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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. This emergency organisation, which is regularly tested and evaluated, is also regularly revised to take account of operating experience feedback from exercises and from management of real situations.

Radiological incidents or accidents can also occur outside BNIs, for example:

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

ASN takes part in managing the radiation protection aspects of these emergency situations. ASN has thus divided its duties into four main areas:

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

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 of the emergency plans, in order to determine the measures necessary to protect plant staff and the population and to control the accident on the site.

The on-site emergency plan (PUI), 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 off-site emergency plan (PPI or ORSEC plan), drafted by the *préfet*², is to protect

populations in the short term in the event of potential danger and provide the licensee or the party in charge of transport with outside intervention assistance. It defines the tasks assigned to the various services concerned, the 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, containing the PUI in particular, before start-up of the installation.

The on-site emergency plan must specify the organisational measures, response methods and necessary resources the licensee intends to implement in the event of an emergency in order to protect its personnel, the

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

2. In a *département*, representative of the State appointed by the President.

public and the environment from ionising radiations and to preserve or restore the safety of the installation.

During the course of 2008, ASN drafted a regulatory text giving a more precise definition of the required content of the PUI. This work was done as part of a broader reflection on the creation of a new regulatory pyramid. In 2008, ASN involved IRSN in this work.

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

Participation in drafting the off-site emergency plans

Pursuant to the 13 September 2005 orders concerning the PPI and the ORSEC plan, the *préfet* is responsible for preparing and approving the PPI. ASN assists the *préfet* in analysing the technical data to be provided by the licensees, in order to determine the nature and scope of the consequences. This analysis is conducted jointly by ASN with its technical support organisation IRSN, which takes account of the most recent available data on serious accidents and radioactive material dispersal phenomena. ASN makes sure that the PPI and PUI are consistent.

Definition of the response levels³ is based on the most recent international recommendations and, since 2003, has been stipulated in regulatory requirements.

Following on from the actions taken in 2004, and jointly with the Ministry for the Interior, ASN is taking part in drafting the ORSEC plans (the part covering the specialised emergency plan for transport of radioactive materials), initiated by the circular issued to the *préfets* on 23 January 2004 and revising the PSS-TMR (specialised emergency plan for the transport of radioactive materials).

Population protection actions

Based on the above-mentioned response 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 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, in particular:

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

The scope of nuclear emergencies and of radiological emergencies in general, is specified in the Government directive of 7 April 2005. The response organisation of the authorities and that of the licensee are presented in diagram 1. This is specific to an accident affecting a PWR reactor. A similar organisation is put in place when dealing with another nuclear licensee or in the event of an accident involving a radioactive material transport.

1 | 2 | 1 Local arrangements

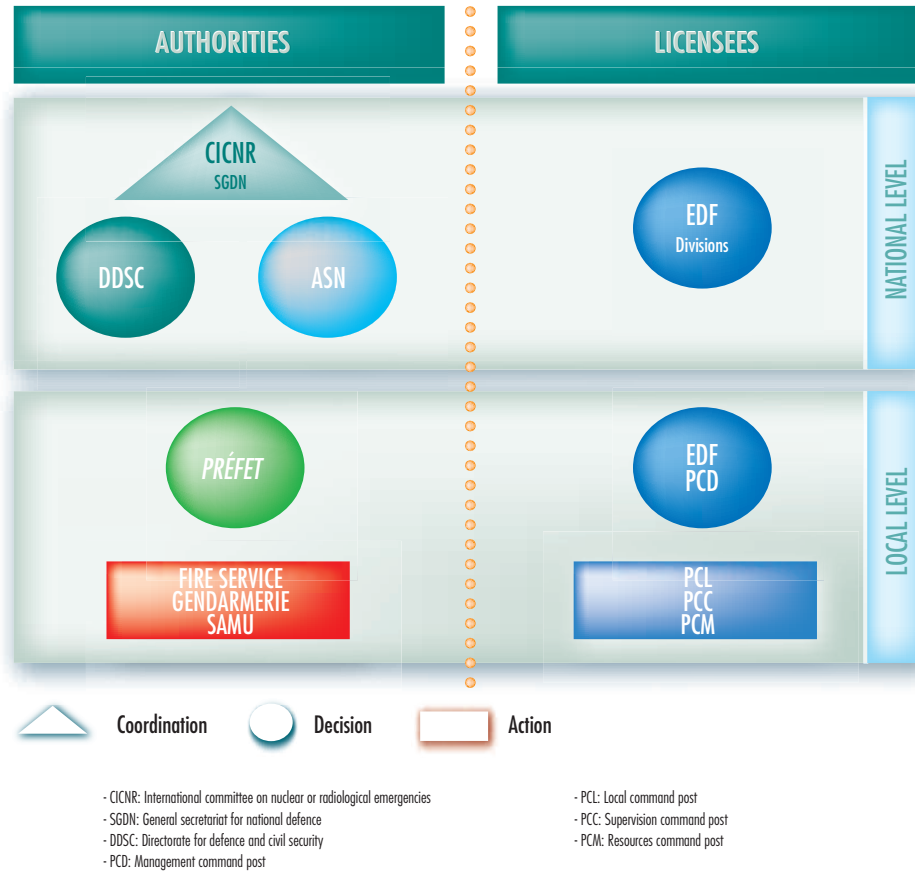
In an emergency situation, there are only two individuals with authority to take operational decisions:

