

# ASN report abstracts

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ON THE STATE OF  
NUCLEAR SAFETY AND RADIATION  
PROTECTION IN FRANCE IN **2013**



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The ASN (Nuclear Safety Authority) Report on the state of nuclear safety and radiation protection in France in 2013.

This report is specified in Article L. 592.31 of the Environment Code.

It was submitted to the President of the Republic, the Prime Minister and the Presidents of the Senate and the National Assembly, pursuant to the above-mentioned Article.

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# Editorial

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**Forward planning** is necessary for nuclear safety and radiation protection



The Commission

In 2013, ASN actively continued its regulation and oversight of nuclear safety and radiation protection. 2013 is on the whole in line with previous years and ASN identified no new major problems. The number of incidents notified remained stable. From this viewpoint, the current situation is on the whole relatively satisfactory.

This should not however let us forget that events with very large scale consequences, such as those of Fukushima and *Épinal*, can nonetheless occur. The persistence of significant incidents means that vigilance must be maintained with regard to a severe accident, which always remains a possibility.

But, and above all, this observation must not mask the importance of the forthcoming crucial choices for nuclear safety and radiation protection. In the near future, key decisions will need to be taken concerning the continued operation of the NPP reactors, the management of a nuclear accident in Europe, the plan for the deep geological disposal of radioactive waste, management of medical exposure to ionising radiation, and exposure to radon.

ASN's responsibilities in the field of regulation and oversight of nuclear safety and radiation protection, mean that forward planning is essential. The ASN Commission issued a number of strategic position statements in this respect in 2013.

## Operating life extension of the EDF reactors

The French electricity system must retain operational margins: ASN recalled *"the importance of having sufficient margins in the electricity system to cope with the simultaneous suspension of operation of several reactors should they display a serious generic fault"*.

### From left to right:

**Margot TIRMARCHE**  
Commissioner

**Michel BOURGUIGNON**  
Commissioner

**Pierre-Franck CHEVET**  
Chairman

**Jean-Jacques DUMONT**  
Commissioner

**Philippe JAMET**  
Commissioner

Moreover, the current reactors will one day need to be finally shut down, for safety reasons. Preparations for this inevitable step must be made right now: ASN underlines *"the need, in the short term, to make decisions relative to the electricity production capacities - whatever the production source - and energy savings, to prepare for the future final shutdowns of reactors for reasons of safety"*.

From this viewpoint, ASN recalled that any operating life extension of the reactors beyond the fourth ten-yearly safety review was anything but a foregone conclusion. This milestone is particularly important as it corresponds to the theoretical operating life initially adopted for the estimation of ageing and for determining the safety approach. Operating life extension beyond the fourth periodic safety review means that several essential conditions must be met. Firstly, the equipment important for safety must continue to meet the requirements to which it is subject. This question is particularly important for ageing components and which cannot be replaced, such as the reactor vessel or the containment. The facilities must also be reassessed in the light of the most recent safety requirements which apply to the new generation of reactors, such as the EPR. Finally, the improvements requested further to the stress tests carried out after the Fukushima accident must be implemented. These led to technical prescriptions from ASN more specifically aimed at installing a "hardened safety core" of more robust safety equipment and emergency response teams able to intervene on the facilities impacted within a few hours. Implementation of this range of provisions will require exceptional mobilisation on the part of the industrial firms concerned.

## Developing European cooperation for management of a nuclear accident

At the European level, following the revision of the directive on basic radiation protection standards in 2013 and the probable adoption in 2014 of a new directive on nuclear safety, the management of a nuclear accident is a major topic on which progress needs to be made. In the same way as Chernobyl, the Fukushima accident showed that over and above all the safety measures designed to prevent such accidents and mitigate their consequences, preparations must be made at the international level to deal with large-scale, long-term emergencies.

In addition to the prime responsibility of the licensee for on-site management of a nuclear accident, ASN considers that exceptional emergency management provisions must be adopted in Europe, enabling the safety Authority of the country in which an accident were to occur to benefit from

1. ASN Opinion 2013-AV-0180 of 16th May 2013.

ASN is therefore **attentive** to ensuring that its **day to day activities** are conducted without losing sight of the **long-term objectives**

increased human resources. It is also essential, at the European level, to ensure that the steps taken to protect the populations following an accident are coherent and to ensure coordination between the Authorities responsible for these steps. Together with its European counterparts, ASN will aim to propose solutions and promote an operational organisation meeting these challenges.

## The fate of high-level long-lived waste

The 2006 Act adopted the principle of deep geological disposal of High and Intermediate Level, Long-Lived Waste (HLW/ILW-LL). The pertinence of this means of disposal with regard to the safety and radiation protection issues is recognised internationally.

ASN will not however be able to issue a position statement on any particular project until its safety has been conclusively demonstrated. In this respect, the characteristics of the site chosen and the inventory of waste to be accepted by the repository, will be decisive factors. This is why, in its Opinion 2013-AV-0179 of 16th May 2013, ASN stressed that *“the potential changes in the inventory must be presented to the stakeholders in worst-case scenarios, depending on the possible energy policy choices, more specifically concerning the question of the disposal of spent fuels”*. In any case, ASN will ensure that the safety of the operation of HLW/ILW-LL waste disposal facilities is maintained over the long-term, to take account of the inevitable uncertainties regarding the time-frame for the actual availability of a deep geological disposal facility.

## Managing the increase in doses delivered to medical imaging patients

Exposure to ionising radiation from medical imaging is the second source of exposure of the French population after exposure to natural radiation and it has been increasing in recent years. The management of medical exposure to ionising radiation is a priority objective for ASN. There are two complementary ways of achieving this: justification, consisting in only resorting to ionising radiation if the need for it is proven, and optimisation, consisting in minimising the doses received for a given examination.

The inspections carried out by ASN in the field of imaging, as well as the experience feedback from the events notified to it, highlighted shortcomings in the optimisation of practices. Progress in this field notably involves more detailed knowledge of the doses delivered, checks on the quality of the imaging equipment and an increase in the numbers of medical physicists.

Managing medical exposure to ionising radiation also involves rigorous implementation of the justification principle. This implementation implies greater use of best practices and wider access to Magnetic Resonance Imaging (MRI) as an alternative to the use of scanner.

## Radiotherapy

Radiotherapy is a key technique in cancer treatment, used in more than half of all treatments and with a high success rate (about 80%). Since the accidents at *Épinal* and *Toulouse*, radiotherapy has been the subject of reinforced monitoring by ASN.

In the field of radiotherapy, the pace of technological innovation is currently outstripping that of the corresponding improvements in quality assurance. Operation of these increasingly complex machines requires competent teams comprising sufficient numbers of medical physicists and dosimetrists. Even if some progress has been achieved, the situation is still unsatisfactory when compared with other European countries.

ASN would therefore once again draw attention to the importance of the decisions to be taken in the health field to improve radiation protection in radiotherapy and medical imaging. The probability of an accident, which remains possible, is aggravated by the shortage of medical physicists, itself exacerbated by the lack of health professional status and a specific university curriculum.



## Radon

Radon, a gas that can cause lung cancer, is a subject of considerable concern for ASN, because it makes a major contribution to the exposure of the French population to ionising radiation, albeit with significant local variations.

Within the framework of the health-environment plan, ASN today focuses on radon detection and mitigation, in other words, measures to reduce its concentration in establishments open to the public in the 31 French *départements*<sup>2</sup> considered to be priorities owing to their radon emanation levels.

2013 saw the arrival of two new elements:

- a new map of the radon exhalation potential at the commune level, produced by the French Institute for Radiation Protection and Nuclear Safety (IRSN) and the French Geological and Mining Research Office (BRGM), enabling the higher risk zones to be more clearly identified;
- the new directive 2013/59/Euratom on Basic Safety Standards in radiation protection, which in particular requires the drafting of a national action plan to cope with the long-term risks due to exposure to radon in buildings, including housing.

New regulatory guidelines will therefore need to be issued at interministerial level, to take account of these elements. ASN will submit proposals to significantly improve the protection of the population against radon-related risks.

protection can only be guaranteed for the long-term through a revision of its funding sources and by including the nuclear licensees, in complete transparency and under the control of Parliament.

Furthermore, ASN would like to see the range of its nuclear facility monitoring tools expanded with the implementation of a system of financial penalties in the event of a proven delay in the performance of the prescribed works.



For ASN, the regulation and oversight of nuclear safety and radiation protection is a major responsibility, which it strives to carry out in complete independence, with stringency, competence and transparency. ASN is therefore attentive to ensuring that its day to day activities are conducted without losing sight of the long-term objectives it has set for itself in the performance of the duties entrusted to it by law. ■

## Long-term State oversight commensurate with the nuclear safety and radiation protection issues

In a context of restrictions in the 2014 Budget Act, ASN was particularly heartened by the budget efforts made, which enabled it to maintain its manpower levels, operating credits and expert appraisal capacity<sup>3</sup>.

It would however underline the inevitable growth in the number of its long-term tasks, both for oversight of nuclear facilities (ageing, periodic safety reviews, follow-up to the Fukushima accident, etc.) and for radiation protection in the medical sector (increased use of ionising radiation for diagnosing and treating diseases), both of which are areas where the concerns of society have become more loudly heard in recent years.

At a time of considerable pressure to balance public finances, ASN considers that the means devoted to the regulation and oversight of nuclear safety and radiation

2. Administrative region headed by a Prefect.

3. ASN Opinion 2013-AV-0186 of 4th July 2013.



**Competence**  
**Independence**  
**Rigour**  
**Transparency**

# The Nuclear Safety Authority (ASN)

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**ASN was created by the 13th June 2006 Nuclear Security and Transparency Act. It is an independent administrative Authority responsible for regulating civil nuclear activities in France. It also contributes towards informing the citizens.**

**ASN is tasked, on behalf of the State, with regulating nuclear safety and radiation protection in order to protect workers, patients, the public and the environment from the hazards involved in nuclear activities.**

**ASN aims to provide efficient, impartial, legitimate and credible nuclear regulation, recognised by the citizens and regarded internationally as a benchmark for good practice.**

# ASN

## Its roles, Its key figures, Its organisation.

### Its roles

#### Regulating

ASN contributes to drafting regulations, by giving the Government its opinion on draft decrees and Ministerial Orders, or by issuing statutory resolutions of a technical nature.

#### Authorising

ASN examines all individual authorisation applications for nuclear facilities. It can grant all authorisations, with the exception of major authorisations for basic nuclear installations, such as creation and decommissioning. ASN also issues the licenses provided for in the Public Health Code concerning small-scale nuclear activities and issues authorisations or approvals for radioactive substances transport operations.

#### Monitoring

ASN is responsible for ensuring compliance with the rules and requirements applicable to the facilities or activities within its field of competence. Inspection is one of ASN's main means of monitoring, although it also has appropriate powers of enforcement and sanction.

#### Informing

Primarily through its website [www.asn.fr](http://www.asn.fr) and its *Contrôle* magazine, ASN informs the public and the stakeholders (Local Information Committees, environmental protection associations, etc.) of its activity and the state of nuclear safety and radiation protection in France.

#### In emergency situations

ASN monitors the steps taken by the licensee to make the facility safe. It informs the public of the situation. ASN assists the Government. It in particular sends the competent Authorities its recommendations concerning the civil security measures to be taken.

#### Regulation and monitoring of diverse activities and facilities

Nuclear power plants, radioactive waste management, nuclear fuel shipments, packages of radioactive substances, medical facilities, research laboratories, industrial activities, etc. ASN monitors and regulates an extremely varied range of activities and installations. This regulation covers:

- 58 nuclear reactors producing nearly 80% of the electricity consumed in France, along with the EPR reactor currently under construction;
- all French fuel cycle facilities, from fuel enrichment to reprocessing;
- several thousand facilities or activities which use sources of ionising radiation for medical, industrial or research purposes;
- several hundred thousand shipments of radioactive substances nationwide, every year.

### The help of experts

When taking certain decisions, ASN calls on the expertise of technical support bodies. This is primarily the case with the Institute for Radiation Protection and Nuclear Safety (IRSN). The ASN Chairman is a member of the IRSN Board. ASN also requests opinions and recommendations from scientific and technical Advisory Committees of Experts (GPE).

## Its key figures in 2013

478

staff members

3,180

authorisations

82%

management

22

press conferences

280

inspectors

91

information notices

2,191

inspections of nuclear facilities, of shipments of radioactive substances, of the medical, industrial and research sectors, of approved organisations

17

press releases

12,636

inspection follow-up letters available on [www.asn.fr](http://www.asn.fr) on 31.12.2013

9

accident simulation exercises

477

technical opinions sent to ASN by IRSN

79.05

million euros total budget for ASN

24

Advisory Committee meetings

84

million euros IRSN budget devoted to expert appraisal work on behalf of ASN

## Its organisation

### The ASN Commission

The Commission defines ASN general policy regarding nuclear safety and radiation protection. It consists of five Commissioners, including the Chairman.

<b>Pierre-Franck Chevet</b> Chairman  nominated on 12th November 2012 for a 6-year term	<b>Michel Bourguignon</b> Commissioner  nominated on 8th November 2008 for a 6-year term	<b>Jean-Jacques Dumont</b> Commissioner  nominated on 15th December 2010 for a 6-year term	<b>Philippe Jamet</b> Commissioner  nominated on 15th December 2010 for a 6-year term	<b>Margot Tirmarche</b> Commissioner  nominated on 12th November 2012 for a 6-year term
designated by the President of the Republic			designated by the President of the Senate	designated by the President of the National Assembly

#### Impartiality

The Commissioners perform their duties in complete impartiality and receive no instructions either from the Government or from any other person or institution.

#### Independence

The Commissioners perform their duties on a full-time basis. Their mandate is for a six-year term. It is not renewable.

The duties of a Commissioner can only be terminated in the case of impediment or resignation duly confirmed by a majority of the Commissioners.

The President of the Republic may terminate the duties of a member of the Commission in the event of a serious breach of his or her obligations.

#### Competences

The Commission issues resolutions and publishes opinions in ASN's *Official Bulletin*.

The Commission defines ASN external relations policy both nationally and internationally.

The Commission defines ASN regulatory policy. The Chairman appoints the nuclear safety inspectors, the radiation protection inspectors, the conventional safety inspectors for the nuclear power plants and the staff responsible for verifying compliance with the requirements applicable to pressure vessels.

The Commission decides whether to open an inquiry following an incident or accident. Every year, it presents the *ASN Report on the state of nuclear safety and radiation protection in France* to Parliament. Its Chairman reports on ASN activities to the relevant commissions of the French Parliament's National Assembly and Senate as well as to the Parliamentary Office for the Evaluation of Scientific and Technological Choices.

The Commission drafts ASN internal regulations and appoints its representatives to the High Committee for Transparency and Information on Nuclear Security.

