### Radiological emergency and post-accident situations

#### 1. Anticipating

- **1.1** Looking ahead and planning
  - 1.1.1 The emergency plans for basic nuclear installations (BNIs)
  - 1.1.2 The ORSEC-TMR plan
  - 1.1.3 The response to other radiological emergency situations
  - 1.1.4 Role of ASN in the preparation and follow-up of emergency plans
- 1.2 Controlling urban development around nuclear sites
- 1.3 Organising a collective response
  - 1.3.1 Local response organisation
  - 1.3.2 National response organisation
- 1.4 Protecting the public
  - 1.4.1 General protective actions
  - 1.4.2 Iodine tablets
  - 1.4.3 Care and treatment of contaminated persons
- 1.5 Understanding the long-term consequences

#### 2. Acting in emergency and post-accident situations

- **2.1** Performing all duties in an emergency situation
  - 2.1.1 ASN’s duties
  - 2.1.2 Organisation of ASN
  - 2.1.3 ASN’s emergency response centre
- 2.2 Ensuring efficient coordination with international authorities
  - 2.2.1 Bilateral relations
  - 2.2.2 Multilateral relations
  - 2.2.3 International assistance

#### 3. Learning from experience

- **3.1** Carrying out exercises
  - 3.1.1 National nuclear and radiological emergency exercises
- 3.2 Assessing with a view to improvement

#### 4. Outlook
Nuclear activities are carried out with the two-fold aim of preventing accidents and mitigating any consequences should they occur. Despite all the precautions taken, an accident can never be completely ruled out and the necessary provisions for dealing with and managing a radiological emergency situation, no matter how improbable, must be planned for, tested and regularly revised.

Radiological emergency situations, arising from an incident or accident which risk leading to an emission of radioactive substances or to a level of radioactivity, liable to affect public health, include:
- emergency situations arising on a BNI;
- accidents involving radioactive material transports (RMT);
- emergency situations occurring in the field of small-scale nuclear activities.

Emergency situations affecting nuclear activities can also comprise non-radiological risks, such as fire, explosion or the release of toxic substances.

These emergency situations are covered by specific material and organisational arrangements, which include the emergency plans and involve both the licensee or party responsible for the activity and the public authorities.

The French nuclear safety regulator (ASN) is involved in managing these situations, with regard to questions concerning the regulation of nuclear safety and radiation protection and, backed by the expertise of its technical support organisation, the Institute for Radiation Protection and Nuclear Safety (IRSN), it has the following four key duties:
- to ensure and verify the soundness of the steps taken by the licensee;
- to advise the Government and its local representatives;
- to contribute to the circulation of information;
- to act as competent Authority within the framework of the international conventions.

To ensure management of the post-accident phase, following on from the radiological emergency management phase, ASN in 2005 set up a steering committee (CODIRPA), whose doctrine concerning the emergency phase exit, transition and long-term periods was published in November 2012.

1 ANTICIPATING

111 Looking ahead and planning

1111 The emergency plans for basic nuclear installations (BNIs)

The emergency plans relative to accidents occurring at a BNI define the measures necessary for protecting the site personnel, the general public and the environment, and for controlling 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. Pursuant to decree 2007-1557 of 2nd November 2007, the PUI is one of the items to be included in the file sent by the licensee to ASN prior to commissioning of its facility.

The off-site emergency plan (PPI) is established by the Prefect 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.

The PPI implements the orientations of civil protection policy in terms of mobilisation of resources, information, alert, exercises and training”. This decree also stipulates the characteristics of the facilities or structures for which the Prefect 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 departmental or zonal ORSEC plan applies in full.

More broadly, the interministerial directive of 7th April 2005 on the response by the public authorities to 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 PIRATE1 plans.

1 Plans which are part of a larger system of vigilance, prevention, protection and counter-terrorism.
The ORSEC-TMR plans

Radioactive substances transport (RMT) in France represents more than 900,000 packages of various dimensions and types. The risk varies according to the content.

Pursuant to the international regulations on dangerous goods, those involved in the transport of dangerous goods must take steps appropriate to the nature and scale of the foreseeable hazards, in order to avoid damage or, as applicable, to mitigate the effects. These steps are described in a management plan for events linked to RMT.