- the licensee of the affected nuclear installation, who must implement the organisational arrangements and the means to bring the accident under control, to assess and mitigate its consequences, to protect the individuals on the site and alert and regularly inform the authorities. This arrangement is defined beforehand in the licensee's mandatory PUI;
- the *préfet* of the *département*⁴ in which the installation is located, who is responsible for decisions as to the measures required to ensure the protection of both population and property at risk owing to the accident. His actions will be regulated by the PPI specially prepared for the vicinity of the installation concerned. He is thus responsible for co-ordination of the PPI resources, both public and private, equipment and manpower. He keeps the population and the authorities informed of events. Through its regional divisions, ASN assists the *préfet* in drafting the plans and managing the situation.

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

4. Administrative region headed by a *préfet*.

Diagram 1: emergency response in the event of an accident affecting a nuclear reactor operated by EDF



1 | 2 | 2 National arrangements

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 Aid Committee (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 duties, jointly with the other competent administrations, especially those responsible for civil security;

- Ministry of Defence: the Defence Nuclear Safety and Radiation Protection Delegate (DSND) is the competent authority for regulating the safety of secret basic nuclear installations (INBS), military nuclear systems (SNM) and defence-related transport. A protocol was signed by ASN and the DSND on 26 January 2005 to ensure coordination between these two entities in the event of an accident affecting an activity under the supervision of the DSND, to facilitate the transition from the emergency phase managed by the DSND to the post-accident phase for which ASN is competent;
- General Secretariat for National Defence (SGDN): the SGDN handles the secretarial functions for the Interministerial Committee for Nuclear and Radiological Emergencies (CICNR). It is responsible for 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 a committee convened at the initiative of the Prime Minister. Its role is to coordinate governmental action in the event of a radiological or nuclear emergency.

- 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 duties in the event of an emergency are detailed in point 2 | 1 | 1. The organisation of the ASN is based primarily on its regional divisions.

Finally, the emergency response of some of the licensees is organised at a national level, providing technical expertise and coordinating the licensee's resources nationwide.

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 (PPI) for a BNI. 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 large-scale radioactive releases, the *préfet* may order evacuation. The population is then asked to prepare a bag, secure the home, leave it and go to the nearest muster point.

Furthermore, in order to minimise contamination by ingestion, a ban on the consumption of contaminated foodstuffs may be ordered as a precaution during the emergency phase. Maximum allowable 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 concerning its consequences. He may remind people that they must not pick plants or vegetables from their gardens or farms for consumption during the sheltering period.

1 | 3 | 2 Iodine tablets

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

The Government also asked the *préfets* to make plans for stockpiling in each département in order to cover the entire country. A circular dated 23 December 2002 provided the *préfets* with help in drawing up plans for managing stocks of stable iodine tablets.

The Ministry for Health asked ASN in June 2006 to draft, on the basis of past experience, a “new iodine policy” targeted at the most susceptible populations and harmonised with the policies of neighbouring countries. In response to this request, ASN set up two national and international working groups.

Following the work initiated by these two groups, the ASN Commission decided on further guidelines and proposed implementation of them in a letter dated 27 November 2007, sent to the Minister for Health. These guidelines are detailed in the above box. In a letter of 9 January 2009, the Minister for Health gave his agreement to these proposals and requested that ASN adopt

Abstract of a Master's thesis on sheltering and listening in an accident situation

The instruction to take shelter and listen for further instructions in the event of a nuclear accident in a BNI is in principle simple and quickly applied. However, the lack of any quantified scientific argument to demonstrate its effectiveness means that this measure cannot be implemented without the acceptance of the local residents concerned, who may have a natural tendency to flee. In order to ensure this acceptance, it is recommended that the population be involved in preparations for management of the consequences of a radiological emergency. This involvement must be part of a more general overhaul of institutional communication in the civil nuclear sector.