### Commission figures in 2013

76  
sessions

21  
opinions

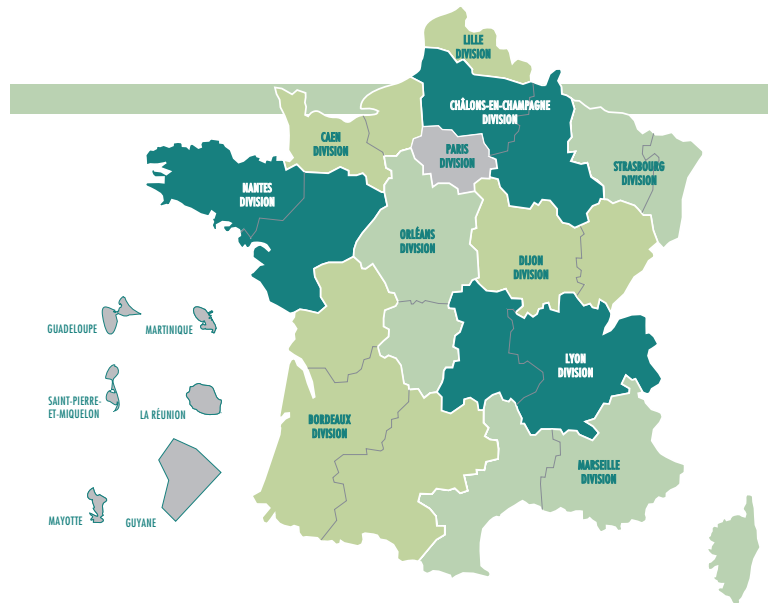
61  
resolutions

## Headquarters and the regional divisions

ASN comprises a headquarters and eleven regional divisions with competence for one or more administrative regions. This organisation enables ASN to carry out its regulation and monitoring duties over the entire country and in the overseas territories of France.

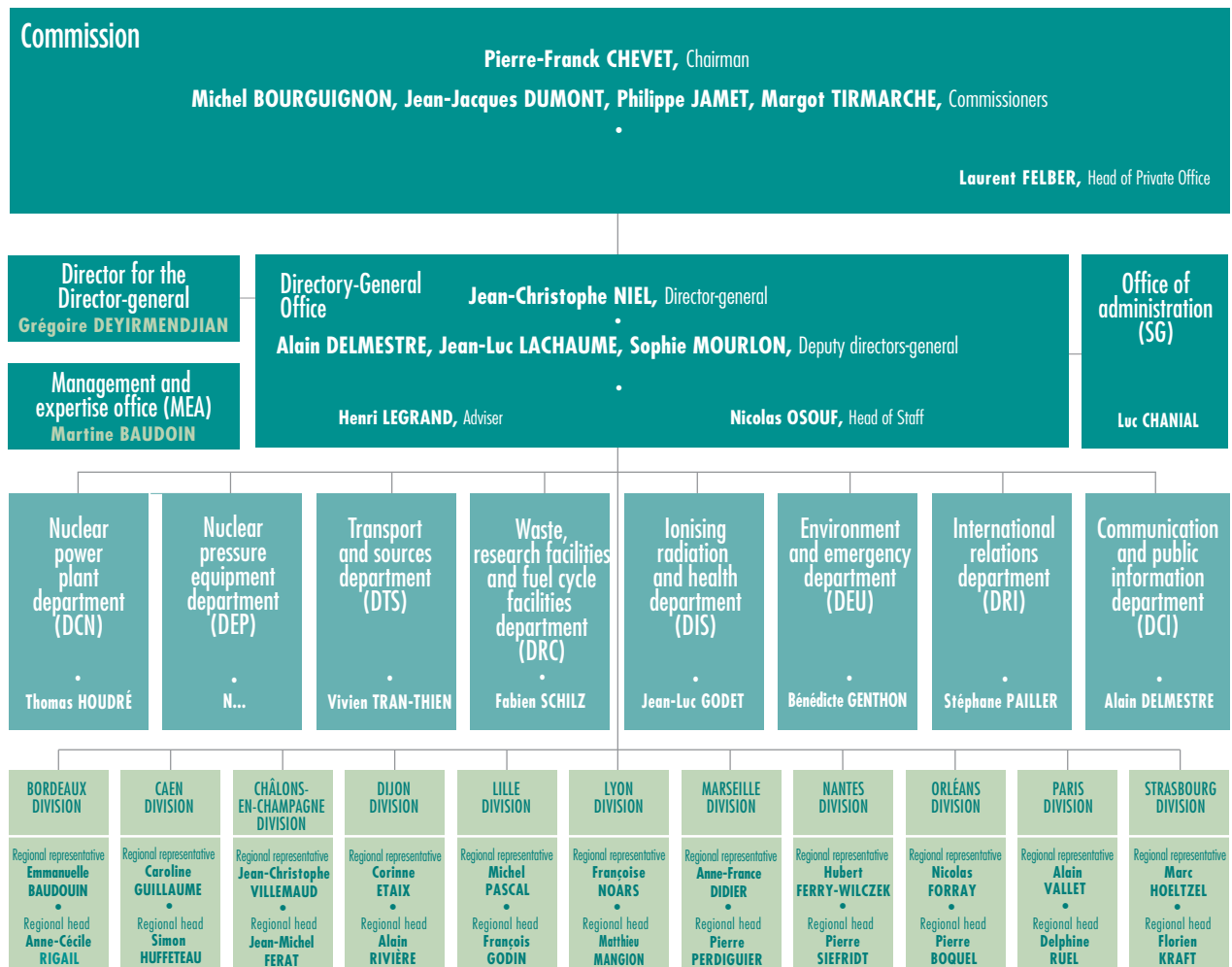
The headquarters are organised thematically and are responsible at a national level for their fields of activity.

The ASN regional divisions operate under the authority of the regional representatives, appointed by the ASN Chairman. They are ASN's representatives in the regions and contribute locally to ASN's public information role. The divisions carry out most of the direct inspections on nuclear facilities, radioactive substances transport operations and small-scale nuclear activities.



In emergency situations, the divisions assist the Prefect of the *département*, who is in charge of protecting the general public, and supervise the operations carried out to safeguard the facility on the site.

## ASN organisation chart



On 1st February, 2014

# The year 2013

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Montrouge, 4th March 2014

In its editorial, the Commission states: “...ASN is attentive to ensuring that its day to day activities are conducted without losing sight of the long-term objectives it has set for itself in the performance of the duties entrusted to it by law”. Thus:

## Some figures

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As every year, 2013 was active and productive in all fields. A few figures give an idea of ASN's day-to-day activities:

- 2,191 inspections were carried out in all the fields under ASN responsibility.
- ASN rated 4 events at level 2 and 126 at level 1 on the INES scale applicable to nuclear activities, 1 at level 2+, 5 at level 2 and 91 at level 1 on the ASN-SFRO scale applicable to the radiation protection of patients.

- 36 infringement reports were drawn up.
- The Commission met 76 times, to issue 61 resolutions and draw up 21 opinions.
- ASN convened its various Advisory Committees 24 times and received 477 opinions from IRSN to help guide its resolutions.
- The Scientific Committee met twice.
- 91 information notices and 17 press releases were published.
- 9 national level nuclear emergency exercises entailed activation of the new emergency centre.
- As at 31st December 2013, ASN had 478 staff members.

Beyond these figures, I would like to take a look at some of the ASN activities:



## Regulating

In this field, we continued the work to overhaul the general technical regulations applicable to Basic Nuclear Installations (BNI) through the revision of the BNI Order. This order is thus supplemented by statutory resolutions which clarify certain topics such as the environment, the prevention of the fire risk, the periodic safety reviews, reactor shutdown, hardware modifications, or indeed safety management. These resolutions, which are open to public consultation before they are adopted, are published in the *ASN Official Bulletin* on [www.asn.fr](http://www.asn.fr).

Our efforts must be continued, to create a coherent, integrated and stable regulatory framework, to meet the undertakings made within WENRA, which brings together the heads of the European nuclear safety regulators, and to promote our safety approach at the international level. It should be remembered that before the drafting of these texts, as required by the Act on transparency and security in the nuclear field, ASN did not have a set of reference documents giving a systematic and well-organised presentation of the French safety approach.

In the field of radiation protection, major changes are in the pipeline, with the transposition of the European directive on Basic Safety Standards.

ASN is also devoting efforts, and must continue to do so in 2014, to improve regulation of the use of gamma radiography. This technique, which is used throughout the industrial world, can cause serious irradiation accidents among workers.

ASN also wants to see improvements in the way the radon risk is dealt with.

Finally, ASN is working to improve the quality, robustness and transparency of environmental radioactivity monitoring, more specifically by changing the organisation of the national network for environmental radioactivity monitoring and the approval of the laboratories performing these measurements.

## Monitoring

ASN employs many monitoring methods. These include inspections, 2,191 of which were conducted in 2013. The inspections, for which the follow-up letters are made public on [www.asn.fr](http://www.asn.fr), are scheduled and organised so that they are commensurate with the risk and with our assessment of the activity or the site being inspected.

Four in-depth inspections, each involving about ten inspectors, accompanied by IRSN experts and taking several days, were carried out in 2013. Their topics were the decommissioning of the gas-cooled reactors (EDF sites at Chinon and Saint-Laurent-des-Eaux), waste management (Marcoule site) in cooperation with the Defence Nuclear Safety Authority<sup>1</sup> (ASND), operational stringency (EDF NPP at Civaux) and radiation protection in small-scale nuclear activities (CEA Grenoble).

In 2014, the programme comprises four review inspections: in an EDF NPP, in a fuel cycle installation, in an industrial facility using ionising radiation and, for the first time, in a hospital.

This monitoring approach is supplemented by actions to inform professionals, for example through national or local seminars on emergency response organisation and emergency plans, or on operating experience feedback, radiotherapy, gamma radiography and nuclear medicine. Along these same lines, a major national seminar on the regulations applicable to BNIs will be held on 21st March 2014.

## Reporting

ASN has further strengthened its ties with Parliament and with elected officials more generally. The ASN Chairman was thus on several occasions given a hearing by members of Parliament or by Parliamentary Commissions, more specifically the sustainable development commission of the National Assembly and the Parliamentary Office for the Evaluation of Scientific and Technological Choices, on subjects with nuclear safety implications.

In late November, there were nearly 200 visitors to the ASN stand at the French Mayors Fair, which ASN was attending for the first time. The emergency arrangements applicable in the vicinity of NPPs, the management of the consequences of a nuclear accident, the risk linked to radon in the home or the medical uses of ionising radiation were the subjects of discussions between elected officials and ASN.

1. Structure responsible for regulating nuclear safety and radiation protection with regard to defence related nuclear activities and installations. It is placed under the authority of DSND.

For any regulatory authority, **credibility is crucial** and entails demonstrating and explaining what it does.

### Managing an emergency

Of the nine national emergency exercises carried out in 2013, two in particular should be underlined. One concerned the Saint-Laurent-des-Eaux NPP in June; it was an opportunity, at ministerial level, to test for the first time the new Government emergency plan drawn up in the wake of the Fukushima accident: the “Major nuclear or radiological accident” national response plan. The other exercise, the aim of which was to test post-accident management jointly with border countries, concerned the Cattenom NPP in June. It lasted three days.

Four other exercises also included “simulated media pressure” from journalists, designed to evaluate and improve ASN reactivity to the media and the pertinence of the messages put across by the various actors, licensees and public authorities, both nationally and locally.

In 2014, the exercises will again cover the deployment of the Government’s emergency management plan and the post-accident approach.

### Informing

In 2013, we continued to inform the public, with the publication on [www.asn.fr](http://www.asn.fr) of documents on the radiological quality of water, the management of radioactive waste (to coincide with the publication of the new National Plan for Radioactive Materials and Waste Management, or on the occasion of the public debate on *Cigéo*), management of the fire risk, or experience feedback from radioactive substances transport events.

### Consulting the public

ASN is also continuing to pursue its goal of openness to the public. For any regulatory authority, credibility is crucial and entails demonstrating and explaining what it does.

In January 2013, ASN together with IRSN, its technical support organisation, decided to make public its most important position statements.

As required by the Environment Charter, it initiated a process of public consultation which is still in the experimental phase. It could undoubtedly be improved and we will review it in 2014. Even if these measures require a high level of investment, they cannot be avoided.

ASN also looked to overhaul the composition of its Advisory Committees in order to include members of civil society. These new Advisory Committees should be operational in May 2014.

ASN involvement in the work of the High Committee for Transparency and Information on Nuclear Security (HCTISN) and in that of the Local Information Committees, which are vital to transparency and to the process of debate, was both significant and constant. ASN is present within the HCTISN and takes part in its plenary sessions (four in 2013) or, at the local level, in the meetings of the CLIs. Jointly with the national association of local information committees, it organised the 25th CLI Conference. ASN also contributes to funding them, more specifically for public information actions.

ASN is open to schools and invited several classes to visit the public information centre in its new premises, more specifically on the occasion of the *Fête de la science* (3-week long national science festival).

### Contributing to European harmonisation

In accordance with ASN’s multi-year strategic plan for the period 2013 to 2015, its European commitment remains high. Several measures are worth mentioning:

- the drafting of the directive on Basic Safety Standards, which will enable protection against ionising radiation to be improved for the public, workers and patients;
- work on the revision of the European directive on nuclear safety, many aspects of which we support: reinforcing the independence of the regulators, transparency, defining general safety objectives, but this must not lead to confusion with regard to who is responsible for what;
- contribution to the second European conference on nuclear safety, held in June 2013, which aims to become the equivalent of the large annual conference organised in the USA by the NRC - *Nuclear Regulatory Commission*, the American nuclear safety regulator;
- initiation of the drafting of the first report on implementation of the European directive on nuclear safety in 2009.

## Continuing the continuous progress approach

ASN has been committed to a continuous progress approach since 2007. The NF EN ISO/IEC 17020<sup>2</sup> standard accreditation of its nuclear pressure equipment department on 31st July 2013 is today clear evidence of this.

ASN is also preparing to host an IRRS – *Integrated Regulatory Review Service* mission in November 2014. This will be a mission to review the ASN organisation by its peers, under the aegis of the International Atomic Energy Agency (IAEA). ASN was peer-reviewed for the first time

in 2006, at the time of its creation as an independent authority. In 2009, the obligation to undergo such an audit at least once every ten years was instituted by the European directive on nuclear safety. ASN considers that these review missions can only improve the international safety and radiation protection system. It is fundamental for the regulatory authorities in countries with large NPP fleets to commit to receiving such missions or themselves to propose highly qualified auditors.

To conclude, I would like to underline that the quality of our actions and our decisions depends on the commitment, the professionalism, the availability and the considerable day to day work of everyone at ASN, with the unfailing support of the teams at IRSN. ■

2. "Requirements for the various types of bodies performing inspections".

# Significant events in 2013

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# 01

## Nuclear activities: ionising radiation and health and environmental risks

Ionising radiation may be of natural origin or caused by human activities, referred to as nuclear activities. The exposure of the population to naturally occurring ionising radiation is the result of the presence of radionuclides of terrestrial origin in the environment, radon emanations from the ground and exposure to cosmic radiation.

Nuclear activities are activities entailing a risk of exposure to ionising radiation, emanating either from an artificial source or from natural radionuclides processed for their radioactive, fissile or fertile properties, as well as interventions in the event of a radiological risk following an accident or a contamination event. These nuclear activities include those conducted in Basic Nuclear Installations (BNIs) and the transport of radioactive substances, as well as in all medical, veterinary, industrial and research facilities where ionising radiation is used.

Ionising radiation is defined as radiation that is capable of producing ions - directly or indirectly - when it passes through matter. It includes X-rays, alpha, beta and gamma rays, and neutron radiation, all of which have different energies and penetration powers.