To prepare for the possibility of an RMT accident in his département, each Prefect draws up a specific plan, called the ORSEC-TMR plan which is encompassed within the ORSEC plan. This plan complies with the interministerial directive of 7th April 2005 and the circular of 23rd January 2004 approving the guide to the drafting of the ORSEC-TMR plans. Faced with the diversity of possible types of transport operation, the ORSEC-TMR plans define the criteria and simple measures enabling the first respondents (departmental fire and emergency service (SDIS) and law enforcement services in particular) to initiate the first reflex response measures to protect the general public, based on their findings on the site of the accident.

The response to other radiological emergency situations

Apart from incidents affecting nuclear installations or an RMT operation, radiological emergency situations can also occur:
– 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 circular 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-NRBC (nuclear, radiological, biological, chemical) plan.

Given the large numbers of those who could possibly issue an alert and the corresponding alert circuits, all the alerts are centralised in a single location, which then distributes them to the parties concerned: this is the fire brigade’s centralised alert processing centre CODIS-CTA (Departmental Fire and Emergency Operations Centre – alert processing centre), that can be reached by calling 18 or 112.

Role of ASN in the preparation and follow-up of emergency plans

Examination of emergency plans for nuclear facilities or activities

ASN examines the on-site emergency plans before authorising the commissioning of BNIs or authorising the possession and utilisation of high-level sealed sources (Article R.1333-33 of the Public Health Code), as well as the management plans for events linked to RMT.

Participation in drafting the off-site emergency plans

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

Off-site emergency plans, such as the PPI, identify the general public protection measures such as to mitigate the health and environmental consequences of any accident. The Prefect decides whether or not to deploy these measures on the basis of the predicted dose that would be received by a person situated in the open air at the time of the accident.

The intervention levels associated with the implementation of general public protection measures in a radiological emergency situation, mentioned in Article R.1333-80 of the Public Health Code, are:

- Level 1: To be notified by phone (18). The Prefect is informed of the status.
- Level 2: To be notified by phone (18). An alert is sent to the parties concerned.
- Level 3: To be notified by phone (18). An alert is sent to the parties concerned, and intervention begins.

TO BE NOTED IN 2012

EDF’s new PUI baseline requirements

EDF undertook a revision of its emergency baseline requirements (2RC project) in 2008, which led to the implementation of new PUIs on the sites on 15th November 2012, following their examination by the ASN divisions. The main objectives of these baseline requirements, which take account of operating experience feedback, are:
- better integration of all risks, whether or not radiological;
- a clarified emergency response organisation which is made modular and graduated;
- guaranteed uniformity of response organisation on all sites, consistently with EDF’s national response organisation;
- provision of a statutory PUI document complying with the new requirements of the regulations.

These new baseline requirements also comply with an instruction issued by ASN following the Fukushima Daiichi accident, by introducing “Climatic and Similar Safety Hazards” into the PUI, allowing management of events affecting one or more facilities on the same site, including in the event of isolation of the site.
Code are thus defined by ASN resolution 2009-DC-0153 of 18th August 2009:
- 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 predicted doses are those that it is assumed will be received until releases into the environment are brought under control, generally calculated over a period of 24 hours. In the event of doubt concerning the duration of the releases, the time adopted for the calculation does not exceed one week.

The accident which occurred in Fukushima Daiichi showed that a severe accident in an NPP could have consequences over several tens of kilometres, which goes beyond the current emergency planning limits. In France, PPI planning makes provision for civil protection of the population residing within a 10 km radius around the affected reactor in the initial hours of the accident. The effectiveness of this organisation thus requires the preparation and, as applicable, the implementation of measures beyond the PPI perimeter as part of the ORSEC planning process. Interministerial work is currently examining the robustness of the system and the possibility of improvements beyond the current PPI perimeters.

As of 2013, ASN will assist the General Directorate for Civil Security and Emergency Management (DGSCGC) with supplementing the PPIs with regard to aspects relating to post-accident management (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 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 facility accident that occurred in Toulouse (South of France) in 2001. The TSN Act, now codified in Books I and V of the Environment Code, enables the public authorities to control urban development around BNIs, by implementing institutional controls limiting or prohibiting new constructions 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 Prefect informs the mayors of the risks that exist and ensures the legality of the actions by the municipalities;
- ASN supplies technical data in order to characterise the risk, and offers the Prefect 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 sheltering and evacuation measures. It focuses on the “reflex” zones of the PPIs, or the rapid-development hazard zones, 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.

