Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management

First national report
on the implementation by France
of the obligations of the Convention

English version - Original report in French

March 2003

Table of contents

Section A – INTRODUCTION

A.1 Subject of the report

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, hereinafter referred to as the "Joint Convention", is the result of international discussions which took place following adoption of the Convention on Nuclear Safety in 1994. France signed the Joint Convention on 29 September 1997, the first day on which it was opened for signature, during the General Conference of the International Atomic Energy Agency (IAEA). France approved it on 22 February 2000 and deposited the corresponding instruments with the IAEA on 27 April 2000. The Joint Convention entered into force on 18 June 2001.

For many years, France has been taking an active part in international action to reinforce nuclear safety and it considers the Joint Convention to be a key step in this direction. The fields it covers have for a long time been part of the French approach to nuclear safety.

This report, which is the first of its kind, is published in accordance with article 32 of the Joint Convention and presents the measures taken by France to meet each of the obligations set out in the Convention.

A.2 Facilities concerned

The facilities and radioactive material covered by this Convention differ widely in nature and in France are subject to different regulatory authorities, as it is explained in section E of this report.

Above a certain radioactive content threshold, a facility is called a "basic nuclear installation" (BNI) and is placed under the control of the Nuclear Safety Authority. This category includes in particular all facilities receiving spent fuel (reactors, reprocessing plants, storage facilities, etc.), most of the facilities whose "primary purpose is radioactive waste management " as defined by this Convention, and a large number of facilities containing radioactive waste, even if management of the waste is not their primary purpose: if all the BNI are taken together, they number about 125.

Below this threshold, a facility containing radioactive material can be an "installation classified on environmental protection grounds" (ICPE) and is placed under the supervision of the ministry for the environment. In France there are about 600,000 industrial facilities in the ICPE category, including nearly 65,000 subject to issue of an authorisation. Limiting oneself to ICPEs, which are classified owing to the radioactive substances they contain or use, they number about 800.

Facilities only containing small quantities of radioactive material are not subject to regulatory supervision in this respect. The radioactive sources they use can nonetheless be supervised, as mentioned in this report, and remain under the general regulation for radiation protection.

A.3 Report authors

This report was produced by the Nuclear Safety Authority (ASN), which was responsible for its coordination, with contributions on the one hand from the Directorate for the Prevention of Pollution and Risks, the Directorate for Regional Action and Small and Medium-sized Enterprises, the Directorate General for Energy and Raw Materials and the Institute for Radiation Protection and Nuclear Safety and, on the other, from the main operators of nuclear facilities, Electricité de France (EDF), the Compagnie générale des matières nucléaires (COGEMA), the French Atomic Energy Commission (CEA) and the National Agency for Radioactive Waste Management (ANDRA). The final version was completed on 31 March 2003 after consultation with the French parties concerned.

A.4 Structure of the report

For this first report, France took account of the experience acquired with its first two reports for the Convention on Nuclear Safety: this report is a stand-alone document based on existing documents and reflecting the viewpoints of the various stakeholders (regulatory authorities and operators). Thus, for each of the chapters in which the regulatory authority is not the only party to express its point of view, we adopted a three-stage structure: first of all a description by the regulatory body of the regulations, followed by a presentation by the operators of the steps taken to meet the regulations and finally, an analysis by the regulator of the steps taken by the operators.

This report is structured according to the “guidelines regarding the format and the structure of national reports” for this Convention, in other words with an "article by article" presentation. Each article is the subject of a separate chapter at the beginning of which the corresponding text of the Convention article is recalled in a shaded box. The various sections following this introduction (section A), according to the order recommended in the above guidelines, deal with the following topics in turn:

- section B: policy and practices in the field of the Convention (article 32-1);
- section C: the scope of application (article 3);
- section D: the spent fuel and radioactive waste inventories, along with the list of facilities concerned (article 32-2);
- section E: the legislative and regulatory framework in force (articles 18 to 20);
- section F: the other general safety provisions (articles 21 to 26);
- section G: the safety of spent fuel management (articles 4 to 10);
- section H: the safety of radioactive waste management (articles 11 to 17);
- section I: transboundary movement (article 27);
- section J: disused sealed sources (article 28);
- section K: the planned activities to improve safety.

Finally, it is supplemented by a number of annexes (section L).

It should be noted that the regulatory provisions common to the safety of spent fuel management facilities and to the safety of radioactive waste management facilities have been presented in section E in order to avoid partial duplication within section G and section H, as recommended in the guidelines regarding the structure of national reports.

A.5 Publication of the report

The Joint Convention comprises no obligation regarding public communication of the report stipulated in article 32. Nonetheless, given its duty to inform the public and its permanent desire to improve the transparency of its activities, the Nuclear Safety Authority has decided to make it accessible to anyone who so wishes. The report is thus available, in French and in English languages, on the Nuclear Safety Authority's website (*www.asn.gouv.fr*).

Section B – POLICIES AND PRACTICES (Article 32 - §1)

1. In accordance with the provisions of Article 30, each Contracting Party shall submit a national report to each review meeting of Contracting Parties. This report shall address the measures taken to implement each of the obligations of the Convention. For each Contracting Party the report shall also address its:

(i) spent fuel management policy;

(ii) spent fuel management practices;

(iii) radioactive waste management policy;

(iv) radioactive waste management practices;

(v) criteria used to define and categorize radioactive waste.

B.1 Spent fuel management policy

The ministry for industry supervises energy policy in France. Production of energy from nuclear power in France reached 416 TWh in 2002. This nuclear electricity production today means that about 1,150 tonnes of spent fuel are unloaded each year.

Like a number of other countries, France has opted for the reprocessing-recycling option for its spent fuel. To do this, it has set up a consistent, high-technology industrial tool for each stage in the nuclear fuel cycle, following the strategic decisions taken in the 1970s. This arrangement comprises a fuel reprocessing plant with a total annual capacity of 1,700 tonnes (this figure varies according to the burn-up fraction of the fuels involved). In addition, the French nuclear power plant fleet comprises a total of 58 standardised reactors, including 20 operating with MOX fuel produced by recycling, and another eight whose design enables this fuel to be used after minor operational modifications. This choice was made primarily for energy and environmental reasons.

To avoid accumulating quantities of separated plutonium for which there would be no use, the fuel is reprocessed as and when uses for the extracted plutonium appear ("equal flow" principle). This leads today to reprocess annually about 850 tonnes of fuel, out of the 1,150 tonnes unloaded from the reactors in France, and enables the plutonium being recycled in the form of about 100 tonnes of MOX fuel. This means that the gradually reprocessed fuel has to be stored in cooling pools. Other options are also being looked at, such as long-term storage of fuel, which is not reprocessed immediately. The eventual development (or not) of fast neutron or other types of reactors able to incinerate waste will be a determining factor in the storage time for these fuels, the rate at which they are disposed of and their final destination.

This option demands that the public authorities maintain a constant watch on its radiological impact on the population and the environment, through epidemiological and impact assessments, which so far have revealed no harmful consequences.

B.2 Spent fuel management practices

B.2.1 EDF management of spent fuel from its nuclear power reactors

EDF assumes its responsibility for the future and the reprocessing of its spent fuel and the associated waste, in accordance with the guidelines defined with the public authorities and in accordance with the safety requirements concerning basic nuclear installations and radioactive material transportation.

EDF's current fuel cycle strategy is to reprocess spent fuel while at the same time increasing the energy efficiency of fuels for the coming decade.

After a cooling period in the fuel building pools in the nuclear units, spent fuel assemblies are shipped to the COGEMA plant at La Hague.

After a few years, the spent fuel there are reprocessed by dissolution to separate the high level waste (fission products and minor actinides: 4%), which are vitrified, from the materials which can be reused (95% uranium and 1% plutonium). These materials are recovered and reused in MOX fuels (plutonium) or, for a small part (uranium), into the reprocessed uranium fuels after re-enrichment.

With today's facilities and using proven techniques, this industrial reprocessing–recycling process:

- allows specific conditioning of the high level waste by vitrification, using existing, recognised and approved techniques, guaranteeing safe, long-term and compact containment;
- ensures long-term control of the quantities of spent fuel pending reprocessing, using existing facilities and current pool storage capacity, if necessary after adaptation, through reprocessing which decreases the quantities of spent fuel in pool storage and through improved fuel energy efficiency and burn up;
- keeps open the option in the coming decades and depending on the energy context, of eventually using the potential energy resource contained in the spent fuel assemblies (UO_2 and MOX);
- enables the flexibility and reversibility of the choices made concerning the future of high level waste to be maintained, according to policy guidelines to be defined in the year 2006 under article L.542 of the Environment Code (see § B.4.1).

A review of the entire fuel cycle from the point of view of the safety of facilities and associated transportation, radiation protection and control of the waste produced, was conducted by the operators and presented to the Nuclear Safety Authority.

EDF, together with the industrial partners in the fuel cycle, was thus required in 2001 to produce a file concerning the consistency between changes in fresh or spent fuel properties and changes to the facilities in the cycle and the impact on them of the envisaged changes, taking into account:

- the quantities of stored radioactive material produced by past fuel management policies and practices;
- current management, which could require a review of the safety reference system for the fuel cycle facilities, or even adaptation of these facilities;
- the fuel assemblies in which the structural or rod cladding materials are different from those taken into account in the fuel cycle facilities safety studies;
- the scenarios concerning the new fuel management practices and the new products which are to be implemented in the coming ten years;
- the unloaded spent fuel management scenarios;
- the consequences of these management practices and management scenarios between 2000 and 2010 on the one hand, and then beyond 2010 on the other, for the by-products and waste resulting from fuel manufacture and reprocessing (processing possibilities and corresponding technologies, interim storage or disposal possibilities).

This file was examined in late 2001 and early 2002 by the Advisory Committee for laboratories and plants and the Advisory Committee for radioactive waste and by several members of the Advisory Committee for nuclear reactors. The members ot the committees considered the file to be satisfactory, subject to a number of additional questions, in particular that R&D be continued on several subjects and that the new decrees concerning the La Hague reprocessing plants be issued (These were published on the 13 January 2003).

Actions taken regarding the future of the spent fuel are consistent with the requirement that the charge of managing and packaging the high level waste produced today not be passed down to future generations, but that the necessary steps be taken now, while continuing to study the solutions representing the best choices for society.

Current facilities are thus able to accommodate long-term spent fuel management, in proven conditions today recognised as being safe, provided that there is appropriate monitoring and supervision.

Furthermore, studies are also under way into the interim storage and disposal of spent fuels, in particular in accordance with article L.542 of the Environment Code, in order to keep open as many options as possible:

- industrial spent fuel dry interim storage designs exist internationally, for time frames of several decades, and are now applicable;
- long-term spent fuel interim storage designs are also being examined under article L.542 of the Environment Code;
- deep geological disposal studies cover vitrified waste as well as packaged spent fuel.

Current spent fuel packaging studies also cover the transitional phases between the various options: industrial interim storage, reprocessing, long-term interim storage and final disposal.

Spent fuel management and processing as today conducted are consistent with the fact that spent fuel remains a potential energy source rather than just waste, by keeping open the option of recycling the appropriate materials and possibly reusing the spent fuel as an energy resource in future fuels and future reactors and which could be called on, at least in part, in an energy context different from that prevailing today.

B.2.2 CEA management of spent fuel from research reactors

The CEA's reference strategy is to send fuels without further use to the "downstream" plants in the fuel cycle for reprocessing, as soon as possible. In practice, they were shipped to the COGEMA UP 1 reprocessing plant in Marcoule, primarily used for military and defence programmes, until it was finally closed down in 1997. Closure of this facility led the CEA to develop its own long-term storage capacity and to size it for the previously defined volume, ensuring robust compliance with current and foreseeable safety rules.

The CEA's current interim storage facilities consist of the PEGASE pit and the CASCAD dry storage building in Cadarache (dry storage vault for irradiated fuel elements, with the pits cooled by natural convection). PEGASE is an old facility, which should cease operations around the year 2015. CASCAD is more recent, but will be saturated by about 2010. Temporary storage facilities are still available in Saclay, Cadarache and Marcoule, but the fuels they contain should be rapidly evacuated. This situation led the CEA to envisage the construction of a new dry storage facility in Marcoule, called ECUME. The project has reached the end of the feasibility study stage and it could be commissioned by the end of 2008. It will in particular be used for interim storage of spent fuels produced by the PHENIX experimental fast neutron reactor.

B.2.3 Spent fuel management by COGEMA

COGEMA offers the French operators access to all the resources needed to implement their spent fuel management policy.

This range of services is in the same way made available to utilities or countries outside France who have adopted a similar policy. The spent fuels are shipped to the La Hague site where they are cooled for the appropriate period. The recyclable products and the waste are conditioned for return to their owners, in accordance with article L.542 of the Environment Code as regards waste.

The recyclable materials are separated from the various wastes, and both are then conditioned in the La Hague plants, while plutonium is recycled in MOX fuel in the MELOX plant in Marcoule or the ATPu shop in Cadarache, in the latter case until July 2003.

B.3 Criteria used to define and categorise radioactive waste

Radioactive wastes vary considerably in their radioactivity, their lifetime, their volume and their nature. Each type of waste requires an appropriate processing and disposal solution in order to control the potential hazards, in particular radiological. The radioactive waste categorisation is then related to the disposal channels.

Two main parameters are used to assess the radiological hazard: on the one hand the activity level, and on the other the lifetime, or radioactive decay half-life, of the radionuclides present in the waste. We therefore on the one hand make a distinction between very low level, low level, intermediate level or high level waste, and on the other between short-lived waste, primarily containing short half-life radionuclides (radioactivity halved in less than 30 years) and long-lived waste, which contains large quantities of long half-life radionuclides (radioactivity halved in more than 30 years). Finally waste, the half-life of which is less than 100 days and which can be managed by radioactive decay and return to the conventional waste channels, are designated as very short-lived waste.

The following table shows the progress made in implementing the various waste management channels, in particular the channel chosen for final disposal. It reveals that no final disposal solution has yet been decided for certain types of waste.

Existing or future disposal channels for the main solid radioactive wastes

<table>
<tr><th>half-life
activity</th><th>very short lived
(half-life < 100 days)</th><th>short-lived (SL)
(half-life < 30 years)</th><th>long-lived (LL)</th></tr>
<tr><td>very low level (VLLW)</td><td rowspan="4">management by radioactive decay</td><td colspan="2">dedicated surface repository
recycling channels</td></tr>
<tr><td>low level (LLW)</td><td rowspan="2">surface disposal (Aube repository)</td><td>dedicated subsurface disposals being devised</td></tr>
<tr><td>intermediate level (ILW)</td><td>channels being devised under article L.542 of the Environment Code (law of 30 December 1991)</td></tr>
<tr><td>high level (HLW)</td><td colspan="2">channels being devised under article L.542 of the Environment Code (law of 30 December 1991)</td></tr>
</table>

The so defined categories are usually abbreviated as follows:

- HLW High level (HA in French)
- ILW-LL Intermediate level – long-lived (MA-VL " ")
- LLW-LL Low level – long-lived (FA-VL " ")
- LILW-SL Low/Intermediate Level – Short-lived (FA/MA-VC " ")
- VLLW Very low level waste (TFA " ")

B.3.1 Very low level waste (VLLW)

Waste from areas in which it is likely to have been contaminated by radioactive substances or activated by radiation is as a precaution dealt with at least as "very low level waste" (see § B.4.2) in the channels authorised in this respect.

Apart from mining residues, which can be very low level waste or sometimes low level waste, the very low level waste today comes primarily from the dismantling of nuclear facilities or from the cleanup of conventional industrial sites polluted by radioactive substances. The quantity produced will rise significantly with the complete, large-scale dismantling of the nuclear power reactors currently in operation. The radioactivity of this waste is a few becquerels per gram. A surface repository for this waste will be opening in 2003.

The treatment residues generated by working of uranium mines, which in France lasted for the whole of the second half of the 20th century, contain natural radionuclides (uranium, radium, thorium) which are very long half-life alpha emitters. Owing to their considerable volume (about 50 million tonnes) their total activity requires that special steps be taken.

B.3.2 Low level long-lived waste

Low level long-lived waste comprises on the one hand waste containing a significant quantity of radium (long-lived natural radionuclide) and producing radon and on the other, graphite waste chiefly resulting from dismantling of the "gas-graphite" nuclear reactors. The National Radioactive Waste Management Agency (ANDRA) is currently examining specific designs for subsurface disposal (at depths of more than 15 metres) for each of these two types of wastes.

B.3.3 Low and intermediate level short-lived waste

The activity of low or intermediate level short-lived waste, called "A waste" by the nuclear operators, is primarily the result of the presence of radionuclides emitting beta or gamma radiation, with a half-life of less than 30 years. In these wastes, the long-lived radionuclides (such as the alpha particle emitters) content is strictly limited. The waste in this category comes from nuclear reactors, fuel cycle plants, research centres, university laboratories and hospitals. It mainly comprises filters or ion exchanger resins used to purify water circuits, used equipment and materials, cleaning cloths and protective clothing. This category also includes certain products resulting from treatment of liquid and gaseous effluent at nuclear facilities.

The technical solution generally adopted for this type of waste is removal to a surface storage repository, either directly or after incineration or melting, where the waste packages are stored in concrete structures. Such a design ensures containment of the radionuclides for a period enabling full advantage to be taken of the radioactive decay phenomenon, as well as institutional surveillance of the site for 300 years. This disposal channel has been operational since 1969, when France abandoned sea dumping of low level radioactive waste. Until then, 14,300 tonnes of radioactive waste originating in France had been disposed of at sea. In France there are now two disposal centres for this type of waste: the Manche repository, today full and which in January 2003 entered its institutional surveillance phase, and the Aube repository, commissioned in 1992.

Some short-lived low or intermediate level waste has properties such that it cannot currently be accepted by the Aube repository. This is for example the case of waste containing significant quantities of tritium, which is a hard to contain radionuclide, or sealed sources. A working group, co-ordinated jointly by the competent regulatory authorities and comprising The ANDRA and the main waste producers (CEA, COGEMA and EDF), has been tasked with examining the most appropriate management channels for this type of waste.

B.3.4 High level waste and long-lived intermediate level waste

This waste contains long half-life emitters, in particular alpha emitters. We make a distinction between intermediate level waste on the one hand and high level waste on the other. The first are mainly process waste (spent fuel hulls and end-pieces, effluent treatment sludge, etc.) and maintenance waste produced by reprocessing facilities and research centres. In this waste, the alpha emitters can reach significant quantities. The second are minor actinides, fission and activation products produced by spent fuel reprocessing. They are characterised by intense heat release (up to 4 kilowatts per 150 litre container). High level waste can also include spent fuel from CEA research reactors or EDF spent fuel that would not be sent to reprocessing. Investigations into ways of disposing of this waste, currently stored on the production sites, are under way along the three lines defined in article L.542 of the Environment Code (law of 30 December 1991) presented below.

B.4 Radioactive waste management policy

B.4.1 General framework

In the same way as any industrial activity, nuclear activities generate waste. Radioactive waste management therefore falls within the general framework defined by law n° 75-633 of 15 July 1975 (article L.541 of the Environment Code) and its implementation decrees, concerning the disposal of waste and retrieval of materials. The basic principles of this law are the prevention of waste production, the responsibility of the waste producers up until disposal, the traceability of these wastes and the need for public information. In addition only ultimate waste, for which reuse or recycling cannot be envisaged in current technical and economic conditions, can be disposed of.

Waste management begins with the design of the facilities and continues through operation, with the aim of limiting the volume of waste produced, its toxicity and the quantity of residual hazardous materials. It ends with disposal of the waste (recycling or final disposal), after identification, sorting, processing, packaging, transport and interim storage. All the operations associated with management of a waste category from production to disposal forms a channel. Each channel must be appropriate to the nature of the waste being dealt with.

With regard to waste traceability, whether or not radioactive, a draft decree concerning control of the waste treatment channels is currently being prepared by the ministry for the environment. This text aims to ensure improved control and monitoring of waste throughout the processing and disposal phases, by requiring that traceability systems be set up (registers, periodic declarations to the administration and waste follow-up forms).

The operations in a given channel are closely linked, and all the channels are inter-dependent. All the radioactive waste operations and channels thus constitute a system which has to be optimised as part of a global approach to the management of these wastes, which takes account of safety, traceability and volume reduction issues.

Finally, article L.542 of the Environment Code (resulting from the law of 30 December 1991) set the broad guidelines for research into management of high level and long-lived radioactive wastes:

- high level and long-lived radioactive waste must be managed in a manner compatible with the protection of nature, the environment and health, while at the same time considering the rights of future generations;
- work will be conducted into:
  - the search for solutions for separating and transmuting the long-lived radioactive elements present in these wastes (line 1);
  - study of the possibility of reversible or irreversible storage in deep geological formations, in particular by building underground laboratories (line 2);
  - study of packaging processes and long-term surface storage for these wastes (line 3).

B.4.2 Conventional waste, radioactive waste, very low level waste

The waste produced in facilities conducting nuclear activities are of two types, depending on whether or not they are radioactive.

Non-radioactive, or "conventional" waste mainly comes from areas on sites in which no radioactive materials are handled, or which are considered to be non-contaminating (administrative buildings, technical areas, etc.). It can also for example comprise packagings removed before equipment or products enter one of the nuclear parts of the sites. With regard to BNI, these conventional wastes are sorted, packaged and then disposed of in the same way and in the same facilities as the waste produced by the classified installations on environmental grounds (ICPE). The facilities which receive conventional waste from a BNI are placed in a particular category of the ICPE nomenclature, so that monitoring and traceability can be guaranteed.

Nuclear waste, on the other hand, comes from areas in facilities likely to be contaminated or activated. This definition clearly implies a degree of precaution. Management of these wastes incorporates a number of operations designed in the short and long term to protect persons, preserve the environment and minimise the constraints imposed on future generations. This management must be safe, strict and clear.