The effects of ionising radiation on living beings can be «deterministic» (health effects such as erythema, radiodermatitis, radionecrosis and cataracts, which are certain to appear when the dose of radiation received exceeds a certain threshold) or «probabilistic» (probability of occurrence of cancers in an individual, but no certainty). The protective measures against ionising radiation aim to avoid deterministic effects, but also to reduce the probability of occurrence of radiation-induced cancers, which constitute the main risk.

Understanding the risks linked to ionising radiation is based on health monitoring (cancer registers), epidemiological investigation and risk assessment via extrapolation to low doses of the risks observed at high doses. Many uncertainties and unknown factors nonetheless persist, in particular with regard to high-dose radiopathologies, the effects of low doses or the effects on non-human species. Individual radiosensitivity (variability of the effect of a given dose according to the individual receiving it) is an ongoing field of research and one that involves questions that go beyond the boundaries of radiation protection.

## Exposure to ionising radiation in France

The entire French population is potentially exposed to ionising radiation, but to differing extents, depending on whether the ionising radiation is of natural origin or the result of human activities.

On average, the exposure of an individual in France was estimated by the French Institute for Radiation Protection and Nuclear Safety (IRSN) at 3.7 millisieverts (mSv) per year, varying by a factor of 2 to 5 depending on the location; the sources of this exposure are as follows:

- for about 1 mSv/year, naturally occurring radioactivity excluding radon, including 0.5 mSv/year for radiation of telluric origin, 0.3 mSv/year for cosmic radiation and 0.2 mSv/year for internal exposure from food;
- for about 1.4 mSv/year, radon, with considerable variation related to the geological characteristics of the land (a new map of the country was produced in 2011 according to the radon exhalation potential) and to the buildings themselves; in zones defined as high-priority, periodic measurements must be taken in teaching or health and social establishments and in places of work. As of 2014, this could be extended to include residential buildings. A 2011-2015 national action plan is currently being drawn up;
- for about 1.3 mSv/year, medical treatments, with a clear upward trend (from 0.8 mSv per year in 2002 to 1.3 mSv per year in 2007, the last year included in the estimates currently available) primarily due to the increase in the doses delivered by diagnostic radiological examinations. Particular attention is required for monitoring and reducing the doses linked to medical imaging, in particular when alternative techniques exist, because the multiplication of the most heavily irradiating examinations for a given person could lead to the attainment of a level of exposure at which a link to radiation-induced cancers has been observed;
- representing 0.03 mSv/year, the other artificial sources of exposure: past airborne nuclear tests, accidents affecting facilities, releases from nuclear installations.

The automated monitoring networks managed by IRSN nationwide allow real-time monitoring of environmental radioactivity, signalling any abnormal variation.

Some workers are subject to particular levels of exposure. With regard to nuclear workers, who undergo specific monitoring (more than 350,000 individuals in 2012, representing a slight but regular increase in number), the annual dose remained lower than 1 mSv (annual effective dose limit for the public) for more than 96% of the workforce monitored; the number of times the limit of 20 mSv (annual regulatory limit for nuclear workers) was exceeded is significantly down (14 cases in 2011); the same applies to the collective dose (drop of about 46% since 1996) whereas the population monitored has increased by about 50%. For workers in activity sectors entailing technological enhancement of naturally occurring radioactive materials, the doses received in 85% of cases are less than 1 mSv/year. In a number of known industrial sectors however, it is quite probable that this value will be occasionally exceeded.

Finally, aircrews are subject to particularly close monitoring owing to their exposure to cosmic radiation at high altitude. Of the recorded doses, 81% are between 1 mSv per year and 5 mSv per year, while 19% are below 1 mSv per year.

## Outlook

For 2014, ASN will remain particularly attentive to the correct working of the occupational exposure monitoring system managed by IRSN (SISERI).

ASN will assist the Government to allow the effective implementation of a new regulatory framework concerning radon screening in the home.

ASN will continue the steps it initiated in 2011 to maintain the mobilisation, at all levels, of the health authorities and health professionals concerning the increase in France of the doses delivered to patients during diagnostic examinations. A round-up of the steps taken or still to be taken will be published in early 2014.

Individual hyper-sensitivity to ionising radiation merits particular attention owing to the forthcoming availability of tests to screen for potential undesirable side-effects of radiotherapy and susceptibility to radiation-induced cancers.



# 02

## Principles and stakeholders in the regulation of nuclear safety and radiation protection

Nuclear activities must be carried out in compliance with the eight fundamental principles of the Environment charter, the Environment Code and the Public Health Code (CSP).

The principles involved are the prevention principle (anticipation of any environmental threat through rules and measures taking account of the «best available techniques at an economically acceptable cost»), the «polluter-pays» principle (the polluter responsible for the environmental damage bears the cost of pollution prevention and remediation), the precautionary principle (the lack of certainty, in the light of current scientific and technical knowledge, must not delay the adoption of proportionate preventive measures), the participation principle (the populations must take part in determining public decisions), the justification principle (a nuclear activity can only be carried out if justified by the advantages it offers by comparison with its inherent exposure risks), the optimisation principle (exposure to ionising radiation must be kept as low as is reasonably achievable), the limitation principle (the regulations set limits for an individual's exposure to ionising radiation resulting from a nuclear activity except for medical or biomedical research purposes) and the principle of the nuclear licensee's prime responsibility for the safety of its installation.

## The nuclear activity regulators

The current French organisation for the regulation of nuclear safety and radiation protection was established by the 13th June 2006 Act on transparency and security in the nuclear field (TSN Act); this regulation is primarily the responsibility of the Government and ASN, within the legislative framework defined by and under the control of Parliament.

Parliament regularly monitors the regulation of nuclear safety and radiation protection, in particular through its special commissions, which conduct hearings, or the Parliamentary Office for the Evaluation of Scientific and Technological Choices (OPECST), which has issued a number of reports on this subject and to which ASN presents its annual report on nuclear safety and radiation protection in France.

On the advice of ASN, the Government defines the general regulations for nuclear safety and radiation protection. Also on the advice of ASN, it takes key individual decisions concerning BNIs (creation or decommissioning authorisation, closure in the event of an unacceptable risk, etc.). It is responsible for civil protection in an emergency.

In the current governmental organisation, the Minister for Ecology, Sustainable Development and Energy is responsible for nuclear safety and, together with the Minister for Social Affairs and Health, for radiation protection.

In the *départements*, the Prefects, as representatives of the State, are the guarantors of public order and have a particular role to play in the event of an emergency, given that they are in charge of prevention measures for the population. The Prefect also takes part in the various procedures concerning the nuclear installations in his *département*, overseeing local consultations and providing the Ministers or ASN with his recommendations as applicable.

ASN is an independent administrative Authority created by the TSN Act. It is responsible for regulating nuclear safety and radiation protection and contributes to informing the populations on these subjects. It sends the Government proposals for regulatory texts and is consulted on the texts prepared by the Ministers. It clarifies the regulations by issuing statutory resolutions which are then sent to the competent Ministers for approval. It issues certain individual authorisations and proposes others to the Government. Nuclear activities are monitored and inspected by the ASN staff and by organisations duly authorised by ASN. ASN contributes to France's European and international actions. It alerts and informs the Authorities of third-party States in the event of a radiological emergency and in turn receives alerts and information from them. Finally, it provides its assistance for management of radiological emergencies.

In technical matters, ASN relies on the expertise provided by IRSN and by the Advisory Committees of Experts (GPE) that it has set up. It also convenes pluralistic working groups enabling all the stakeholders to contribute to drafting doctrines and action plans and monitor their implementation.

ASN has made a commitment to research, to identify areas of knowledge essential for medium and long-term expertise. In 2010, it therefore created a Scientific Committee.

ASN is run by a Commission of five full-time, irrevocable Commissioners, nominated for a non-renewable 6-year mandate by the President of the Republic (who nominates the Chairman and two Commissioners) and by the President of the Senate and the President of the National Assembly (who each nominate one Commissioner).

ASN has headquarters and eleven regional divisions around the country. On 31st December 2013, its total workforce stood at 478 employees. In 2013, the ASN budget reached €79.05 M. In addition, IRSN receives €84 M for the technical support it provides to ASN; these credits include a State subsidy and the revenue from a tax paid by the licensees of the large nuclear facilities.

In total, the State's budget for transparency and the regulation of nuclear safety and radiation protection amounted to €173.8 M: These credits are at present divided among five budget programmes, which hinders the overall clarity of the cost of regulation and also leads to problems with budgetary preparation, settling budget allocation conflicts and execution.

2013 was the first year of implementation of the "Multiyear Strategic Plan" (PSP) for the period 2013-2015.

Finally, in preparing its decisions and resolutions, ASN currently relies on the opinions and recommendations of seven advisory committees. In 2014, it will reform their members selection process and their operating procedures, in order to enhance their independence.

## Consultative bodies

The organisation of nuclear security and transparency also involves a number of consultative bodies, in particular the High Committee for Transparency and Information on Nuclear Security (HCTISN), an information, consultation and debating body for the risks related to nuclear activities and the impact of these activities on human health, the environment and nuclear security. There is also the French High Public Health Council (HCSP), a scientific and technical consultative body reporting to the Minister for Health and which takes part in defining multi-year public health objectives, evaluates the extent to which national public health targets are met and helps with their annual monitoring.

## Outlook

Seven years after its creation as an independent regulatory authority, ASN has initiated a process of operating experience feedback analysis in order to propose changes designed to reinforce the system of regulation and oversight of nuclear safety and radiation protection, transparency and monitoring by Parliament.

ASN will also take steps to further encourage the involvement of the stakeholders in pluralistic working groups, especially in the Steering Committee for Social, Organisational and Human Factors which it set up in 2012.





# 03

## Regulations

The legal framework for radiation protection is based on international norms, standards and recommendations issued by various organisations, including the International Commission on Radiological Protection (ICRP), an NGO which publishes recommendations about protection against ionising radiation (the latest recommendations appear in the 2007 ICRP publication 103), the International Atomic Energy Agency (IAEA) which regularly publishes and revises nuclear safety and radiation protection standards, and the International Organisation for Standardisation (ISO) which publishes international technical standards.

At a European level, under the EURATOM Treaty, various directives set basic rules for radiation protection, safety and the management of radioactive waste and spent fuel; these directives are binding on all the member States.

With regard to radiation protection, a process to merge and revise the directives led on 5th December 2013 to the adoption of Council directive 2013/59/Euratom, which sets out basic standards for health protection against the dangers resulting from exposure to ionising radiation, published on 17th January 2014. By providing support for the Government, ASN made an active contribution to this adoption.

In June 2013, the European Commission presented a draft modification to Council Directive 2009/71/Euratom of 25th June 2009 establishing a Community framework for the nuclear safety of nuclear installations. ASN is taking part in the negotiations, which could be completed in 2014.

Nationally, the legal framework for nuclear activities has been extensively overhauled in recent years. The main texts appear in the Public Health Code (CSP) and in the Environment Code or the TSN Act. Other texts are more specialised, such as the Labour Code, which deals with radiation protection of workers, or the Defence Code, which contains provisions regarding defence-related nuclear activities or the prevention of malicious acts. Finally, various texts

apply to certain nuclear activities but without being specific to them.

The activities or situations regulated by ASN include a number of different categories presented below, along with the relevant regulations.

**Small-scale nuclear activities:** this category covers the many fields that use ionising radiation, including medicine (radiology, radiotherapy, nuclear medicine), human biology, research, industry and certain veterinarian, forensic or food-stuff conservation applications.

The Public Health Code (CSP) created a system of authorisation or notification for the manufacture, possession, distribution (including import and export), and utilisation of radionuclides or products or devices containing them. Licences are issued by ASN and notifications are filed with the ASN regional divisions.

The general rules applicable to small-scale nuclear facilities are the subject of ASN statutory resolutions. For example, in 2013, ASN resolution 2013-DC-0349 of 4th June 2013 was published, setting the minimum technical design rules to be met by installations in which X-ray radiation is produced by devices operating under high voltage of 600 kV or less.

**Exposure of individuals to radon:** human protection is based primarily on the obligation of monitoring in geographical areas where the concentration of naturally occurring radon can be high. This monitoring is mandatory in certain premises open to the public and in the workplace. A strategy to reduce this exposure is necessary, if the measurements taken exceed the action levels laid down in the regulations. This obligation should be extended to residential buildings.

**Activities involving technological enhancement of naturally occurring radioactive materials:** certain professional activities which cannot be defined as «nuclear activities» can lead to a significant increase in the exposure to ionising radiation on the part of the workers and, to a lesser extent, the neighbouring populations. This in particular concerns activities which utilise raw materials, construction materials or industrial residues containing natural radionuclides not used for their radioactive, fissile or fertile properties (phosphate extraction and phosphate-based fertiliser manufacturing industries, dye industries, in particular those using titanium oxide and those utilising rare earth ores such as monazite). The radiation protection measures required in this field are based on a precise identification of the activities, an estimation of the impact of exposure for the persons concerned, the implementation of corrective measures to reduce this exposure, if necessary, and to monitor it. They are governed by the Labour Code and by the Public Health Code (CSP).

**Basic Nuclear Installations (BNIs):** these are the most important nuclear facilities; they are the facilities of the nuclear electricity generating sector (nuclear power plants, main facilities of the “fuel cycle”), the large storage and disposal facilities for radioactive substances, certain research facilities and the large accelerators or irradiators. There are nearly 150 of them, spread over about 40 sites.

The legal regime for the BNIs is defined by section IX of book V of the Environment Code and its implementing decrees. This regime is said to be “integrated” because it aims to prevent or manage all risks and detrimental effects that a BNI is liable to create for man and the environment, whether or not radioactive in nature. It in particular requires that the creation or decommissioning of a BNI be authorised by a decree issued on the advice of ASN and that ASN authorise start-up of the installation and stipulate requirements regarding its design and operation with respect to protection of the population and the environment.

ASN is carrying out work to overhaul the general technical regulations for BNIs, together with the Ministry responsible for the environment; this led to the publication of the Order of 7th February 2012 setting the general rules for BNIs. Most of the provisions of this order entered into force on 1st July 2013. In the next few years it will be supplemented by about fifteen ASN statutory resolutions. In 2013, ASN thus adopted two resolutions: ASN resolution 2013-DC-0352 of 18th June 2013 concerning public access to the modification project files specified in Article L. 593-15 of the Environment Code and ASN resolution 2013-DC-0360 of 16th July 2013 concerning the management of nuisances and the impact of BNIs on health and the environment. This system is supplemented by ASN guides, which are not legally binding and which present ASN doctrine; in 2013, guides No. 9 on determining the perimeter of a BNI and No. 13 on integrating the risk of external flooding, were published.

**The transport of radioactive substances:** the safe transport of radioactive substances is based on the “defence in depth” principle involving on the one hand the packaging and its content, which must withstand the foreseeable transport conditions, and on the other the means of transport and its reliability, plus the response measures deployed in the event of an incident or accident. The consignor is responsible for implementing these lines of defence.

The regulation of the carriage of radioactive substances has a significant international component. It is based on IAEA recommendations integrated into the international agreements dealing with the various modes of transport for dangerous goods. At a European level, the regulations are grouped into a single 24th September 2008 directive, transposed into French law by an amended Order dated 29th May 2009, known as the “TMD Order”.