A circular from the Ministry of the Environment dated 17th February 2010 has asked the Prefects 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.

This working group, which involved the administrations, elected officials, the National Association of Local Information Commissions and Committees (ANCCLI) and the licensees concerned, proposed a draft guide in 2011 for the management of activities around BNIs, based on the following principles:
- to preserve the operability of the emergency plans;
- to favour urban development outside the zone in which the risk could rapidly develop;
- to allow controlled development that meets the needs of the resident population.

This guide was the subject of extensive public consultation on the websites of the Ministry in charge of the environment and ASN, in late 2011. In 2012, work continued with the Ministry in charge of the environment to supplement the guide with procedures for setting up institutional controls designed to take account of the principles of activities management in the planning and land use documents.

1.3 Organising a collective response

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

Act 2004-811 of 13th August 2004 on the modernisation of civil protection, 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. Several decrees implementing this Act have been issued to clarify it:
- 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 communal disaster contingency plan (PCS).

The field of radiological emergency situations is clarified in the interministerial directive of 7th April 2005, which constitutes the basis for the organisations adopted by the public authorities and the licensee presented in diagram 1.

Following the Fukushima accident, considerable thought was given nationally and internationally to consolidating and, as applicable, improving the response organisation measures adopted by the public authorities. The accident which occurred at Fukushima Daiichi showed that it was necessary to improve preparation for the occurrence of a multi-faceted accident (natural disaster, accident affecting several facilities simultaneously). The response organisations set up must therefore be robust and capable of managing a large-scale emergency for a long period of time. There must be greater anticipation of and preparation for interventions in a degraded radiological situation along with better international relations to enable support to be provided to the country affected.

Thus, at the national level, ASN is closely involved in interministerial work on nuclear emergency management.

At the international level, ASN is taking part in the experience feedback work being done by international bodies such as the IAEA, the NEA, and within Authority networks such as WENRA or HERCA, which bring together the heads of the European nuclear safety and radiation protection authorities.

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

Local response organisation

In an emergency situation, several parties have the authority to take decisions

– the licensee of the affected nuclear facilities deploys the response organisation and the resources defined in its PUI (see point 111);

– ASN has the role of overseeing the actions of the licensee. In an emergency situation, aided by IRSN’s assessments, it can at any time ask the licensee to perform assessments and take the necessary actions;

– the Prefect 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. 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 Prefect 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 measures to protect the population. To this end, the mayor of a town included within the scope of application of a PPI must draw up and implement a local safeguard plan to provide for, organise and structure the actions to accompany the Prefect’s decisions. The mayor also plays a role in passing
on information and heightening population awareness during iodine tablet distribution campaigns.

1.3.2 National response organisation

In the event of a severe accident, an interministerial crisis committee (CIC) is set up. The ministries concerned, together with ASN, work together to advise both the prefect at the local level and the government, within the CIC, on protective measures to be taken. They provide the information and advice necessary 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 parties concerned and liable to be convened within the CIC are as follows:
- Ministry of the Interior: the DGSCGC houses the government emergency management operational centre (COCIG) and the nuclear risk management support team (MARN). It provides the prefect with material and human resources for the protection of individuals and property;
- Ministry in charge of Health: responsible for human health protection against the effects of ionising radiation;
- Ministry in charge of the Environment: the nuclear safety and radiation protection authority (ASN) takes part in the state’s nuclear safety and radiation protection responsibilities, jointly with the other competent administrations;
- 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 (SNM) 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 and 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. Its role is to coordinate governmental action in radiological or nuclear emergency situations;
- ASN is involved in the management of radiological emergency situations. Its duties are detailed in point 2.1.1.

1.4 Protecting the public

1.4.1 General protective actions

The steps to protect the populations that can be taken during the emergency phase, as well as the initial actions as part of the post-accident phase, aim to protect the populations from exposure to ionising radiation and to any chemical and toxic substances that may be present in the releases. These actions must be included in the PPI.

In the event of a serious accident, liable to lead to releases, a number of preventive measures can be envisaged by the prefect 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 prefect broadcast by radio;
- administration of stable iodine tablets: when ordered by the prefect, 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 prefect 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.