It should be recalled that in France, there is no universal clearance threshold below which a nuclear waste can be considered as no longer constituting a radioactive hazard. The clearance authorisations can be granted on a case by case basis subject to sufficient knowledge of the situation and the origin of the waste, and according to a specially authorised disposal channel ensuring sufficient traceability.

In this context, a dose of 10 microsieverts per year is considered to be negligible from the radiation protection viewpoint and thus, that this type of channel could be set up for waste whose disposal would not lead to doses in excess of 10 microsieverts per year for the most heavily exposed persons, without it being necessary to implement specific provisions for protection against ionising radiation. However, channels leading to higher doses could also be authorised if the principles of justification and optimisation are followed. Furthermore, the disposal channel authorisation process must ensure that the public is sufficiently informed.

Waste containing only natural radioactivity and originating from facilities other than those classified according to the radioactive substances they contain, are managed with no particular radiation protection measures, unless a radiological impact assessment demonstrates that the doses received by the most heavily exposed workers exceed one millisievert per year. An optimisation process is implemented as and when necessary.

B.4.3 Sealed sources unlikely to activate the materials

The use of sealed sources unlikely to activate the materials produces no radioactive waste other than the source itself. There are regulatory mechanisms which in particular comprise a system of financial guarantees to ensure that, at the end of its service life, the source will be retrieved by its producer who shall process it in the appropriate manner. All the other wastes from the corresponding facility will be managed as conventional waste.

B.4.4 Other sources, ICPE and mining residue

The nomenclature of installations classified on environmental protection grounds (ICPE) defines several classification categories according to the packaging of the radioactive substances used and the uses to which they are put. For each of these categories, the classification thresholds are set in order to regulate those installations concerned, which have the most significant impact.

The radioactivity involved in ICPE is far lower than in BNI. However, there is a possibility of contamination of materials and wastes. The general provisions concerning hazardous industrial waste apply, as radioactivity is simply one of the characteristics which can constitute a hazard: waste from ICPE can only be disposed of in duly authorised facilities, on the basis of an impact assessment taking account of all hazard factors of the waste handled. Current regulations prohibit the presence of radioactive waste in conventional industrial hazardous waste disposal facilities, and radioactive waste can only be disposed of in dedicated repositories.

However, given that no substance is completely free of radionuclides, natural or otherwise, the provisions of paragraph B.4.2 are implemented in practice to determine the radioactive or conventional nature of the waste, in other words, a specific impact assessment is conducted as and when needed.

For medical waste, a circular explains the need to sort waste likely to have been contaminated by radioactive substances from other waste. For ICPE, there are standard general requirements that the departmental authority can modify according to the hazard level of the radionuclides used in the installation.

Finally, French regulations applicable to the limitation and assessment of the dosimetric impact of mining residue repositories comprises a complex set of general legislative texts relative to environmental protection and legislation specific to the mining industries. These regulations are based on decree 77-1133 of 21 September 1977 concerning ICPE, on decree 80-331 of 7 May 1980, as modified, creating the general regulations for the mining industries (Mining Code) and on decree 90-222 of 9 March 1990 supplementing the previous decree with regard to protection of the environment against ionising radiation.

B.4.5 Basic Nuclear Installations (BNIs)

The management of radioactive waste from basic nuclear installations (BNI) relies on a strict regulatory framework specified by an interministerial order of 31 December 1999 setting the general technical regulations for preventing and limiting pollution and external hazards resulting from operation of basic nuclear installations. It provides for:

- the production of "waste survey files" for each nuclear site, using an approach already employed for some ICPE; the waste survey file, which should lead to an inventory of waste management provisions on a site, in particular comprises the definition of "waste zoning[1]", distinguishing between the zones of the installation in which waste is likely to have been contaminated by radioactive substances or activated by radiation and zones in which the waste cannot contain any added radioactivity. The survey must be approved by the ASN;
- for each type of nuclear waste (see definitions in § B.4.2), definition of the appropriate and duly authorised channels, based on impact assessments and the subject of public information or consultation;
- setting up waste monitoring systems to ensure traceability.

The waste survey system should help to improve overall management of the waste, in particular in terms of transparency, and to develop optimised management channels.

In addition, with regard to long-lived high level wastes, article L.542 of the Environment Code mentioned above stipulates that Parliament will have to rule on the choice of solutions adopted for their disposal in 2006.

B.4.6 Responsibilities of the parties

The producer of the waste is responsible for it up to disposal in a duly authorised facility. However, various parties are also involved in the waste management process: shipping companies, processing contractors, operators of the interim storage or final disposal centres, research and development

[1] "**Waste zoning**" divides the facilities into zones which generate nuclear (or radioactive) waste and zones which generate conventional waste. It takes account of the design and operating history of the facilities and is confirmed by radiological checks.

It should be noted that pending setting up of "waste zoning", all waste generated in a controlled zone is to be considered radioactive, barring rare waivers.

organisations working on waste management optimisation. Each of them is responsible for the safety of its own activities.

The producers of the waste must pursue an objective of minimising the volume and activity of their wastes, upstream during the design and operation of the facilities and downstream during management of the waste. The quality of the packaging must also be guaranteed.

The waste processing (compacting, incineration, melting) contractors can be working on behalf of the producers, who retain ownership of their waste. These contractors are responsible for the safety of their installations.

The research organisations take part in technical optimisation of radioactive waste management, both during production and during development of processing, packaging and packaged waste characterisation processes. Good coordination of these research programmes is needed to improve the overall safety of this waste management.

Managers of the interim storage and final disposal waste centres are responsible for the medium and long term safety of their facilities. Among these managers, the ANDRA, a public body responsible for radioactive waste management, has a national duty of long-term management of the repositories and coordination of waste disposal research. The ANDRA is today responsible for all radioactive waste disposal facilities in France.

B.4.7 Nuclear Safety Authority policy

For its part, the Nuclear Safety Authority (ASN), responsible for supervising the safety of the BNIs only, but in charge of radiation protection of all nuclear facilities and activities, drafts regulations - consistent with the general regulations applicable to waste – concerning the management of radioactive waste and directly controls the general organisation put in place by the ANDRA for the design and operation of the disposal centres as well as for acceptance by these centres of waste from the producers. It assesses the waste management policy and practices implemented throughout the nuclear activities.

The ASN has three primary concerns:

- the safety of each step in radioactive waste management (production, processing, packaging, interim storage, transportation and disposal of the waste);
- the safety of the overall radioactive waste management strategy, ensuring that it forms a consistent set;
- the development of management channels appropriate to each category of waste, given that any delay in the search for waste disposal solutions leads to a rise in the volume and size of the amounts stored on-site.

B.5 Radioactive waste management practices

B.5.1 Radioactive waste from the BNIs

B.5.1.1 Management by EDF of the waste from its nuclear power reactors

The waste resulting from operation of pressurised water reactors is primarily short-lived low and intermediate level waste. It contains beta and gamma emitters and few or no alpha emitters. It can be sorted in two categories:

- process waste resulting from purification of circuits and treatment of liquid or gaseous effluents, designed to reduce activity prior to discharge. This comprises ion exchanger resins, water filters, evaporator concentrates, liquid sludge, pre-filters, absolute filters and iodine traps;

- technological waste arising from maintenance operations. It can be solid (cloths, paper, cardboard, vinyl sheets or bags, pieces of wood or metal, rubble, gloves, protective clothing, etc.) or liquid (oil, decontamination effluents).

It should be noted that although, amongst process waste, ion exchanger resins and water filters only account for about 5% of the total volume of waste produced, they account for more than 90% of the activity removed The following table gives the annual breakdown of operating waste.

Annual production of operating waste from EDF nuclear power reactors

RESULTS 2001 (56 PWR included)	Channel	Gross volume before conditioning (m^3)	Volume of packages stored in CA(1) (m^3)	Activity (TBq)
- Process waste	CA / CTO(2)	1,430	3,000	214
- Technological waste	CA / CTO	8,600	2,400	19
TOTAL		10,030	5,400	233

(1) CA: Aube repository managed by the ANDRA.

(2) CTO (CENTRACO): Processing and Packaging Plant operated by SOCODEI (subsidiary of EDF & COGEMA).

The technological waste, which represents the main stream (85% of the total volume of gross waste) is:

- either shipped directly, after compacting on-site in 200 litre metal drums, to the Aube repository's press for re-compaction and then final storage after concreting in 450 litres drums. The most radioactive technological waste is for its part packaged on the site in concrete shells and disposed of directly in the same repository;
- or, when incinerable and low-level, shipped in metal or plastic drums to the CENTRACO incineration unit, while metal scrap is sent to the melting unit in the same plant. Waste resulting from incineration (ash and clinker) and melting (ingots) is also sent for final disposal in the Aube repository.

The plant for the treatment and packaging of low level waste, CENTRACO, located in the commune of Codolet near the Marcoule site in the Gard department, and operated by SOCODEI (a subsidiary of EDF and COGEMA), specialises in the treatment of low and very low level waste, either by melting of metal waste or incineration of incinerable or liquid waste (oil, thinner, evaporation concentrates, etc). With this installation, part of the low or very low level metal waste can be recycled in the form of biological shielding for packaging other more radioactive wastes within concrete shells.

The process waste is packaged in reinforced concrete shells with a metal liner. The filters, evaporator concentrates and liquid sludge are encapsulated in a hydraulic binder in facilities which can be either fixed (in the nuclear auxiliaries building or the plant effluent treatment building) or mobile, depending on the type of reactor.

For final packaging of ion exchanger resins, EDF uses two encapsulation processes, the older PRECED process and the more recent MERCURE. Each of these processes involves a mobile machine. These units operate on a programmed series basis and move from site to site (a second mobile MERCURE machine has replaced PRECED since 2002). The packages produced by both machines are intended for surface disposal. The biological shielding of the packages produced by MERCURE is provided by a concrete container reinforced with a leaktight steel liner, whereas those produced by PRECED are provided with lead biological shielding. Using MERCURE thus helps reduce the quantity of toxic chemicals (lead) sent to the Aube repository. The steel biological shielding inserted into the containers are now made of slightly contaminated steel recycled in the CENTRACO facility.

Maintenance of the nuclear power plants may make it necessary to replace certain large components such as reactor vessel heads, steam generators, fuel storage racks, and so on. These special wastes are stored either on the site, or in the SOCATRI at Tricastin, and then disposed of in the Aube repository.

B.5.1.2 CEA management of waste from nuclear research facilities

CEA's radioactive waste management strategy can be summarised as follows:

- to bring down the stocks of old waste as soon as possible, by taking action to retrieve and characterise, along with the appropriate treatment and packaging channels;
- to minimise the volumes of waste actually produced;
- to no longer produce waste without a specific management channel;
- to sort waste at the primary production site according to the management channels defined, in particular to avoid over-classification of waste or subsequent recovery operations;
- to dispose the waste to the existing channels (ANDRA repositories or, failing which, the CEA's long-term interim storage facilities), ensuring that the disposal stream is equivalent to the production stream: this is to prevent experimental facilities or waste processing and packaging plants from becoming congested, as they are not designed for storage of large quantities of waste over long periods;
- to perform these actions in optimum conditions of safety and radiation protection, but also in the best technical and economic conditions.

B.5.1.2.1 Waste from treatment of radioactive liquid effluent

The radioactive aqueous effluents from the Fontenay-aux-Roses and Grenoble centres are sent to Cadarache or Saclay for treatment. The radioactive liquid effluent treatment plants at Cadarache and Saclay are primarily designed to decontaminate the aqueous effluents, to package the residues and control their release into the environment within the framework of the discharge permits of each site.

In Cadarache, the beta-gamma emitting effluents are treated by evaporation. The concentrates are encapsulated in cement for disposal in the Aube repository. The alpha emitting effluents are treated by precipitation-filtration with the resulting sludge encapsulated in cement and then temporarily stored in Cadarache pending final disposal. The CEA also is committed itself to replace the existing facility with a new effluent treatment plant on the Cadarache site, called AGATE, with commissioning scheduled for 2005.

In Saclay, the effluents are treated by evaporation and the concentrates are encapsulated in bitumen for disposal in the Aube repository. This old facility should be shut down in 2003 and will be replaced by a new facility called STELLA, which will package the concentrates in concrete.

Organic liquid effluent is incinerated in Grenoble.

B.5.1.2.2 Radioactive solid waste

Low and intermediate level solid waste is either incinerated or compacted in the facilities at Cadarache, Saclay or Grenoble. The compacted waste is then encapsulated or blocked in cement. Depending on the activity of the package, it is shipped to the Aube repository or stored in the temporary storage centre in Cadarache. Incineration ash is stored in drums in the same facility, pending shipment to the Aube repository after approval of the means of packaging.

The CEA's very low level waste has been taken by Cadarache since 1998 in a dedicated storage area.

The only final disposal site currently available is the Aube repository, able to take short-lived low and intermediate level waste. For the other types of radioactive wastes, the CEA therefore requires a storage facility whose capacity and design, particularly with regard to safety, are compatible with its production forecasts and the lead-time to construction of the repositories that the ANDRA is to be building.

This was anticipated by the CEA for LLW/ILW-LL (low and intermediate level – long-lived waste) as plans were made in 1994 to replace the existing dedicated storage facility in Cadarache (BNI 56), which was of an old design and reaching saturation point, by the CEDRA project (see § H.3.1.2) pending a corresponding final disposal facility.

The time needed to commission the repository for VLLW waste in Morvilliers (see § B.5.3.3) meant that the CEA had to use interim solutions in Saclay, Cadarache and Marcoule.

Similarly, pending appropriate final disposal facilities, CEA LLW/ILW-LL waste and HLW-LL waste is currently being stored in the COGEMA facilities in Marcoule and La Hague.

The other categories of wastes produced by the CEA (specific waste), although they pose no major operational problems, are also the subject of studies and actions with a view to their disposal. This primarily concerns:

- sodium waste from R&D work conducted on fast neutron reactors and the operation of experimental reactors or prototypes using this technology. A specific treatment facility is under study in Marcoule, with operational service entry scheduled for 2007. After treatment and stabilisation, these wastes will be acceptable for disposal in the Aube repository;
- graphite waste from R&D on the natural-uranium-gas-graphite and heavy water reactors, as well as from operation of these types of reactors. Most of this waste, comprising graphite stacks taken from the reactors, is temporarily stored in the decommissioned reactors. The ANDRA is examining solutions for final disposal;
- waste containing radium stored in Saclay and Cadarache, mainly on behalf of the ANDRA and RHODIA-Terres rares. A specific disposal project is also being under study by the ANDRA;
- contaminated metal waste, such as lead and mercury, for which decontamination processes exist and have been used in Saclay (melting for lead and distillation for mercury). The disposal channel could be recycling in the nuclear industry or disposal by the ANDRA (after physical-chemical stabilisation for mercury).

As regards the waste produced by defence programmes, LLW/ILW-SL type waste transferred to the civilian programme is sent by the CEA to the Aube repository. This waste represents 500 m^3 out of the total of around 2,500 m^3/year packaged in CEA's facilities. The few alpha emitting waste that they contain is in small quantity and in compliance with package acceptance specifications.

Finally, it should be pointed out that treatment and packaging of the wastes produced by the high-flux research reactor operated by the Laue-Langevin Institute (ILL), an international research organisation, is handled by the CEA's waste treatment facility in CEA Grenoble. The CEA and ILL have signed a convention, which stipulates the conditions and the financing procedures.

Achieving the technical-economic optimum in waste management in particular presupposes:

- a network of service facilities and a transportation fleet;
- a range of packages suited to the characteristics of the CEA waste, but also to those of the ANDRA repositories.

In this context, CEA policy is to use packagings which are suitable for long-term storage on its sites and directly acceptable by the ANDRA. This is why the CEA is an active participant in the discussions concerning the ANDRA's various projects.

B.5.1.3 Management by COGEMA of waste from the fuel cycle facilities

In principle, since the end of the 1980s, the waste has been systematically packaged as it is produced (or temporarily deferred until the packaging facilities have been built). Old wastes stored in bulk still however exist. The conditions for their retrieval and packaging is currently under examination.

The wastes resulting from reprocessing of fuels belonging to customers outside France are returned to their owners as soon as technical and administrative conditions so allow.

Here is described the management of waste generated by current operations.

B.5.1.3.1 Fission products

Solutions of fission products (very high level) are concentrated by evaporation before being stored in stainless steel tanks, equipped with permanent cooling and mixing systems, and a system for continuous sweeping of the hydrogen produced by radiolysis. After a period of deactivation, the fission product solutions are calcined then vitrified using a process developed by the CEA. The resulting molten glass, into which the fission products are incorporated, is then cast into stainless steel containers. After solidification of the glass, the containers are transferred to an interim storage facility where they are cooled by air.

B.5.1.3.2 Waste from treatment of radioactive effluents

The La Hague site has two radioactive effluent treatment plants (STE2 and STE3). The effluents are treated by co-precipitation and the resulting sludge is encapsulated in bitumen and then cast into stainless steel drums in the more recent of the installations (STE3). These drums are stored on the site. The throughput of these two facilities has fallen off considerably in recent years, because most of the acid effluents are now evaporated in the various fuel reprocessing shops and the concentrates are sent for vitrification.

COGEMA also has a facility for mineralisation of organic effluents by pyrolysis, in the MDSB shop. This facility produces cemented packages suitable for surface disposal.

Finally, the water in the fuel unloading and storage pools is continually purified through ion exchanger resins. Once used, these resins form process waste which has to be managed. In September 2000, COGEMA was authorised to start up the resins packaging shop (ACR) which uses a cement encapsulation process.

B.5.1.3.3 Technological and structural solid wastes

Solid technological waste is sorted, compacted and then encapsulated or blocked in cement in the AD2 shop. When they meet the ANDRA's technical specifications for surface disposal, the packages are sent to the Aube repository. If not, they are stored pending a final disposal solution.

Some of the intermediate level long-lived waste (hulls and end-pieces) has been stored pending start-up of the compacting shop (ACC) at the end of 2001. This compacting leads to the production of standard compacted waste packages (CSD-C) replacing and offering considerable volume savings over the cemented packages previously produced by COGEMA. This process also enables certain categories of technological waste to be packaged.

The compacted hulls and end-pieces storage shop (ECC) was precommissioned in May 2002.

B.5.2 Radioactive waste from industrial, research or medical activities

The industrial, research and medical activities concern a very large number of sites.

For sealed sources, the manufacturer is obliged to recover its sources (via the provider). Should the manufacturer fail to do so, financial guarantees allow financing of recovery of the source by another manufacturer, who then manages the source as if it were waste, if it is not recycled. If no manufacturer agrees to recover a disused source, the public authorities, relying on the notion of public service, call in the CEA, the only establishment with the facilities capable of receiving these sources for storage. The CEA uses the guarantee fund to obtain compensation for the service provided. This situation is however extremely rare (just a few cases in six years). At present, authorisation for sealed sources disposal in the Aube repository was given only for a limited number of low level and short-lived sources. All the other used sources are stored by their manufacturers.

As regards the use of unsealed sources, a collection system has been set up by the ANDRA to recover the associated wastes. The volumes concerned are relatively small, apart from the waste resulting from clean-up of sites polluted by the radium industry or uranium ore processing residues. It is accepted that for very short half-life radionuclides (less than 100 days) the waste can be managed on-site through radioactive decay.

As with the other areas of radioactive waste production, a number of disposal channels are as yet unavailable for wastes from certain industrial, research and medical activities, in particular used sealed sources. Depending on their nature, these sources could be eventually disposed of in the Aube repository or in the various types of repositories investigated by the ANDRA. Acceptance criteria remain to be defined. However, in general, the high cost of long-term management of radioactive waste poses problems in this activity sector.

B.5.3 Mining residue management

Waste arising from uranium mines working in France was the subject of a report published on 9 June 1993 by the General council for bridges and roads at the request of the ministry for the environment. This report, entitled “Low level waste – Part 1: disposal of uranium ore processing residues” begins as follows:

“Uranium ores worked in France have a quite low content, of the order of a few kilograms per tonnes of ore. In these conditions, for the whole of CEA and COGEMA extractions, at the end of 1990, 47.5 Mt of ore were extracted, containing 63,200 tonnes of uranium, that is an average content of 0.133 %”

“The lowest content of extracted ores depends on local conditions of the mine and moreover of the world price of uranium. At certain time when the price was high, relatively poor quality ores were worked. Nowadays the low price of uranium leads to the contrary to the shutdown of the various mines in France.”

“When mineral areas are close to the surface, the working can be performed in the open-air; excavations are done in terraces, down to a 30 to 40 m depth and sometimes to 100 m. The relative proportion of tailings increase with the depth of the open-air mine. In average this proportion is 10 tonnes of residue for 1 ton of ore, but in some case can reach up to 20 tonnes. These tailings are not to be mistaken with residue from ore processing: this waste has indeed some uranium content (generally less than 0.03%) and was not subject to any physical treatment (grinding, crushing) or chemical treatment but the extraction.”

Taking into account their characteristics, the waste from mining work per se was not directly the subject of this request.

Regulatory provisions concerning tailings taken up to now by the Prefects did not cause great sensation or apparently heavy consequences for the environment. On the opposite, the presence at some working sites of chemical ore treatment units and the overlapping of mining installations with those coming under the Environment Code, led the people in charge of on-site inspection under both regulations to intervene firstly on the ICPE grounds, promoting then the withdrawal of the facility from the Mining Code.

Though this situation is generally observed, some special site conditions should be mentioned such as the Bois Noirs site at Saint-Priest-la-Prugne in the Loire department where provisions taken under the Mining Code go together with those taken under the Environment Code due to the single treatment station for water coming from both the overflow of the mine and from water percolation through the dike containing the waste from these treatments.

But for all that, provisions taken up to now do not allow a sufficiently clear vision of the actual situation in the absence of investigation of the actual impact of the mining work. That is to cope with that the Directorate for Regional Action and Small and Medium-sized Enterprises (regulatory body for mining) is part to a study that the Directorate for the Prevention of Pollutions and Risks (regulatory body for ICPE) entrusted the Institute for Radiation Protection and Nuclear Safety with in 2002. The study aims at, in a first step, performing an exhaustive assessment of what exists, and in a second step at measuring the actual impact of the mining work on one side and of ore processing on the other side, at drawing up consequences for future actions, either to confirm the soundness of already taken provisions under the Mining Code, or to implement the new provisions of this Code as regards hazard prevention. At the end of the one year fist step of the study, will be obtained an assessment of the radiological information.