Within this legal framework, ASN is responsible for approving package models for the most hazardous shipments.

**Contaminated sites and soils:** management of sites contaminated by residual radioactivity resulting either from a past nuclear activity, or an activity which generated deposits of natural radionuclides, warrants specific radiation protection actions, in particular if rehabilitation is envisaged. Depending on the current and future uses of the site, decontamination objectives must be set and the removal of the waste produced during clean-out of the contaminated premises and soil must be managed, from the site up to storage or disposal.

In 2012, ASN published its doctrine for the management of sites contaminated by radioactive substances.

## Outlook

In 2014, ASN will contribute to the continued work being done to revise the European directive on nuclear safety and to transpose into French law the directive establishing a community framework for the responsible and safe management of waste and spent fuels and the directive setting basic standards for health protection against the dangers resulting from exposure to ionising radiation. It will continue to publish its statutory resolutions concerning BNIs or small-scale nuclear facilities.

The energy transition Act should also be passed in 2014 and should include changes in the various fields that concern ASN.



# 04

## Regulation of nuclear activities and exposure to ionising radiation

In France, nuclear activity licensees hold prime responsibility for the safety of their activity. They cannot delegate this responsibility, and must ensure permanent surveillance of their installations.

Control and regulation of nuclear activities is a fundamental responsibility of ASN. The aim is to verify that all licensees fully assume their responsibility and comply with the requirements of the regulations relative to radiation protection and safety, in order to protect workers, patients, the public and the environment against the risks associated with nuclear activities.

Inspection is the key means of control available to ASN. It involves an ASN inspector travelling to a site being inspected. The inspection is proportionate to the level of risk presented by the installation or the activity and the way in which the licensee assumes its responsibilities. It consists in performing spot checks on the conformity of a given situation with regulatory or technical baseline requirements. After the inspection, a follow-up letter is sent to the head of the inspected site and published on [www.asn.fr](http://www.asn.fr). Any deviations found during the inspection can lead to administrative or penal sanctions.

ASN has a broad vision of control and regulation, encompassing material, organisational and human aspects. Its actions take the tangible form of resolutions, requirements, inspection follow-up documents and assessments of safety and radiation protection in each sector of activity.

### Significant events of 2013

In 2013, 2,191 inspections were carried out, including 678 in the BNIs (369 in nuclear power plants and 309 in the other BNIs), 86 in activities linked to pressure equipment, 131 in radioactive substances transport activities, 1,165 in activities employing ionising radiation and 131 in approved organisations and laboratories.

ASN also carried out three in-depth inspections in BNIs:

- the first in-depth inspection on the topic of decommissioning was carried out on the Chinon and Saint-Laurent-des-Eaux NPP sites;
- the second was carried out jointly by ASN and the Defence Nuclear Safety Authority (ASND), in various facilities on the Marcoule platform (CEA, AREVA MELOX, CENTRACO) on the topic “waste and effluents”;
- the third was carried out in the Civaux NPP on the topic of operational rigorousness.

The ASN labour inspectorate also carried out 834 interventions during the 282 inspection days in the NPPs.

In 2013, the ASN Nuclear Pressure Equipment Department obtained its accreditation of compliance with standard NF EN ISO/CEI 17020 as a type A organisation for manufacturing inspection and in-service monitoring of nuclear pressure equipment.

With regard to the transport of radioactive substances, more than 45% of the inspections were carried out on the topic of “consignments” in industry, BNIs and the medical sector. Road carriage on the one hand and the other modes of transport on the other, account for 15% and 10% respectively of the inspections performed.

For activities employing ionising radiation, ASN carried out 1,165 inspections in 2013, nearly one quarter of which were unannounced. These inspections are divided among the medical (57%), industrial or research (34%) and veterinary (7%) sectors.

In 2013, ASN carried out 131 inspections of approved organisations and laboratories, 46% of which were unannounced.

ASN also monitors radiation protection in premises where exposure of individuals to natural ionising radiation can be enhanced owing to the underlying geological context (radon in premises open to the public) or the characteristics of the materials used in industrial processes (non-nuclear industries).

With regard to the tritium White Paper, for which the action plan is available on <http://livre-blanc-tritium.asn.fr>, ASN set up a pluralistic committee to monitor its action plan. Its last meeting was held on 4th December 2013. Some actions started in 2011 were continued in 2013.

In 2013, ASN was notified of:

- 1,123 significant events concerning nuclear safety, radiation protection and the environment, in BNIs, including 103 level 1 events and 2 level 2 events;
- 51 significant events concerning the transport of radioactive substances, including 1 level 1 event;
- 622 significant events concerning radiation protection in small-scale nuclear activities, including 154 rated on the INES scale (of which 22 were level 1 events and 2 were level 2 events).

With regard to environmental monitoring, ASN took part in the Response Assistance Network (RANET) exercise organised by IAEA in Fukushima Prefecture from 28th to 31st May 2013. This exercise analysed the coordination and management of the assistance teams from various countries, enabled the assistance teams to share their expertise in the field and allowed an inter-comparison via the measurement results obtained during the field exercise, with identification of the points to be improved in the performance of the exercise.

As a result of infringements observed, the ASN inspectors (nuclear safety inspectors, labour inspectors and radiation protection inspectors) transmitted 36 infringement reports to the public prosecutor's offices, ten of which were related to labour inspections in the NPPs.

ASN took administrative action (formal notice, suspension, etc.) against 18 licensees and managers of nuclear activities. Further to proposals from the ASN labour inspectors, the Regional Directorates for Enterprises, Competition, Consumption, Labour and Employment (DIRECCTE) served formal notice on NPPs on three occasions in 2013.

## Outlook

In 2014, ASN scheduled 2,030 inspections on BNIs, radioactive substances transport operations, activities employing ionising radiation, organisations and laboratories it has approved and activities involving pressure equipment. Continuing the approach used in 2013, ASN will as a priority inspect the activities with potentially high consequences, taking account of the experience feedback from 2013.

During 2014, ASN will aim to further increase the effectiveness of its oversight, drawing more specifically on the work done to optimise its inspection programme. It will also continue the in-depth inspection approach in small-scale nuclear activities and will carry out its first in-depth inspection in the medical sector.

At the same time, ASN will continue to revise the criteria and procedures for the notification of significant events.

It will draw conclusions from the implementation of an approach proportionate to the risk in small-scale nuclear facilities, in particular by proposing changes to the penalties policy applicable to the industrial and medical fields.

In the environmental field, ASN will ensure effective implementation by the licensees of the new provisions resulting from ASN resolution 2013-DC-0360 of 16th July 2013. ASN will continue to implement its tritium action plan, notably with the assistance of the pluralistic committee responsible for monitoring the action plan. A study of the overhaul of the website of the national network for environmental radioactivity monitoring will be initiated in order to improve its clarity and facilitate the public's understanding of the measurement results. ASN will finalise its examination of the changes to be made to the approval process for environmental radioactivity monitoring laboratories and will modify its resolution 2008-DC-0099 ASN of 29th April 2008 accordingly.



# 05

## Radiological emergency and post-accident situations

Nuclear activities are carried out with the two-fold aim of preventing accidents and mitigating any consequences should they occur. An accident can never be completely ruled out and the necessary provisions for dealing with and managing a radiological emergency situation must be planned, tested and regularly revised.

A distinction must be made between:

- emergency situations arising on a Basic Nuclear Installation (BNI);
- accidents involving radioactive substance transports;
- emergency situations occurring in the field of small-scale nuclear activities.

Emergency situations affecting nuclear activities can also present 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.

ASN takes part in management of these situations, for questions concerning the regulation of nuclear safety and radiation protection, drawing on the expertise of its technical support organisation, IRSN.

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

The On-site Emergency Plan (PUI), prepared by the licensee, is designed to restore the plant to a safe condition and mitigate the consequences of an accident.

The Off-site Emergency Plan (PPI) is drawn up by the Prefect to protect the populations, property and the environment. The PPI implements the orientations of the civil

security policy for mobilisation of resources, information and alert, exercises and training. 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 (Organisation of the Response by the Disaster and Emergency Services) that specifies the protection measures implemented in large-scale emergencies. Consequently, beyond the perimeter established by the PPI, the modular and progressive *département* or zone ORSEC plan applies in full.

The transport of radioactive substances in France represents more than 980,000 packages of varied dimensions and types. To prepare for the possibility of an accident, each Prefect draws up a specific plan within the ORSEC arrangements.

ASN has four main duties in an accident situation:

- check the actions taken by the licensee and ensure that it is fully exercising its responsibilities to control the accident, mitigate its consequences and inform the public authorities rapidly and regularly. Require that the licensee make the necessary evaluations or steps, although without taking its place in terms of technical oversight;
- inform the Government and advise the Prefect concerning the steps to be taken to protect the health of the public;
- inform the public and the media locally, nationally and internationally, through press releases and press conferences;
- act as competent Authority within the framework of the international agreements (IAEA and European Union) on early notification and assistance.

## Significant events of 2013

### The new ASN emergency arrangements

In moving to new headquarters in Montrouge in March 2013, ASN was able to set up a new emergency system based on the lessons learned from the Fukushima accident, during which ASN activated its emergency centre for a period of one month.

It comprises:

- at the national level, in Montrouge:
  - a “Strategy” Command Post, consisting of the ASN Commission, which could be called on to issue resolutions and impose prescriptions on the licensee of the installation concerned in an emergency situation;
  - a “Technical” Command Post in constant contact with its technical support organisation, IRSN, and with the ASN Commission. Its role is to adopt positions in order to advise the Prefect, who acts as the director of emergency operations;
  - A “Communication” Command Post, the ASN Chairman or his representative acts as spokesperson, a

role which is distinct from that of the head of the technical command pot.

– at the local level:

- ASN representatives working with and advising the Prefect in his decisions and communications;
- ASN inspectors present on the site affected by the accident.

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

In the event of an accident abroad, ASN could send one of its representatives to the French embassy in the country affected by the accident.

The ASN emergency system was activated on 15th July 2013 when demonstrators broke into the Tricastin NPP.

ASN played an extensive role (50 staff) in the exercise on 11th and 12th June 2013 at Saint-Laurent-des-Eaux with the intervention of the Ministerial level of the national emergency organisation and deployment of an Interministerial Crisis Committee (CIC). The contribution of the work done by the Post-Accident Steering Committee (CODIRPA) and the benefits to be gained from regularly testing the emergency organisation and the central role of the CIC were confirmed.

On 28th November 2013, ASN organised an information and discussion day for licensees looking to better understand their role in an emergency and gain a clearer picture of the stakes involved in the PUI. This day more specifically targeted the licensees of facilities which, in the event of an accident, do not require activation of a PPI.

## CODIRPA

In 2005, ASN set up a Steering Committee that is extensively open to the stakeholders, concerning the Management of the Post-Accident phase (CODIRPA). In November 2012, ASN sent the Prime Minister elements of the policy 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](http://www.asn.fr) and widely distributed at local, national and international levels. In its opinion, the Commission considers that drafting and publishing the first elements of the policy 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 2013, the CODIRPA, chaired by ASN, continued its work, more specifically on the need to learn the first lessons from the post-accident management implemented in Japan in the wake of the Fukushima disaster, but also to support the preparatory work to be organised at the national level. Some questions are also still on hold, following the first phase of the CODIRPA's work and the thought that has so far been given to intermediate scale accidents must be more specifically extended to include the management of severe accidents.

In this context, three areas for focus were proposed:

- test and complete the policy elements with respect to the different accident situations;
- assist with regional implementation of the elements of post-accident management;
- take part in international work carried out on the post-accident theme, share and integrate its results.

The new duties of CODIRPA 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 policy.

The new programme is set for a period of five years. ASN will continue to act as technical secretary and chair of CODIRPA.

## At international level

In 2013, ASN continued to conduct regular exchanges with its transboundary counterparts with regard to coordinated emergency management procedures. A procedure specifying the transboundary alert and information exchange mechanisms was defined with Luxembourg. ASN staff took part in emergency exercises in 2013 in the United Kingdom, in an observer capacity. The drafting of an exchange protocol in the event of an emergency situation has been initiated with Norway. French emergency exercises concerning the border NPPs of Cattenom and Fessenheim were an opportunity to test transboundary information exchanges in the event of an accident.

## Outlook

ASN contributes to the thought currently being given to the follow-up to the Fukushima accident, in order to improve the national radiological emergency response organisation.

In 2014, ASN will continue with the European initiatives taken with a view to transboundary harmonisation of actions to protect individuals in an emergency situation and to develop a coordinated response by the safety and radiation protection Authorities in the event of a near or remote accident.

Emergency exercises are a means of testing the organisation specified in the emergency plans, notably the interfacing between the ORSEC and PPI systems, in order to ensure that the skills of the stakeholders required in an emergency remain current and to improve transboundary coordination. ASN will ensure that the populations are extensively involved in the preparation of these exercises and that international relations are put to use.

A new campaign to inform the populations living in the vicinity of the NPPs should soon be organised, concerning the justification for and correct use of iodine tablets.

Concerning the management of post-accident situations, ASN will ensure that the ORSEC-PPI implementation system, placed under the control of the Ministry for the

Interior, indicates the policy elements concerning the exit from the emergency phase.

ASN will also take part in the work overseen by the General Secretariat for defence and national security, with regard to implementation of the “Major nuclear or radiological accident” national response plan published on 4th February 2014.

Finally, ASN suggested to the Government that it continue to provide assistance with organising the emergency exercises, continue with preparation for nuclear post-accident management in the regions and update the elements of the first national policy, more specifically taking account of experience feedback from the Fukushima accident.



# 06

## Public information and transparency

“Transparency in the nuclear field consists in the set of provisions adopted to ensure the public’s right to reliable and accessible information on nuclear security” (Article L.125-12 of the Environment Code which codifies Article 1st of the TSN Act).

ASN is responsible for the correct implementation of the requirements of the TSN Act, particularly those concerning transparency. ASN considers that nuclear subjects are everyone’s business and that all citizens should be able to reach their own opinions.

ASN ensures that the TSN Act is applied by the stakeholders and attaches importance to overseeing compliance by the nuclear licensees with their obligations of transparency. The licensees are required to release to anyone who so requests the information in their possession concerning the risks involved in their activities and the safety or radiation protection measures taken by them to prevent or mitigate these risks.

ASN also focuses on ensuring participation by civil society in subjects related to nuclear safety and radiation protection, in the spirit of the Aarhus Convention which encourages consultation of the public and the stakeholders and the transparency of information. It supports steps in favour of transparency by the Local Information Committees (CLI) and the HCTISN.

Every year, ASN presents Parliament with its *Report on the State of Nuclear Safety and Radiation Protection in France* and develops its relations with members of Parliament and local elected officials.

## Significant events of 2013

The creation of a new public information centre at the headquarters in Montrouge enabled ASN to receive numerous groups of students and the general public interested in topics related to nuclear safety and radiation protection. The Information Centre now comprises three areas: a documentation area, an exhibition area and an auditorium. In 2013, ASN's public Information Centre answered nearly 2,000 queries (up by 20%). The Information Centre hosted the exhibition entitled "Rayons X, radioactivité, radioprotection... Quelle histoire !" presenting the history of the management of risks linked to radioactivity.