Summary of the proposals by the national and international working groups concerning protection of the population against releases of radioactive iodine

In the event of releases of radioactive iodines affecting several countries, the provision of common references is proposed for the first hours following an accident and until such time as official international coordination intervenes. In addition to the administration of stable iodine tablets, a coherent range of population protection measures is now proposed, in order to prevent the appearance of radiation induced cancers. This system includes sheltering and listening, consumption restrictions and evacuation. It implies adequate information of the populations and stakeholders concerned, in particular the emergency response teams. The existing arrangements applicable to young people and, by extension, to pregnant women, need to be strengthened. The radiological emergency response level for the thyroid should therefore be lowered from 100 mSv to 50 mSv and new stable iodine tablets of 65 mg instead of 130 mg must be developed.

and implement the new arrangements. As part of its public information duty, ASN set up a working group at the end of 2008 to look at the overall information arrangements for the public concerned, in order to ensure that the stable iodine distribution campaign was a success in the PPI zones around the EDF power plants concerned.

1 | 3 | 3 Care and treatment of radiation victims

In the event of a nuclear or radiological accident, a significant percentage of the injured 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 are designed to act as guidelines for the services and organisations in charge of planning for and handling emergency situations. This circular is currently being revised.

Together with the Directorate for Hospitalisation and Health Care Organisation (DHOS) of the Ministry for Health, the departments of the Defence High Official (HFD) of said ministry, the specialists from the Paris SAMU (emergency medical service), the French Army Radiological Protection Service (SPRA), IRSN, CEA, EDF and universities, ASN drafted and in 2007 and 2008 updated a collection of Response information sheets entitled “Medical response to a nuclear or radiological event”. This document contains all useful information needed by front-line medical personnel responsible for collecting and transporting the injured, as well as by hospital personnel who will be receiving them in the nearby hospital facilities. This guide, distributed in October 2008, acts as a teaching aid for the medical emergency professionals national training programme set up by the Ministry for Health and the French SAMU emergency medical service.

The “Medical response to a nuclear or radiological event” sheets come in addition to circular DHOS/HFD/DGSNR 2002/277 of 2 May 2002 concerning the organisation of medical care in the 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 hazards.



Guide distributed by ASN to professional users, concerning medical intervention in the event of a nuclear or radiological event – October 2008

To deal with the response to a nuclear, radiological, biological and chemical threat (NRBC), ASN has since 2006 organised a post-university theoretical and practical training module and distributed teaching tools to physicians in nuclear medicine departments. To do this, ASN has obtained assistance from the Paris SAMU emergency medical service, the Paris public hospitals, the HFDS of the Ministry for Health, CEA and a private company. These awareness and training days are a means of maximising the knowledge available to the response personnel.

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 if a situation felt to be acceptable is to be restored. Pursuant to the government directive of 7 April 2005, ASN, in association with the ministerial departments concerned, is responsible for “establishing the framework, for defining, preparing and implementing the steps necessary to deal with the post-accident situation”.

In order to draft a post-accident policy, ASN first of all focused on developing the post-accident aspect when carrying out national and international exercises (such as INEX3) and initiated a more general debate by bringing together all the stakeholders in a steering committee (CODIRPA) in charge of the post-accident aspect. In addition to ASN, which acts as Chair, this committee comprises representatives from the various ministerial departments concerned by the subject, health agencies, associations, representatives of the local information committees (CLI) and IRSN.



No 180 of the *Contrôle* magazine published by ASN concerning post-accident management of a nuclear accident – July 2008

In 2008, CODIRPA continued to work on consolidating initial aspects of policy, initiating discussions with the stakeholders and broadening the scope of the dialogue by taking account of other accident scenarios. The decision was also made to hold an extended steering committee meeting once a year, involving representatives of the licensees, the CLIs and ANCLI.

Summary of the CODIRPA work and proposals

In a letter dated 5 March 2008, ASN sent the Prime Minister a summary of the work done so far by CODIRPA and a summary of the reports produced by the working groups.

The work, which is scheduled to continue over the period from 2008 to 2010, will enable the creation of a process of consultation with the stakeholders at local and national levels, in order to compare the proposals made with the actual situation in the field. The work will also be expanded to include other accident scenarios (in particular a scenario involving an accident occurring abroad).

Given the scale of the work under way, it became apparent that the resources invested by the structures already involved had reached their limits in the current configuration. It would therefore appear necessary to increase these resources in order to continue with and indeed investigate further the issues raised during the first phase of the work.

2 MANAGING EMERGENCY SITUATIONS

2|1 Assisting the Government

2|1|1 ASN's role in emergencies

In an emergency situation, the roles 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 action 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, minimising 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 release). 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:

- institutional information: ASN keeps the Government informed, along with the SGDN responsible for informing the President of the Republic and the Prime Minister;
- provision of information to 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 organisations who are themselves involved in communication (*préfet*, local and national licensee, etc.);
- information of foreign regulatory bodies: ASN informs the foreign regulatory bodies concerned by any consequences on their territory.

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. In this capacity, it collects and summarises the information needed for the notifications, information and requests provided for in these conventions. This information is forwarded to the international organisations (IAEA and European Union).