B.5.4 Waste management by the ANDRA

The ANDRA contributes to research into long-term management of high level long-lived waste, for which it is examining the feasibility of repository in deep geological formations. It is also developing disposal concepts for waste categories, which for the time being have no disposal channel:

- graphite waste (stacks and jackets) from the old "gas-graphite" reactors;
- waste containing radium;
- tritiated waste.

It operates the two low level and intermediate level short-lived waste repositories: the Manche repository, currently in the surveillance phase (see § D.3.3.1), and the Aube repository, currently in operation (see § D.3.3.2). The principle of these repositories is to contain the radioactivity, protected from all aggression (water circulation, human intrusion) until it has decayed sufficiently.

The volume of waste packages delivered to the Aube repository in 2001 was about 13,000 m^3, which can be broken down as follows between the various producers:

- EDF (all facilities): 5,500 m^3
- COGEMA: 4,000 m^3
- CEA (civilian facilities and linked military facilities): 2,650 m^3
- Various producers of the nuclear fuel cycle: 430 m^3
- Small producers (collection and treatment by the ANDRA): 230 m^3
- ANDRA (waste produced by the repositories, laboratory samples): 90 m^3

For very low level waste, the ANDRA has begun a process to create a repository, which should be commissioned in the second half of 2003 (see § D.3.3.3).

The ANDRA is also involved in collecting waste produced outside the nuclear industry: small and medium industries, universities, hospitals, and so on. A collection guide was produced for these "small producers". It sets the conditions for collection of the waste, for which the ANDRA possesses treatment channels allowing disposal including at the Aube repository. The waste is collected and then grouped in a basic nuclear installation belonging to the SOCATRI company, to which the ANDRA subcontracts the sorting and repackaging; the waste is then shipped to the processing installations: incineration in the CENTRACO plant in Codolet, compacting or injection in the Aube repository. Collection of this waste annually represents 3,000 to 4,000 packages from about 300 producers spread around the country. The total number of producers in the ANDRA's customer base is about 700.

For waste from small producers without disposal channel, the ANDRA is studying interim storage facilities. CEA's facilities are still however used for disused sealed sources or radium lightning arresters. The ANDRA has applied for an authorisation to use the storage areas provided by the SOCATRI company for the americium lightning arrester heads and the waste containing radium from small producers or from clean-up of polluted sites.

Section C – SCOPE OF APPLICATION (Article 3)

1. *This Convention shall apply to the safety of spent fuel management when the spent fuel results from the operation of civilian nuclear reactors. Spent fuel held at reprocessing facilities as part of a reprocessing activity is not covered in the scope of this Convention unless the Contracting Party declares reprocessing to be part of spent fuel management.*
2. *This Convention shall also apply to the safety of radioactive waste management when the radioactive waste results from civilian applications. However, this Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party.*
3. *This Convention shall not apply to the safety of management of spent fuel or radioactive waste within military or defence programmes, unless declared as spent fuel or radioactive waste for the purposes of this Convention by the Contracting Party. However, this Convention shall apply to the safety of management of spent fuel and radioactive waste from military or defence programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes.*
4. *This Convention shall also apply to discharges as provided for in Articles 4, 7, 11, 14, 24 and 26.*

C.1 The place of reprocessing in spent fuel management

On the occasion of the diplomatic conference to adopt this Convention, held from 1 to 5 September 1997 in the IAEA headquarters, France, Japan and the United Kingdom, made the following declaration (Final Act § 12 – Minutes of the 4th plenary session §§ 93-95 – GC(41)/INF 12/App. 2):

"The United Kingdom, Japan and France regret that no consensus could be reached on the inclusion of reprocessing in the scope of the Convention.

They declare that they shall report, within the context of the Convention, on reprocessing as part of spent fuel management.

The United Kingdom, Japan and France invite all other countries that undertake reprocessing to do the same".

In accordance with its commitments, France reports here on the measures taken to ensure the safety of the reprocessing facilities, which it considers to be spent fuel management facilities for the purposes of the Convention, that is corresponding to the definition of spent fuel management facilities expressed in article 2 of the Convention.

C.2 Naturally occurring radioactive materials

Concerning wastes which contain only naturally occurring radioactive materials and which do not originate from the fuel cycle, France applies the same safety and radiation protection principles as for radioactive materials of artificial origin.

For application of the regulations regarding disposal, wastes containing naturally occurring radionuclides and originating from the non-nuclear industries are considered as being satisfactorily disposed of when a radiological impact assessment can demonstrate that the doses received by the most exposed individuals do not exceed 1 mSv/year and when an optimisation study has been performed as necessary. This provision is founded on the definition of a radioactive substance as employed by the French regulations and on the "Radiation protection n°88" recommendation from the European Commission concerning significant increases in exposure due to natural sources of radiation.

C.3 Other spent fuels and radioactive wastes treated in civilian programmes

With regard to spent fuel and radioactive waste produced by military or defence programmes and when they are transferred to civilian programmes, they are included in the inventories and are treated in the facilities presented in this report.

C.4 Effluent discharges

The discharge of radioactive effluent from basic nuclear installations is subject to specific interministerial authorisation. The corresponding regime is described in the relevant sections of the report.

The discharge of radioactive effluent from facilities, which are not classified as basic nuclear installations, is subject to the general regime of polluting discharge permits.

The aim of law 92-3 of 3 January 1992, as amended, which is today part of the Environment Code, is to ensure protection, valorisation and development of water as a usable resource, while ensuring that natural balances are respected. This law covers the general principle and planning of management of the water resources, the associated administrative and financial structures, the procedures to be followed for the installations and activities with an influence on water and the penalties to be applied in the event of pollution or failure to abide by the stipulated procedures.

For discharges from medical or biomedical activities, in particular those from hospitals, and for those from establishments other than BNIs, ICPEs and mines, decree n°2002-460 of 4 April 2002 (article R.43-7 of the Public Health Code) creates a new regulatory framework for setting the technical rules applicable to the collection, treatment and disposal of the effluent likely to contain radionuclides. An order implementing this article is currently being prepared. In the meantime, for management of effluent from facilities likely to contain radionuclides, reference should be made to the basic principles given in circular DGS/DHOS of 9 July 2001. These principles are based on decay management of the effluent collected (effluent containing radionuclides with a half-life of less than 100 days) and control of activity prior to disposal into the sewerage system. If radionuclides with a half-life of more than 100 days are present in significant quantities, the liquids are recovered and sent to authorised facilities.

Section D – INVENTORIES AND LISTS (Article 32 §2)

This report shall also include:

i) a list of the spent fuel management facilities subject to this Convention, their location, main purpose and essential features;

ii) an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;

iii) a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;

iv) an inventory of radioactive waste that is subject to this Convention that:

a) is being held in storage at radioactive waste management and nuclear fuel cycle facilities;

b) has been disposed of; or

c) has resulted from past practices.

This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;

v) a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities.

The locating map of the main facilities concerned is given at the beginning of the section L.

D.1 Spent fuel management facilities

D.1.1 Facilities producing spent fuel

Most spent fuel is produced in France by the 58 pressurised water nuclear power reactors, with power ranging from 900 MWe to 1450MWe, commissioned between 1977 and 1999 and distributed over 19 EDF sites. The fuel used in these reactors is either based on uranium oxide slightly enriched with uranium 235, or a mixture of depleted uranium oxide and plutonium originating from reprocessing of spent fuel (MOX).

The other spent fuel originates from the 11 research reactors in operation, of various types, with a thermal power of between 100 kW and 350 MW, and commissioned between 1964 and 1978. 10 of them are located in the CEA's centres in Cadarache, Marcoule and Saclay with the 11th located in the Laue-Langevin Institute near the CEA centre in Grenoble.

The list of these facilities is given in appendix (§ L.1.1).

D.1.2 Spent fuel storage or treatment facilities

Certain basic nuclear installations play a role in spent fuel management. These are the spent fuel research laboratories, the spent fuel storage facilities and the spent fuel reprocessing facilities. The inventory of these facilities, managed by EDF, CEA or COGEMA, is given in appendix (§ L.1.2).

D.1.2.1 COGEMA facilities

D.1.2.1.1 General presentation

All the COGEMA spent fuel management facilities currently in service are located in the La Hague plant, situated on the north-west tip of the Cotentin peninsula, 20 km to the west of Cherbourg.

In 1959, the French Atomic Energy Commission (CEA) decided to build the UP 2 plant to process the spent fuel from the natural uranium gas-graphite reactor (GGR) series; the CEA was authorised in 1974 to expand plant UP 2 with a shop for processing fuel from light water reactors: the high activity oxide (HAO) shop.

Plant UP 2 and the HAO shop were commissioned in 1978, forming plant UP 2-400, with an annual fuel processing capacity of 400 tonnes.

Responsibility for operating the site was transferred to COGEMA in 1978. By three decrees of 12 May 1981, COGEMA was also authorised to build the following plants:

- UP 3-A, with a practical annual capacity of about 1,000 tonnes of fuel from the light water reactor series;
- UP 2-800, with the same purpose and capacity;
- STE3, designed to purify effluents from the above two units before discharge into the sea.

Plant UP 2-400 can be used for particular operations.

The various shops in plants UP 3-A, UP 2-800 and STE3 were commissioned from 1986 (reception and storage of the spent fuel) to 1992 (vitrification shop), with most process shops precommissioned in 1989-1990, and ended with commissioning of the ACC (hull compacting) and R4 (end of the plutonium line in unit UP 2-800) shops in 2001.

The main line in these facilities comprises reception and interim storage of the spent fuel, shearing and dissolution of it, chemical separation of the fission products, final purification of the uranium and plutonium and treatment of the effluent.

The reprocessing capacity of the site is administratively limited to 1,700 tonnes per year.

D.1.2.1.2 The future: the SITOP project

The plant has reached maturity. The contracts helping to finance the plants are nearing completion (7000 tonnes reprocessed for foreign customers). A new organisation has been gradually set up since the end of 2001, to optimise use of the site's industrial and human resources. This new organisation is the subject of the SITOP (for "site optimisation") project.

At the request of the ASN, COGEMA submitted a file corresponding to the SITOP project, which in particular ensures that the operator takes account of the human factors aspect of this project.

D.1.2.1.3 Reception facilities

Delivery of the shipment casks and interim storage of the spent fuel are the first operations performed in the plant. On arrival in the reprocessing plant, the casks are unloaded either under water in the deep pool, or dry, in a leaktight shielded cell. The fuel is then stored in pools in which it will spend at least two to three years.

Three unloading facilities are available, HAO North, which is the oldest shop, operating underwater, NPH, also underwater, used to unload casks with a heating power of up to 85 kW, and finally the T0, the most recent and operating dry. Dry unloading minimises operator exposure during preparation of the casks and during decontamination of them after unloading. As the casks are not immersed they are simpler to prepare and this can be done almost totally remotely. Furthermore, they are not contaminated by the pool water, which obviates the need for most of the decontamination operations.

The capacity of the NPH and T0 shops is about 1,400 tonnes each per year.

D.1.2.1.4 Interim storage facilities

After delivery, the fuel elements are placed in racks with a cross-section of about 1 m^2 and able to take between 9 and 25 of them, depending on their size. These baskets are placed in pools about 8.5 m deep, ensuring a depth of water above the fuel such that the dose rate on the surface enables the personnel to access the edges of the pool.

The plant comprises five interconnected fuel pools, with a total capacity in the current configuration of 14,400 tonnes of initial uranium.

Three of these pools contain installations for recovering fuel elements, feeding the UP 2-400, UP 2-800 and UP 3-A reprocessing facilities respectively.

D.1.2.1.5 Reprocessing facilities

After shearing, the spent fuel is separated from its metal cladding during dissolution with nitric acid. The pieces of cladding, which are insoluble in the nitric acid, are removed from the dissolver, rinsed in acid then water, and transferred to a packaging unit. The solutions taken from the dissolver are then clarified in a centrifuge.

The elements separation phase consists in separating out the fission products and minor actinides from the uranium and plutonium and then the uranium from the plutonium.

After purification, the uranium in the form of uranyl nitrate is concentrated and stored. This uranyl nitrate is intended for conversion into a solid compound containing uranium (oxide).

After purification and concentration, the plutonium is precipitated by oxalic acid, dried, calcined into plutonium oxide, packaged in leaktight boxes and stored. The plutonium is used in the manufacture of MOX fuel. The plutonium originating from fuels belonging to customers outside France is returned to the country of origin, either as PuO_2, or as MOX fuel.

Treatment of the effluent and control of discharges into the environment is essential, because the sequence of production operations, from shearing to the finished products, uses chemical processes generating gaseous and liquid effluents.

A large part of the gaseous effluent is released during shearing of the cladding and during dissolution under ebullition. These discharges are treated by washing in a gas treatment unit. Some residual radioactive gases, in particular krypton, an inert gas with an extremely low radioactive impact, are simply monitored before being discharged into the atmosphere.

The liquid effluents are treated according to their activity and chemical composition, undergoing various evaporation and concentration cycles.

The final packaging and storage of the radioactive waste produced by the primary reprocessing chain and the liquid and gaseous effluent treatment facilities takes place on the plant site. Four methods are used: vitrification, compacting, encapsulation in cement and encapsulation in bitumen.

In accordance with article L.542 of the Environment Code concerning radioactive waste management, imported radioactive waste cannot be disposed of in France, even if reprocessed there. Consequently, the waste belonging to customers outside France is gradually shipped back to them. The radioactive waste belonging to domestic customers is either sent to the national surface repository, or stored pending implementation of a solution for its disposal.

Two main reprocessing facilities are in service in the La Hague plant, the UP 2-800 facility and the UP 3-A facility, each of which has a technical capacity of about 1,000 tonnes/year.

The head-end HAO shop (shearing, dissolution, clarification) of the UP 2-400 facility, in which all the other shops have been replaced by those of UP 2-800, can be used jointly with the UP 2-800 shops for specially scheduled operations, as its batch dissolver is more flexible than the continuous dissolvers operated in UP 2-800 and UP 3-A which are optimised for industrial reprocessing of fuel elements from light water reactors.

D.1.2.2 The other interim storage facilities

The fuel storage shop (APEC) for the Superphénix fast neutron reactor, a sodium-cooled industrial prototype with a thermal power of 3000 MW and which was finally shut down in 1998, mainly comprises an interim storage pool on the Creys-Malville site, and was commissioned on 25 July 2000. The irradiated assemblies were extracted from the reactor from 1999 to 2002, washed and then stored in the facility's pool.

The fuel from CEA civilian programmes without further use is stored, pending final solution (reprocessing or disposal) either dry (in a pit), in the CASCAD facility, or under water (pool storage) in the PEGASE facility in the Cadarache centre, which is scheduled to continue operating until 2015. Owing to the capacity and heat dissipation limits of the CASCAD facility in the Cadarache Centre, the CEA intends to build a facility called ECUME, the characteristics of which would enable it to take fuel classes which cannot be accepted by CASCAD (see § B.2.2). ECUME is scheduled to enter service in 2008.

D.2 Inventory of stored spent fuel

The spent fuel stored in France mainly comes from PWR or BWR nuclear power reactors, and is then of the uranium oxide or MOX type, or comes from research reactors. It is stored in the various installations mentioned in the previous paragraphs.

At the end of 2002, about 7,200 tonnes of French fuel was stored at La Hague, 3,600 tonnes in EDF's nuclear power plants and 120 tonnes in the CEA's centres.

Apart from French fuel, the pools at La Hague contained at the end 2001 about 450 tonnes of fuel from the following foreign nuclear power reactors with the following origin: Germany (347 t), Switzerland (95 t) and the Netherlands (4 t).

They also contained, on the 30 September 2002, fuel from research reactors coming from France (0.5 t), Belgium (0.3 t) and Australia (0.2 t).

D.3 Radioactive waste management facilities

The spent fuel management facilities listed in appendix (§ L.1), by their very nature also have to manage radioactive waste. The inventory of the other radioactive waste management facilities is given in appendix (§ L.2).

D.3.1 Installations producing radioactive waste

D.3.1.1 The BNIs in operation

Radioactive waste is produced in all BNIs in operation, the list of which is given in appendix for spent fuel management facilities (§ L.1) and for the other BNIs (§ L.2.1) producing radioactive waste (decommissioned reactors, laboratories, plants and storage facilities).

D.3.1.2 BNIs being dismantled

Radioactive waste is also produced in BNIs being dismantled (old reactors, old laboratories and old plants), the list of which is given in appendix (§ L.3).

D.3.1.3 Installations classified on environmental protection grounds

As previously mentioned, there are in France about 800 installations classified on environmental protection grounds because of the radioactive substances they hold and use. They are spread around the country. These are in particular research laboratories, industrial facilities (manufacturers of sealed radioactive sources, manufacturers of lightning arresters, plants using naturally radioactive ores, irradiators) or health establishments (hospitals, clinics, medical analysis laboratories).

D.3.1.4 Polluted sites

French regulations provide for treatment and clean-up operations if a site uses or stores naturally occurring or artificial radioactive substances in conditions such that the site presents health and environment hazards.

The treatment and clean-up operations on these polluted sites can produce radioactive waste.

In France, a large proportion of the polluted sites dates from the days of the radium industry, which was extensively developed in the first half of the 20th century, or the mining industry in the second half of the century. However, there are other cases, which originate from past industrial activities (phosphated fertilisers, rare earths, etc.).

As part of its public service duties, the ANDRA keeps an up to date inventory of all these sites, within its "national inventory of radioactive waste" the last publication of which was issued in November 2002 (freely available upon request on the Web: http://www.andra.fr/fra/observatoire/). It is produced in addition to the inventory of sites polluted by other industrial activities in France, the database for past industrial sites and service activities (BASIAS – available on the Web: http://basias.brgm.fr).

These clean-up operations generally produce a large volume of waste with low specific activity. Some long-lived radionuclides and waste containing radium constitute a hazard owing to the radon they emit and must be controlled. Management channels for these latter are not yet available, so this waste must be stored pending completion of current studies into the subject.

The ANDRA coordinates cleanup of polluted sites, either under authorisation from the regional Prefects responsible for these sites, or at the request of the owners of the sites. In any case, the health objectives of the clean-up process are defined by the ASN and the site is evaluated after decontamination.

D.3.2 Radioactive waste treatment facilities

The radioactive waste treatment facilities can be sorted in two categories: pre-treatment facilities and interim storage facilities.

The list of pre-treatment facilities operated by the CEA, COGEMA, EDF or SOCODEI is given in appendix L.2.2.

The list of interim storage facilities operated by the ANDRA, CEA, COGEMA, EDF or SOCODEI is also given in appendix L.2.2.

D.3.3 Waste disposal facilities

D.3.3.1 The Manche repository

The Manche repository, managed by the ANDRA, entered service in 1969. It is located in Digulleville, on the Cotentin peninsula, in the immediate vicinity of the spent fuel reprocessing plant at La Hague. 527,000 m^3 of waste packages were disposed of in it until it ceased operation on 30 June 1994.

In 25 years, the design of storage facilities has changed. The general design principle used to be to separate, collect and control water likely to have been in contact with the packages. The facilities consist of concrete slabs on which the packages are either directly stacked or stored in concrete cells built on these slabs. The structures were loaded in the open air and the rainwater collected from the slabs is fed to a piping network running through underground galleries.

The repository occupies a fifteen-hectare site and since 1997 has been covered by a multilayer cap including a bituminous layer within a system of draining or waterproof layers, constituting an assembly designed to prevent water infiltration. The covering layer is grassed over.

The Manche repository officially entered its surveillance phase of no more than 300 years in January 2003 but has been under particularly active monitoring since 1997. The transition from operation to surveillance was the subject of a process of the same type as that applied for creation of a nuclear installation, including a public inquiry.

D.3.3.2 The Aube repository

The Aube repository, managed by the ANDRA, was commissioned in January 1992. It has taken over from the Manche repository and its design benefited considerably from the experience feedback from it. It is located in eastern France and comprises packaging shops and a disposal area covering about thirty hectares. It is authorised to dispose a volume of one million cubic metres of waste packages.

The disposal structures form cells of about 25 metres on a side, in which the packages are placed. The slab is made of watertight concrete, covered by a sealing polymer. It has a hole to recover any water infiltration, which is sent to a pipe running through an underground gallery under the structures (separate free-falling underground sewer). Loading takes place sheltered from rainwater under a mobile roof. The metal envelope packages are concreted in the structure, whereas the durable concrete envelope packages are stabilised in the structure with gravel. Once the structure is full and the packages immobilised, a closure slab is poured over its upper surface and then covered with a provisional sealing layer pending final coverage of the facility.

On 31 December 2001, the volume stored stood at 124,000 m^3. 54 structures had been closed since the repository was commissioned, out of a planned total of about 400. Given the rate of deliveries, between 10,000 and 15,000 m^3 per year, and the fact that the repository was designed for an annual intake of 30,000 m^3, the facility could be operated for more than fifty years.

The conditioning shops can compact 200 litre drums or inject metal containers of 5 or 10 m^3.

D.3.3.3 The future VLLW waste repository in Morvilliers

This 650,000 m^3 capacity repository managed by the ANDRA and located a few kilometres from the Aube repository will be receiving its first deliveries in the second half of 2003. The regulatory public inquiry process for creation of this facility began in June 2001 and continued into June-July 2002. Given the radiological activity it is to contain, the facility is not covered by the regulations applicable to basic nuclear installations (BNIs) but the regulations for installations classified on environmental protection grounds (ICPEs). It covers an area of 45 hectares.