ASN continues to strengthen its contacts with schools, in order to develop the nuclear risk culture among teachers and students. ASN renewed its support for the "Ateliers de la radioprotection" (radiation protection workshops) involving its Bordeaux, Lyons and Strasbourg divisions. In 2013, ASN created a partnership with the French Institute for Major Risks and Environmental Protection Instructors (IFFO-RME), a network of risk specialists with experience of working in a schools environment. The ASN headquarters hosted the annual meeting of "major risks" academic coordinators. For the first time, ASN took part in the "Fête de la science" science festival. ASN and IRSN have designed a new modular exhibition on the topic of the nuclear risk culture. This exhibition was presented to the public for the first time on the occasion of the "Fête de la science".

ASN relations with elected officials were developed, more specifically with ASN's first participation this year at the French Mayors' Fair. Its stand attracted 200 visitors. ASN was also given a number of hearings by members of Parliament in 2013. Pierre-Franck Chevet took part in the "Mardis de l'Avenir" organised by Claude Bartolone, the Speaker of the National Assembly, on the subject "What future for nuclear energy?".

ASN expressed its positions in topical debates on nuclear matters (energy transition, Cigéo project, operating life of the nuclear power plants).

In 2013, the public was widely involved in the decision-making process: about thirty draft ASN statutory resolutions and draft guides were the subject of public consultation on [www.asn.fr](http://www.asn.fr). Since 1st June 2013, ASN has also been submitting its draft individual decisions to the opinion of the public concerning nuclear facilities with a significant impact on the environment, before they are adopted by the ASN Commission.

In 2013, ASN reorganised its website to promote access to information by its various audiences. To ensure greater accessibility of content, the site now proposes access from the homepage to all oversight documents (incident notices, inspection follow-up letters, position statements, reactor outage notices), which are transmitted daily to the licensees and simultaneously posted on [www.asn.fr](http://www.asn.fr). The site also offers sections specifically tailored to the needs of professionals. Each year ASN thus posts more than 2,000 inspection

follow-up letters on its website for all the activities it inspects. As at 31st December 2013, 12,636 follow-up letters had been posted on [www.asn.fr](http://www.asn.fr). The ASN website is now compatible with the new reading media (digital tablets, smartphones) and the main social networks and media, to enable the news to be followed in real-time. [www.asn.fr](http://www.asn.fr) presents ASN positions on various subjects by means of video films, recordings of press conferences and Parliamentary hearings. In 2013, the [www.asn.fr](http://www.asn.fr) website received 700,000 visitors.

ASN publishes the "La Lettre de l'Autorité de sûreté nucléaire" (ASN newsletter) (2,000 paper copies and more than 5,500 digital subscribers).

In 2013, ASN carried out an extensive editorial revision of its *Contrôle* magazine, which has been published since 1994 and has a distribution list of more than 10,000.

The *ASN Report on the State of Nuclear Safety and Radiation Protection in France* constitutes the reference document on the state of the activities regulated and monitored by ASN.

The collection of "ASN guides" is part of the approach offering pedagogical support for professionals and comprises 19 guides detailing ASN doctrine, specifying the recommendations, suggesting the means it considers to be relevant for attaining the objectives set by the regulations and sharing methods and best practices resulting from experience feedback from significant events. The guides can be consulted on [www.asn.fr](http://www.asn.fr).

In 2013, ASN held more than twenty national and regional press conferences on a variety of topics, notably: the follow-up to the stress tests, the state of the French nuclear facilities and the incidents which had occurred, the management of nuclear waste and management of exposure to ionising radiation. On 15th January 2013, in the presence of about twenty journalists from the national and international press, Pierre-Franck Chevet, ASN Chairman, and Jean-Christophe Niel, Director General, presented a review of ASN, its development, relations with its international counterparts and its strategic priorities for 2013. On 16th April 2013, ASN presented its *report on the state of nuclear safety and radiation protection in France in 2012* to OPECST, in the presence of about twenty journalists.

The ASN barometer is designed to measure the ASN name awareness and the level of satisfaction of both the general and informed public with regard to its information actions. It also enables ASN's information policy to be adapted to its various interlocutors.

ASN supports CLI actions through financing of more than a million euros and aims to see them benefit from a subsidy taken from the BNI tax. At the end of 2013 there were 37 CLIs created under the TSN Act. The 25th CLI conference brought together 215 participants on 11th December 2013 in Paris, at the initiative of ASN and in partnership with the National Association of Local Information Committees and Commissions (ANCCLI).



The HCTISN plays an important consultation role at the national level. In 2013, it held four plenary meetings and more specifically worked on the *Cigéo* project.

IRSN accounts for its activities in its annual report and implements a policy of information and communication, more specifically through its website [www.irsn.fr](http://www.irsn.fr) and its magazine *Repères*.

### Outlook

In 2014, ASN will continue to develop its actions to communicate with the general public, in order to make the technical subjects presented to them clearer and more accessible. ASN will continue to suggest that the public contribute to the drafting of regulatory texts, by submitting their opinions on [www.asn.fr](http://www.asn.fr).

The development of its public information centre, its strengthened ties with schools and the national education system, the creation of new information media for the populations situated in the PPI zones around nuclear facilities, are all priorities designed to raise awareness among the various audiences with regard to the risk culture and to questions concerning nuclear safety and radiation protection.

The development of exchanges with elected officials and the stakeholders will continue to be a major focal point for 2014. Within its area of expertise, ASN will take part in the debates on nuclear matters.

In 2014, ASN will continue its efforts to develop the implementation of measures concerning the transparency of the licensees and of procedures concerning nuclear activities. With regard to nuclear activities, it will in particular contribute to new legislative and regulatory provisions concerning public participation in decisions relating to the environment. It will learn the lessons from the procedures put into place, ensuring that the stakeholders are involved.

ASN will make proposals to extend the system of information access to categories of nuclear activities other than BNI operations or the transport of radioactive substances. ASN will continue to support CLI activities. With ANCCLI and in agreement with the licensees, it will establish rules of good practice to make it easier for the CLIs to perform their duties. It will reiterate its proposals to the Government with a view to ensuring that the CLIs are given the human and financial resources they need.

In 2014, ASN will take part in the drafting of the energy transition bill and will provide the public with information within its field of competence.



### International relations

ASN devotes significant resources to international cooperation, with the aim of contributing to strengthening nuclear safety and radiation protection worldwide and becoming recognised as an “international benchmark”.

### Significant events of 2013

As in 2012, the year 2013 was marked by intense activity on the part of the international organisations to examine the worldwide nuclear safety implications of the accident which struck the Fukushima nuclear power plant in 2011. ASN played a full part in this process, in particular at the European level, and recalled that it was vital to learn all the lessons from the accident in order to understand the technical aspects, as well as those linked to social, organisational and human factors. ASN also considers that it is absolutely essential for the independence of the national regulators to be reinforced worldwide.

In 2013, the countries of the European Union which took part in the stress tests exercise in 2011 and 2012 decided to organise a European peer review of the national action plans drawn up further to this exercise. After the members of ENSREG (*European Nuclear Safety Regulators' Group*) and the European Commission adopted the final stress tests report and the associated recommendations on 26th April 2012, the various countries involved in the exercise published their national action plans taking account of these recommendations. ENSREG opened these action plans to public consultation and in April 2013, organised a seminar in Brussels to review them, the conclusions of which were made public and entail a further follow-up exercise for the actions initiated in the 2015-2016 time frame.

For several years now, Europe has been a priority focus for ASN's international actions and it thus aims to contribute to the construction of a Europe at the forefront of topics related to nuclear safety and radiation protection. After the adoption of European directives on the safety of nuclear facilities (2009), the management of waste and spent fuel (2011) and the basic standards for health protection against the dangers arising from exposure to ionising radiation (2013), ASN is actively participating in the work being done to revise the Safety directive of 2009, as requested by the Council of Europe in the wake of the Fukushima accident. ASN played an active role in defining the ENSREG position on the draft revision of the directive and, on the occasion of the negotiations concerning this project, recalled the importance it attached to the reinforcement of the independence of the safety regulators and the overall consistency of the directive, in order to allow effective implementation in Europe and in France. Within WENRA (*Western European Nuclear Regulators' Association*), ASN contributed to the drafting of an update of the nuclear safety reference levels adopted in 2006 to take account of the first lessons learned from the Fukushima accident.

In the field of radiation protection, the work done by HERCA (*Heads of European Radiological protection Competent Authorities*) continued in 2013, more specifically with the approval of a document containing practical measures to improve the harmonisation of the response by European countries in the event of a nuclear or radiological emergency in a non-European country.

Outside Europe, a large number of initiatives have been taken to harmonise nuclear safety practices and regulation. Within IAEA, ASN actively participates in the work of the Commission on Safety Standards (CSS) which drafts international standards for the safety of nuclear installations, waste management, the transport of radioactive substances and radiation protection. Although not legally binding, these standards do constitute an international reference. ASN is also closely involved in the peer review process, which is a key component of the consideration being given to changes in the international nuclear safety framework. Within the NEA (OECD's *Nuclear Energy Agency*), ASN takes part in the work of the Committee on Nuclear Regulatory Activities (CNRA). Finally, ASN is taking part in the MDEP (*Multinational Design Evaluation Programme*) the aim of which is to perform a joint assessment of the design of new reactors such as the EPR, or AP 1,000, or APR 1,400 and which at present comprises twelve safety regulators.

ASN has signed bilateral cooperation agreements with many countries. It also maintains close relations with the main countries equipped with nuclear reactors or looking to acquire them and with countries, such as Ireland and Norway, which are not nuclear but are interested in radiation protection and emergency situation management issues. It also pays particularly close attention to relations with France's neighbours. For many years, ASN has also been promoting exchanges with or secondment of personnel to its foreign counterparts and opens up its Advisory Committees to foreign experts.

In 2013, ASN continued to be approached by countries wishing to benefit from its assistance in the regulation of nuclear safety. In accordance with the policy guidelines it has set for itself, ASN replies to these approaches within the framework of bilateral actions with the safety regulator of the country concerned, or via international instruments such as IAEA's *Regulatory Cooperation Forum*, for which Jean-Luc Lachaume, ASN Deputy Director General, was elected President in 2013. The purpose of this cooperation is to enable the countries concerned to acquire the safety and transparency culture that is essential for a national system of nuclear safety and radiation protection regulation.

Finally, France is a contracting party to four international agreements aimed at preventing accidents linked to the use of nuclear energy and mitigating their consequences. IAEA is the depository of these agreements and acts as secretary. In 2013, ASN published the French national report drafted for the sixth review meeting of the Convention on Nuclear Safety, which will be held in Vienna from 24th March to 4th April 2014 and will be chaired by André-Claude Lacoste, the former Chairman of ASN.

## Outlook

In 2014, at the European level, ASN will remain attentive to the negotiations that should lead to the approval of the nuclear safety directive, with the aim of ensuring overall coherence. The need to reinforce European harmonisation of the preparation for and response to radiological emergencies will also remain a key focus for work in the coming years.

ASN will be taking part in the sixth review meeting of the Convention on Nuclear Safety and will submit proposals aimed at reinforcing safety and improving the international implementation of this convention.

ASN is also preparing for the *Integrated Regulatory Review Service - IRRS*, a peer review of the organisation of the regulation and oversight of safety in France, organised under the aegis of IAEA, which it requested for November 2014. The IRRS mission will also enable ASN and its counterparts to share regulatory experience and knowledge.



# 08

## Regional overview of nuclear safety and radiation protection

This chapter sets out the nuclear safety and radiation protection situation observed locally by ASN's regional divisions.

Summary sheets present the BNIs and small-scale nuclear facilities (medical, industrial and research) and the local actions particularly representative of ASN's work in the regions. This presentation follows the same principle as that adopted in the various ASN information media, in particular on [www.asn.fr](http://www.asn.fr).

# 09

## Medical uses of ionising radiation

For more than a century, medicine has made use of various sources of ionising radiation, both for diagnostic purposes and for therapy. Even if their benefits and usefulness have long been medically proven, these techniques do however make a significant contribution to exposing the population to ionising radiation.

Behind exposure to natural ionising radiation, medical exposure represents the second source of exposure for the population and the leading source of artificial exposure. In 2012, according to IRSN, 201,402 people working in the field of medical uses of ionising radiation (57% of all the exposed workers monitored) received dose monitoring.

As at the end of 2012, in France, there are several thousand conventional or dental radiology appliances, 1,118 computed tomography facilities, 217 nuclear medicine departments using unsealed sources for *in vivo* or *in vitro* diagnosis and internal radiotherapy, and 175 external radiotherapy centres equipped with 452 treatment devices, treating some 175,000 patients every year. The activities presenting the highest risk from the radiation protection standpoint require authorisation. In 2013, ASN thus issued 691 authorisations, including 374 in computed tomography, 163 in nuclear medicine, 110 in external radiotherapy, 36 in brachytherapy and 8 for blood product irradiators.

In 2013, by means of two resolutions, ASN also revised the rules for outfitting of and access to radiology installations and initiated the consultations necessary for updating the design, operation and maintenance rules for nuclear medicine facilities.

The use of new radiopharmaceutical products is continuing to develop, as is the use of radiology devices in operating theatres for radioguided surgical procedures, which can require long-duration exposure of the patients but also of the professionals, in particular their hands.

In 2013, ASN drew up a new report on the state of radiation protection in nuclear medicine centres, based on the inspections carried out from 2009 to 2011 and two national reports, based on the inspections carried out in 2011, in the field of radiotherapy on the one hand and computed tomography on the other.

## Significant Radiation protection Events (ESR)

Since the notification system was set up in 2007, the number of ESR notified in the medical field has been rising and in late 2013 there were an average of two notifications per working day which, for 2013, means a total of 554 (48% for radiotherapy, 20% for nuclear medicine and 18% for computed tomography). This number is more than 5% up on 2012.

A significant rise in notifications has been observed in the radiology sector (scanner, interventional and conventional radiology) along with a slight drop in the number of notifications in the other fields.

For workers, the 44 ESR concern all activity sectors. For patients, 62% of the 341 ESR notified come from a radiotherapy unit. These events entail no serious consequences for patient health and were rated level 1 (108), level 2 (5) and level 2+ (1). Two notifications were issued in 2013 by health professionals not belonging to a radiotherapy department, owing to the severity of the deterministic effects observed in the patient. The incident notices are published on [www.asn.fr](http://www.asn.fr).

The events notified to ASN in 2013 show that the consequences with the most significance in radiation protection terms concern:

- for workers, interventional radiology and nuclear medicine;
- for patients, interventional radiology during particularly complex and lengthy procedures, but also nuclear medicine, with errors in the administration of radiopharmaceuticals;
- for the public and the environment, leaks from effluent containment devices in nuclear medicine.

The experience feedback from the ESR notified to ASN underlines the need to make greater use of and give greater means to persons with competence for radiation protection and medical physicists, to develop the training of professionals who are not specialists in ionising radiation, to adopt approaches to manage the quality, safety and evaluation of professional practices.

## The radiation protection situation in radiotherapy

Since 2007, radiotherapy health care safety has been a priority for ASN regulation and inspection. In the light of the results of the inspections and the progress made in terms of treatment safety, the radiotherapy centres are, since 2012, inspected every two years. Inspection frequency of one year is however maintained for centres showing potential signs of vulnerability, with particular attention given to those adopting new techniques.