2|1|2 ASN's organisation

Nuclear safety organisation

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 command centre (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 analysis team led by IRSN's Director General or his representative. This team is located in IRSN's Technical Emergency Centre (CTC). ASN and its technical support organisation IRSN, 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

Incident in the Krško nuclear power plant in Slovenia

On 4 June 2008, at 17 h 38, ASN was notified of an incident in the Krško nuclear power plant in Slovenia. This notification led to a large number of clarification requests from the French press.

The member States of the European Union are obliged to notify their counterparts of any nuclear event occurring on their territory and liable to lead to radioactive releases, so that they can, if necessary, take steps to protect their population. To do this, they use the ECURIE system created in 1987.

ASN regularly tests the ECURIE system during the ten or so exercises it organises periodically every year. As the competent authority, ASN keeps track of events and assesses the nature of the danger for the populations and the environment, immediately alerting the authorities as and when necessary.

ASN also uses additional information arrangements: exchanges with its counterparts and notes and press releases placed on-line on its website, www.asn.fr. It also exchanges information with the heads of the nuclear regulatory bodies in various countries, especially through conventions and agreements with its neighbours.

The Krško power plant in Slovenia entered service in 1981. Its design is similar to that of the French pressurised water reactors. On Wednesday 4 June 2008, at 15 h 07, a leak occurred in the primary coolant system of the Krško power plant reactor core, while it was operating at full power. This leak, which occurred inside the containment, was of about 2 m³/h. The control teams reduced reactor power and shut it down. After checks carried out by the licensee, the origin of the leak was located in the primary system reactor coolant pumps. The leak was contained inside the reactor building and there were no releases into the environment. This limited-scope incident should not have required use of the ECURIE alert system.

consistency of the information issued to the public and the media.

Responding to any 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 ministers and stakeholders concerned, drafted circular DGSNR/DHOS/DDSC 2005/1390 of 23 December 2005. This circular defines how the government 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 effects of ionising radiations 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 “one-stop shop” where all alerts arrive and where they are then passed on to the other parties concerned. This one-stop shop is the fire brigade’s central emergency call alert processing unit which can be reached by dialling 18.

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 for the individuals involved, confirmation of the radiological nature of the event, securing the zone and reducing the emission and, finally, clean-out.

