, the doctrine adopted initially left it up to the decision-makers to assess whether the population should be kept at home or evacuated, on the basis of a range of dose values. A number of zones corresponding to specific issues (waste, population protection, ban on consumption, etc.) were also proposed. The exercises carried out showed that it was hard to take a decision based on overly complex technical criteria. The exercises thus enabled a simplification of the various post-accident zones to be proposed.

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. Operating experience feedback from the exercises shows that the measurement results were only reaching the experts and decisionmakers 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, in order to produce local measurement programmes tailored to the individual installations. In 2008 and 2009, ASN maintained its commitment to this subject, to contribute towards improved access to and utilisation of the radioactivity measurements taken by the various stakeholders (licensees, SDIS, IRSN, etc.). In 2009, this work led to a guide for the production of a measurement master plan prepared by IRSN and presented to ASND and ASN.

This document was sent to all the *préfectures* to enable them to draft a specific measurement master plan to be appended to the off-site emergency plan.

The exercises are a means of improving existing procedures:

- the scenarios increasingly frequently include a health component, involving management of the (sometimes contaminated) injured, who have to be given care and be evacuated;
- testing of the information procedures between the *départements* or even the States adjoining an installation help broaden the scope of mutual communication.

Operating experience feedback from nuclear or radiological 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. ASN calls all the stakeholders together twice a year to review good practices and identify areas for improvement.

4 OUTLOOK

With its experience of many years of international exchanges, ASN has identified good practices for the response organisation of nuclear regulators and the human and technical resources deployed in an emergency situation. In the coming years, ASN intends to implement a plan to modernise its own organisation and its emergency centre. In 2010, ASN will in particular be setting up a stand-by duty system to further improve its responsiveness in the event of an emergency.

Together with the government departments and public institutions concerned, ASN drafted the circular concerning exercises for 2010. It objectives were defined at the national level to incorporate the regular operating experience feedback received. They concern post-accident management, the response to extreme media pressure, treatment and care of the injured or contaminated victims, handling of a minor event that does not require activation of the off-site emergency plan and radioactivity measurements. An unannounced exercise will be carried out in order to test the alert procedures and the responsiveness of the stakeholders. ASN is continuing to look at ways of strengthening its doctrine to control urban development around the BNIs. ASN's responsibilities include informing local authorities of the risks inherent in nuclear installations. This information must be provided coherently and systematically for all installations with an off-site emergency plan. For the longer term, it will be necessary to define the methodology for drawing up public protection restrictions to limit urban development and thus limit the consequences of an accident occurring in an installation.

In the post-accident field, an operational guide for preparing future local post-emergency phase management plans will be tested in several pilot *départements* in which an NPP is located.

An international seminar is scheduled for early 2011.