In 2014, ASN will issue a position statement on the conditions for implementing high-precision irradiation techniques in radiotherapy.

The ASN inspections performed in 2012 confirm the positive trend with regard to the increase in human resources for medical radiation physics, although a number of centres are still vulnerable. The improvement in adoption of the management of the safety and quality of the care given to patients is encouraging, even if extremely varied. The potential risks to the patients are only analysed and updated in 43% of the centres inspected in 2012.

## The radiation protection situation in nuclear medicine

ASN continued the inspections of nuclear medicine units in 2013, and initiated or continued work on the regulations to improve radiation protection in this field of activity.

A working group including all the stakeholders (heads of health care establishments, nuclear medicine professionals, wastewater treatment plant and sewerage system operators, administrations and regulating authorities concerned, technical experts) was set up in early 2013 to issue recommendations on the conditions of discharge of radionuclide-contaminated effluents into the public sewerage system. These recommendations are expected during the course of 2014.

## The radiation protection situation in conventional radiology and computed tomography

In 2013, ASN assessed the progress made in response to its recommendations of 2011 concerning management of the doses delivered to medical imaging patients, more specifically in computed tomography (computed tomography procedures represent 10% by volume and 58% of the mean effective dose for the population). In 2014, ASN will publish a complete report on the progress of the steps taken and, as necessary, will issue new recommendations.

Following the inspections carried out in 2011 and 2012, ASN observes improved implementation of the radiation protection rules for workers and patients. However, there is insufficient experience in the use of the optimisation tools. In 2013, ASN took part in the HERCA initiatives aimed at the manufacturers of scanners, with a view to improving the optimisation tools available on the equipment.

### The radiation protection situation in interventional radiology

Since 2009, the monitoring and regulation of radiation protection in interventional radiology has been a national priority for ASN. In recent years, ASN has been notified of significant radiation protection events after the appearance of lesions (radiodermatitis, necrosis) in patients who had undergone particularly lengthy and complex interventional procedures. In addition to these events which emphasise the major implications of radiation protection for patients, one must add those concerning professionals whose exposure has resulted in the regulatory limits being exceeded.

The findings further to the 2012 inspections confirm the observations made in recent years. Greater account is taken of the radiation protection of workers in fixed installations dedicated to radiology than in operating theatres where mobile devices are used. However, the inspections reveal inadequacies in the risk assessments and workplace studies, a lack of training for the professionals working in operating theatres, shortcomings in the radiation protection culture and incomplete adoption of dosimetry.

With regard to patients, inadequate operator training entailing a lack of operating expertise meant that the doses delivered to the patients could not be optimised. Increased use of medical physicists would help optimise the use of the equipment.

In 2014, ASN will be publishing a national report on the inspections carried out over the period 2010 to 2012 covering more than 400 units performing interventional radiology procedures and will maintain its oversight of interventional radiology as a national priority in its 2014 inspection programme.



# 10

## Industrial, research and veterinary uses and source security

Industry, research and numerous other sectors use sources of ionising radiation from radionuclides, in sealed or unsealed sources, or ionising radiation generators, in a wide variety of applications.

### ASN assessments in 2013

Industrial radiology activities have serious radiation protection implications for the workers and are an inspection priority for ASN, with more than 110 inspections carried out per year. Through its inspections, ASN observes that the way risks are taken into account varies between companies, with inadequate application of the justification principle. The examination by the non-destructive inspection professionals of the field of justification and optimisation, led to the drafting of guidelines which are as yet insufficiently widely implemented. In 2013, ASN carried out a national survey to clarify the organisation of this sector nationwide and more specifically the number and distribution of facilities, the number of non-destructive tests carried out and the radiologist headcount.

ASN oversight since 2002 of research establishments and laboratories using sources, has shown a clear improvement in radiation protection in this sector. The situation could however still be improved on certain points, particularly internal radiation protection checks, the notification and monitoring of significant events and the management of radioactive effluents and waste. The disposal of old sealed sources which have been in storage for several years should be the subject of an action plan with regard to the available disposal routes.

With regard to veterinary structures, the administrative situation has been continuously improved for a number of years now (as at end 2013, nearly 3,100 structures had been notified or authorised) but this is still unsatisfactory given the number of establishments utilising ionising radiation in the country (about 5,000).

In the field of radiopharmaceuticals production, for which there are 32 low and medium energy cyclotrons in France, ASN has had regulatory and oversight duties since early 2010. ASN performs about twelve inspections in these establishments every year.

The regulatory framework applicable to the use of ionising radiation generators needs to be updated and added to. On the basis of the standardisation work conducted by the *Union technique de l'électricité* (UTE), ASN has initiated an update of the design and layout rules for installations in which X rays are produced and used. The work done by ASN in this field led to the publication of a resolution in June 2013 concerning the minimum technical rules for the design of facilities in which X rays are present, which entered into force on 1st January 2014.

ASN also considers that the increase in the number of cases in which radioactivity is detected in metals and consumer goods across the world is worrying. ASN considers that France must rapidly adopt a national strategy for radioactivity detection on its territory, and make the corresponding investments in equipment and training.

The removal of old lightning arresters containing radioactive sources is an activity involving major radiation protection challenges. ASN therefore wants to see an organised and gradual recovery of these radioactive lightning arresters, and for several years now has been informing the professionals to ensure that their removal guarantees compliance with radiation protection requirements for the workers and the public.

Monitoring sources for radiation protection and safety purposes as well as to protect against malicious acts have many aspects in common and mutually consistent objectives. The Government thus decided to entrust ASN with the task of monitoring the follow-up and protection measures incumbent on the party responsible for the nuclear activity. The legislative process initiated in 2008 led to a Bill being tabled before the Senate in 2012. ASN continued its work to prepare implementing texts under the control of the Ministry for Ecology, Energy and Sustainable Development and reinforced measures to identify and inventory the existing installations. This identification process, which focused on establishments holding high-level sealed sources, led to 106 visits by ASN in 2013.

texts with stricter requirements in the field of justification, given the existence of recognised alternative methods, and in the preparation for incidents management.

The work done by ASN concerning the suppliers of electric generators of ionising radiation should enable a draft resolution to be finalised in 2014 setting out technical requirements for the devices distributed in France.

The guide intended for the professionals concerning the means of protection necessary when removing radioactive lightning arresters will be published in 2014 on the basis of the results of the measurements campaign carried out in 2012. At the same time, ASN will propose procedures to the Government for accelerated recovery in line with the recovery capacity of the French National Radioactive Waste Management Agency (ANDRA).

With regard to source security, ASN and its institutional partners will continue in 2014 to prepare the implementing texts required for effective implementation of regulation. At the same time, it will continue the steps initiated in 2013 to produce an inventory of the existing installations and anticipate staff training and the development of appropriate tools for rapid and effective implementation of this new duty.

## Outlook

In 2014, ASN will be maintaining significant monitoring efforts in the field of industrial radiography. ASN will also be continuing the approach engaged with the General Directorate for Labour, aimed at overhauling the regulatory



# 11

## Transport of radioactive substances

About 770,000 consignments of radioactive substances are transported each year in France. This corresponds to about 980,000 packages of radioactive substances, which represent just a few per cent of the total number of dangerous goods packages transported each year in France. 88% of the transported packages are intended for the health, non-nuclear industries or research sectors, of which about 30% is accounted for by the medical sector alone. The nuclear industry accounts for about 12% of the annual transports of radioactive substances (for example, about 300 annual shipments of new fuel, 250 of spent fuel, about thirty of MOX fuels and about sixty of plutonium oxide powder).

The content of the packages varies widely: their radioactivity level varies from a few thousand becquerels for low-activity pharmaceutical packages, to trillions of becquerels for spent fuel. Their weight also varies from a few kilogrammes to about a hundred tonnes. Road transport accounts for about 90% of radioactive substances shipments, rail 3% and sea 4%. Air transport is widely used for small, urgent packages to be transported over long distances, for example short-lived radiopharmaceuticals. All of these transport operations can be international. The main participants in transport arrangements are the consignor and the carrier. The consignor is responsible for package safety.

ASN ensures correct application of the regulations concerning the safe transport of radioactive and fissile substances for civil uses. This safety must not be confused with security, or physical protection, which is the prevention of loss, disappearance, theft or misappropriation of nuclear materials (usable for making weapons), for which ASN is not responsible. The major risks in the transport of radioactive substances are the risks of irradiation, contamination, criticality, but also toxicity or corrosion. To prevent them, the radioactive substances in the packages must be protected from

fire, mechanical impact, water ingress into the packaging, thus facilitating criticality reactions, chemical reaction between package components, etc. Safety is thus based above all on the robustness of the package, which is the subject of rigorous regulatory requirements. Given the international nature of these shipments, the regulations are drawn up on the basis of recommendations issued under the aegis of the International Atomic Energy Agency (IAEA). Although all packages must comply with strict rules, only 3% require ASN approval.

## Significant events of 2013

Radiation protection is the subject of specific requirements in the regulations applicable to the transport of radioactive substances. In 2013, ASN asked IRSN to conduct a study on the doses received by individuals exposed during transport operations, which shows that radiation protection optimisation efforts are required on the part of certain transport companies.

Dangerous goods transport operations can take place on the private roads of nuclear sites, in what are referred to as "on-site transport operations". Since 1st July 2013, these transport operations have been subject to the requirements of the BNI Order.

In 2013, ASN drew up an information sheet on the transport of radioactive substances, intended for the general public and available on [www.asn.fr](http://www.asn.fr). This sheet answers the questions frequently asked by the public, notably concerning the risks inherent in these transport operations, the organisation of the response by the public authorities to an emergency or the routes taken for the transport operations.

In 2013, ASN issued 39 approval certificates. Most of these certificates correspond to prolongations or extensions of certificates already granted and one certificate concerned a new package model. Half of the package models concerned are for the transport of new or spent nuclear fuels.

In 2013, ASN carried out 131 inspections in all sectors and at all steps in the transport of radioactive substances: the inspections concerned the transport operation itself (50% of the inspections were devoted to checking the consignments and carriers) but also the organisation of the transport operations, the manufacture of new packagings or maintenance operations.

The most active packages are carried by rail. Following the derailment of a wagon containing depleted natural uranium in Saint-Rambert-d'Albon station in January 2013, ASN increased the number of its inspections devoted to rail transport. Several inspections were thus carried out in 2013, including one in the Woippy marshalling yards and another in the Drancy-Le Bourget marshalling yards, following an incident in December 2013.

In April 2013, ASN inspected three packages of MOX type fuel carried by sea and destined for Japan.

In 2013, ASN carried out a cross-inspection with its Belgian counterparts on the transport of packages of radiopharmaceuticals.

In 2013, the European Association of Competent Authorities (EACA) continued with its drafting of a European inspection guide, which could be used by the inspectors of each Authority.

The follow-up letters to these inspections are available on [www.asn.fr](http://www.asn.fr).

In 2013, 50 events rated level 0, and one event rated level 1 on the INES scale were notified to ASN. The number of level 1 events is down. The number of level 0 events has remained stable and is the same as the average number of level 0 events notified over the past ten years.

More than half of the events are notified by the industrial stakeholders in the nuclear cycle (EDF and AREVA in particular). About 14% of the significant events concern the radioactive pharmaceutical products shipped by CIS bio international.

The conventional industry and research sectors notify very few transport events, probably owing to the lack of notification by the professionals in the small-scale nuclear sector.

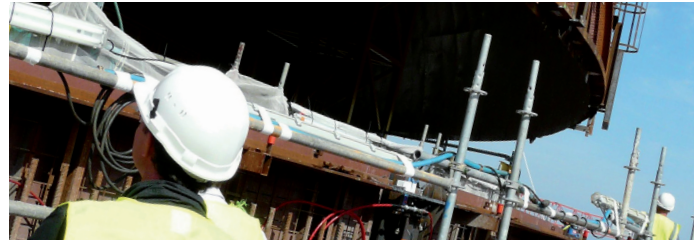
Road transport accounts for the majority of the notified significant events. The proportion of significant events concerning air transport, about 17% in 2013, reflects greater awareness by the airport companies that detect deviations and are more familiar with the notification process. Three derailments of wagons carrying radioactive substances were also notified in 2013.

In 2013, ASN made public a report on the state of safety of the transport of radioactive substances in France, based on the event notifications transmitted to ASN and the inspections covering the period 2007 to 2011. Three areas for improvement were identified, concerning package preparation, organisation and consignment in BNIs as well as during the carriage of packages, the manufacturing and maintenance of packagings, the examination of approval applications and the management of emergency situations.

## Outlook

In 2014, compliance with the regulatory requirements of the BNI Order on on-site transport, packages not requiring ASN approval, packaging manufacture and maintenance will be the subject of close monitoring by ASN.

In 2014, ASN will draw the initial conclusions from its examination of application of the lessons learned from the Fukushima accident to the field of transports.



# 12

## Nuclear power plants

Regulating Nuclear Power Plants (NPPs) is one of ASN's fundamental duties. The 58 French nuclear reactors in operation are technically similar and are operated by EDF.

ASN applies the highest standards for regulating NPPs and adapts them continuously in the light of new knowledge. It is developing an integrated vision of control and regulation that covers not only the design of new installations, their construction, modifications, integration of feedback on events or maintenance issues but also, through the expertise its inspectors have built up, social, human and organisational factors, radiation protection, the environment, worker safety, as well as the application of labour legislation.

## Significant events of 2013

### The inspections carried out following the Fukushima accident

Following the nuclear accident at Fukushima, ASN considered that stress tests needed to be carried out on French civil nuclear facilities in order to take account of the experience feedback from the accident. Further to these stress tests, ASN issued nineteen resolutions on 26th June 2012, requiring EDF to take additional steps to reinforce the robustness of the NPPs to extreme situations, more specifically:

- a “hardened safety core” able to perform vital safety functions in the event of hazards or unforeseen circumstances exceeding those adopted for the general design of the facility;
- creation of the “Nuclear Rapid Intervention Force” (FARN) proposed by EDF, a national emergency system involving specialised crews and equipment for intervening on an affected site within less than 24 hours;



– reinforced measures to reduce the risk of uncovering of the spent fuel in the fuel storage pits in the various installations.

After analysis by IRSN and the Advisory Committee for Reactors of the EDF proposal for the “hardened safety core” and having collated the comments from the public, ASN issued further resolutions on 21st January 2014 clarifying the components of this “hardened safety core” and the requirements applicable to their design and implementation.

At the same time, the action plans drawn up by the various European States further to the stress tests and published in late 2012, were submitted to a peer-review process at a European level, from January to April 2013 (see previously, the notable findings of chapter 7).

### Continued operation of the nuclear power plants

In June 2013, ASN expressed its opinion on the orientations of the general study programme presented by EDF with a view to extending the operating life of the reactors beyond 40 years. ASN requested additional studies and underlined the fact that if operation of the existing reactors were to be extended beyond 40 years, they would be operating alongside other reactors around the world of more recent design and compliant with significantly strengthened safety requirements. Through its requests, ASN thus restated that the reactor operating life extension desired by EDF was in no way a foregone conclusion. Over and above the question of management of ageing, it is also dependent on an ambitious safety reassessment aiming to achieve a level as close as possible to that of a new reactor.