Diagram 2: planned safety response

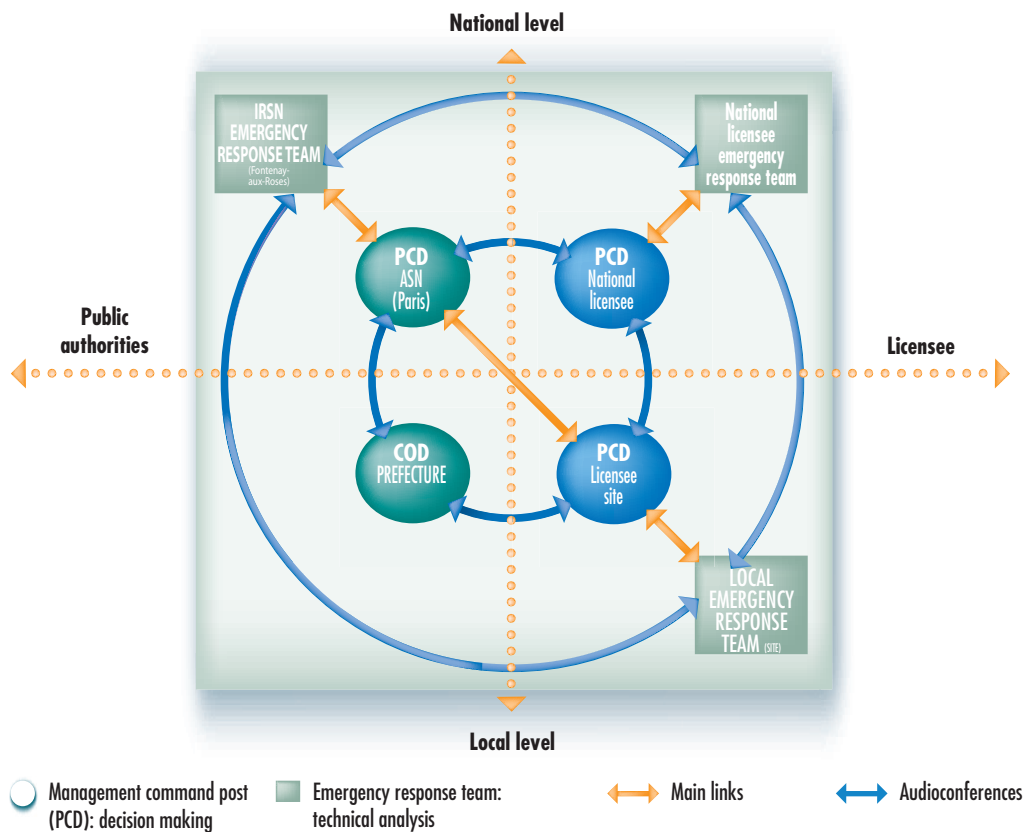
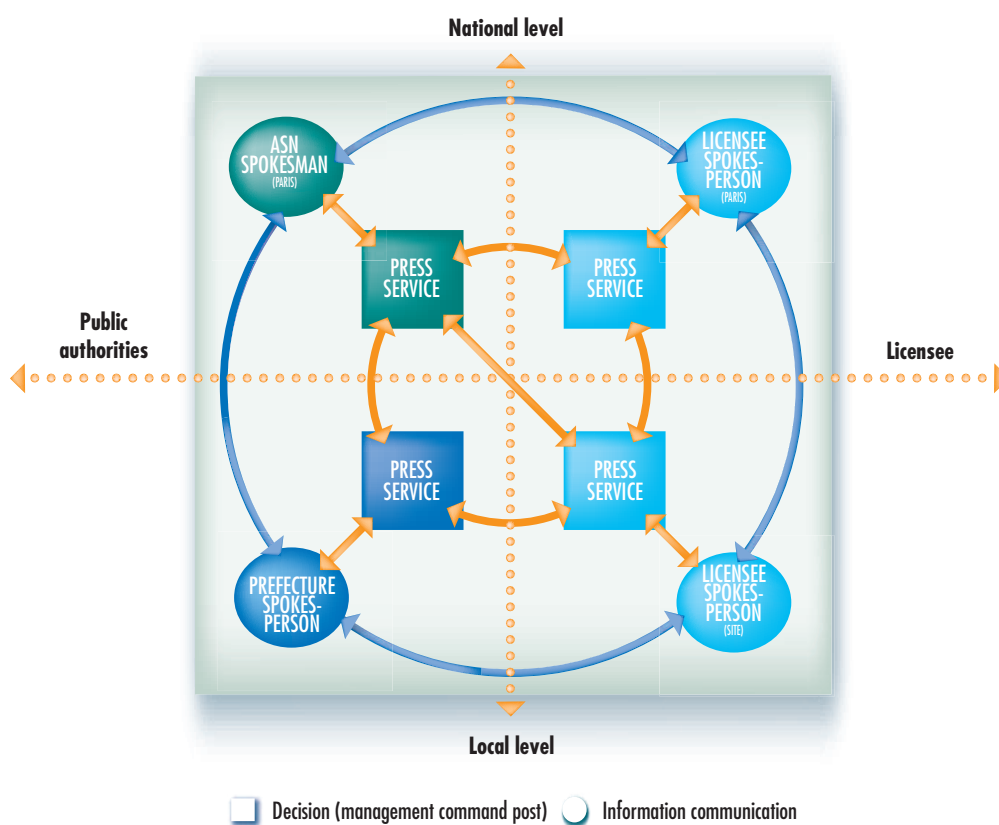


Diagram 3: planned communication response



The Mayor or the *préfet* coordinates the intervention teams 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 facility performing a nuclear activity (hospital, research laboratory, etc.) who implements the on-site emergency plan (PUI) as stipulated in article L. 1333-6 of the Public Health Code (if the risks from the installation so warrant) or with the site owner concerning the safety of the individuals on the site;
- the Mayor or *préfet* concerning public safety outside nuclear installations.

In 2008, ASN took a detailed look at setting up an on-call duty system within ASN, further improving the emergency response system.

2 | 1 | 3 ASN's emergency response centre

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

- swift mobilisation of ASN staff;
- reliable exchange of information between the many partners 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, triggering of the centre offers ASN technical management and communication resources that are easily accessible to all parties involved.

This emergency centre was in fact activated to deal with the incidents that occurred in the Nogent-sur-Seine and

Blayais nuclear power plants in 2005. In 2007, the emergency centre was triggered during the night of 9 April 2007 when there was a loss of electrical power on the Dampierre-en-Burly nuclear power plant, and 5 April 2007 when a transport accident occurred in Fère-Champenoise (51).

As demonstrated by these events, ASN's alert system allows swift mobilisation of ASN staff and the IRSN. This 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 SGDN and Météo-France. This system is regularly tested during exercises or when actual emergencies arise.

In addition to the public telephone network, the emergency response centre is connected to several restricted access networks providing secure direct or dedicated lines to the main nuclear sites. ASN's PCD also has a video-conferencing system which is the preferred means of contact with IRSN's CTC. The PCD also makes use of IT equipment adapted to its assignments, in particular for information exchanges with the European Commission and the Member States (ECURIE system). Since 2005, the PCD has had access to the dose rate values permanently measured by IRSN's Téléray network of probes.

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



ASN emergency centre in Paris during a nuclear emergency exercise in the Chinon power plant (Indre-et-Loire *département*) – November 2006

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 (ECURIE network). 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 the competent national authority 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 (see box concerning the event that occurred in Krško).