Given the activity level of the waste, it is packaged not for long-term containment, but to prevent any dispersal of radioactive material while it is being transported and disposed of. The waste must however be solid and inert. Under a mobile roof protecting it from any rain, it is placed in cells hollowed out from the clay. A membrane at the bottom of the cell seals the arrangement. The cells are then filled with sand, then covered with another membrane and a layer of clay. An inspection shaft is used to check for any water infiltration.

D.3.4 Mining residue repositories

The mining residue generated by the uranium mining industry, today no longer active in France, is currently stored in 33 surface repositories spread over 22 sites of different sizes, corresponding to the old mining works sites.

Depending on economic criteria, ores were routed either toward a static treatment unit for the poorer or toward a dynamic treatment for the others. According to the ores' nature, the treatment was performed with acid or basic conditions. In most of the French sites, uranium lixiviation was performed with sulphuric acid and, if needed, in the presence of sodium chlorate acting as an oxidising agent.

These processes left intact almost all of ore's constituents after the uranium dissolving has ended. The uranium remaining within the residues represents about 0.1 kg per ton, unrecoverable, because in very little soluble form or unreachable in the chemical attack conditions. On the opposite, the radium very insoluble has all remained in the solid residue.

The only facilities built by the mining operators are treatment stations for water overflowing from hydraulic ponds set up by the operating worksites or the gallery such as the treatment installations of the old Bois-Noirs mine at Saint-Priest-la-Prugne.

D.4 Inventory of radioactive waste

D.4.1 Annual production of radioactive waste

The annual production of waste, according to the categories defined in paragraph B.3, and its origin, is summarised in the following table:

Type of waste	Volume	Fuel cycle and electricity production	Nuclear research	Others
LL/ILW-SL	12 000 m^3	75 %	23 %	2 %
ILW-LL	930 m^3	80 %	20 %	0
HLW	155 m^3	~100 %	low	0

The volumes given for ILW-LL and HLW include here all the reprocessing waste produced in France, and include then the production corresponding to all the COGEMA customers.

The percentages were calculated on the basis of the waste packages. These figures are approximate and deal with past production rather than production of a given year. The percentages are calculated excluding VLLW, LLW-LL (the production of LLW-LL is low), and exclude disused sealed sources. Stored spent fuel is also ignored when calculating the percentage. The "others" category only includes medical waste and waste from the non-nuclear research industries.

D.4.2 Waste present in the interim storage facilities

The volumes given for LL-LL, ILW-LL and HLW corresponding to reprocessing, only shows the French part of the waste generated by this activity. The total volume of radioactive waste in the interim storage facilities as at the end of 2001 can be broken down as follows, according to the international categories:

- ILW-SL Low and intermediate level short-lived waste (tritiated waste): 1,800 m^3
- ILW-LL Intermediate level – long-lived waste: 46,000 m^3
- HLW High level waste (vitrified waste): 1,500 m^3

The low-level long-lived waste (waste containing radium and graphite waste) is not included in this inventory.

The volume of waste containing radium, a large part of which comes from industrial ore processing (extraction of rare earths, zirconium industry), is currently about 50,000 tonnes. The mass of graphite containing radioactivity is about 23,000 tonnes, most of which is still in the cores of the natural uranium gas-graphite reactors, meaning that it does not as yet have official waste status. Only 3,500 tonnes of graphite jackets are temporarily stored on the site, outside the reactors: several disposal options are being examined, they fall also into the LLW-LL category.

Very low level waste (VLLW) is not included in the inventory as its activity corresponds to the exemption or clearance levels indicated by the international organisations. For France's own reasons, this waste will be stored in a dedicated facility. It cannot in any case be placed in the LILW-SL category and the total volume of this VLLW stored in France currently stands at about 60,000 m^3.

The buffer stocks of LILW-SL waste on the production sites, pending shipment to the Aube repository, correspond to an average of one year of production for those packaged in concrete containers and half a year for those packaged in metal or plastic drums, or a total of about 6,000 m^3.

It should be noted that with regard to some categories of very low level and low level waste, which for a long time had no disposal channel (oils, resins, scrap, etc.) buffer stocks have been set up on the sites and are currently being absorbed primarily by treatment in CENTRACO. At the end of 2001, 10,000 tonnes of waste were stored on the EDF sites.

Disused radioactive sources are not included in the above figures. About 100,000 of them are currently being stored.

The volume of waste currently unpackaged is included, taking account of the future packaging of this waste.

Finally, it should be noted that the mining residue generated by the uranium extraction industry represents about 52 million tonnes. They constitute a particular category of VLLW waste, which is separately managed.

D.4.3 Waste in final disposal

The total volume of low-level (LLW) and intermediate level (ILW) short-lived radioactive waste in final disposal at the end of 2001, amounts around to 660,000 m^3. It is located as follows:

- immersion of 14,300 tonnes (1967 and 1969): 9,900 m^3
- Manche repository: 527,000 m^3
- Aube repository: 124,000 m^3

In France at the end of 2002, no intermediate level (ILW) long-lived waste or high level waste (HLW) has been disposed of in France.

D.5 Nuclear facilities being dismantled

The nuclear facilities dismantled or being decommissioned as at the end of 2002 comprise 24 old nuclear reactors (9 power reactors and 15 research reactors) and 15 old laboratories or plants, inventoried in appendix L.3. Should be added to this inventory 3 former small power reactors (Marcoule) coming from defence programmes but the decommissioning waste of which are transferred to civil programme.

Section E – LEGISLATIVE AND REGULATORY SYSTEM (Articles 18 to 20)

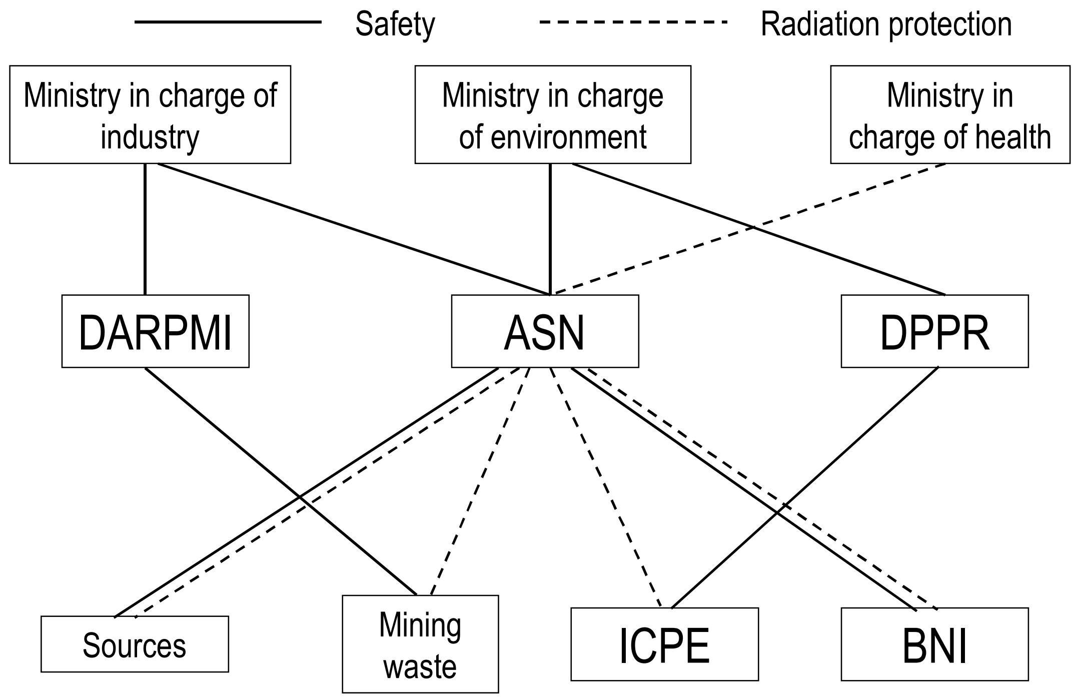
E.1 Implementing measures (Article 18)

Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention.

E.1.1 The general regulatory framework of nuclear activities

The French nuclear safety and radiation protection organisation rests on the principle of the prime responsibility of the key player (operator of a BNI, user of a source, consignor of a radioactive material package, and so on), supervised by the Government's departments, whose extensive powers of assessment require that it obtains as many competent opinions as possible from advisory and technical support organisations. With respect to radiation protection, the regulation and supervision of all nuclear activities were unified in February 2002: the regulatory authority in charge is the Nuclear Safety Authority placed under the joint authority of the ministers with responsibility for industry, health and the environment. With respect to the safety of nuclear activities, the supervision organisation differs according to the hazards involved in the use of the radioactivity and is illustrated by the diagram hereafter.

Schematic overview of nuclear activities supervision in France



Sealed sources are regulated once they exceed the exemption threshold, defined by decree 2002-460 of 4 April 2002, which is set at a very low level. They require that a licence to possess be held by someone designated in person and must be returned to the manufacturer once they are no longer needed or if their age means that the seal can no longer be guaranteed without a check. Licences to possess sources are mainly based on radiation protection and physical protection considerations to prevent inappropriate use. The regulatory authority in charge is the Nuclear Safety Authority

Above a certain threshold for unsealed sources and another, higher threshold for sealed sources (this threshold, defined by the ICPE nomenclature – decree 53-578 of 20 May 1953 amended - also depends on the hazards involved in using the radionuclide in question), their use is considered as constituting a risk outside the facility in which they are used. The regulations concerning installations classified on environmental protection grounds (ICPEs) then apply. These regulations generally apply to any activity dangerous for or detrimental to the environment. The responsible authority is the Prefect, as the State's representative in the department (French local administrative entity). He is backed up by a number of State inspectors and the ICPE Inspectorate, the activities of which are co-ordinated nationally by the Directorate for the Prevention of Pollution and Risks (DPPR), a central directorate of the Ministry for the environment. As regards to mining residues, coordination comes under the Directorate for regional action and small and medium-sized enterprises (DARPMI) a central directorate of the Ministry for industry.

When a second threshold is crossed (this threshold depends on whether the source is unsealed or sealed, and on the hazards involved in using the radionuclide and defined by a ministerial order of 11 March 1996) or if the fissile materials are used in quantities which imply the possibility of a chain reaction, or for very powerful accelerators, the French legislators felt that the installation concerned is of national importance. It is then designated a basic nuclear installation (BNI), its construction is subject to a national decision (government decree) and it is supervised by the Nuclear Safety Authority.

It should be noted that for national defence installations, there is a similar activities classification system, but the responsible authorities are specific authorities reporting to the Ministry for industry and/or the Ministry for defence. However, the radioactive waste produced by these installations is disposed of in civilian waste disposal facilities and the Nuclear Safety Authority therefore takes part in inspection of the waste in these facilities.

For information, supervision of physical protection of the radioactive materials (nuclear security supervision) is performed by another authority, the Defence High Official at the Ministry in charge of industry.

E.1.2 The general safety frameworks for ICPEs and mines safety

The legislation applicable to installations classified on environmental protection grounds covers industrial activities, intensive livestock breeding installations and waste treatment activities other than nuclear installations and mines (covered by other legislation).

The legislation applicable to the ICPEs is based on an integrated approach, which means that:

- a single environment protection licence is issued for an industrial site (rather than several licences, including one for liquid discharges, one for gaseous discharges, one for hazards, etc.). The integrated approach enables all environmental impacts to be taken into account (air, water, soil, noise, vibrations) along with the industrial hazard;
- a single authority is competent to apply this legislation. In France, only the State is competent in terms of legislation of ICPEs. It acts through the Prefect (State's representative in each department) assisted by technical support divisions.

The industrial activities covered by legislation on ICPEs are listed in a nomenclature, which subjects them either to the need for declaration, or to the need for a licence. The regulations for these ICPEs concern 500,000 installations subject to declaration and 64,600 installations requiring a licence, i.e. a total of nearly 600,000 installations. As mentioned earlier, about 800 installations are classified because of the radioactive substances they possess or use.

Facilities with little impact on the environment are subject to a simple declaration procedure. The operator sends the local Prefect a declaration file which in particular stipulates the nature of the activity it intends to perform. The Prefect examines the compliance of the file and issues a receipt along with general requirements applicable to the activity category concerned.

The licence concerns the more polluting or more hazardous activities. The licence procedure begins with compilation of a licence application file, containing impact and hazards assessments. These assessments must be commensurate with the size of the planned facility and its foreseeable impact on the environment.

The file is then examined by the ICPE Inspectorate under the authority of the Prefect. It leads to various consultations, particularly consultation with the local authorities, and to a public inquiry. The procedure ends with issue (or refusal) of the licence in the form of an order from the Prefect containing the requirements (for example for discharges: the maximum concentration and flow levels for the various pollutants) to be followed by the industrial operator.

The Prefect has at his disposal a range of administrative penalties (formal notice, deposit of surety, automatic execution, suspension of licence, closure) in the event of failure to comply with these requirements.

The ICPE Inspectorate checks compliance with the technical provisions imposed on the installation. It also intervenes in the event of any complaint, accident or incident. If it observes that the provisions are inappropriate, the Inspectorate may propose that the Prefect issue an order stipulating additional requirements. If the operator fails to abide by the provisions by which it is bound, it runs the risk of administrative and criminal penalties. The law provides for considerable penalties should these requirements be breached.

The general regulations are drawn up by the Ministry for the environment, in compliance with European Union directives. It ensures that these regulations are applicable and applied. The Directorate for the Prevention of Pollution and Risks co-ordinates the inspection and provides technical, methodological, legal and regulatory management at a national level.

Mining regulations are different from those covering the ICPEs, primarily for historical reasons and also because, apart from their strategic nature, mine workings pose particular technical and safety problems. The departmental Prefect, as the local government representative, is the supervisory Authority. However, the mining rights (concessions or operating licences) and the subsequent mine working permits are issued nationally after recommendation by the General Mining Council.

Mining regulations cover mining work proper and the facilities legally dependent on the mines; most surface working facilities for uranium mines (ore treatment plants, spoil heaps, residue repositories) are currently classified as ICPEs.

E.2 Legislative and regulatory framework (Article 19)

1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.

2. This legislative and regulatory framework shall provide for:

- *i) the establishment of applicable national safety requirements and regulations for radiation safety;*
- *ii) a system of licensing of spent fuel and radioactive waste management activities;*
- *iii) a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a licence;*
- *iv) a system of appropriate institutional control, regulatory inspection and documentation and reporting;*
- *v) the enforcement of applicable regulations and of the terms of the licences;*
- *vi) a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management.*

3. When considering whether to regulate radioactive materials as radioactive waste, Contracting Parties shall take due account of the objectives of this Convention.

Safe management of activities involving radioactive materials comprises two inseparable aspects: radiological protection and nuclear safety.

In terms of radiological protection or radiation protection there is a single set of regulations in France and a single regulatory body in charge of implementing it: the Nuclear Safety Authority (ASN).

However, in terms of nuclear safety, as mentioned in the introduction and specified in paragraph E.1.1, the facilities and radioactive materials covered by this Convention are of very different natures and in France are subject to different regulatory frameworks.

Above a certain threshold, which according to the type of facility and the radionuclide in question, is set by joint order of the ministers with responsibility for industry, health and the environment, a facility is called a "basic nuclear installation" (BNI) and placed under the supervision of the above-mentioned Nuclear Safety Authority. This category in particular includes all facilities receiving spent fuel (reactors, reprocessing plants, interim storage facilities, etc.), all facilities "whose primary purpose is radioactive waste management" as defined by this Convention, and a large number of facilities containing radioactive waste, even if their management is not the main purpose of these installations: all told, there are about 125 BNIs.

Below this threshold, an installation containing radioactive materials can be an "installation classified on environmental protection grounds" (ICPE) and is placed under the supervision of the Ministry for the environment. This category includes the other facilities using radioactive materials for industrial or medical purposes and which are distributed around the entire country, they are around 800 ICPEs.

Finally, radioactive sources are specifically regulated and since April 2002 have been under the supervision of the Nuclear Safety Authority (ASN).

This chapter in turn describes the radiation protection regulations, then the regulations applicable to the three nuclear activity categories listed above.

E.2.1 The general radiation protection regulatory framework

Since publication of the 96/29 and 97/43 Euratom directives, the legislative and regulatory provisions of the Public Health Code and the Labour Code have been completely updated. The legislative part was updated in 2001 and the implementation decrees were partly published in 2002.

E.2.1.1 The legislative basis for radiation protection

E.2.1.1.1 The Public Health Code

The new chapter V.I entitled "Ionising radiation", introduced by the ordinance of 28 March 2001, covers all "nuclear activities", in other words, all activities comprising a risk of human exposure to ionising radiation, from either an artificial source – whether substances or devices – or from a natural source when natural radionuclides are or have been treated owing to their fissile or fertile radioactive properties. It also includes "interventions" designed to prevent or reduce a radiological hazard following an environmental contamination accident.

The general radiation protection principles defined internationally (ICRP) underlying from the beginning the French regulations, are now incorporated into the legislation (art. L.1333-1).

This new legislative basis now makes it possible to issue decrees to lay down general rules concerning the conditions for prohibiting, licensing and declaring the use of ionising radiation (art. L.1333-2 and 4), as well as the rules for management of artificial or natural radionuclides (art. L.1333-6 to L.1333-9). These licences and declarations concern all uses of ionising radiation generated by radionuclides or electrical X-ray generators, whether for medical, industrial or research purposes. Some may however be granted exemptions. This new regime is also extended to the Atomic Energy Commission (CEA) which hitherto had benefited from special treatment.

Transposition of European directive 96/29 also makes it necessary to introduce new measures for evaluating and reducing exposure to natural radiation, in particular exposure to radon, when human activities contribute to its augmentation (art. L.1333-10).

A general obligation to train the medical professions in matters dealing with patient protection is introduced under application of European directive 97/43 (art. L.1333-11).

E.2.1.1.2 The Labour Code

The new provisions of the Labour Code (art. L.230-7-1 and 2), arising from the ordinance of 28 March 2001, introduce a legislative basis specific to the protection of workers, whether or not employees, with a view to the transposition of directives 90/641 Euratom and 96/29 Euratom. They bring French legislation into compliance with directive 90/641 on the operational protection of outside workers exposed to the hazard of ionising radiation. They reinforce protection of temporary workers, whether or not from outside the facility, in order to prevent high exposure received in the workplace from impairing the future employability of these temporary workers.

The link with the three radiation protection principles given in the Public Health Code is established in the Labour Code. The rules concerning worker protection are the subject of a specific decree, which was signed the same day this report was completed, the decree 2003-296 of 31 March 2003.

E.2.1.2 General radiation protection regulations

E.2.1.2.1 Protection of the population against ionising radiation produced by nuclear activities

Apart from the particular radiation protection measures regarding nuclear activities taken for the benefit of the population at large and the workers, several more general measures (decree of 4 April 2002, art. R.43-1 to R.43-7 of the Public Health Code) are targeted more specifically at the general public:

- The intentional addition (R.43-2) of natural or artificial radionuclides in all consumer goods and construction materials is prohibited. Waivers may however be granted by the Ministry for health after receiving the advice of the French High Council for Public Health, except with respect to foodstuffs and materials placed in contact with them, cosmetic products, toys and jewellery. This new range of prohibitions, which is broader than that implemented in Europe, does not concern the radionuclides naturally present in the initial components or in the additives used to prepare foodstuffs (for example potassium 40 in milk) or for the manufacture of materials used in the production of consumer goods or construction materials.

Furthermore, the use of materials or waste from a nuclear activity is also in principle prohibited, when they are contaminated or likely to have been contaminated by radionuclides as a result of this activity. Waivers may however be granted on a case by case basis.

- The maximum effective annual dose (R.43-4) received by a member of the public (1 mSv) as a result of nuclear activities, had already been regulated by the decree of 8 March 2001. Similarly, new maximum permissible annual dose equivalents for the crystalline lens (15 mSv) and for the skin (50 mSv average value for any 1 cm^2 area of skin) are defined. These limits are carried over in the decree of 4 April 2002. The calculation method for the effective and equivalent dose rates (R.43-5), and the methods to be used to estimate the dosimetric impact on a population will be defined by ministerial order.
- A national network for collection (R.43-6) of environmental radioactivity measurements is set up; the data collected will contribute to estimating the doses received by the population. It collates the results of the various measurements into the environmental required by the regulations, in particular for licensing of nuclear activities, and those of measurements performed by the various government departments and its public establishments, by local authorities and by associations who so request. To obtain validated and comparable measurement results, the laboratories working in this network must meet the certification criteria defined by ministerial order (not yet published).
- The waste and effluents (R.43-7) produced by medical and biomedical activities and by all nuclear activities other than basic nuclear installations, installations classified on environmental protection grounds and industries governed by the Mining Code are also regulated. Their management rules are defined in the special codes concerning them. Under application of this article, the rules for management of the waste and effluents produced by hospitals will be laid down by inter-ministerial order (not yet published). They will have to be disposed of in duly authorised facilities, barring special provisions for the organisation and check of radioactive decay on-site (this concerns short-lived radionuclides).

E.2.1.2.2 Protection of workers involved in nuclear activities

Decree 75-306 of 28 April 1975 concerning the protection of workers against the hazards of ionising radiation in basic nuclear installations and decree 86-1103 of 2 October 1986 concerning the protection of workers against the hazards of ionising radiation, setting the effective dose limit to 50 mSv in one year was still applying during the report preparation. Decree 2003-296 of 31 March 2003, concerning worker protection, designed to transpose directive 96/29 Euratom, has changed the limit to 20 mSv over one year (with a 2 year transitional period where it is set to 100 mSv over 5 years, with a maximum of 35 mSv over one year).

E.2.1.2.3 Protection of persons exposed for medical and medicolegal purposes

E.2.1.2.3.1 Justification and optimisation

Decree 2003-270 of 24 March 2003 specifies the implementation of the principles of justification and optimisation mentioned in article L.1333-1 for medical and medicolegal uses of ionising radiation; its definitions include the notions of diagnostic reference and dose constraint levels for medical applications. It covers all diagnostic and therapeutic applications, biomedical research, human biology, but also screening, occupational medicine and medicolegal applications (insurance, customs, exposure at hiring of certain workers, prisons, etc.). It introduces a system of certification of training organisations authorised to train health professionals in patient radiation protection.