If radioactive substances are actually released into the environment, the first actions to be taken are decided on in order to prepare for management of the post-accident phase: they are based on the definition of area zoning to be implemented on exiting the emergency phase and including:
- a population protection zone (ZPP) within which action is required to reduce both the exposure of the populations to ambient radioactivity and the consumption of contaminated food, as low as reasonably achievable;
- a heightened territorial surveillance zone (ZST), which is larger and which is more concerned with economic management, within which specific surveillance of foodstuffs and agricultural produce will be set up;
- if necessary, an evacuation perimeter is created within the ZPP defined according to the ambient radioactivity (external exposure). The residents must be evacuated for a varying length of time depending on the level of exposure in their environment.

1.4.2 Iodine tablets

Taking stable iodine tablets is a means of saturating the thyroid gland and protecting against the carcinogenic effects of radioactive iodines.

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. This circular requires that the licensee finance the public information campaigns within the perimeter of the PPI and carry out permanent preventive distribution of the stable iodine tablets, free of charge, through the network of pharmacies.

The last national distribution campaign for iodine tablets dates back to 2009 and concerned the populations located within the zone covered by the PPIs around the NPPs operated by EDF. This campaign was run by ASN. 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 highlights shortcomings in the “risk culture” and the need for better information and communication. Consequently, in early 2010, the boxes were posted to those who had not collected their tablets from a
pharmacy. Following this second phase, the total coverage ratio for the population around the NPPs, was about 93%.

Outside the zones covered by PPIs, tablets are stockpiled to cover the rest of the country. In this respect, the Ministries in charge of health and the interior decided to create stocks of iodine tablets, positioned and managed by the Health emergency preparedness and response organisation (EPRUS). In his department, each Prefect organises the procedures for distribution to the population, relying in particular on the mayors for this. This arrangement is described in a circular dated 11th July 2011. The Ministry of Health thus ordered the manufacture of 110 million 65 mg tablets, which were shipped to the regional platforms managed by the EPRUS. Pursuant to this circular, the Prefects set up plans for iodine tablet distribution in the event of a radiological emergency situation.

143 Care and treatment of contaminated persons

In the event of a radiological emergency, 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 substances. 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 need to be adapted to the situations encountered.

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.

15 Understanding the long-term consequences

The post-accident phase concerns the handling over a period of time of the consequences of long-term contamination of the environment by radioactive substances following a nuclear accident. It covers the handling of consequences that are varied (economic, health, social), by their nature complex and that need to be dealt with 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, was tasked with establishing the framework for defining, preparing and implementing the steps necessary for dealing with post-accident situations following a nuclear accident. In order to draw up the corresponding aspects of doctrine, ASN in June 2005 created the Steering committee for managing the post-accident phase of a nuclear accident or radiological emergency situation (CODIRPA).

In order to carry out its work, the CODIRPA set up various thematic working groups as of 2005, involving a total of several hundred experts from a range of backgrounds (local information committees, associations, elected officials, health agencies, appraisal organisations, authorities, etc.) Experiments designed to test the doctrine under construction were carried out at the local level in 2010 on three nuclear sites and in various neighbouring communes, as well as during national emergency exercises carried out since 2008. All this work led to two international seminars organised by ASN in 2007 and 2011.

In November 2012, ASN sent the Prime Minister elements of the doctrine drafted by the CODIRPA, covering the emergency exit, transition and long-term phases, accompanied by an opinion from the ASN Commission. These elements were then posted on www.asn.fr and sent out to the ministries concerned.

In its opinion, the Commission considers that drafting and publishing the first elements of the doctrine is a first and important step in preparing for post-accident management and underlines the importance of continuing with and intensifying the implementation process.

In late 2012, the CODIRPA, chaired by ASN, decided to continue its work, primarily driven by the need to take account of the lessons learned from the post-accident management implemented in Japan in the wake of the Fukushima disaster, but also to ensure support for the preparatory work to be organised in the regions. Some questions are also still on hold, pending the outcome of the first phase of the CODIRPA’s work and the thought that has so far been given to intermediate scale accidents must be extended to include the management of severe accidents.

In this context, three areas for focus were proposed:
– to test and complete the elements of doctrine with respect to the different accident situations;
– to assist with regional implementation of the elements of post-accident management;
– to take into consideration and share international work done on the post-accident topic.

Post-accident management of a nuclear accident is a complex subject involving numerous aspects and many players. The ongoing reflection being given to this subject must continue to benefit from the support of a pluralistic structure based on the current participants of the CODIRPA, plus other stakeholders involved in the preparation of post-accident management.