Within IAEA's National Competent Authority Coordinating Group (NCACG), ASN was designated to chair the competent authorities for western Europe. In 2007 and 2008, the work of this group focused on the concepts and tools needed to ensure effective international coordination in

the fields of assistance and communication between authorities.

2 | 2 | 1 Bilateral relations

Within the framework of bilateral relations, particularly with neighbouring countries, ASN in 2008 initiated and continued with drafting of a protocol for the exchange of information and assistance in order to deal with radiological emergencies. These drafts 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 at precisely identifying the various stakeholders and entities responsible for and to whom the information is to be sent. The protocol is currently being finalised with the German authorities. This process is advanced with the Belgian authorities and discussions are continuing with the other neighbouring countries concerned.

At the request of the South African authorities, ASN conducted an audit from 10 to 14 April 2008 on South African preparation and organisation for a radiological emergency. This audit identified a number of areas for progress, especially concerning the carrying out of exercises, the general organisation of the response to a radiological emergency, the creation of expert structures needed to assess the technical situation and the outfitting of the South African regulatory body's emergency centre.

ASN initiated a series of visits to organisations responsible for managing emergencies and in this respect met its



Reception of the French delegation in the local emergency centre of the Fukushima power plant (Japan) – October 2008

foreign counterparts and was able to observe emergency exercises in Spain (June 2008), Canada (September 2008) and Japan (October 2008). In the light of the experience gained in this way, ASN hopes to enhance its own organisation with the aim of ensuring continuous improvement.

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 nuclear power plants are however located in the immediate vicinity of the border (Bugey, Cattenom, Chooz, Fessenheim, Graveline plants).

Since 2007, work has been under way with the neighbouring countries to harmonise management of radiological emergencies (see box in point 1 | 3 | 2).

ASN took part in IAEA's work to implement an action plan by the competent authorities to improve international exchanges of information in the event of a radiological

emergency. For this action plan, ASN is helping to define the strategy concerning international assistance requirements and resources and to set up the emergency assistance response network (ERNET). ASN is also working with NEA to define a strategy for carrying out international exercises.

As one of the European radiation protection authorities, ASN took part in 2008 in several meetings of the group responsible for proposing harmonised pan-European population protection actions. The work in progress highlighted the various international approaches to the response thresholds or the messages addressed to the populations in an emergency. The group aims to identify and quantify these differences in order to propose common response 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

Organisation of an assistance mission for an irradiated Tunisian worker

On 30 April 2008, in its capacity as competent Authority, ASN received an assistance request from Tunisia, following a radiological accident that occurred on 23 March 2008. A young Tunisian assistant operator in a private industrial company was the victim of an irradiation incident involving a gamma radiography appliance containing an iridium source with an activity of approximately 2.9 TBq which he had held in his hands and had in his pocket for several minutes.

On 19 April, the Tunisian National Centre for Radiation Protection (CNRP) was informed of this irradiation and made informal contact with IRSN and the Percy military hospital in Paris.

On 29 April the Permanent Mission of the Republic of Tunisia to the International Organisation in Vienna referred the matter to IAEA and indicated that the Tunisian authorities wished to ask France for help with obtaining a medical opinion on the victim's condition and his hospitalisation in a specialised facility, given that the cost of transport, hospitalisation and treatment would be covered by the Tunisian Ministry of Health.

On 30 April, after consultation with the Ministry of Foreign Affairs and the agreement of Percy hospital, ASN notified the Tunisian authorities, through IAEA, that France would be able to provide medical care for the victim in Percy hospital. Owing to the urgency and his serious condition, the victim reached Percy hospital on 1 May and was immediately treated by the surgery unit. He received a graft of his own skin, combined with cellular therapy through local administration of mesenchymal stem cells. Most of the lesions regressed, although a few extremely limited occasional relapses were again treated in Percy hospital using the same protocol.

At the request of IAEA and Tunisia, ASN took part in an audit in November 2008 to review the response in Tunisia to a radiological emergency. The role of this audit was to look at the organisation put in place by the Tunisian government and the nuclear licensees to anticipate and manage radiological emergencies in line with the standards published by IAEA. The members of the audit team therefore met the various stakeholders likely to be involved in management of an emergency, particularly the National Centre for Radiation Protection (CNRP), the National Office for Civil Protection and the National Centre for Nuclear Science and Technology (CNSTN), which have mobile measurement devices and also operate irradiation installations. Following this review, a report giving the conclusions of the audit was submitted by IAEA to the Tunisian authorities.

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.

SGDN 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. France sent IAEA details of its assistance capability on 19 August 2008.