E.2.1.2.3.2 Maintenance and quality control of medical appliances

Decree 2001-1154 of 5 December 2001 allows the creation of mandatory maintenance and quality control (internal and external) or certain medical appliances, including medical appliances used in medical exposure to ionising radiation. For each medical appliance, a decision by the director general of the French Health Product Safety Agency (AFSSAPS) will be taken to determine the acceptability criteria, the follow-up parameters and the frequency of the checks run on the medical appliances concerned.

E.2.1.2.4 Protection of persons exposed to "increased" natural radiation

Since the publication of the decree of 4 April 2002, professional activities which use material with naturally occurring radionuclides not used for their radioactive properties, but which may create exposure likely to harm the health of the workers and the public (increased natural exposure) are subject to a new regulatory framework (art.R.43-8 to R.43-11 of the Public Health Code). The list of activities of this type so identified is currently being drawn up.

For these activities, there is a new obligation to monitor exposure and estimate the doses to which workers and public are subjected. In addition, the minister for health may request implementation of protective measures against ionising radiation should this appear necessary in the light of the estimates made.

This new regulation also takes account of the issue of radon in premises open to the public (art. R.43-11 and R.43-12 of the Public Health Code). It allows consolidation of the action taken by the services of the Ministry for health since January 1999, following publication of the circular of 27 January 1999 by the State Secretaries with responsibility for health and for housing, concerning the management of radon-related hazards. A ministerial order will have to be issued to define: the list of departments in which those responsible for premises open to the public are required to carry out radon measurements, the list of the types of buildings concerned owing to the time spent by members of the public in these premises (schools, kindergartens, etc.), as well as the procedures for conducting diagnostics of the premises by approved organisations; the levels of activity above which the owners are required to implement special provisions or even conduct works necessary to reduce exposure, are also set in this order (respectively 400 and 1000 Bq/m^3).

E.2.1.3 Radiation protection regarding BNIs

BNIs are part of the "nuclear activities" (see § E.2.1.1.1), specifically regulated and monitored owing to the risks of significant exposure to ionising radiation. In particular, the performance of this type of activity requires prior radiation protection licensing, in this case through procedures defined in decree 63-1228 of 11 December 1963 concerning basic nuclear installations, as modified, and decree 95-540 of 4 May 1995 concerning liquid and gaseous discharges and water intake by BNIs. Under the terms of these procedures, the BNI operator provides the necessary proof of compliance with the general principles of radiation protection and the special rules applicable in this field (see below § E.2.1.4.1).

Protection of workers against the hazards of ionising radiation in BNIs is regulated by decree 75-306 of 28 April 1975, as modified, as well as by a number of ministerial implementation orders. This decree sets the same general rules as those which apply to all workers exposed to ionising radiation (annual dose limits, exposed worker categories, definition of limited access areas and controlled access areas, etc.), as well as the technical or administrative provisions specific to BNIs (organisation of work, prevention of accidents, keeping registers, workers from outside contractors, etc.).

Apart from the general provisions contained in the Public Health Code concerning the general principles of protection against ionising radiation, the prevention and monitoring of public exposure as a result of normal operation of BNIs are regulated by the decree of 4 May 1995 mentioned above. In order to obtain a permit to discharge radioactive effluents, the operator of a BNI must prove that the effluent produced is collected and treated so that the discharges are kept as low as reasonably achievable, and estimate the foreseeable radiological impact on the most exposed populations (so called "reference groups") in order to check that the annual exposure limits will be complied with. The validity of this demonstration is checked, with the support of the IRSN, by the ASN responsible for examining the discharge permit application. Once the inter-ministerial discharge permit has been granted, the discharges and the environment will be monitored on the one hand by the operator under the terms of its regulatory obligations and on the other by the ASN inspectors responsible for checking compliance with the relevant regulations (including by means of unannounced inspections during which samples are taken).

Finally, the regulations require that emergency plans be drawn up (on-site emergency plan produced by the operator, off-site emergency plan drawn up by the Prefect) defining the organisations and resources intended to control an accident situation, limit its consequences and take the appropriate measures for protecting persons against its effects.

E.2.1.4 Discharge permits

E.2.1.4.1 BNI discharge permits

Normal operation of nuclear facilities produces radioactive effluents. Their discharge into the environment is subject to strict conditions, specified by a regulatory authorisation, in order to protect the personnel, the public and the natural environment. Furthermore, operation of most nuclear facilities, depending on the specific situation, also requires that water be taken from the natural environment and that non-radioactive liquid and gaseous effluents be discharged into it. The permit concerns liquid radioactive discharges and gaseous discharges. It takes account of the radioactivity as well as the chemical characteristics of these two types of effluents.

In this respect, BNIs are subject to the provisions of decree 95-540 of 4 May 1995 implementing on the one hand the law of 12 August 1961 concerning atmospheric pollution and odours and on the other, law 92-3 of 3 January 1992 concerning water, as modified. This decree sets the conditions for granting permits to discharge liquid and gaseous effluents and to take water into these installations. Under application of this decree, a single permit issued at ministerial level regulates discharge of radioactive and non-radioactive liquid and gaseous effluents as well as intake of water by the BNI in question. The procedure, explained by two inter-ministerial circulars (health – industry – environment) of 6 November 1995 and 20 May 1998, is carried out on the basis of a single application submitted for that purpose and in all cases examined by the ASN.

The orders authorising effluent discharge and intake of water for all the basic nuclear installations are currently being renewed under application of decree 95-540 of 4 May 1995. For this purpose, the ASN has initiated a systematic approach with all the nuclear operators to revise the permits concerning all intake of water and discharge of effluents, including discharge of chemical substances. The ASN's aim is to ensure that most of the existing permits are reviewed by 2006. For many of them, up-to-date techniques and practices should enable a reduction to be made in the authorised discharge limits. It is in conformity with this approach that the ASN has begun to examine the discharge permit applications from several installations, including those from the COGEMA reprocessing facilities at La Hague.

These permit renewals are an opportunity for the ASN to merge into a single text all the requirements, which were stipulated in a variety of ministerial or prefectoral orders, depending on the nature of the discharges. In this context, the ASN decided to modify the discharge regulations in accordance with the following principles:

- concerning radioactive discharges, and as the actual discharges from the installations are frequently well below the current limit values, the ASN intends to lower these limit values, in line with its clearly stated policy of recent years. For example, for power reactors, the discharge limits have been divided by a factor of from 2 to nearly 40, depending on the radionuclides. Furthermore, iodine and carbon 14 releases are now covered by separate individual limits;

- with regard to chemical substances, the ASN has decided to improve the way discharge of these substances is regulated, to fill in the gaps in the previous requirements.

The discharge orders in particular set the authorised limits, the discharge conditions and the details of the environmental monitoring program. The determining limit from the standpoint of impact on the public and the environment is the maximum volume activity added to the environment by a facility, whatever its size. This limit, in terms of calculated added activity, was traditionally regulated by the licensing orders. The new orders make it possible to introduce a total volume activity measured in the receiving environment, which is easier to check and which is more representative of the overall impact of the nuclear activities. The activity which it is authorised to add to the environment induces a total dose, assuming that resulting concentration is kept at the limit level throughout the year, which is far lower than the permissible dose limits.

The procedural rules of the above-mentioned decree also apply to installations classified on environmental protection grounds, included within the perimeter of a BNI. This process thus enables the overall impact of a facility's water intake and discharges on its environment to be assessed.

Finally, in compliance with article 37 of the Euratom treaty, France provides the European Commission with general data on all projects involving discharges of radioactive effluents.

E.2.1.4.2 Discharge permits for ICPE and mines

For the ICPEs, the regulations require an integrated approach to risks. The discharge permits and conditions are set in the general facility licence (see § E.1.2). The general principles governing setting of the discharge conditions and limits are identical to those followed for the BNIs, because they stem from the same laws (in particular law 92-3 of 3 January 1992 concerning water).

For mines, the regulations do not explicitly provide for discharge permits, in particular concerning drainage water. Discharge limits can be set on a case by case basis by the State. Mines discharges are regulated by the second part of the “Ionising radiation” section of the general regulation for extractive industries. The authorisations for start of work granted by prefectoral orders have specified these conditions. However, it should be noted that the installations associated with the mines and from which the discharges are likely to have the most significant impacts (ore processing plants, etc.) are generally classified as ICPEs and their discharges are consequently regulated by this framework.

E.2.2 The regulatory framework for the safety of basic nuclear installations

Apart from the general regulations such as those concerning labour law and the protection of nature, basic nuclear installations (BNIs) are subject to two types of specific regulations: licensing procedures and technical rules.

Supervision by the ASN is designed to ensure that the operator of a nuclear facility respects in full its safety responsibilities and obligations. This external supervision in no way relieves the operator of its responsibility for organising its own monitoring of its activities, in particular those contributing to safety.

E.2.2.1 The BNI licensing procedures framework

French legislation and regulations prohibit the operation of a nuclear facility without a licence. BNIs are thus regulated by decree 63-1228 of 11 December 1963, as modified, implementing amended law 61-842 of 2 August 1961 concerning the prevention of atmospheric pollution and odours. This decree in particular provides for a plant authorisation decree procedure followed by a further series of licences issued to mark the main steps in the life of these installations: siting, design, pre-commissioning,

commissioning, final shutdown, dismantling. Its article 5 also enables the ministers in charge of nuclear safety to ask the operator at any time to review the safety of the installation.

An operator who runs an installation either without the necessary licences, or in breach of these licences, may be subject to administrative and criminal penalties. These are mainly laid down in articles 12 and 13 of the decree of 11 December 1963 mentioned above, regarding the authorisation, and in articles 22 to 30 of the water law of 3 January 1992, regarding the discharge of effluents and intake of water.

Implementation of the various licence procedures runs from the siting and the design phase up to final dismantling.

E.2.2.2 BNI site selection procedures

Well before requesting an authorisation, the operator informs the administration of the site(s) on which it envisages building a BNI. It is then possible to examine the main characteristics of the future sites at a very early stage.

This examination covers the socio-economic and safety aspects. If the BNI project is to produce energy, the Directorate General for Energy and Raw Materials at the Ministry in charge of industry is closely associated with it. For its part, the ASN analyses the characteristics of the sites from the safety viewpoint: seismic activity, hydrogeology, industrial environment, sources of cold water, etc.

An additional decree of 22 October 2002 concerning the organisation of public debates and the national public debate commission, stipulates that construction of a BNI must be referred to the public debate commission, so that the debate can be organised, whenever it concerns any new nuclear power production site or any new nuclear site not producing electricity and corresponding to an investment of more than 300 million euros. If the investment is between 150 and 300 million euros, the objectives and characteristics of the project must be made public, with a view to the possible organisation of a public debate.

Finally, neighbouring countries are informed by the French government in accordance with treaties in force, in particular the Euratom treaty.

E.2.2.3 Procedures concerning the design, construction and safety evaluation of a BNI

E.2.2.3.1 Safety evaluation

E.2.2.3.1.1 The safety options

When an operator decides to build a new BNI, it is normal although not compulsory for it to present the safety objectives and main characteristics as early as possible, and well before submitting a licence application.

The ASN asks the IRSN for its opinion on these proposals and then informs the operator of the questions to which it will have to provide answers in its authorisation decree application.

This preparatory procedure does not replace the subsequent regulatory reviews, but aims to make them easier.

E.2.2.3.1.2 Periodic safety reviews and re-assessments

To take account of both the effect of time on the facilities and changes in safety requirements, the ASN asks the operators to conduct a BNI periodic safety review at regular intervals (about every ten years), based on permanent analysis of experience feedback.

This provision is laid down in the regulatory texts. Article 4 of the decree of 19 July 1990, amending the initial decree of 11 December 1963, introduced an article 5 which in particular stipulates that the ministers for the environment and industry "may jointly and at any time ask the operator to review the safety of the facility".

If new data concerning the sites (earthquakes, flooding, etc.) or data from national or international experience feedback is likely to compromise the safety of the facility, a safety re-assessment is conducted. In any case, each BNI regularly undergoes a periodic safety review.

The periodic safety review of a facility comprises two stages:

- a conformity check which systematically aims at ensuring that the facility is in compliance with its design assumptions;
- a safety re-assessment which comprises a study phase, the aim of which is to review the BNI's safety analysis, with the benefit of experience feedback and using new analysis methods and tools (codes, probabilistic safety assessments). This study phase leads to modifications to be implemented during scheduled outages, such as to improve the level of safety of the BNIs, in particular the older ones.

Each periodic safety review ends with updating of the installation's safety analysis report.

E.2.2.3.2 Plant authorisation decree

E.2.2.3.2.1 Submission of the plant authorisation application

The application for BNI authorisation decree is submitted to the ministers in charge of nuclear safety, that is the minister for the environment and the minister for industry, who forward it to the other ministers concerned for their recommendation (interior, health, agriculture, town planning, transport, labour, etc.). It comprises a preliminary safety report.

Processing this application includes a public and administrative inquiry and a technical review.

E.2.2.3.2.2 Consultation of the public and the local authorities

The public inquiry is opened by the Prefect of the department in which the installation is to be located. The documents submitted to the inquiry must in particular specify the identity of the applicant, the subject of the inquiry, the nature and essential characteristics of the installation, and include a plan of the new plant, a map of the region, an assessment of the hazards and an environmental impact assessment.

In accordance with the relevant general provisions, the duration of the public inquiry is between a minimum of one month and a maximum of two months, although it can be extended by a further two weeks if the Inquiry Commission so decides for good reason. Furthermore, in the case of BNIs, a specific provision introduced by a decree of 12 May 1993, enables the government to extend the inquiry period by a maximum of one month.

The subject of the inquiry is to inform the public and receive its perceptions, suggestions and counter-proposals, to enable the competent authority to obtain all the information it needs. Thus any interested party, wherever he or she lives, and of whatever nationality, is invited to express himself or herself.

An Inquiry Commissioner (or an Inquiry Committee, depending on the nature or scale of the operations) is appointed by the president of the competent administrative court. He can receive all documents, visit premises, interview all persons, organise public meetings and request extension of the inquiry.

At the end of the inquiry, he examines the public's comments recorded in the planning inquiry registers or sent to him directly. He forwards a report and his recommendation to the Prefect within one month following closure of the inquiry.

The departmental or regional services of the ministries concerned by the project are also consulted by the Prefect during an administrative conference.

Finally, the Prefect forwards his recommendation along with the report and conclusions of the inquiry commissioner and the results of the administrative conference, to the ministers with responsibility for nuclear safety.

The public inquiry organised prior to a possible public interest statement may in some cases replace the public inquiry required for a plant authorisation decree application.

E.2.2.3.2.3 Consultation of technical organisations

The preliminary safety analysis report appended to the plant authorisation application is subject to review by one of the advisory committees reporting to the ASN, on the basis of an analysis report prepared by the IRSN.

After recommendations are received from the expert advisory committee, and taking account of the results of the public inquiry and any observations from the other ministers the ASN will, if there is no obstacle, prepare a draft decree authorising construction of the installation.

This draft is then forwarded to an inter-ministerial advisory commission, the CIINB (see § E.3.3.2.2), which is required to submit its recommendation within two months. The draft decree, possibly amended, is then submitted to the minister for health, who is required to issue his assent within three months.

E.2.2.3.2.4 The authorisation decree

The authorisation decree, implemented after a report by the ministers for the environment and industry, sets the perimeter and characteristics of the facility, along with any special requirements with which the operator has to comply. It also specifies the justifications the operator will be required to present for pre-commissioning and then commissioning of its facility and later, for its final shutdown.

The requirements specific to the facility are applicable without prejudice to implementation of the general technical regulations, the regulations covering effluent discharges and the other texts applicable to environmental protection or worker health and safety.

E.2.2.4 Procedures concerning BNI operations

E.2.2.4.1 Operating licences for power reactors

The first load of fresh fuel elements may only be delivered in the reactor fuel storage building after authorisation by the ministers for the environment and for industry. This authorisation is issued after the ASN has examined the storage conditions provided for by the operator and presented to the ASN at least three months beforehand, along with the conclusions of an inspection conducted shortly before the scheduled date for the delivery of the fuel elements.

In addition, six months before the reactor is loaded, the operator must send the ministers for the environment and industry a provisional safety analysis report together with provisional general operating rules (RGE) and an on-site emergency plan (PUI) specifying the organisation and the resources to be implemented on the site in the event of an accident. The ASN consults its technical support organisations, in particular the Advisory Committee for nuclear reactors (see § E.3.1.6), about these documents, and then drafts its own recommendation. It is on the basis of this recommendation that the ministers can authorise fuel loading and pre-commissioning testing.

For pressurised water reactors, at least four successive licences are required during the start-up phase: the loading licence, the pre-critical hot testing licence, the licence for first criticality and power build-up to 90% of planned nominal power and the licence for build-up to 100% of planned nominal power.

After first start-up, within a time limit stipulated in the authorisation decree, the operator requests the issue of a commissioning licence from the ministers for the environment and industry. Its request is substantiated by a final safety analysis report, the final general operating rules (RGE) and a new version of the PUI. These documents must take account of lessons learned during the period of operation since first start-up.

E.2.2.4.2 Operating licences for BNIs other than power reactors

The authorisation decrees for BNIs other than power reactors stipulate that commissioning is subject to authorisation by the ministers for the environment and industry.

This so-called "pre-commissioning" licence, which corresponds to the introduction of radioactive material within the installation, requires notification of technical requirements. It is preceded by an examination by the ASN and its technical support organisations, in particular the relevant advisory committee, of the documents submitted by the operator. These documents include the provisional safety analysis report, the general operating rules (RGE) for the facility and the on-site emergency plan (PUI).

Furthermore, before final commissioning of the installation, which must take place within a time limit stipulated in the authorisation decree, the operator must submit a final safety analysis report to the ministers for the environment and industry. Commissioning is subject to ministerial authorisation plus, as necessary, an update of the technical requirements and the general operating rules, using a procedure similar to that employed for power reactors.

E.2.2.4.3 Effluent discharge and water intake permits

The effluent discharge and water intake regulations are presented in paragraph E.2.1.4. The process for examining the permit applications is described below.

E.2.2.4.3.1 Submission of the permit application

The application concerning effluent discharge and water intake concerns all operations for which a permit is requested. It is sent to the ministers for industry and for the environment. This application includes various drawings, maps and information, a description of the operations or activities envisaged along with a study of their impact on the environment, comprising the proposed compensatory measures and the intended monitoring resources.

E.2.2.4.3.2 Recommendation by the ministers concerned

The application is forwarded to the ministers for health and civil safety for their opinion, as well as to the Directorate for the Prevention of Pollution and Risks of the Ministry for the environment.

E.2.2.4.3.3 Consultation of the public and the local authorities and organisations

After asking the operator for any necessary additions or modifications to the file, the ministers for industry and the environment transmit the application along with the recommendations of the ministers to the Prefect of the department concerned.

The Prefect calls an administrative conference between the devolved general government departments he feels that it would be useful to consult and subjects the licence application to a public inquiry in conditions similar to those described earlier for plant authorisation decrees.

However, in this procedure, the inquiry is opened in the commune in which the operation is to take place, as well as in the other communes to which its effect could spread, in particular communes along the rivers and waterways located downstream.

In addition, the Prefect consults the municipal councils concerned as well as various organisations such as the departmental health council and, if necessary, the local river authority (Mission déléguée de bassin) or the government representative managing the public domain. Finally, he forwards the application file to the local water commission for information.

E.2.2.4.3.4 The inter-ministerial licensing order

The Prefect then sends the results of the administrative conference, consultations and inquiry, together with his recommendation, to the ministers for industry and the environment.

The licence is granted by joint order of the ministers for health, industry and the environment.

Within the framework of the general technical rules defined by regulatory order of 26 November 1999, this order sets:

a) limits for the intake and discharges the operator is authorised to carry out;
b) the means of analysing, measuring and monitoring the structure, installation, works or activity, and of monitoring their effects on the environment;
c) the conditions in which the operator reports to the ministers for health and for the environment and the Prefect on water intake and discharges it has carried out, as well as the results of the monitoring of their effects on the environment;
d) how the public is informed.

At the request of the licence holder or at their own initiative, the ministers for health, industry and the environment may, after consulting the departmental health council, issue an order to modify the conditions stipulated in the licensing order.

Finally, any modification made by the operator to the installation or its operation, and such as to entail consequences on effluent discharges or water intake must, prior to implementation, be made known to the ministers for industry and the environment, who consult the minister for health. If they feel that the modification is likely to prove dangerous or harmful for the environment, they may demand submission of a new licensing application.

E.2.2.4.4 Operating documents

For operation of nuclear installations, the personnel refer to various documents, among which the ASN pays particular attention to those concerning safety.

These are primarily general operating rules (RGE) which present the steps taken during normal and incidental operation of the BNIs; they supplement the safety analysis report, which mainly deals with the steps taken at design of the installation. Decree 63-1228 of 11 December 1963, as modified, in particular stipulates that the operator must provide these two documents to support its application for commissioning of a basic nuclear installation.

E.2.2.4.5 Event monitoring

Articles 12 and 13 of the "quality" order of 10 August 1984 stipulate the provisions concerning anomalies and incidents. Any deviation from a requirement defined for performance of or the result of an activity concerned by quality, any situation likely to prejudice the defined quality or any situation which, from a safety viewpoint, warrants corrective action, is referred to in this order as "anomalies or incidents", as applicable.

Action to correct an anomaly or incident thus defined is considered to be an activity concerned by quality. An up to date record of anomalies or incidents is kept.

Safety-related anomalies or incidents must be identified. These anomalies or incidents are designated "significant anomalies or incidents" in this order.

For this purpose, a procedure must - for each activity concerned by quality, and taking account of pre-determined criteria whenever possible – allow identification of which incidents or anomalies are to be considered significant. It specifies the functions of the persons responsible for this identification.