The new duties will focus on keeping a watching brief and on supporting and analysing the various post-accident preparation processes, with the aim of periodically proposing updates to the doctrine.
2 ACTING IN EMERGENCY AND POST-ACCIDENT SITUATIONS

2.1 Performing all duties in an emergency situation

2.1.1 ASN’s duties

In an emergency situation, the responsibilities of ASN, with the support of IRSN, are as follows:
1) to verify and check the soundness of the steps taken by the licensee;
2) to advise the Government and its local representatives;
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

In the same way as in a normal situation, ASN acts as the regulatory Authority in an accident 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. 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.

Advising the Government and the Prefect

The decision by the Prefect concerning the general public protective measures to be taken in radiological emergency and post-accident situations 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 Prefect in this respect, integrating the IRSN’s analysis. This analysis combines diagnosis of the situation (understanding of the situation at the installation affected, consequences for man and the environment) and prognosis (assessment of possible developments, notably radioactive releases). This advice also concerns the steps to be taken to protect the health of the general public.

Dissemination of information

ASN is involved in a number of ways in informing:
– the media and the public: ASN contributes to informing both the media, the general public and the stakeholders 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 (Prefect, local and national licensee, etc.);
– institutional entities: ASN keeps the Government informed, along with the SGDSN, which is responsible for informing the President of the Republic and the Prime Minister.
– foreign nuclear safety regulators.

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 in BNIs

In 2011, following the Fukushima accident, ASN carried out an examination which, in the event of an incident or an accident occurring in a BNI, led it to deploy a response organisation in particular comprising:
– at the national level:
  • the ASN Commission, which could be called on to issue resolutions and requirements in an emergency situation;
  • a technical strategic management command post (PCD), located in the ASN emergency response centre in Paris and in constant contact with its technical support organisation, IRSN, and with the ASN Commission. Its role is to adopt a stance for advising the Prefect, who acts as the director of emergency operations;
  • a communication command post 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 Prefect in his decisions and communications;
  • ASN inspectors on the damaged site, forwarding the positions adopted at the national level and monitoring the decisions taken by the licensee.

ASN is supported by an analysis team working at the IRSN’s Technical Emergency Centre (CTC).

Experience feedback from the Fukushima accident also led ASN to envisage sending one of its representatives to work alongside the French embassy in the country where the accident occurred.

Diagram 2 summarises the role of ASN in a radiological emergency situation. This simple and functional diagram is based on an ASN representative working with the Prefect, transmitting and explaining the recommendations from the ASN strategic management command post (PCD).

Diagrams 3 and 4 show the relations between the public authorities, the Government and the safety regulator, the licensees and the technical experts in a radiological emergency situation.
These relations are organised around three circles of expertise, decision and communication, within which regular audio-conferences are held. 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 (PCD) post spokespersons, who are responsible for ensuring that the information sent out to the public and the media is consistent. For the year 2013, as an experiment and in order to train its spokespersons, IRSN will also be involved in the planned communication organisation.

It should be pointed out that these diagrams represent a simplified version of a complex organisation which also involves the ministerial levels.

Organising a response to any other radiological emergency situation

A special telephone number enables ASN to receive calls notifying incidents involving sources of ionising radiation used outside BNIs or during RMT. It is accessible 24 hours a day, 7 days a week. The information given during the call is transmitted to an ASN official, also available round the clock, who will act accordingly. Depending on the seriousness of the accident, ASN may decide to activate its emergency response centre in Paris. If not, only the ASN local level (division concerned) intervenes to perform its support for the Prefect and communication duties, if necessary calling on the expertise of the headquarters offices. Investigations are currently ongoing to look at ways of adapting and reinforcing the graduated nature of ASN’s response and organisation in the event of an emergency.

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 Prefect 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 Prefects, 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 Prefect concerning public safety outside nuclear installations.

211 3 ASN’s emergency response centre

In order to perform its duties, ASN has its own emergency response centre, the activation of which is in no way indicative of the gravity of the situation. This emergency response centre has been activated in real-life situations in the event of incidents or
CHAPTER 5
RADIOLOGICAL EMERGENCY AND POST-ACCIDENT SITUATIONS

Diagram 3: Planned safety response

Diagram 4: Planned communication response
accidents. Thus, in 2012, it was activated for the 5th April 2012 incident which occurred on the Penly site following tripping of a fire alarm and failure of a reactor coolant pump oil system.