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*⁵ - ASN and IRSN. They are a means of testing the emergency plans, the response organisation and procedures and help with training the participating staff. The main aims are defined before the beginning of the exercise. They are primarily to ensure a correct assessment of the situation, to bring the installation on which the accident occurred to a safe condition, to take appropriate measures to protect the 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

2|3 Dealing with emergencies

In 2008, ASN was called more than sixty times via its radiological hotline, via its duty staff, or directly via those in charge of the various files, to deal with a number of radiological emergencies, such as triggering of the radiation portal monitors (customs checkpoints, technical landfills) or the discovery of unidentified sources during the course of inventories. Even if they entail no health risk, these events warrant verification and radioactivity measurements.

2009, announced to the *préfets* in a circular signed jointly by ASN, the DSND, DSC and SGDN. This circular in particular makes provision for two types of exercises:

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

During most of these exercises, simulated media pressure is placed on the main parties concerned, in order to test their ability to communicate. Table 1 describes the key characteristics of the national exercises conducted in 2008.

ASN maintains international relations to exchange good practices observed during exercises carried out abroad. During the course of 2008, ASN thus organised the Fessenheim exercise together with the German authorities.

In 2008, France in particular took part in the international exercises organised by the European Community and IAEA. These tests were an opportunity for checking the alert, transmission and information exchange procedures between the competent national authority (ASN) and the emergency centres of the European Community and IAEA.

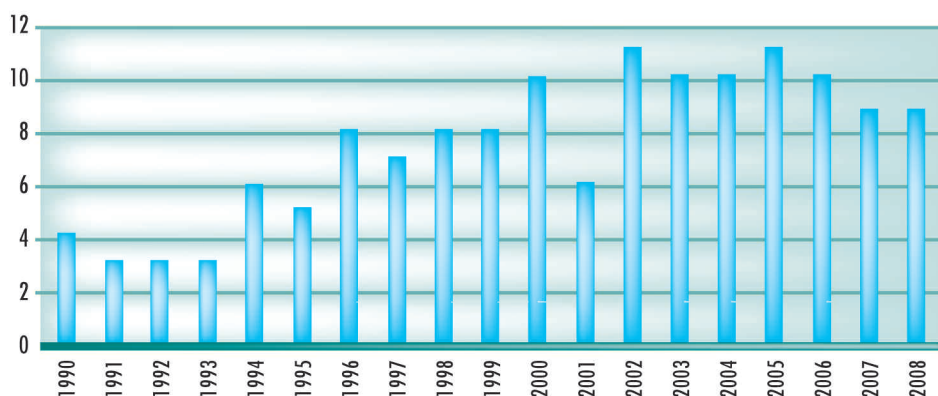
Apart from the national exercises, the *préfets* are asked to conduct local exercises with the sites concerning them, in order to improve preparations for a nuclear or radiological

3. Office of the *préfet*.

Table 1: National civil nuclear and radiological emergency exercises conducted in 2008

Nuclear site	Date of exercise	Target of the exercise	Particular characteristics
Institut Laüe Langevin	8 April 2008	Nuclear safety	Health aspect limited to the site
Nogent-sur-Seine nuclear power plant	27 May 2008	Nuclear safety	Investigation of possible contamination of the Seine; testing of a decontamination system
Transport of radioactive materials	5 June 2008	Nuclear safety	
Marcoule	12 June 2008	Civil defence	Inter-département cooperation, combined civil and defence exercise
Golfech nuclear power plant	19 June 2008	Nuclear safety	Post-accident aspects, identification and contamination of water
Saint-Laurent-des-Eaux nuclear power plant	7 October 2008	Civil defence	Real evacuation and testing of a decontamination system
La Hague	16 October 2008	Civil defence	Environmental measurements, evacuation of the Jobourg CROSS
Fessenheim nuclear power plant	20 November 2008	Civil defence	Transboundary aspects, testing of information protocols, building washing
FBFC Romans sur Isère	9 December 2008	Civil defence	Check on sheltering instructions

Graph 1: national nuclear and radiological emergency exercises conducted in 2008



emergency and in particular test the time needed to mobilise all the parties concerned.

In addition to the exercises organised by the licensees to test their in-house organisation, a national nuclear and radiological emergency exercise held every three years on each site with a BNI would seem to be a fair compromise between staff training and the time needed to effect organisational changes. Therefore, 9 national exercises were carried out in 2008.

The number and scope of the national exercises are considered to be considerably greater than is the case abroad. The international review conducted in 2006 (IRRS mission) 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.



Participants putting on protective equipment during an emergency exercise in Nantes (Loire-Atlantique département) – October 2007

3 | 2 Assessing with a view to improvement

Review meetings are organised in each emergency command post immediately after each exercise. Along with the other participants in the emergency exercise, ASN aims to identify the good and bad practices highlighted during the experience feedback meetings in order to improve the response organisation as a whole. These same feedback meetings are organised in order to learn the lessons from any real situations that have occurred.