Incidents are declared to the Safety Authority within 24 hours and are systematically rated on the INES scale. An incident report comprising an initial analysis must be sent by the operator to the Nuclear Safety Authority within 2 months.

E.2.2.4.6 Final shutdown and dismantling licences

Article 6 b of decree 63-1228 of 11 December 1963 states that when, for whatever reason, the operator intends to carry out final shutdown of its installation, it must inform the ministers responsible for nuclear safety, by sending them:

- a document explaining the chosen status of the installation after final shutdown and specifying the steps involved in its subsequent dismantling, including the target final status of the site;
- a safety analysis report applicable to the final shutdown operations and the steps ensuring the safety of the installation;
- the general surveillance and maintenance rules to be observed to maintain a satisfactory level of safety;
- an update on the on-site emergency plan for the installation concerned.

In accordance with the general regulations for the protection of nature, the operator must also enclose with its documents an environmental impact assessment for the measures proposed.

Implementation of these various provisions is dependent on their being approved by a decree signed by the ministers for the environment and industry, after assent by the minister for health, and prior to consultation of the CIINB (see § E.2.2.3.2.3).

All the operations included in normal operation of the installation and its authorisation decree (for example, unloading and shipment of nuclear fuel, dismantling of glove boxes, etc.) can be carried out during the final cessation of operation phase, before the final shutdown and dismantling decree. However, this decree is a prerequisite to the other operations not involved in normal operation, such as destruction of civil engineering structures.

The final shutdown and dismantling decree authorises the works corresponding to the operator's application and specifies how the installation must be administratively managed at the end of the dismantling work. This decree is implemented after examination of the operator's justification that the risks linked to this dismantling work have been evaluated and that the appropriate steps have been taken for all stages of dismantling.

When the final status targeted by the operator following the work authorised by the final shutdown and dismantling decree still requires classification of the facility as a basic nuclear installation, a new decree implemented following public inquiry must authorise this new facility. If not, following the dismantling work and depending on the radioactivity and remaining chemical products, the facility becomes an installation classified on environmental protection grounds or may even no longer be regulated.

In most cases, the ASN attempts to ensure that a trace of the past use of the land is preserved in the town planning records to ensure that a future buyer of the land is informed of its history.

In February 2003, the ASN issued an instruction concerning the various technical and administrative aspects of final shutdown and dismantling of BNIs. This text for example takes account of the experience acquired on the subject since January 1990, date on which the above-mentioned decree of 11 December 1963 concerning nuclear facilities was amended on this point.

E.2.2.5 Technical rules concerning BNIs

A hierarchical series of texts sets the rules and technical practices in terms of nuclear safety. They are summarised below, in ascending order of detail. Initially these texts, which have regulatory status, are relatively general, covering a broad scope but usually not going into too much technical detail. The later ones however, deal with subjects in precise detail. Their legal format is more flexible.

E.2.2.5.1 General technical regulations

The general technical regulations, based on article 10 a of the decree of 11 December 1963 mentioned above, currently deal with four major subjects: pressure vessels (subject not relevant to the installations within the scope of the Convention), the quality organisation (see § F.3, article 23), BNI water intake and effluent discharges (see § F.4, article 24), detrimental effects and external hazards resulting from BNI operation (see § .2.2.6.3 below).

E.2.2.5.2 Basic safety rules

On various technical subjects, concerning both power reactors and other BNIs, the ASN issues basic safety rules (RFS). These are recommendations, which define safety objectives and describe practices that the ASN feels to be satisfactory to ensure that they are met.

These are not regulatory texts as such and an operator may choose not to follow the provisions of a basic safety rule if it can prove that the alternatives it proposes enable the safety objectives it has set to be attained.

Through its flexibility, this type of text enables the technical provisions to be updated according to technical progress and new knowledge.

There are currently about forty RFS and other technical rules issued by the ASN which can be consulted in brochure n° 1606 published by the Official Gazette and the Nuclear Safety Authority, under the title "The safety of nuclear installations in France – laws and regulations". The list of RFS that more particularly concern the facilities within the scope of the Convention is given in appendix L.4. They cover the following areas:

- determination of seismic movements to be taken into account in the safety of facilities and installations;
- criticality hazards;
- fire protection;
- design and operation of ventilation systems;
- taking into account hazards linked to aircraft crashes;
- taking into account hazards linked to the industrial environment and communication routes of any kind.

E.2.2.6 The scope of supervision of the BNIs

Nuclear safety supervision assignments are distributed within the ASN between the Directorate General for Nuclear Safety and Radiation Protection (DGSNR) and the nuclear safety and radiation protection departments (DSNR) of the regional directorates for industry, research and the environment (DRIRE). The DSNR are entrusted with “on the spot” supervision. They are in permanent contact with the nuclear operators, co-ordinate most of the inspections performed on the nuclear sites, and supervise maintenance outages, following which the ASN is required to decide whether to authorise restart of the facility. The DSNR also examine certain authorisation and waiver applications and conduct an initial examination of the incident reports. The DGSNR co-ordinates and guides the DSNR in these fields, deals with generic events, and defines and implements national nuclear safety policy.

ASN supervision aims also at checking that any user of ionising radiation assumes full responsibility for its radiation protection obligations. In the case of BNIs, this check – which also covers nuclear safety – involves both inspections of all or part of a facility, and examination of files, documents and information supplied by the operator to justify its actions. This supervision is applicable at all stages in the life of an installation: design, construction, commissioning, operation, final shutdown, dismantling. In other areas, the ASN is gradually setting up supervision based on the one hand on examination of the files concerning the procedures stipulated by the regulations and on the other on a system of radiation protection inspections in the nuclear activities.

E.2.2.6.1 Supervision of nuclear safety

As part of its supervision activities, the ASN looks at all elements contributing to the safety of the installations. Supervision thus concerns both the actual equipment constituting the installations and those responsible for their operation, together with the related working methods and the organisational arrangements.

The scope of ASN supervision also extends to the entire life of a nuclear facility, from the initial design phases up to dismantling, covering its construction, commissioning, operation, modifications, final shutdown and dismantling.

At the design and construction stage, the ASN analyses the safety analysis reports describing and justifying the design principles, the equipment design calculations, their operating and test rules, and the quality organisation set up by the prime contractor and its suppliers.

During operation of such a nuclear facility, all safety-related modifications made by the operator must be authorised by the ASN. Furthermore, the ASN regularly requires that the operator conduct periodic safety reviews, as described in § E.2.2.3.1.2

Nuclear operator compliance with the safety reference system is monitored through regular supervision activities. These mainly take the form of inspections on the nuclear sites, but also whenever necessary at the Head Office department of the large nuclear operators or at the premises of their suppliers, in order to check correct implementation of the safety provisions.

When the supervisory actions conducted by the ASN reveal breaches of compliance with safety requirements, penalties can be imposed on the operators, if necessary after formal notice to comply. These can in particular consist in forbidding restart-up or suspending of operation of a nuclear installation until such time as corrective steps are taken.

Finally, the ASN is kept informed of unforeseen safety-related events, such as equipment failures or errors in implementation of operating rules. The ASN ensures that the operator has conducted a relevant analysis of the event and has taken appropriate steps to correct the situation and prevent it happening again.

E.2.2.6.2 Radiation protection

Since 22 February 2002, supervision of implementation of radiation protection rules has been the responsibility of the ASN, placed for this purpose under the authority of the Ministry for health.

This responsibility for radiation protection was anticipated by the ASN, which had already included radiation protection concerns in its BNI supervision. There is indeed a strong link between safety, which aims to prevent the accidental dispersal of radioactivity, and the practical steps taken by the operator to control radioactive materials transfer, detect any contamination, and more generally to monitor and limit the doses received by persons working in the facilities, in particular during safety checks. This final aspect coincides with the scope of action of the DRIRE, regarding inspection of work in nuclear facilities (see § E.2.2.6.4).

E.2.2.6.3 Environmental protection

The prevention and limitation of detrimental effects and risks for the environment as a result of BNI operations, are ensured through implementation of:

- the decree of 11 December 1963 concerning BNIs, in conjunction with an implementation order of 31 December 1999 which sets out the general requirements concerning the prevention of environmental risks (in particular accidental contamination) and noise pollution, as well as waste management in the BNIs;
- legislation on those installations classified on environmental protection grounds (ICPEs) included within the perimeter of the BNIs;
- the decree of 4 May 1995 concerning discharge of liquid and gaseous effluents from and intake of water into BNIs, together with an implementation order of 26 November 1999 and the circular of 20 January 2002;
- the order of 31 December 1999 stipulating the general technical regulations designed to prevent and limit detrimental effects and external risks arising from operation of the BNIs.

More generally, the policy followed by the ASN in terms of environmental protection tends towards that applied to conventional industrial activities. For example, the order of 26 November 1999, laying down the general technical provisions concerning the limits and procedures for intake and discharges performed by the BNIs and subject to authorisation, requires that a BNI's discharge limits be set on the basis of the use of the best available technologies at an economically acceptable cost, taking account of the specific characteristics of the site environment. This approach leads to clarification and strengthening of the limits concerning discharge of chemical substances, as well as to a reduction of the authorised limits for discharge of radioactive and chemical substances. As the effluent discharge permits expire, they are renewed according to the above provisions.

It should be noted that the ASN now supervises liquid and gaseous radioactive effluent discharges from BNIs, which until now had been the responsibility of the Office for protection against ionising radiation (OPRI – see § E.3.1.5.1).

In parallel with this approach, the ASN has in recent years developed inspections concerning effluent and waste management and the implementation of rules applicable to the ICPEs. This action has been strengthened through new inspection procedures involving sampling, which have been in force since 1st January 2000.

E.2.2.6.4 Working conditions in the BNIs

In a BNI as in any company, supervision of compliance with health and safety at work regulations is the responsibility of the work and safety inspectors. In the case of EDF nuclear power plants, this monitoring is performed by DRIRE personnel under the authority of the Directorate for Energy Demand and Energy markets (DIDEME) of the Ministry of the economy, finance and industry, acting on behalf of the Ministry for labour. The DRIRE personnel who carry out this activity may also be BNI inspectors.

Nuclear safety supervision, radiation protection supervision and work and safety inspections share a number of concerns, in particular the organisation of work sites and the conditions for use of subcontractors. The ASN, the DIDEME and the work and safety inspectors therefore pay particular attention to co-ordinating their respective actions. The concerns regarding monitoring of the contractors of the main operators led the ASN to reinforce its actions since 1999 by requesting more detailed information concerning contractor working conditions, and in 2000 by setting up more systematic inspection of work sites, in addition to the inspection of BNI works carried out by work and safety inspectors, which remain the number one priority.

Finally, exchanges with the work and safety inspectors can also be a valuable source of information about the status of labour relations, within a more general nuclear safety picture which pays more attention to the importance of people and organisations.

E.2.2.7 BNI supervision procedures

There are many ASN supervision procedures, chiefly consisting of:

- on-site inspections;
- work-site inspections during maintenance outages;
- technical meetings on site with the BNI operators or the manufacturers of equipment used in the installations;
- examination of supporting documents submitted by the operators.

E.2.2.7.1 Inspection

E.2.2.7.1.1 Principles and objectives

Inspection by the ASN consists in checking that the operator is complying with the provisions it is required to implement regarding safety and radiation protection. Without being systematic or exhaustive, the aim of inspections is to detect occasional deviations or nonconformities, as well as any drift indicating a possible deterioration in the safety of the installations.

During the inspections, the operator is informed of any factual findings, which are recorded, concerning:

- nonconformities regarding safety or radiation protection in the facility, or safety-related points requiring further explanation in the opinion of the inspectors;
- deviations between the situation observed during the inspection and the regulatory texts or documents produced by the operator in accordance with the regulations, with regard both to safety and radiation protection and to the related fields under ASN supervision (waste management, effluent discharges, installations classified on environmental protection grounds).

The ASN draws up an annual programme of inspections, taking account of the inspections already conducted, its knowledge of the installations and the progress made on technical subjects under discussion between the ASN and the operators. The programme is drawn up jointly by the DGSNR, the nuclear safety and radiation protection departments of the DRIRE and the IRSN, using a methodical approach defining priority national topics and an adequate distribution among the sites. This programme is not made known to the operators of the nuclear installations and facilities.

The inspections are either announced to the operator a few weeks before the visit, or are unannounced.

They mainly take place on the nuclear sites, but can also be in the operators' engineering offices, the workshops and design offices of the subcontractors, as well as on the construction sites or in the manufacturing plants or shops producing various safety-related components. Even when the inspection does not take place on the nuclear site, it is the BNI operator who is responsible for the results, in particular concerning the quality of the work performed and the efficiency of its own surveillance at its subcontractor's or supplier's works.

The inspections are generally performed by two inspectors, one of whom is more particularly in charge of co-ordination, with the assistance of an IRSN representative specialised in the installation to be inspected or the technical topic of the inspection.

The BNI inspectors are ASN engineers, selected from among the inspectors for installations classified on environmental protection grounds by joint order of the ministers for the environment and industry. They carry out their inspection functions under the authority of the director general for nuclear safety and radiation protection. The inspectors take an oath and are bound to professional secrecy.

E.2.2.7.1.2 Inspection practices

The ASN can perform six types of inspections:

- standard inspections;

- reinforced inspections, on topics involving particular technical difficulties and normally conducted by senior inspectors;
- review inspections, which take place over several days and require an entire team of inspectors, to carry out in-depth examination of pre-determined subjects;
- inspections involving sampling and measurements, allowing spot checking of discharge levels independently of that performed by the operator;
- reactive inspections conducted following an incident or particularly significant event;
- work-site inspections, ensuring a significant ASN presence on the sites during scheduled outages.

The ASN has also set up a system of inspector qualification taking account of their experience and their training. This system means that responsibility for the more complex inspections is entrusted to the senior inspectors.

Annually, the ASN carries out about 650 inspections, about half of which concern the power reactors and the other half the other installations. The number of unannounced inspections has risen in recent years and now accounts for 25%, as shown in the following table.

Number of inspections conducted by the ASN

Year	total	reactors	other installations	unannounced inspections
1998	674	350	324	68
1999	667	326	341	87
2000	678	360	318	118
2001	653	383	270	129
2002	647	326	321	157

E.2.2.7.2 Technical examination of the documents supplied by the operator

The operator is required to provide the ASN with the information needed for its supervision. The volume and quality of this information should enable the inspections to be targeted and the technical demonstrations presented by the operator to be analysed. It should also allow identification and monitoring of the significant events during the operation of a BNI.

E.2.2.7.2.1 Significant events

For all the facilities, the ASN has defined a category of "significant events", which have nuclear safety implications such as to justify that they be immediately reported. The ASN would subsequently receive a more complete report stating the conclusions the operators have drawn from their analysis of the incidents and the measures they are taking to improve safety. This for example includes excursions outside an installation's normal operating range, malfunction of certain safety systems or unscheduled radioactive discharges.

The DRIREs are responsible for immediately investigating significant events in all basic nuclear installations, to check implementation of immediate corrective measures and where necessary to prepare information to be released to the public. The ASN co-ordinates the actions of the DRIRE in this respect and every year provides training for the engineers concerned.

Investigation of a significant event by the DRIRE consists in examining compliance with current rules regarding detection and reporting of significant events, the immediate technical steps taken by the operator to keep the facility in or bring it to a safe condition, and finally the relevance of the significant event reports supplied by the operator.

A deferred examination of experience feedback on nonconformities and events is performed by the ASN and its technical support organisations, in particular the IRSN. The information received from the DRIRE and analysis of the significant event reports and periodic summaries sent in by the operators constitute the basis for the ASN experience feedback organisation. This experience feedback is in particular taken into account during the periodic safety reviews of installations and can lead to requests for improvement of the condition of the installations and of the organisation adopted by the operator, or transmission of information to other operators who may be concerned.

E.2.2.7.2.2 The other information presented by the operators

The operator periodically submits activity reports and summary reports regarding liquid and gaseous discharges and the waste produced.

Similarly, a large amount of information concerns specific subjects such as the earthquake resistance of the facilities, fire protection, contractor relations, and so on.

E.2.2.7.2.3 Assessment of the information supplied

The purpose of much of the information submitted by a BNI operator is to demonstrate that the goals set by the general technical regulations or those set by the operator itself are met. The ASN and DRIRE are required to check the completeness of the file and the quality of the demonstration.

Whenever it feels it to be necessary, the ASN calls on its technical support organisations, primarily the IRSN, for advice. The safety assessment requires cooperation by a large number of specialists and effective co-ordination in order to identify the key safety-related aspects. The IRSN assessment relies on studies and R&D programmes focused on risk prevention and improving knowledge about accidents. It is also based on in-depth technical exchanges with the operating teams who design and run the facilities.

For a number of years, the ASN has been diversifying its technical support organisations by calling on both French and foreign organisations.

The way in which the ASN requests advice from a technical support organisation and, as applicable, an advisory committee, is described in § E.1.3.6. For more important matters, the ASN requests the opinion of the competent advisory committee to which the IRSN presents its analyses; for the other matters, the safety analyses are the subject of a recommendation sent directly to the ASN by the IRSN.

E.2.3 The regulatory framework of the ICPEs and mines

E.2.3.1 ICPE Regulatory framework

In France, the State is responsible for prevention of industrial and agricultural pollution and risks. The State lays down policy for controlling the risks and detrimental effects generated by industry. The Directorate for the Prevention of Pollution and Risks within the Ministry for the environment is in charge of this task. Legislation applicable to ICPEs, codified in part 1 of Book V of the Environment Code, is the legal basis for the industrial environment policy in France. This legislation superseded a law of 1917, which itself replaced a decree of 1810.

These texts provide a general definition of the principles applicable to any facility which can constitute a hazard or inconvenience either for the peace and quiet of the neighbourhood, or for public wellbeing, safety and health, or for agriculture, or for protection of nature and the environment, or for conservation of historic sites and monuments.

Regulation of the ICPEs covers activities as varied as livestock breeding, large oil refineries, quarries or use of radioactive materials.

The legislation for ICPEs uses a simple system. Industrial activities covered by this legislation are listed in a nomenclature, which subjects them either to a licensing system, or a declaration system.

The nomenclature of activities lists all the activities considered to require regulation in this respect and, for each activity, specifies the thresholds of either the declaration or the licence. Below the declaration threshold, the owner of the facility needs complete no particular administrative formalities. Between the declaration and licence thresholds, a declaration to the departmental Prefect is required. General requirements must be met and the facility can be inspected. Above the licence threshold, prior licensing from the departmental Prefect is required. This licence is issued after a public and administrative inquiry, on the basis of the report of the ICPE Inspectorate and on the recommendation of the departmental health committee.

Whereas the requirements for facilities subject to declaration are standardised, those applying to facilities subject to licensing are drawn up on a case by case basis. However, ministerial orders can be issued to set the minimum requirements to be included in the licensing orders.

The rights of third parties are always protected, even if the industrial facility complies with the regulations.

"Polluter pays" is a key principle in environment policy. It consists in having the polluter pay for the damage it causes to the environment through its activity and in particular through the impact of liquid and gaseous discharges or even waste.

Depending on the substance concerned, mineral extraction works are placed in either the mines or quarry category. The mine category in particular contains workings of all metal ores, in particular uranium and its compounds. Mines must first of all be issued an extraction permit for the substance concerned from the central government: concession or a mining permit for small quantities. A licence to begin mining must then be obtained, in particular in the light of the impact assessment for the activities in question.

Substances in the quarry category are left at the disposal of the owner of the land. Quarries are however ICPEs and their operator must obtain the necessary licences or declarations accordingly.

E.2.3.2 Mining regulatory framework

As regards mining operation, radioactive material releases into the environment are regulated by decree 90-222 of 9 March 1990 and its implementation circular of 9 March 1990. This decree consists in the second part of the “Ionising radiation” section of the general regulation for extractive industry set up by the decree n° 80-331 of 7 May 1980, the latter issued for implementing Article 77 of the Mining code.

This regulation applies to operating work themselves, together with official dependence of these workings, i.e. surface facilities which are their necessary supplement and to other necessary facilities, such as mechanical ore preparation before its chemical treatment, which is not under the Mining Code but under the Environment Code.

A mine can only be worked with either a concession or an extraction permit. The work start-up authorisation is granted by the Prefect of the department at the end of a procedure including a public inquiry.

At the end of the work or of a part of the work, the operator has to declare his cessation of work and to inform about the provisions he intends to implement to preserve the interests mentioned in Article 79 of the Mining Code. The prefect makes acknowledgement of these ones or requests supplementary measures.

Since the law of 30 mars 1999, when important hazards are likely to implicate the safety of goods of people, the operator implements and operates equipment necessary for their monitoring and their prevention. When the mining permit expires, the responsibility of monitoring these hazards goes to the State.

The State elaborates and implements mining hazard prevention plans with the provisions of articles 40-1 to 40-7 of the law 87-565 of 22 July 1987 related to the preparedness of the civil security, the forest protection against fire and the prevention of major hazards.

E.2.3.3 The scope of supervision of the ICPEs and mines

E.2.3.3.1 Safety supervision

As part of its supervision duties, the Inspectorate for installations classified on environmental protection grounds looks at all elements contributing to the safety of the facilities. It is thus required to examine the physical equipment making up the facility and the people responsible for operating it, the working methods and the organisation.

When the checks carried out by the ICPE Inspectorate reveal any failure to comply with the requirements of the facility licensing conditions, penalties may be imposed on the operators, possibly after formal notice to comply. These penalties may in particular consist in forbidding restart or suspending operation of a facility until such time as corrective measures have been taken, or may involve works being carried out at the expense of the operator if it refuses to carry them out itself, should the situation constitute an immediate danger. A programme of inspections is set yearly. The inspection frequency for the facilities depends on their hazard potential and on complaints from neighbours.

Mines are inspected by the DRIRE. This concerns the safety of mining operations, the health and safety of the mine workers and any environmental detrimental effects arising from the mine working.