### Regulation of construction of the EPR reactor in Flamanville

The Creation Authorisation Decree for the EPR Flamanville 3 reactor was signed in April 2007 and construction work began in September 2007. The next regulatory step is “commissioning” authorisation by ASN. With this in mind, ASN in 2007 initiated the examination of certain topics requiring lengthy investigation and oversight of the detailed design of the most important or innovative systems, which continued in 2013. On 7th May 2013, ASN also issued new prescriptions for the preparation and performance of the commissioning tests, which will verify that the installation’s performance is as expected.

At the same time, ASN oversees the construction of the reactor (detailed design studies, manufacturing in the factory, construction site), through inspections and examination of documents. Thus, in 2013 and with the support of IRSN, ASN carried out four inspections in the engineering centres and 22 inspections on the construction site concerning the safety of the facility. It also carried out 35 days of labour inspection work. In 2013, ASN paid particularly close attention to the civil engineering work, more specifically during installation of the reactor building dome, the mechanical and electrical installation activities and the lifting equipment used for installation of the large reactor components. Concerning the manufacture of nuclear pressure equipment, ASN assesses the conformity of this equipment with

the requirements of the regulations, or has it assessed by approved inspection organisations. ASN thus carried out, or had approved organisations carry out, more than 2,700 checks on this equipment at the manufacturer AREVA NP, its suppliers and their subcontractors and on the Flamanville site. ASN also examined the conditions in which the installation of reactor coolant system equipment could begin, along with installation of the reactor vessel.

ASN maintains close relations with the safety regulators in the countries where the construction of EPR type reactors is in progress (Finland, China), or planned (United Kingdom, etc.). ASN is also actively participating in the MDEP multinational cooperation programme for new reactors and in particular, together with IRSN, in the working group dedicated to the detailed design of the EPR, which in 2013 more specifically carried out work on the commissioning tests. This cooperative work helps reinforce the robustness of the safety reviews conducted.

## ASN assessments in 2013

In ASN’s opinion, 2013 was a relatively satisfactory year in terms of nuclear safety and radiation protection in NPPs. However, in the light of the results of the past year, ASN considers that management of reactor outages requires priority attention on the part of EDF. As in 2012, ASN noted a significant rise in the length of reactor maintenance outages by comparison with what was initially scheduled by EDF. This situation reveals inadequate organisation of the scheduling and performance of maintenance work. It could have unfavourable impacts, as a result of the ensuing disorganisation, on the quality of the maintenance operations themselves, on the preparation for restart of the reactors following the outage and on the preparation and performance of subsequent outages. In the run-up to the extremely wide-ranging maintenance programmes for the third ten-yearly outage inspections and the “Major overhaul” planned by EDF, ASN asked EDF to present a corrective action plan, the implementation of which it will monitor in 2014.

ASN attaches particular importance to the stringency of day-to-day operations and notes that this point remains a priority for EDF. It observes with satisfaction a drop in the number of deviations linked to application of the periodic test rules, but does however observe that there are contrasting results in the field of reactor operations. The rigorous application of the operating baseline requirements needs to be further improved.

In the field of preparation for emergency situations, the inspections carried out in 2013 confirmed the correct assimilation by the sites of the new baseline requirements concerning On-site Emergency Plans (PUI) put into place by EDF in November 2012, but showed the need to strengthen the oversight of the corrective measures decided on following the exercises, more specifically for the management of mobile equipment used in an emergency situation.

Equipment maintenance and replacement programmes, the safety review process and correction of the deviations identified all help keep NPP equipment in a generally satisfactory condition. ASN nonetheless expects improvements in the process to manage equipment deviations and, with the support of IRSN, will examine the method proposed by EDF for analysis of the combined effects of deviations. ASN also notes that there is room for improvement concerning the second containment barrier but that it is improving thanks to continuation of the steam generators cleaning strategy adopted in recent years.

With regard to social, organisational and human factors, ASN considers that the organisation set up on the EDF sites to manage staff skills and qualifications is on the whole satisfactory and coherent. On the other hand, ASN feels that the way human factors are taken into account in operation and maintenance, differs from one site to another and could be further improved. ASN notes the considerable efforts made by EDF to develop the adoption of practices to enhance the reliability of the interventions (“human performance” project) but considers that this approach must remain a complement to other improvement actions concerning the organisation and management of safety or of intervention conditions. ASN observes that even on sites where these reliability practices have been adopted, “human” or “organisational” aspects still contribute to the occurrence of significant events.

In the NPPs, ASN is also responsible for the labour inspection duties, which enables it to carry out oversight integrated with nuclear safety issues. In the field of occupational safety, ASN notes that the results of 2013 remain significantly better than those observed on average in French industry, but fall short of the best results obtained internationally in the nuclear industry. With regard to the organisation of work, ASN noted progress in 2013 regarding compliance with the daily rest requirements. In 2013, however, ASN once again observed that the maximum working hours were exceeded, sometimes significantly, especially during reactor outages. ASN considers that EDF must continue with the substantial efforts made since 2011 to improve the situation.

Finally, in terms of professional relations and with regard to all the NPPs, the ASN’s labour inspectorate notes that the institutions representing the personnel on the whole function correctly, even though social dialogue is occasionally difficult locally.

Generally speaking, ASN considers that the radiation protection organisation defined and implemented in the NPPs is on the whole satisfactory. However, although the results concerning individual exposure are continuing to improve, the collective dosimetry per reactor has risen by about 18% in relation to 2012. This increase, linked to the growth in maintenance activities, is greater than anticipated, notably owing to the considerable extension in the duration of certain outages. EDF must increase the steps it takes to mitigate the expected rise in collective dosimetry.

With regard to the NPP operating environment, despite the positive picture observed in previous years and a satisfactory organisation on most of the sites, ASN still observes numerous deviations by all the NPPs and considers that there is room for performance improvements in this field. ASN considers that operation of the buildings and the radioactive, conventional or potentially pathogenic waste storage and management areas, can be improved on most sites.

The ASN assessment of each NPP is detailed in chapter 8 of the report. Some sites stand out in this general assessment:

- with regard to nuclear safety: Golfech and Penly;
- in the field of radiation protection: Civaux, Golfech and Penly;
- in the environmental field: Dampierre-en-Burly.

Other sites are under-performing with respect to at least one topic:

- with regard to nuclear safety: Bugey, Chinon and Civaux;
- in the field of radiation protection: Cattenom;
- in the environmental field: Belleville-sur-Loire, Chinon and Chooz.

## Outlook

The measures stipulated by ASN following the Fukushima accident involve work that is both complex and wide-ranging. ASN will specifically monitor it, notably the initial work linked to the creation of the “hardened safety core”.

Oversight of the construction and commissioning tests of the Flamanville 3 EPR will continue until authorisation for commissioning of the installation. ASN will continue its oversight on the construction site, in the EDF engineering departments and at its suppliers. At the same time, with the support of IRSN, ASN will continue with its advance review of certain parts of the required commissioning authorisation application file. ASN will carry out these steps jointly with its foreign counterparts also concerned by the project.

In the light of the anticipated increase in the volume of maintenance over the coming years, ASN will obtain the opinion of the Advisory Committee of experts for Reactors (GPR) concerning the optimisation of doses during future reactor outage campaigns for the NPPs operated by EDF.

ASN will also continue to monitor the optimisation of discharges from NPPs and EDF actions to maintain reservoirs and tanks with a view to preventing pollution.

In 2014, ASN will continue to examine the safety reviews for the fleet of French reactors and should more specifically adopt a position on the continued operation of the reactors at Belleville 1 and 2, Blayais 1, Bugey 5, Cattenom 2 and 3, Civaux 1, Chooz B1, Dampierre 1 and 2, Gravelines 1, Nogent 1 and 2, Penly 1, Saint-Alban 1 and 2 et Tricastin 2 and 3. In addition, in early 2015, ASN will issue a position statement on the conclusions of the studies conducted by EDF as part of the periodic safety reviews for the 1,300 MWe plant series on the occasion of their third ten-yearly outage inspections. Finally, ASN will examine the

guidelines proposed by EDF for the periodic safety review associated with the fourth ten-yearly outage inspections of the 900 MWe reactors and the associated study and work programme. ASN anticipates issuing a position statement on this programme in 2015, after consulting the Advisory Committee of experts for nuclear Reactors.



# 13

## Nuclear fuel cycle installations

The fuel cycle comprises the fabrication of the fuel and the subsequent reprocessing of the spent fuel, to reuse the recoverable elements in the nuclear reactors.

The main plants of the cycle - COMURHEX, AREVA NC Pierrelatte, EURODIF, GEORGES BESSE II, FBFC, MELOX, AREVA NC La Hague - are part of the AREVA group. These plants include facilities which have BNI status.

### Significant events of 2013

With regard to uranium conversion activities, the COMURHEX II plant (storage and distribution of hydrofluoric acid) was commissioned in 2013. ASN is satisfied with AREVA's replacement of the existing conversion units by a more modern and safer plant.

With regard to the uranium enrichment activities, more specifically the EURODIF plant which has now been shut down, AREVA in the first quarter began rinsing the circuits with chlorine trifluoride ( $\text{ClF}_3$ ), as phase which lasted about three years and is called PRISME. The licensee will submit a Final Shutdown and Decommissioning Application (MAD-DEM) for the installation before 31st March 2015, so that this can begin at the end of the rinsing operations. The PRISME operation will enable virtually all of the uranium deposits to be recovered. In parallel with the EURODIF shutdown, the GEORGES BESSE II plant, comprising two enrichment units, is gradually being brought on line.

With regard to the fuel fabrication activities, ASN considers that FBFC needs to make significant improvements in its operational rigorousness and safety management. This is why the ASN Commission summoned the FBFC management and AREVA to present a remedial plan. ASN aims to regulate the main improvement measures by means of prescriptions.

With regard to the back-end fuel cycle, the most significant point is the currently ongoing review by ASN of the conclusions of the first periodic safety review of the UP3-A plant at La Hague. This involves work of considerable scope, which will have led to five meetings of the Advisory Committee of experts for Laboratories and Plants between 2012 and 2014 and which will lead to ASN ruling on the conditions for the continued operation of this plant. This work will also determine a general periodic review methodology for the facilities of the AREVA group. ASN is particularly attentive to ensuring that the Equipment Important for Protection (EIP) and the corresponding requirements are correctly defined and incorporated into the dossiers supplied by AREVA. ASN will draw the conclusions of the review in 2014.

## ASN assessments in 2013

### and outlook

#### Cross-disciplinary aspects

ASN asks that AREVA implement high-quality management of safety and radiation protection in its facilities, taking account of the daily activities and work in the field by all the actors of the group, commensurate with AREVA's clearly stated ambitions.

In 2014, ASN will continue the work started in 2013, in particular to examine the authorisation or major modification applications for the fuel cycle facilities, and to set the framework for these operations: application for modification of the operating conditions of plant STE3 and authorisation for modification of UP3-A to expand the CSD-V storage capacity. Moreover, it will continue to assess the periodic safety review files, in particular those concerning the facilities at La Hague.

Following on from the steps taken in 2013, ASN will be particularly attentive to the integration of experience feedback by the AREVA group licensees, and to the implementation of the internal authorisation systems for the Tricastin, Romans-sur-Isère and MELOX sites, in addition to that already in place at La Hague.

ASN will continue to specifically monitor the steps involved in implementation of the additional safety measures requested following the stress tests, more specifically the AREVA proposals concerning the definition of systems, structures and components robust to extreme hazards and the management of emergency situations.

Finally, it will continue with its checks to ensure correct integration into the BNI operating baseline requirements of the new provisions of the order of 7th February 2012.

#### Fuel cycle consistency

ASN will give its opinion on the note transmitted by EDF concerning oversight of the French fuel cycle and its developments. ASN will in particular focus on monitoring the level of occupancy of the spent fuel underwater storage

facilities (AREVA and EDF). It will ask EDF to examine the impact on the anticipated saturation dates for these storage facilities of the shutdown of a reactor and a possible modification in the spent fuel reprocessing traffic, as well as the solutions envisaged for delaying these dates.

ASN will also continue to monitor the files associated with fuel cycle consistency, notably ECUREUIL and E/EV/LH 2 concerning the storage capacity for reprocessed uranium and vitrified waste packages from spent fuel reprocessing, respectively, but also the changes in the composition of the MOX fuels.

#### Tricastin site

In 2014, the platform will continue with its reorganisation, with the aim of the licensee AREVA NC taking over operation of all the facilities. ASN will examine licensee change requests linked to this project at the request of the Ministry responsible for nuclear safety and will remain vigilant to maintaining the technical and financial capacity of the future licensee as well as the provision for the long-term costs as specified in the Environment Code. Furthermore, ASN will issue a resolution ruling on the internal authorisation process the licensee wishes to implement. Finally, ASN will continue to examine the authorisation applications for the creation of the ATLAS BNI and the operation of the REC II unit in GB II.

#### Romans-sur-Isère site

On the Romans-sur-Isère site, the industrial equipment renewal programme for the AREVA FBFC nuclear fuel fabrication unit is now completed, but significant work still needs to be done to bring several buildings into conformity.

In the light of the malfunctions observed by ASN in recent years, AREVA FBFC was given a hearing by the ASN commission so that it could explain itself on the following subjects:

- operational rigorousness and safety;
- management of the criticality risk;
- the technical quality of the files, more specifically the periodic safety review report in 2013;
- its ability to meet its commitments and implement projects.

ASN will carry out reinforced monitoring of the facility in 2014 with a view to improving this licensee's nuclear safety performance, which will more specifically take the shape of an in-depth inspection. It will be attentive to compliance with the deadlines for performance of conformity work further to the latest periodic safety reviews of the units in the site's facilities and the revision of its safety baseline requirements. It will also be attentive to ensuring the implementation of the improvements planned as part of the stress tests.

#### MELOX plant

ASN will be vigilant with regard to the means selected to support changes to the MOX manufactured at MELOX, in the light of the expected nuclear safety and radiation protection requirements as assessed by the facility's periodic safety review in 2013. ASN will return its conclusions on the

plant's periodic safety review in 2014. In this context, the management of dosimetry, the incorporation of social, organisational and human factors, the monitoring of subcontracted operations and the prevention of criticality risks will remain oversight priorities.

Finally, ASN will monitor the implementation of the measures adopted further to post-Fukushima experience feedback.

### La Hague site

For the La Hague plants, ASN considers that efforts must be continued, particularly for the recovery and packaging of legacy waste on the site. Within the framework of the periodic safety reviews of the facilities, 2014 should see the continued implementation of the process to identify Equipment Important for Protection (EIP) and the improvement of the general operating rules in these plants.

As regards the recovery of legacy waste, ASN will be attentive to ensuring that U-turns in industrial strategy do not significantly delay the recovery and disposal of the waste from silos 130 or HAO. ASN already issued prescriptions in this respect in 2010 for silo 130 and will issue a resolution concerning the entire legacy waste recovery programme in 2014.

Finally, ASN will continue to monitor the internal authorisations system implemented in 2011 in the La Hague plant.