ASN’s alert system allows rapid mobilisation of its emergency response centre staff and those of IRSN. 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. This thus gives ASN reliable channels for exchanging information with its many contacts. It also has a video-conferencing system which is the preferred means of contact with IRSN’s CTC.

Finally, the emergency response centre uses dedicated computer systems for alerts and information exchanges with the European Commission, the IAEA and the member states (ECURIE3, USIE4).

On the occasion of ASN’s relocation to new premises in 2013, the emergency response centre will be modernised. The specifications for the future emergency response centre outline the broad design objectives. It shall in particular:
– be functional, scalable and modular, to allow effective technical and media-related emergency management;
– provide tools for digital sharing of data and modelling of the zones liable to be affected;
– allow regular and frequent exchanges with the IRSN CTC, the Prefects, the ASN staff deployed locally, the Ministers and foreign nuclear safety regulators;
– be integrated into a broader spatial organisation, involving other players and other decision-making locations within ASN.

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 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 abroad and finally to provide the ministers concerned with a copy of the notifications and information transmitted or received.

2 For more details on this incident, see www.asn.fr
3 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.
4 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.
Bilateral relations

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

In 2012, ASN thus continued to conduct regular exchanges with its transboundary counterparts with regard to coordinated emergency management procedures. Experience feedback from the Fukushima accident and the steps taken since then in each country, were at the heart of the debate. Finally, a procedure specifying the transboundary alert and information exchange mechanisms was defined with Switzerland.

ASN is continuing to develop bilateral relations in emergency management with countries such as the Russian Federation, Sweden and South Korea. ASN staff have been invited to these three countries and in 2012 participated in emergency exercises, as observers (see box). In particular, during an exercise in Russia, extensive participation by the local population and significant deployment of human and material resources was observed.

Multilateral relations

The Fukushima Daiichi accident occupied a substantial amount of time of many of the ASN and IRSN staff, even though it was a remote accident for which the radiological consequences in France would appear to be limited. In addition, ASN’s actions were also limited, because it is not its responsibility to monitor the actions of the Japanese licensee.

This accident highlighted the problems that would be encountered by ASN, IRSN, but also their European counterparts, in managing a large-scale accident in Europe. The nuclear safety regulators confirmed the need for mutual assistance mechanisms and have already undertaken international work to improve their response organisations.

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 Response Assistance Network (RANET). In April 2012, ASN thus took part in the meeting of the competent Authorities concerning the Conventions on Early Notification and on International Assistance.

ASN is a member of the IAEAs National Competent Authorities’ Coordinating Group (NCACG) and has represented the competent authorities of Western Europe since 2005. During the above-mentioned meeting of the competent Authorities, ASN was re-elected and its mandate was extended to the Eastern European region.

ASN also works with the NEA and participates in the Working Party on Nuclear Emergency Matters (WPNM).

At the European level, ASN is a participant in the “Emergencies” working group reporting to the HERCA Association. It also acts as secretary. 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.

Within WENRA, ASN is pilot for the “Mutual assistance” working group tasked with proposing mutual assistance actions.

“Unified exercise” in South Korea

On 10th and 11th October 2012, ASN staff along with representatives from IRSN and the French Embassy in Seoul, were able to observe one of the large-scale exercises held every five years in South Korea. The exercise scenario was an earthquake followed by a 12-metre tidal wave striking the Ulchin NPP (Eastern coast of Korea). The exercise involved several emergency response centres and a large number of high-level participants (in particular several Ministries, the nuclear safety regulator (NSSC), technical institutes (KINS, KIRAMS), local authorities and the operator). Considerable equipment resources were deployed, notably helicopters, fire trucks, water cannons and decontamination tents. Finally, extensive communication was carried out with the media and information exercises were conducted in the evacuation centres where the local populations participating in the exercise had been assembled.

This spectacular exercise however did not enable the observers to see the aspects relating to the alert and to the initial response by the players who had been pre-positioned, nor those linked to communication and international aspects.
between European nuclear safety regulators, with a view to ensuring coordinated, rational and efficient accident management. It also acts as secretary.