E.2.3.3.2 Monitoring of radiation protection outside the BNIs

Decree 2002-255 of 22 February 2002 states that the DGSNR draws up the technical regulations concerning radiation protection and is responsible for organising the inspections involved in monitoring it in the industrial, medical and research fields, including by monitoring sources of ionising radiation used in these fields. This duty is exercised jointly with other inspection bodies, such as the work and safety Inspectorate, the ICPE Inspectorate and the Inspectorate of the French agency for the safety of health products. The aims of the inspections are to check compliance of the facilities with the application file for a licence to possess sources and compliance with the safety and radiation protection requirements.

E.2.4 The regulatory framework for radioactive sources

The old system of licences for possession of artificial radionuclides and the procedure for approval of X-ray generators as used for radio-diagnostic purposes, in force until April 2002, were abrogated, in particular to take account of the dissolution of the inter-ministerial committee on artificial radionuclides (CIREA) and the corresponding creation of the DGSNR, which takes over the relevant responsibilities. The new licensing and declaration system, which covers all sources of ionising radiation, is now described in full in section 3 of chapter V.I. of the Public Health Code, with the general rules for management of radioactive sources being given in section 4.

E.2.4.1 The new licensing and declaration systems

The new licensing and declaration systems instigated by the decree of 4 April 2002 (art. R.43-12 to R43-49 of the Public Health Code) concern the manufacture, ownership, distribution including import and export, and use of radionuclides, or products or devices containing them. The use of X-ray machines is subject either to declaration in the case of medical radio-diagnostic (except for heavy machinery) or to a licence in all other cases.

It should be noted that the licensing system applies without distinction to companies or establishments which have radionuclides on their sites, but also to those which deal in them without directly possessing them. This provision, which already applies in France, would seem to be in conformity with directive 96/29 Euratom, which explicitly mentions import and export. From the public health and safety viewpoint, this obligation is necessary in order to keep a close watch on source movements and prevent accidents resulting from disused sources.

It should be recalled that, in accordance with article L.1333-4 of the Public Health Code, licences concerning industries covered by the Mining Code, basic nuclear installations and installations classified on environmental protection grounds also act as radiation protection licences. However, this exception does not concern the use of ionising radiation for medical purposes or biomedical research.

Consequently, all nuclear activities linked to a medical and biomedical research use of ionising radiation (sub-sections 1 and 2 of the corresponding section of the Public Health Code) are included, whether or not the establishments are covered by the regulations for installations classified on environmental protection grounds. The same applies to the distribution, import and export of radionuclides for industrial and research applications. All other research-related (non-medical) or industrial nuclear activities are excluded from the licensing system covered by the Public Health Code, since they are subject to specific licensing under application of the Mining Code, regulations applicable to basic nuclear installations or installations classified on environmental protection grounds.

For medical and biomedical research applications, there are no exemptions to the licensing system:

- the licences required for the manufacture of radionuclides, or products or devices containing them, as well as for their distribution, import or export, are issued by the French agency for the safety of health products. This proposal is consistent with the duties and privileges entrusted to this agency in the field of health products, including radio-pharmaceutical and "irradiating" medical devices;
- the licences required for the use of radionuclides, or products or devices containing them are issued nationally by the ASN;
- low-level X-ray generators (radiology or dental surgery) which until April 2002 had been subject to technical approval by the OPRI, are now subject to declaration to the Prefect although heavy equipment (scanners) requires a licence issued by the ASN.

The ASN is also responsible for issuing licences for industrial and research applications. It should be noted that the new criteria for licence exemptions adopted by directive 96/29 Euratom (Annex 1, table A) were introduced and replace those contained in decree 66-450 of 20 June 1966. Exemption will be possible if the following conditions are met:

- the total quantities of radionuclides held are less than the exemption values in Bq;
- the radionuclide concentrations are lower than the exemption values in Bq/kg.

For this latter criterion, this decree also introduces a maximum mass criterion (the mass of material involved must be less than 1 ton), this being the reference criterion used when drafting scenarios employed to define the exemption values. The French transposition is thus more restrictive than directive 96/29 Euratom which does not include this mass limit. Introduction of this restrictive criterion is meant to avoid the risk of dilution of radioactive material in order to fall below the exemption threshold.

E.2.4.2 Radioactive sources management rules

The dissolution of the CIREA is compensated by the introduction of a new legislative measure allowing organisation of radioactive sources monitoring at a national level (article L.1333-9). This monitoring is entrusted to the IRSN. Most of the principles and rules established by the CIREA have been integrated into the new part R (Articles R.43-40 to R.43-48) of the Public Health Code. Thus:

- sources may not be transferred or acquired from anyone who does not hold a licence;

- prior registration with the IRSN is mandatory for the acquisition, distribution, import and export of radionuclides in the form of sealed or unsealed sources, or products or devices containing them. This prior registration is necessary for organising monitoring of the sources and inspection by the customs authorities. A simple subsequent declaration would be totally ineffective and compromise public health and safety;
- traceability of the radionuclides in the form of sealed or unsealed sources, or products or devices containing them, is required in each establishment and a quarterly record of deliveries must be sent to this organisation by the suppliers. The notion of mandatory declaration of loss or theft is also introduced;
- the provisions concerning the import and export of sources or products or devices containing them are taken from the existing arrangement put in place by the CIREA and the customs authorities.

The system for disposal and collection of sealed sources which have expired or have reached the end of their useful life is taken from the CIREA special licensing conditions (decision of the 150th CIREA of 23 October 1989):

- all users of sealed sources are required to arrange for collection of sources if expired, damaged or at the end of their useful life, at their own expense (barring waivers granted for radioactive decay on-site);
- if simply requested by the user and without conditions, the supplier is obliged to recover from the user any sources the user no longer employs or if the source has expired.

The question of financial guarantees will be dealt with in another decree implementing the new article L.1333-7 of the Public Health Code (this article introduces the obligation on the supplier to collect sources and the principle of financial guarantees).

E.3 Regulatory body (Article 20)

1. Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 19, and provided with adequate authority, competence and financial and human resources to fulfill its assigned responsibilities.

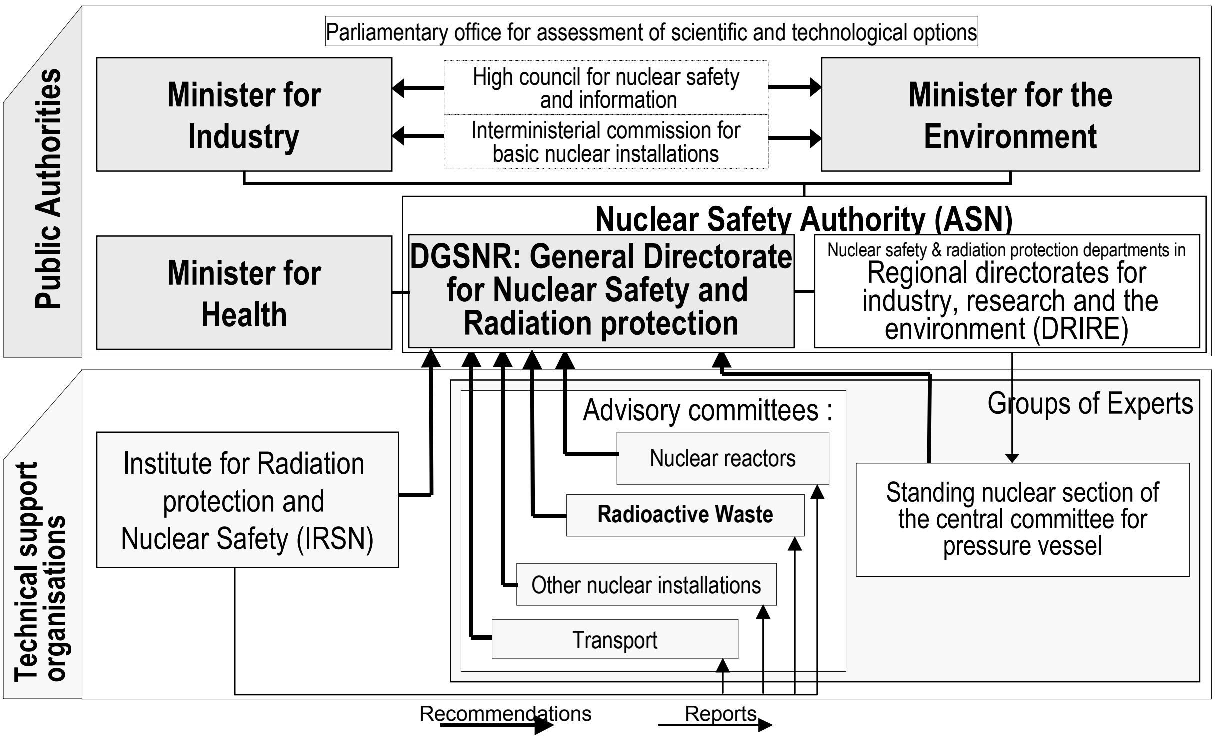
2. Each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organizations are involved in both spent fuel or radioactive waste management and in their regulation.

E.3.1 The Nuclear Safety Authority

Within the public authorities, responsibility for supervision of the safety of basic nuclear installations (BNIs) and the safety of nuclear transportation lies with the ministers for the environment and industry.

According to decree 2002-255 of 22 February 2002, the Directorate General for Nuclear Safety and Radiation Protection (DGSNR) draws up and proposes government policy regarding nuclear safety, under the joint supervision of the ministers for industry and the environment, and regarding radiation protection, under the supervision of the minister for health, respectively.

The joint authority comprising the DGSNR and the nuclear safety and radiation protection departments (DSNR) within the regional directorates for industry, research and the environment (DRIRE) is referred to as the "Nuclear Safety Authority" (ASN). The organisation of the Safety Authority described in this chapter is illustrated by the following diagram.



In the field of nuclear safety, this double supervision by the ministers for industry and the environment guarantees the independence of the Nuclear Safety Authority from the Directorate General for Energy and Raw Materials, responsible for spent fuel and radioactive waste management and which reports exclusively to the minister for industry.

In terms of radiation protection, the ASN is responsible for preparing and implementing government policy for all nuclear facilities and activities. It is more particularly tasked with preparing and implementing spent fuel management safety and radioactive waste management safety policies. In this respect, it constitutes the regulatory body stipulated by the Convention.

The ASN relies on the expertise of outside technical organisations, in particular the Institute for Radiation Protection and Nuclear Safety (IRSN), and asks the advisory committees for their opinions and recommendations.

E.3.1.1 The Directorate General for Nuclear Safety and Radiation Protection

Its main tasks are as follows:

- to draw up and supervise implementation of the general technical regulations for the safety of basic nuclear installations;
- to draw up and implement – together with the other competent administrations -, all measures designed to prevent or limit health risks linked to exposure to ionising radiation;
- to implement BNI licensing procedures (licences for construction, commissioning, discharges, final shutdown, dismantling, etc.);
- to organise and manage surveillance of the installations by the BNI inspectors;
- to monitor the discharge of effluents and the waste from the BNIs;
- to organise, co-ordinate and manage all radiation protection inspections;
- to organise and manage radiation protection inspections in the industrial, medical and research fields;
- to follow-up sources of ionising radiation;
- to supervise the transportation of radioactive and fissile material for civilian purposes;
- to organise radiological monitoring of the environment nationwide;
- to prepare and implement regulations covering the monitoring of radioactive waste management;
- to prepare an emergency response plan in the event of an incident or accident (in a BNI, during transportation of radioactive material or in any other nuclear activity) likely to compromise human health through exposure to ionising radiation;
- to organise public and media information on subjects relating to nuclear safety and radiation protection;
- to take part in the activities of international organisations and develop bilateral relations with foreign nuclear safety and radiation protection authorities.

The ASN also collects all information about research and development work conducted in the fields of nuclear safety and radiation protection, in particular that by the French Atomic Energy Commission, COGEMA, the ANDRA and Electricité de France.

E.3.1.2 The safety and radiation protection departments of the DRIRE

The safety and radiation protection departments (DSNR) of the regional directorates for industry, research and the environment (DRIRE) carry out their activities in a geographical zone comprising one or more administrative regions. The ASN assignments devolved to the DSNR are as follows:

- inspection of nuclear facilities within the sphere of competence of the Safety Authority, in particular supervision of maintenance outages;
- local processing of regulatory permit applications: water intake and discharge of effluents, modifications to the facilities, waivers from compliance with the general operating rules;

- investigation of events;
- supervision of implementation of the ICPE regulations and those concerning pressure vessels, effluent discharges and waste;
- supervision of the radiation protection provisions associated with nuclear safety;
- relations with the local authorities, in particular for nuclear emergency response training.

While some of their assignments were being decentralised, the DGSNR's sub-directorates focused their attention, at a national level, on drafting nuclear safety and radioactive waste management doctrine and on cross-disciplinary actions concerning generic issues affecting several BNIs. They also provide support and co-ordination missions for the DSNR. With the assistance of the DSNR, the sub-directorates examine the documents pertaining to the main stages in the life of the BNIs (authorisation, pre-commissioning, commissioning, final shutdown, dismantling).

E.3.1.4 The regional and departmental health and social action directorates

Development of radiation protection monitoring, in particular the performance of inspections, requires that the ASN be able to call on local support. In addition to the DRIRE's DSNRs, which cover only fifteen of the twenty-two regions, the DGSNR will call on the help of the Regional and Departmental health and social action directorates (DRASS and DDASS) which are already involved in specific environmental radiological surveillance programs.

Initial contacts were made in 2002 in order to define what assignments could be taken on by the DRASS and the DDASS, what procedures to use and how to co-ordinate with the DRIRE, in particular for risk management in a radiological emergency situation.

E.3.1.4 ASN resources and human resources management

E.3.1.4.1 Resources

E.3.1.4.1.1 Human resources

The ASN's total workforce stands at 260 split between the DGSNR and the DRIREs' DSNRs. Of this workforce, 75 persons are made available, as at 31 December 2002, by the CEA and the IRSN under the terms of the agreements signed with each entity.

76% of the ASN's staff are executives, mainly State engineers (mines engineers, construction engineers, industrial engineers, public works engineers, public health physicians, health engineers) often with prior experience of supervision activities (in the nuclear or other fields), as well as engineers made available by the CEA or the IRSN, and who have experience of nuclear or radiological activities.

E.3.1.4.1.2 Financial resources

The ASN's 2002 budget amounts to 24.6 M€. It comprises salaries (11 M€), operating expenses (6.6 M€), works, and safety analyses, studies and assessments entrusted to outside experts (1.2 M€), as well as the means necessary to pay for personnel seconded to the ASN by CEA and IRSN (5.8 M€). To this should be added an amount of 54 M€ corresponding to works and assessments entrusted to IRSN.

E.3.1.4.2 Human resources management

E.3.1.4.2.1 Staff training

Initial and continuous training is a fundamental aspect of professionalism within the Safety Authority. The system used relies on training in nuclear techniques, general training and training in communication methods.

One of the bases of managing the qualification levels within the ASN is a formalised course, which comprises four technical training categories:

- inspector training: this is a training course necessary to move up from trainee inspector to qualified inspector, with issue of the BNI inspector's card;
- 1st year basic training: training supplementing the above and prior to senior inspector training;
- senior inspector training: training course for moving from qualified inspector to senior inspector;
- refresher courses: training not necessarily required for status of senior inspector.

For information, 2142 days of training were given in 2001 to the ASN's personnel. With regard to in-house training, 19 ASN courses were taken by 290 personnel and 13 IRSN courses by 60 personnel. With regard to training provided by outside bodies, 2 long FRAMATOME courses were taken by 12 personnel, 17 CEA/INSTN courses by 75 personnel and a various other courses were taken by 132 personnel.

E.3.1.4.2.2 Inspector qualification

To reinforce the credibility and quality of its actions, the Safety Authority in 1997 undertook a process of qualification of its inspectors, based on recognition of their technical competence. This was backed up by the creation on 25 April 1997 of a Safety Authority Accreditation Committee. This is an advisory committee mainly comprising members from outside the Safety Authority. Its role is to rule on the qualification system as a whole. It examines the training courses and the qualification systems of reference applicable to the various Safety Authority units. These systems of reference in particular comprise definition of the levels of qualification (inspector and senior inspector), a description of the corresponding tasks and the rules governing transition from one level to the next.

On the basis of these systems of reference, the Accreditation Committee interviews the inspectors presented by their hierarchy. It proposes senior inspector appointments to the Director general of the DGSNR, who decides on the outcome.

On 1st March 2003, 34 senior inspectors were working within the Safety Authority.

E.3.1.4.2.3 Internal quality

The internal quality of the ASN's activities is guaranteed by setting up and implementing a system based on a series of organisation procedures. Internal audits are conducted in the various Safety Authority entities by specially composed teams of ASN inspectors, on average every three years, to assess the organisation, operation and results of each of the entities. Spot checks are carried out on the basis of the audit results. Periodic bi-monthly meetings between the heads of the various ASN entities lead to decisions, the implementation of which is checked. Finally, updating of the ASN organisation procedures is carried out as and when necessary.

E.3.1.5 Technical support organisations

The regulatory bodies rely on the expertise of technical support organisations. The Institute for Radiation Protection and Nuclear Safety (IRSN) is the main one, but the Authorities also rely on other national and international organisations.

E.3.1.5.1 The Institute for Radiation Protection and Nuclear Safety

The Institute for Radiation Protection and Nuclear Safety was created by law 2001-398 of 9 May 2001 and instituted by decree 2002-254 of 22 February 2002. This decree organised a separation between the French Atomic Energy Commission (CEA) and its former Institute for Protection and Nuclear Safety (IPSN), and a merger between the latter and the old Office for Protection against Ionising Radiation (OPRI), with regard to the technical aspects, setting up a large nuclear safety and radiation protection research and expertise body, called the Institute for Radiation Protection and Nuclear Safety (IRSN).

Safety analyses on basic nuclear installations, including interim storage and final disposal of radioactive waste, constitute a significant part of the IRSN's activities. These are carried out on the basis of operator proposals, to give the Safety authorities concerned the recommendations they need to conduct their supervision duties. For the more important subjects (examination of safety analysis reports, major modifications to facilities), the ASN asks the relevant expert advisory committee (expert groups) for its opinion on the basis of data provided by the operator and critical analysis of these data by the IRSN. For other matters (minor modifications to facilities, steps taken following minor incidents), the safety analyses give rise to recommendations sent directly to the ASN by the IRSN.

The ASN also calls on the IRSN for examination of the provisions adopted by the operator to guarantee the safety of radioactive or fissile materials transportation.

E.3.1.5.2 The other technical support organisations

The INERIS (National institute for study of the industrial environment and risks) is the government's special technical support organisation with regard to major technological risks. It in particular offers its expertise regarding fire and explosion. It can intervene concerning the safety of radioactive substances when such a risk is present.

The BRGM (Geological and mining research bureau) is the institute in charge of providing data regarding geological characteristics and the processes involved. It in particular intervenes if there are problems with soil pollution or to evaluate geology-based waste disposal structures.

Among the other organisations which recently worked for the ASN, we could mention the CETEN-APAVE concerning quality assurance and fire safety, the British company Galson Ltd, specialised in radioactive waste storage matters, Montpellier University, the INSA in Lyons for the technical evolution of certain materials used in nuclear power plants, and the EMCC company for collection of a series of sediment samples at the end of the discharge pipe from the COGEMA plant at La Hague.

E.3.1.6 The expert groups

The Safety Authority also relies on opinions and recommendations from various expert groups:

- the standing Advisory Committees,
- the standing nuclear section of the Central Committee for Pressure Vessels (this expert group is not involved under the scope of the Convention);
- the radiation protection section of the French High Council for Public Health.

A ministerial decision of 27 March 1973 set up three advisory committees comprising experts and general government representatives to assist the ASN. They examine the safety-related technical problems posed by the construction, commissioning, operation and shutdown of nuclear facilities and their auxiliaries. They are responsible for problems concerning nuclear reactors, radioactive waste disposal facilities and other basic nuclear installations.

A fourth advisory committee was set up by ministerial decision of 1 December 1998, amending the above decision. It is responsible for examining safety-related technical problems concerning transportation of radioactive and fissile materials for civilian purposes.

The advisory committees are consulted by the Director General of the DGSNR with respect to the safety of the BNIs within their sphere of competence.

They therefore examine the preliminary, provisional and final safety analysis reports for each of the BNI. They have access to a report presenting the results of the analysis conducted by the IRSN, and issue an opinion along with a number of recommendations.

Each Committee can call on anyone whose competence would seem to warrant assistance. It may interview representatives of the operator.

The participation of foreign experts can lead to further and more diverse approaches to problems and offer greater benefit from experience acquired internationally.

The Chairmen, Vice-Chairmen and experts in these advisory committees are appointed by the ministers for the environment and industry for a renewable three-year term.

E.3.2 Inspection of the ICPEs and inspection of mines

The Directorate for the Prevention of Pollution and Risks co-ordinates inspection of the ICPEs along with technical, methodological, legal and regulatory management at the national level. Most individual decisions are taken under the authority of the Ministry for the environment, by the Prefect of the department with the help of the Inspectorate for installations classified on environmental protection grounds.

Inspection is performed by personnel chosen from the devolved services, mainly from the DRIRE (regional directorates for industry, research and the environment), the veterinary services and the STIIC (Technical service of the Paris police department). The inspectors – engineers, technicians, veterinarians – are on oath officers of the State. In each region, the DRIRE director is responsible for organising inspection services, under the responsibility of the departmental prefects.

The Inspectorate is to ensure that the operators - industry, artisans, farmers, local authorities – comply with the applicable regulations and assume their responsibilities in full. The inspectors examine licensing applications, and carry out inspection visits and various checks on the ICPEs. In the event of a breach, the Inspectorate submits proposals for administrative sanctions to the Prefect and criminal charges to the public prosecutor's office.

With respect to mines, their prospecting and their working are subject to the surveillance of the administrative authority represented by the Prefect of the department and the DRIRE. The inspection is performed by DRIRE engineers specialised in the extracting industry.