# 14

## Nuclear research and miscellaneous industrial facilities

Nuclear research and miscellaneous industrial facilities, not directly linked to the nuclear power industry, are operated by the Alternative Energies and Atomic Energy Commission (CEA), for the civil part, and by a few other research organisations or industrial firms for commercial activities such as the production of radiopharmaceuticals, industrial ionisation or maintenance. The variety of activities covered and their past history explain the wide diversity of facilities concerned.

### Significant events of 2013

Generic subjects on which ASN focused in 2013 were:

- the continued integration of experience feedback from the Fukushima Daiichi accident;
- the management of civil engineering operations on installations under construction or renovation, ASN having issued a resolution in 2013 more specifically concerning prescriptions for the design and construction of ITER;
- the progress of CEA's major commitments.

During the course of 2013, ASN called the CEA to hearings concerning:

- the actions conducted as part of the experience feedback from the Fukushima accident, and in particular the preparation of the reports on the stress tests on the CEA facilities and the definition of the "hardened safety cores" and associated requirements;
- the monitoring of dossiers with major nuclear safety and radiation protection implications concerning certain facilities (removal from storage at MASURCA, recovery of legacy waste from BNI 56, creation of the DIADEM storage facility, delays in the completion of ongoing decommissioning work, planned modification of the organisation in how certain facilities are run, etc.);
- the results of risk control for the year 2012.

For the facilities other than those operated by CEA, the stress tests follow-up should be noted for the high-flux reactor at the Institut Laue-Langevin (ILL).

As part of the examination of the stress tests, ASN issued resolution 2012-DC-0312 of 10th July 2012, setting additional prescriptions requiring ILL to define and implement a “hardened safety core”, to check the robustness of certain equipment (overhead crane), to propose modifications to reinforce other equipment (gaseous effluent system, handling hood, etc.) and to perform improvement works (ultimate reflooding system, new emergency control station).

ASN considers that the hardened safety core proposed by ILL and the associated requirements are satisfactory and prescribes their implementation in resolution 2013-DC-0381 of 21st November 2013. ASN issued the preliminary approval necessary for implementation of certain improvements proposed further to the stress tests: construction of the new emergency control station (PCS 3), work prior to installation of backup systems, etc. ILL was authorised to commission an ultimate reflooding system and adopt new heavy water management.

ASN considers that following the nuclear accident at Fukushima, ILL has taken significant steps to reinforce the safety of the reactor.

## ASN assessments in 2013 and outlook

A wide variety of research and miscellaneous industrial facilities are monitored by ASN. ASN will continue to monitor and regulate the safety and radiation protection of these installations as a whole and compare practices per type of installation in order to choose the best ones and thus encourage operating experience feedback.

It is in this spirit that ASN defined priorities for the submittal of the stress test reports concerning the nuclear facilities other than the power reactors. A prior analysis was conducted to assess the risks in the light of the experience feedback from the Fukushima accident and the “potential source term”. Given the diversity of the nuclear fleet, each facility must be studied individually.

In 2013, ASN issued a position statement on the “hardened safety core” of the RHF, for which the stress tests were examined in 2011. In 2014, it will issue a position statement on the “hardened safety core” of the other facilities of batch 1 and batch 2 and on emergency management on CEA sites. Finally, it will also monitor the submittal of the reports for the batch 3 facilities which have not as yet undergone stress tests, for which the deadline was specified as late 2013.

Moreover, ASN considers that the “major commitments” initiative implemented by CEA since 2006, must be continued and regularly expanded to include new “major commitments”. Any extension to the deadline must be duly justified and discussed beforehand with ASN. Generally speaking,

ASN will remain vigilant to ensuring compliance with the commitments made by CEA, both for its facilities in service and those being decommissioned. For facilities which have undergone partial review or reinforcement, justified by the imminence of an outage, such as OSIRIS, ÉOLE and MINERVE, ASN will be attentive to compliance with the schedules proposed by CEA. Should it prove necessary, ASN could issue prescriptions, such as for removal from storage in the ÉOLE and MINERVE facilities in the first half of 2014. Similarly, ASN will remain vigilant to ensuring that CEA performs exhaustive periodic safety reviews of its facilities so that ASN can conduct its examination in satisfactory conditions. In this respect, as the missing elements have finally been transmitted, it will be possible to conclude the examination of the periodic safety review on the ÉOLE and MINERVE facilities in 2014.

In 2014, ASN will continue to pay particular attention to two major projects currently under construction, that is the RJH and ITER. For these two major construction sites, ASN considers that the civil engineering operations are currently taking place satisfactorily. ASN will also be attentive to the restart of the CABRI facility, the start-up of the GANIL extension and the reinforcement of the floors in the STAR facility. ASN will in particular monitor the transfer of fissile material from MASURCA to MAGENTA and the work required of CIS bio international following the periodic safety review of its facility.

ASN will examine the conclusions of the periodic safety review of the GANIL, LECA, LEFCA and LECI facilities in order to decide on the acceptability of their continued operation.

Finally, in mid-2012, CEA sent ASN a safety guidelines document concerning the ASTRID prototype, a sodium-cooled fast neutron reactor. This dossier was examined by the Advisory Committee for Reactors in 2013. ASN will make its conclusions known in early 2014.



# 15

## Safe decommissioning of Basic Nuclear Installations

Decommissioning, a phase covering all the activities performed after shutdown of a nuclear facility, until it reaches a predetermined final state, at present concerns about thirty nuclear installations. This phase entails radiological and conventional risks, some of which are similar to those present during the operation of the installation.

### ASN assessments in 2013

In 2013, ASN continued its monitoring of the decommissioning operations on EDF reactors.

In March 2013, ASN in particular conducted an in-depth inspection of the gas-cooled reactors undergoing decommissioning at CHINON A and SAINT-LAURENT-DES-EAUX A. This was the first in-depth inspection on the topic of decommissioning and covered waste management, radioactive materials containment management and radiation protection activities. This inspection revealed good commitment on the part of the local staff and satisfactory radiation protection practices on the on-going decommissioning worksites. Nonetheless, some areas for progress were identified, more specifically concerning greater involvement by the local teams in the Nuclear Environmental and Decommissioning Engineering Centre (CIDEN), management of the baseline safety requirements of the facilities and support for outside contractors. These points will be closely monitored by ASN over the coming months.

With regard to CEA, the decommissioning operations are continuing on a significant number of facilities on the Fontenay-aux-Roses, Grenoble, Cadarache, Saclay and Marcoule sites. ASN served CEA with formal notice in June 2013 to complete the decommissioning operations before 30th April 2014 on the enriched Uranium Processing Facility (ATUe) in the conditions defined by the final

shutdown and decommissioning authorisation Decree of 8th February 2006. ASN specified that it could suspend this formal notice if, before 28th February 2014, CEA submitted a request for modification of the deadline and decommissioning conditions set in the Decree of 8th February 2006, along with all the required justifications.

With regard to the facilities of the AREVA Group undergoing decommissioning work, ASN notably issued a favourable opinion to the Ministry responsible for nuclear safety on 3rd September 2013, concerning the draft decrees, revised after consideration of the comments made by the licensee and the CLI, with regard to final shutdown and decommissioning of BNI 33 (UP2-400), BNI 38 (STE2 and AT1 facility) and BNI 47 (ELAN IIB). The three Decrees were published on 10th November 2013.

In order to take account of the lessons learned from the Fukushima accident, ASN asked the BNI licensees to carry out stress tests, including on the facilities being decommissioned. For certain priority facilities, in particular CEA's PHENIX reactor, ASN set additional prescriptions in June 2012 in the light of the conclusions of the stress tests. The proposals concerning the hardened safety core and associated requirements for PHENIX were examined by the ASN Advisory Committees in April 2013.

### Outlook

The main actions ASN will carry out in 2014 will firstly be the continuing development of the regulatory framework for decommissioning, and secondly the close monitoring of certain installations.

ASN will also focus on the following:

- generally speaking, ensuring that the licensees comply with the deadlines set for the decommissioning of their facilities and the final states specified in the MAD-DEM decrees. Within this context, it will be particularly vigilant concerning the decommissioning of SILOÉ;
- continuing examination of the MAD-DEM applications received in 2011 and 2012, notably that for the PHENIX power plant;
- ensuring that the decommissioning strategy proposed for EURODIF corresponds to the waste volume and harmfulness reduction objectives and the provisions of the 2013-2015 PNGMDR, which prefer the reuse of waste, provided that its characteristics are compatible with reprocessing in the existing or planned facilities;
- examining the decommissioning strategy proposed by EDF for all its installations and issuing a position statement on the deadline for decommissioning of the gas-cooled reactors;
- initiating the preparation of a draft resolution to clarify a certain number of its requirements in terms of decommissioning;
- add to the range of decommissioning and remediation guides, further to the publication of the BNI Order.



# 16

## Radioactive waste and contaminated sites and soils

The management of radioactive waste is governed by the 28th June 2006 Programme Act on the sustainable management of radioactive materials and waste, today codified in the Environment Code. This Act sets a clear framework for management of all radioactive waste, in particular by requiring the adoption of a National Plan for Radioactive Materials and Waste Management (PNGMDR) revised every three years.

The purpose of the PNGMDR is to inventory the existing radioactive materials and waste management methods, to identify the foreseeable needs in terms of storage or disposal facilities and to clarify the necessary capacity for these facilities and the storage durations. Concerning radioactive waste for which there is as yet no final management solution, the PNGMDR defines the objectives.

### Significant events of 2013

#### The PNGMDR

The third edition of the PNGMDR, covering the period 2013-2015, was sent to Parliament in late 2012. The 2013-2015 PNGMDR and its summary were published and posted on-line on the websites of ASN and the Ministry responsible for ecology.

The PNGMDR was also evaluated by the OPECST. This included two public hearings which were held on 28th February and 21st March 2013.

Decree 2013-1304 of 27th December 2013 establishing the prescriptions of the 2013-2015 PNGMDR was published in the *Official Journal* on 31st December 2013. Beforehand,

this decree was the subject of ASN opinion 2013-AV-0188 of 27th August 2013.

#### Reversible deep geological disposal (Cigéo project)

The Cigéo project, for which the client is ANDRA, was the subject of a public debate procedure from 15th May to 15th December 2013.

With regard to the technical examination by ASN of the files prior to a creation authorisation application for a possible geological disposal facility, ASN returned its opinion on 16th May covering four files submitted by ANDRA:

- the Waste Management Industrial Programme (PIGD);
- the results of the 3D seismic reconnaissance campaign carried out in 2010 in the Zone of Interest for In-depth Studies (ZIRA) ;
- the progress review, requested by the PNGMDR, on the development of an operational model for the release of radionuclides by the spent fuels from EDF reactors in disposal conditions;
- ANDRA's responses further to an independent study carried out at the request of the Bure CLIS (Local Information and Monitoring Committee) by an American institute, the Institute for Energy and Environmental Research (IEER).

In its opinion 2013-AV-0179 of 16th May 2013, ASN recalls certain general principles to be met by ANDRA in the design of the project for which it is responsible. It also in particular recalls that the concept adopted for the disposal facility must be able to keep the radiological impact at the lowest level reasonably achievable on the basis of current scientific knowledge, techniques and economic and social factors.

While underlining the quality of the work done by ANDRA, ASN also issues a number of recommendations that it must take into account for the coming works and studies. ASN specifies the principles it adopts concerning the inventory of acceptable waste, for the examination of a future creation authorisation application for a deep geological disposal facility and any modification requests during the course of operation of the disposal facility. In accordance with its duty of public information, ASN finally emphasises the importance of presenting the stakeholders with the potential changes in the inventory if pessimistic hypotheses are considered, depending on the possible choices in terms of energy policy, particularly with regard to the question of spent fuel disposal.

Finally, in December 2013, ASN published a letter which it sent to ANDRA following examination of a file giving a concise presentation of the "overall architecture adopted for the design studies".



## ASN assessments in 2013

### and outlook

Generally speaking, ASN considers that the French radioactive waste management system, built around a specific legislative and regulatory framework, a National Plan for Radioactive Materials and Waste Management (PNGMDR) and an agency for management of radioactive waste independent of the waste producers, is capable of regulating and implementing a structured and coherent national waste management policy.

In 2013, ASN continued with its actions aimed at ensuring that radioactive waste is managed safely, from the moment it is first produced up to disposal. ASN thus checks that it is correctly managed in the nuclear facilities in which it is produced or managed. It also periodically assesses the strategies put into place for this purpose by the licensees, to ensure that each type of waste has an appropriate solution and that the range of solutions implemented are as a whole coherent. ASN in particular remains attentive to ensuring that the licensees recover the legacy waste stored on their sites. ASN notes that the licensees are late in doing this or are experiencing technical difficulties, leading to postponement of the removal from storage of legacy waste on the La Hague and CEA sites. In 2014, ASN will therefore continue to attentively follow the retrieval of waste from storage, with particular emphasis on that presenting the greatest safety risk.

With regard to the long-term management of radioactive waste, ASN's assessment of the way ANDRA operates its radioactive waste disposal facilities is a positive one.

ASN considers that there must eventually be safe disposal routes for all waste. To this end, it is of the opinion that France needs disposal facilities to allow management of low level long-lived waste. ASN will therefore continue to closely monitor the process to develop disposal concepts within the context of the PNGMDR.

With regard to high and intermediate level, long-lived waste, ASN considers that key steps in the development of the disposal project must be reached in the next few years. In its opinion on the dossier submitted by ANDRA in 2009 (opinion 2011-AV-129 of 26th July 2011), ASN defined the main areas for work to be taken further, prior to submission of the creation authorisation application, which should take place in 2015. ASN in particular recommended that ANDRA pursue the analysis of certain risks linked to the operation of the installation and specify the technical provisions to be adopted to manage them, deploying demonstrators to complete its understanding of the damage resulting from the excavation of large structures and to qualify the sealing techniques for the drifts and the connections between the surface and the underground facilities.

2014 will see the conclusions of the public debate on the Cigéo project, which was held in 2013. After publication of the report and the results of the public debate by the

Presidents of the special and national public debate commissions, ANDRA will publish its decision in May concerning the principles and conditions for continuation of the project and, as necessary, the main changes that have been made to it.

For its part, ASN will in 2014 continue with the technical examination of the preparatory files submitted by ANDRA. It will also remain vigilant to ensuring that ANDRA's research programme, more specifically in the Bure laboratory, provides it with the necessary data for the possible transmission of a creation authorisation application file.

With regard to the former uranium mining sites, ASN will ensure the satisfactory performance of AREVA's measures relative to the management of mining waste rock and will continue its work, together with the Ministry responsible for the environment, on the short, medium and long term management of these former mining sites.

With regard to contaminated sites and soils, ASN actions continued in 2013, together with the administrations concerned and the other stakeholders. ASN thus issued a number of opinions in 2013 on rehabilitation projects for contaminated sites, based on the principles of its doctrine published in October 2012 and maintained its investment in the operational oversight of Operation Radium Diagnosis.

**ASN report abstracts on the state  
of nuclear safety and radiation protection  
in France in 2013**

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Iconographer: Olivier Javay

**Photo credits**

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ISSN 1967 – 5127

Legal deposit ...

Realization: ARTYG – Paris 17<sup>e</sup>

Impression : Imprimerie Fabrègue – 87500 Saint-Yrieix-la-Perche





Improving nuclear safety  
and radiation protection