The two above-mentioned working groups agreed on the importance of a shared view of the risk at European level in the event of an accident, prior to harmonising the measures to protect the populations on either side of the borders. A working group common to the “Emergencies” and “Mutual assistance” groups was thus created in order to study the possibility of combining European expertise in the event of an accident, converging on a shared risk assessment, in order to lead eventually to more closely harmonised recommendations and resolutions between the countries.

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 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 2012, in its capacity as Competent Authority, ASN was approached by Peru with a request for assistance concerning workers accidentally exposed to a radioactive source from a gamma radiography device. An IRSN medical expert went to Peru 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. In 2012, ASN thus took part in a workshop on improving the RANET assistance network.

2|2|3  Meeting of the WENRA “Mutual Assistance” working group – November 2012

Resources of the Intra group

Since the INTervention Robotique sur Accidents (INTRA) group was created in 1988 by CEA, EDF and AREVA, it has been in charge of designing, operating and ensuring round-the-clock availability of a fleet of robotic devices capable of intervening in the place of humans in the event of a major nuclear accident. Experience feedback from the Fukushima Daiichi accident was extensively discussed during the annual seminar organised by the GIE Intra, held in June 2012 in Fontevraud (Maine-et-Loire département), during which ASN recalled the international dimension of the management of emergency situations. This seminar was an opportunity to observe these remote-controlled robot devices, which can operate in a contaminated atmosphere. Some of these resources are already included in the database of the RANET international assistance network.
3 LEARNING FROM EXPERIENCE

3.1 Carrying out exercises

Regularly holding exercises is a means of ensuring that the plans are kept up to date, that they are well-known to those in charge and to the participants at all levels and that the corresponding alert and coordination procedures are effective. The main aim of these nuclear and radiological emergency exercises is to test the planned response in the event of a radiological emergency in order:

– to train those who would be involved in such a situation;
– to implement the various organisational aspects and the procedures stipulated in the interministerial directives and in the emergency plans (PUI, PPI, ORSEC-TMR) or in the PCS and the various conventions;
– to identify possible improvements;
– to test the arrangements envisaged for developing the emergency situations management organisation;
– to develop a general public information approach so that everyone can, through their own individual behaviour, make a more effective contribution to civil protection.

These exercises, specified by an annual interministerial circular, involve the licensee, ministries, Préfectures, ASN and IRSN. They aim primarily to ensure a correct assessment of the situation, to bring the installation or the package 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 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 2012, concerning BNIs and RMT operations. This programme, announced to the Prefects in a circular of 20th December 2011, took account of the experience feedback from Fukushima and, for example, the case of a natural event simultaneously affecting several nuclear facilities on the same site.

Generally speaking, these exercises enable the highest-level decision-making circles to be tested, along with the ability of the leading players to communicate, sometimes with simulated media pressure on them. The following table describes the key characteristics of the national exercises conducted in 2012.

Apart from the national exercises, the Prefects are asked to conduct local exercises with the sites in their département, in order to improve preparedness for a nuclear or radiological emergency situation, specifically testing the time needed to mobilise all the parties concerned.

The performance of a national nuclear and radiological emergency exercise, at maximum intervals of 5 years on the nuclear sites, and an annual exercise concerning RMT, would seem to be a fair compromise between the training of individuals and the time needed to effect changes to organisations.

The exercises enable those involved to build on knowledge and experience in the management of emergency situations, in particular for the 300 or so persons mobilised in the field for each exercise.

For 2012, the objectives chosen in the annual circular of 20th December 2011 concerning the national nuclear or radiological emergency exercises were:

– to perform an exercise with safety and security components;
– to test certain elements of the emergency phase exit guide prepared by the CODIRPA;
– to 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 departmental operations centre (COD);

### Table 1: National civil nuclear and radiological emergency exercises conducted in 2012

<table>
<thead>
<tr>
<th>Nuclear Site</th>
<th>Date of exercise</th>
<th>Focus of the exercise</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEA/Cadarache</td>
<td>17th January 2012</td>
<td>Civil protection</td>
<td>Management of a nuclear event triggered by an earthquake</td>
</tr>
<tr>
<td>Saint-Alban NPP</td>
<td>31st January 2012</td>
<td>Civil protection</td>
<td>Emergency management during the first hours, including real time activation of the emergency command posts (PC)</td>
</tr>
<tr>
<td>Flamanville NPP</td>
<td>28th June 2012</td>
<td>Civil protection</td>
<td>Activation of an emergency command post (PC) in real time and implementation of initial post-accident measures</td>
</tr>
<tr>
<td>Bloysis NPP</td>
<td>20th November 2012</td>
<td>Nuclear safety</td>
<td>Ability of the services to deal with a major event on this site and mobilisation of site protection</td>
</tr>
<tr>
<td>Dampierre-en-Buty NPP</td>
<td>18th December 2012</td>
<td>Civil protection</td>
<td>Coordination between zones, of the health chain and evacuation of the personnel from the site to the Belleville-sur-Laire site</td>
</tr>
</tbody>
</table>
– to simulate an accident affecting several facilities on the same site;
– to activate international links.