The real situations that occurred in 2008 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 in particular led to improvements in procedures and policies. For example, to avoid exposure of the personnel in charge of distributing iodine tablets during the release phase, the authorities decided on preventive distribution of iodine tablets within a 10 km radius around nuclear power plants. Furthermore, to take account of rapidly evolving accidents in which the authorities do not have time to react, the decision was taken to incorporate a reflex phase in the PPIs asking the populations to take shelter by alerting them through a network of sirens or other means of telephone-based alert.

In 2007 and 2008, the systematic use of decision-making audio-conferences led to greater consistency in the steps taken to protect workers and the population as decided on by the licensee and the public authorities.

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 populations 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. 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 in 2007 and 2008. It will be gradually implemented by all the licensees concerned.

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

Operating experience feedback from the exercises shows that the measurement results were only reaching the experts and decision-makers after a lengthy delay. In the light of these findings, the national stakeholders worked to improve the response organisation and procedures. This led to drafting of the above-mentioned government directive of 29 November 2005. This directive now needs to be implemented in the emergency plans, in order to produce local measurement programmes tailored to the individual installations. In 2007 and 2008, ASN took part in several meetings to contribute towards improved access to and utilisation of the radioactivity measurements taken by the various stakeholders (licensees, SDIS, IRSN, etc.).

Unannounced exercise

In 2008, together with the Bouches-du-Rhône préfecture, the Ministry for the Interior, the DSND, SGDN, IRSN and Météo-France, ASN for the first time carried out an unannounced exercise involving the entire national response organisation.

This exercise was held on Tuesday 2 December 2008 on the Cadarache site, with none of the parties involved being warned in advance. National assessors were placed in all the command posts in order to contribute to evaluating the exercise.

On the whole, the exercise went smoothly: triggering of the alert, ramp-up and deployment of command posts, initiation of the PPI and exchange of information. Areas for improvement were identified concerning the need for better sharing of the technical diagnosis and ensuring a clearer understanding of the role of all the parties.



Communication by the sub-préfet of Saint-Nazaire (Loire-Atlantique *département*) during a radioactive material transport exercise – October 2007

This work led in 2008 to a measurement master plan prepared by IRSN and presented to the DSND and to ASN.

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

- the scenarios increasingly frequently include a health component, involving treatment of the injured (sometimes contaminated), who have to be given care and be

- evacuated in a potentially or actually hazardous environment;

- 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. In this respect, ASN calls all participants together twice a year to review good practices and identify areas for improvement. ASN thus convened the licensees to ask them to add the automatic telephone call alert system systematically to supplement the existing network of sirens.

4 OUTLOOK

This year saw situations in which ASN was alerted (Socatri incident, see point 3|3 of chapter 14, incident in Slovenia) and for which it was required to take emergency measures and inform the public.

In the light of these events, ASN aims to develop its organisation as an independent authority. ASN therefore continued to visit emergency centres. ASN met its foreign counterparts and was able to observe emergency exercises in Spain (June 2008), Canada (September 2008) and Japan (October 2008). On the basis of this experience, ASN identified good practices concerning organisation of a national emergency response, but also and above all organisation of the nuclear regulatory bodies abroad and human and technical resources deployed. ASN aims to implement a plan to modernise both its emergency response organisation and its emergency centre. These visits will continue in 2009, as will the policy of receiving visitors from abroad to observe exercises in France.

ASN feels that it is important to maintain and pursue relations with countries along France's borders, in order to improve exchanges liable to lead to harmonisation of the population protection provisions. These exchanges helped finalise transboundary harmonisation work on drafting a common iodine policy. The work on international projects for an information exchange protocol between the regulatory bodies and the technical support organisations should be completed some time in 2009.

Since 2006, ASN has devoted efforts to controlling urban development around the BNIs, to help improve protection

of the populations. ASN intends to continue to concentrate on this area in order to strengthen its existing policy. This will help clarify and disseminate the stances adopted by ASN on the occasion of its review of previous files. ASN also has a duty to provide information about the risk created by the operation of nuclear installations. This information must be provided coherently and systematically for all installations with a PPI. This will oblige ASN to work in close collaboration with the State departments responsible for preparing the appropriate tools. Finally, at a later stage, a methodology will have to be defined for studies specifically dealing with controlling urban development.

The period from 2006 to 2008 was devoted to intensive work by the Steering Committee on management of the post-accident phase of a nuclear accident or radiological emergency. The objectives for 2009 are to produce an operational guide for exiting the emergency phase and a report defining the broad outlines of a general programme for dealing with the transitional phase. ASN intends to continue, share and focus this work in order to determine policy aspects which have already been tested during nuclear and radiological emergency exercises.

Together with the government departments and public institutions concerned, ASN drafted the circular concerning exercises for 2009. It ensures that precise and factual objectives can be defined sufficiently early on. Defining these goals, which take account of operating experience feedback, should allow better preparation and a better appreciation of how well the exercise was performed.