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 defence-related facilities (ASND);
– international bodies (IAEA, European Commission, NEA);
– the ministries (Health, Interior, etc.).

With regard to nuclear security, security protection and evaluation exercises (EPEES) 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 Prefect. An EPEES exercise was thus held in the Cruas NPP on 4th October 2012.

With regard to defence-related facilities, three exercises run by the ASND were organised during the course of 2012, 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 Préfecture: a representative of the ASN division concerned goes to the Prefecture to advise the Prefect pending the arrival of the ASND’s representative.

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 response centre immediately after each exercise. ASN, along with the other players, endeavours to identify best 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. Twice a year, ASN brings all the players together to review best practices to improve the response organisation as a whole. These meetings enable the players to share their experience through a participative approach.

The exercises, as well as the real situations that occurred thus demonstrated the importance of communication in an emergency situation, in particular to inform the public sufficiently and the foreign regulators early and avoid the spread of rumours that could lead to panic among the population, whether in France or abroad.

During the exercises, it became clear that the siren system triggered by the licensees to alert the population did not in all cases cover the entire intervention perimeter. In these conditions, the licensees and EDF in particular, undertook to supplement the existing system of sirens by a telephone alert system called “SAPPRE®”. This new additional procedure automatically calls the landlines of the individuals concerned. It has been deployed around all the NPPs.

Finally, for the past two years, IRSN has been testing a system giving a geographical representation of the environmental radioactivity measurements. This tool, called CRITER, gives a rapid display summarising all the environmental radiological measurements taken, giving decision-makers a clear view of any radiological impact.

6. SAPPRE: French acronym for system of population alert in the reflex phase.
In accordance with the important nuclear emergency duties entrusted to it by the TSN Act, ASN makes a full contribution to the review process currently being carried out by the public authorities following the Fukushima accident, with the aim of improving the national radiological emergency organisation.

ASN thus identified areas for improvement in its own emergency organisation. It therefore drew up an action plan, the implementation of which will continue in 2013, in particular through the deployment of ASN’s future emergency response centre. On the occasion of ASN’s relocation to new premises in 2013, the emergency response centre will be modernised. It will have tools enabling it to share information so that it can ensure the most effective technical and media-related management of the emergency.

The Fukushima Daiichi accident highlighted the problems that would be encountered by ASN and its European counterparts, including the appraisal organisations, in managing a large-scale accident in Europe. The nuclear safety regulators confirmed the need for international work to improve their response organisations.

Moreover, the accident in Fukushima Daiichi showed that in the event of a severe nuclear accident in France, the French Government would be directly involved. It is therefore important that the emergency exercises closely involve the licensee managers and the public authorities at a high level. These exercises must also be able to test the interface between the ORSEC and PPI arrangements and ensure that the skill levels of the emergency response players are maintained. ASN will ensure that these exercises also have an educational and informative dimension by extensively involving the populations in their preparation.

ASN will also clarify and reinforce its doctrine with respect to controlling urban development around the BNIs. With the support of the Ministry of the Environment it will finalise the guide for the control of activities around BNIs, so that it can then be sent out to the offices of the Prefects. For all facilities with a PPI, general public information measures and the urban development plans updates resulting from application of the guide will then need to be carried out coherently and systematically.

In the field of post-accident situation management, jointly with the Ministry of the Interior, ASN will send the Prefects those aspects of doctrine concerning the exit from the emergency phase, so that they are taken into account and included in the PPIs. ASN also suggested to the Government that it continue to assist the public authorities with organising the emergency exercises, in continuing with preparation for nuclear post-accident management in the regions and in implementing the elements of the first national doctrine, especially taking account of experience feedback from the Fukushima accident.

Finally, at an international level, ASN will pursue the European initiatives taken with a view to achieving 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.