E.3.3 The other parties involved in safety and radiation protection supervision

E.3.3.1 The Parliamentary Office for assessment of scientific and technological options

Created by law 83-609 of 8 July 1983, the Parliamentary Office for assessment of scientific and technological options, a parliamentary delegation comprising eight members of parliament and eight senators (as well as the corresponding number of deputies), is tasked with informing Parliament of the consequences of scientific and technological options, in particular so that decisions can be made in full possession of the facts.

In 1990, the Parliament asked the Parliamentary Office to examine how the safety and security of nuclear facilities was supervised. Since then, this duty has been renewed on a yearly basis.

These parliamentary evaluations concern both the working of the administrative structures and technical aspects, such as the future of nuclear waste or transports of radioactive materials, as well as socio-political matters, such as the conditions in which information about nuclear subjects is distributed and perceived.

Thus a report drafted by this Office in 1998 underlined several weak points in the nuclear supervision system as a whole, and recommended a number of corrective measures. The reform decided on by the Government in 2002 (creation of the DGSNR and the IRSN) was to a large extent the inspired by this report.

E.3.3.2 The advisory bodies

E.3.3.2.1 The High Council for Nuclear Safety and Information

Through the High Council for Nuclear Safety and Information (CSSIN) created by decree 87-137 of 2 March 1987, the ministers for the environment and industry have a highly competent advisory body whose role extends to all questions concerning nuclear safety and radiation protection, and information of the public and the media.

The Council sends the ministers for the environment, industry and health its recommendations for improving the efficiency of the overall action taken in the fields of nuclear safety and information and of radiation protection. It may decide to entrust examination of particular subjects to working groups, and may call in outside personalities. The DGSNR keeps it informed of the action taken by the Safety Authority and handles the secretarial duties.

E.3.3.2.2 The Inter-ministerial Commission for Basic Nuclear Installations

The Inter-ministerial Commission for Basic Nuclear Installations (CIINB), created by decree 63-1228 of 11 December 1963 concerning nuclear facilities, as modified, must be consulted by the ministers for the environment and industry regarding licences to construct, modify or shut down a BNI, and for special provisions applicable to each of these facilities. It is also required to give its opinion on the drafting and implementation of general BNI regulations. A standing section within the commission is competent for subjects of no particular difficulty.

The CIINB is an internal co-ordinating body within the executive power, comprising representatives from ministries or government establishments, with varying levels of nuclear safety competence or responsibilities. The members of the Commission are appointed by order of the Prime Minister for a 5-year term.

E.3.3.2.3 The French High Council for Public Health

As a scientific and technical advisory body, reporting to the Ministry for health, the French High Council for Public Health is responsible for issuing opinions and recommendations and for carrying out assessments for predicting, evaluating and managing health risks. Consultation of the Council may be mandatory, in particular when preparing certain regulatory texts. The Council comprises four sections (water, transmissible diseases, ambient environments, and radiation protection) each comprising 23 members appointed by the minister for health, for a 5-year term.

Since the DGSNR was created, it has been responsible for the secretarial duties of the radiation protection section.

E.3.3.2.4 The Inter-ministerial Commission for Harmonisation of Environmental Radioactivity Measurements

Until 2002 the minister for health issued qualification certificates for the laboratories carrying out radioactivity measurements in the environment and on foodstuffs. To do this, the applicant laboratories had to take part in comparative testing of a series of measurements on one or more samples. In the light of these results, the Inter-ministerial Committee for Harmonisation of Environmental Radioactivity Measurements issued an opinion for each laboratory and for each radionuclide tested, and the minister for health used this opinion as the basis for granting the laboratory a technical qualification certificate valid for two years. In 2003, new regulations under preparation should replace the certificates by an approval system to be managed by the ASN. In the meantime, the qualification certificates already issued remain valid for 2 years following their date of notification.

E.3.3.3 The public health and safety agencies

E.3.3.3.1 The Health Monitoring Institute (InVS)

The Health Monitoring Institute, which reports to the minister for health, is responsible on the one hand for permanent monitoring and observation of the state of health of the population, for collating data concerning health risks and for detecting any event likely to alter the state of health of the population. Its role is also to alert public authorities, in particular the three public health and safety agencies presented below, of any threat to public health or of any emergency situation, and to recommend appropriate measures.

E.3.3.3.2 The French Health Product Safety Agency (AFSSAPS)

The French Health Product Safety Agency, reporting to the minister for health, takes part in implementing laws and regulations concerning all aspects linked to health or cosmetic products, including those which use ionising radiation. It takes, or asks the competent authorities to take, any health policing measures necessary when the health of the population is threatened.

E.3.3.3.3 The French Health Food Safety Agency (AFSSA)

The role of the French Health Food Safety Agency, reporting to the ministers for agriculture, consumer affairs and health, is to contribute to ensuring the health safety of food, from production of the raw materials to distribution to the consumer.

E.3.3.3.4 The French Health Environmental Safety Agency (AFSSE)

The role of the French Health Environmental Safety Agency, reporting to the ministers for the environment and health, is to contribute to public health and safety in terms of the environment and to assess health hazards linked to the environment. Its task is to provide the public authorities with the competence and scientific and technical back-up needed for drafting and implementing the legislative and regulatory measures within its area of competence.

Section F – OTHER GENERAL SAFETY PROVISIONS (Articles 21 to 26)

F.1 Responsibility of the licence holder (Article 21)

1. Each Contracting Party shall ensure that prime responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.

2. If there is no such licence holder or other responsible party, the responsibility rests with the Contracting Party which has jurisdiction over the spent fuel or over the radioactive waste.

F.1.1 Spent fuel management

Spent fuel can only be produced and stored in basic nuclear installations. The fundamental principle on which the entire specific nuclear safety organisation and regulatory system is based is that of prime responsibility of the operator. This principle of prime responsibility of the operator for safety is the result of the regulatory framework summarised below.

Article 1 of law 61-842 of 2 August 1961 stipulates that " industrial facilities […] must be built, operated or used in such a way that they comply with the provisions implemented under application of this law, in order to prevent atmospheric pollution […] compromising public health or safety, or harming […] the character of the sites". Article 8 of the law stipulates that the provisions of the law "are applicable to pollution of all types caused by radioactive substances".

Article 3 of decree 63-1228 of 11 December 1963 stipulates that a BNI cannot be operated without a licence, which is based on a safety analysis report and a hazard analysis supplied by the operator.

Finally, article 1 of the "quality" order of 10 August 1984 stipulates that the operator of a BNI must ensure that quality commensurate with the safety importance of their function is defined, obtained and maintained for the various components of the facility and its operating conditions.

The provisions implemented by the operator must demonstrate that the quality of the components is obtained and maintained as of the design phase and then throughout all subsequent phases of the life of the BNI.

On behalf of the State, the ASN ensures that this responsibility is assumed in full, in compliance with the regulatory requirements. The respective roles of the ASN and the operator are divided up as follows:

- the ASN defines the general safety objectives;
- the operator proposes and explains technical measures for achieving them;
- the ASN then ensures that these measures are appropriate to the objectives set;
- the operator then implements the approved measures;
- finally, during inspections, the ASN checks correct implementation of these measures and draws the corresponding conclusions.

F.1.2 Radioactive waste management

With regard to radioactive waste, as for any other type of waste, the producer of the waste remains responsible for it up until final disposal in duly authorised facilities. This is a general principle expressed in law 75-633 of 15 July 1975 (codified in Section IV of part V of the Environment Code) concerning waste of all types.

It should be noted that even if the producer of the waste sends it for processing or storage in a facility operated by another company, it remains responsible for the waste until such time as it has been disposed of in a duly authorised waste disposal facility.

With regard to radioactive waste facilities which are BNIs, the respective duties and responsibilities of both the ASN and the operators are in all respects identical to those presented in the previous paragraph concerning spent fuel management facilities.

Legislation concerning installations classified on environmental protection grounds (ICPE) enables the State to take the place of any defaulting party (winding up, actual or alleged insolvency of one of the managers, etc.), to ensure control of the hazards from the sites concerned. With regard to sites polluted by radioactive substances, most of the waste concerned comes from the radium industry or the radium-based clock/watch-making operating at the beginning of the 20th century. Using a specially allocated fund, the State takes charge of collecting and disposing of this waste, or if no disposal solution is available, of storing it. Legal action will always be taken against those responsible, to obtain reimbursement of the public funds committed, whenever possible.

F.2 Human and financial resources (Article 22)

Each Contracting Party shall take the appropriate steps to ensure that:

i) qualified staff are available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility;

ii) adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning;

iii) financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility.

F.2.1 Safety Authority request concerning BNIs

French regulations set no official amount for the resources to be assigned by nuclear facility operators to safety aspects. Nonetheless, there is an indirect requirement, in that the regulations stipulate that the holder of an operating licence must guarantee that all the measures needed to guarantee safety are taken, according to the nature of the activities and the conditions in which they are performed. This guarantee must extend up to the facility dismantling and clean-up phase, since these operations must be carried out in conditions approved by decree. It is therefore at the licensing application stage that the Safety Authority checks that the operator will have the human and financial capacity to operate its facility correctly.

Article 7 of the "Quality" order of 10 August 1984 stipulates that the "human and technical resources and the organisation implemented for performance of an activity concerned by quality (see § F.1.1) must be appropriate to this activity and enable the defined requirements to be met. In particular, only persons with the required competence may be assigned to an activity concerned by quality; the assessment of competence is in particular based on their training and their experience."

F.2.2 Presentation by the BNI operators of the resources allocated to safety

F.2.2.1 ANDRA human and financial resources

F.2.2.1.1 ANDRA financial resources

The ANDRA was created in 1979 as part of the French Atomic Energy Commission, and was transformed by law 91-1381 of 30 December 1991 on radioactive waste (now covered by articles L.542-1 and following of the Environment Code) into a public establishment of an industrial and commercial nature (EPIC). This status gives it a certain independence from both the producers of waste and the organisations responsible for research into waste management. The ANDRA's organisation is presented in appendix (see § L.5.1).

Its mission is to manage all radioactive waste produced in France by the nuclear power industry, the military nuclear industry and small nuclear users (primarily industries other than nuclear industry and hospital/university activities). Its duties are detailed in the law of 30 December 1991:

- participation in research and the definition of research into the long-term management of radioactive waste;
- management of waste repositories;
- design, siting and construction of new waste repositories;
- setting packaging and disposal specifications;
- setting a directory of radioactive waste located in France.

The ANDRA's funds come from conventions or contracts signed with the main waste producers (EDF, COGEMA, CEA and other industrial firms involved in the nuclear power industry). These conventions pre-financed the expenditure incurred in the building of the Aube repository and covering of the Manche repository. Waste package disposal contracts based on the quantities delivered cover operation of the Aube repository. A project run by the Ministry for industry is under way to define long-term financing methods for surveillance of the Manche repository. This financing is currently provided by a periodically renewed convention.

The small nuclear waste producers who have signed no convention with the ANDRA, are invoiced for the services provided by the ANDRA on their behalf, and according to demand. Furthermore, specific conventions are drawn up with the industrial firms concerned, for studies into disposal facility feasibility and design.

In 2001 the agency's turnover was about 110 M€. Operation of the repositories (Aube, Manche) and the corresponding activities in 2001 represented a budget of about 35 M€. The rest is devoted to study of disposal concepts, and above all to geological disposal feasibility studies, including in particular the creation of the Bure underground laboratory in the Meuse department (on the border with the Haute-Marne department).

F.2.2.1.2 ANDRA human resources

The ANDRA employs about 350 people, including 60% engineers and managers. About 90 staff are assigned to general management or transverse support functions: human resources, buying, management, accounts, quality, communication. Safety is the core function of the other personnel, either directly or indirectly.

About 90 staff contribute directly to the industrial activities, in particular operation and surveillance of the surface repositories (Aube repository and Manche repository). These staff include persons in charge of checking that the packages delivered are compliant with the repository safety rules. With regard to these staff, the Agency aims to maintain and develop a strong safety culture through training and through the daily operating procedures (particularly in conjunction with its quality and environmental protection approach). About ten staff in the Aube repository are devoted exclusively to quality, safety, security and environmental monitoring actions. In addition, 6 staff remain based in the Manche repository, with the support of the Aube repository.

Official drafting of safety principles, help for the operators in implementing them and control of their correct implementation, definition of safety analysis methods and experience feedback from operation of the repositories, are carried out in a department whose duties also cover quality and environmental management activities. This department comprises about 40 people.

A science department of about fifty staff contributes to all ANDRA activities in fields such as geology, hydro-geology, materials, the biosphere and modelling. They thus take part in safety studies for both operational and planned repositories.

A project department with a staff of about 80, runs the design studies into future waste management solutions, taking particular account of safety and security at all stages, together with the safety, quality and environment department. It is responsible for the Bure underground laboratory.

F.2.2.2 CEA human and financial resources

F.2.2.2.1 CEA financial resources

The French Atomic Energy Commission (CEA) is a public research agency created in October 1945 to give France atomic expertise, enabling it to be used in the energy, health and defence sectors. The CEA's organisation is presented in appendix (see § L.5.2).

In 2001, the CEA's resources for civilian nuclear programmes, excluding the IPSN, amounted to 1,546 M€, 63% financed from public funds (subsidy) and 37% from its own resources (565 M€ external revenue excluding IPSN).

As of 2002, clean-up and dismantling operations are financed from a special fund created in 2001 and fed by revenue from CEA-Industrie and by contributions from industry and CEA partners to the dismantling costs.

F.2.2.2.2 CEA human resources

At the end of 2001, and for civilian programmes - excluding the IPSN - the French Atomic Energy Commission employed about 10,500 staff, split half-and-half between managers or engineers and technical or support staff, out of a total workforce of about 15,000, including the defence sector. The staff assigned to civilian programmes are distributed over 5 centres: Saclay, Cadarache, Valrho (Marcoule), Fontenay-aux-Roses and Grenoble.

Apart from personnel assigned to radiation protection or security, the human resources allocated to safety stand at about 300 engineers: facility safety engineers, engineers and experts in the support units or safety expertise units, engineers from the safety control units, etc.

F.2.2.3 COGEMA human and financial resources

The COGEMA group was created in 1976 as a subsidiary for certain of the CEA's industrial activities, with the CEA as sole shareholder. At the end of 2001, COGEMA's single shareholder is the AREVA holding company, whose own shareholders are as follows:

Shareholder	Stake in %
CEA	78.96
State	5.19
Investment certificate bearers	4.03
Caisse des dépôts et consignations	3.59
ERAP	3.21
EDF	2.42
Framépargne	1.58
Total Elf Fina	1.02

The consolidated 2001 turnover for the COGEMA group is 4,317 M€, and the consolidated net revenue is 130 M€.

In June 2000, the group reorganised as presented in appendix (see § L.5.3), with the aim of strengthening its technological and industrial advance, stimulating its commercial activities and consolidating its international positions. This organisation comprises an executive committee, three sectors comprising 11 business units, corporate functions (general management) and an operating committee.

Beginning 2001, the group employed 19,330 people, divided up into the following categories:

Category	Number of employees	Percentage
Engineers and managers	4,430	22.9
Supervisors and technicians	9,200	47.6
Support staff	2,300	11.9
Craft personnel	3,400	17.6
Total	19,330	100.0

The turnover of the reprocessing business unit, in charge of spent fuel management, was 1,762 M€ in 2001. Industrial investment on the La Hague site amounted to 27.5 M€ in 2001.

On the La Hague site, which handles management of spent fuel and the associated waste, 3,424 staff are employed (as at 31 December 2001) broken down into the following categories:

Category	Number of employees	Percentage
Engineers and managers	339	9.9
Supervisors and technicians	2,766	80.8
Support staff	296	8.6
Craft personnel	23	0.7
Total	3,424	100.0

Of this workforce, 730 staff are employed by the Quality, safety, environment directorate, including 310 in the radiation protection service, 190 in local security unit and 30 directly assigned to safety co-ordination and surveillance tasks. This workforce does not reflect the number of persons directly involved in obtaining and maintaining safety. Those with primary responsibility for safety are the facility managers, who supervise all operations and modifications. One should also consider the personnel in the training units, who are permanently in charge of personnel retraining and awareness. 8.74% of the establishment's payroll was devoted to training in 2001.

Safety and criticality training and retraining accounted for 81,000 hours in 2001.

The discharge measurement laboratory employs 33 people, while the environment measurements laboratory employs 15.

The hierarchy in the units is responsible for deciding to assign competent personnel to the required tasks and thus for assessing this competence. To do this, it looks at initial training and experience and identifies the need for further training and qualification or certification for specific tasks. It is supported by the competent services of the Human resources directorate and its functional representations on the various sites, who are responsible for providing training and keeping training records.

Every year, the establishment issues a co-ordinated training plan, based on the needs expressed by the hierarchy in the units and the employees, during periodic interviews. Training is scheduled on the basis of this plan.

Under the terms of article 7 of the quality order of 10 August 1984, the Safety Authority regularly organises inspections to check that the human resources are appropriate to the safety requirements.

F.2.2.4 EDF human and financial resources

F.2.2.4.1 EDF human resources

The workforce of EDF's Nuclear Power Generating Division (DPN) is about 20,000 employees, split into three categories: operations (about 11%), supervision (about 65%), management (about 24%). The organisation of EDF (Energy branch) is presented in appendix (see § L.5.4).

To these 20,000 people, directly involved in operating EDF's fleet of 58 nuclear reactors, can be added the following EDF human resources devoted to the development, operation and dismantling of the nuclear reactors:

- nearly 2,500 engineers and technicians in the Nuclear Engineering Division (DIN);
- about 180 engineers and technicians in the Nuclear Fuel Division (DCN);
- about 600 engineers and technicians in the EDF Research and Development Division (EDF R&D).

In terms of human resources devoted to nuclear safety and radiation protection, EDF underlines the fact that it is organised so that a large majority of its personnel devotes a significant part of its time and effort to these matters. The policy of empowerment and decentralisation implemented within the company, and the development of the safety culture among the teams, mean that safety and radiation protection are an integral part of preparing and performing interventions, and supervising and checking the work done.

If we look only at the personnel whose duties and activities are concerned exclusively with nuclear safety (safety engineers in the nuclear power plants, safety specialists and experts in the national staff, engineering entities and supervising entities), then more than 300 persons are involved.

About the same numbers are assigned to security and radiation protection activities.

F.2.2.4.2 EDF financial resources

As an integrated public company responsible for generating, transmitting and distributing electricity nationwide, EDF has in recent years transformed into an international energy group. This change, encouraged by deregulation of the electricity markets in Europe, is the fruit of an expansion policy based on growth by acquisition.

In 2001, EDF's net production in France was 480 TWh, including 400 TWh of nuclear origin and 80 TWh was exported. The main financial results for the EDF group for the year 2001 are detailed below.

The turnover of the EDF group amounts to 40,700 M€. The group's consolidated net result after taxes and before return to the State, is 840 M€. Turnover excluding electricity in France, accounts for 35% of the group's total turnover.

The reserves set aside by EDF in 2001 amount to about 15,500 M€ for spent fuel and nuclear waste management and to about 11,000 M€ for site clean-up and dismantling costs. These reserves are defined on the basis of the evaluations made of the cost of waste processing and final disposal, in connection with the operation generating the waste, which is burn-up in reactors.

With regard in particular to the dismantling of nuclear reactors and treatment of the resulting waste, EDF sets aside accounting reserves throughout the operating period of these reactors, proportional to the investment costs, in order to be able to cover these expenses when the time comes. This reserve is the sum of the reserves for dismantling the 58 EDF power reactors currently in operation and which are set aside every year, plus the reserves for dismantling of the 9 EDF reactors finally shut down, for which dismantling work has begun.

In the light of all the above, EDF considers that it has the financial resources to meet the safety needs of each nuclear facility for its entire life, including the management of spent fuel, processing of waste and dismantling of the facilities.

F.2.3 The ASN analysis

As mentioned at the beginning of this chapter, it is by checking that the operator meets all its requirements, that the Safety Authority ensures its financial ability to operate its facility safely.

Furthermore, the quality order of August 1984 provides for supervision of human resources and, for that purpose, the ASN reviews on the whole from time to time the general organisation of the operators. At present there are no particular problems in this area with the operators. Nonetheless, the ASN is currently working to improve its system of human resources supervision.

F.2.4 The case of ICPEs and mines

Legislation concerning installations classified on environmental protection grounds requires that financial guarantees be provided for quarries, waste storage facilities and the most dangerous "Seveso" class facilities (chemical industries, paper-mills, gas or flammable liquid storages, etc.).

When the Prefect calls in these financial guarantees, the State takes the place of the operator and becomes responsible for cleaning up the site.

The purpose of these guarantees is, depending on the nature of the hazards or inconveniences of each category of installation, to ensure that the site is supervised and kept safe, as well as to provide adequate response in the event of an accident before or after closure. This measure aims to cover the possible insolvency or cessation of activity of the operator. It does not cover compensation due by the operator to any third parties who may suffer prejudice owing to pollution or an accident caused by the installation.

These measures apply in particular to the ICPEs used for radioactive waste repositories (in practice, in France, the only ones currently concerned are uranium ore processing residues repositories and future VLLW waste repository), The operator is responsible for the installation throughout its operating life and at least 30 years after closure (after which period, the State decides whether or not to assume responsibility for the site). For VLLW waste disposal, the operator is the ANDRA, the National Radioactive Waste Management Agency, which will probably retain responsibility for surveillance of the repository, without fixed time limit.

For ICPEs employing radioactive substances but not used for waste disposal, there are no general provisions for guaranteeing the availability of resources to ensure the safety of the facilities during operation and decommissioning. The ICPE Inspectorate simply checks that the operator is taking all necessary steps. The hazards linked to these installations would not seem to justify any additional provisions. In the event of defaulting by the operator, there are mechanisms based on public funds for resolving situations constituting a hazard for the public or the environment.

For mines, any new licence is currently dependent on presentation of the conditions governing cessation of work, along with an estimate of its cost. In the past, this was not required and the French uranium mines were therefore not covered by this provision. However, closing down a mining concession at the end of its operating life was already subject to the implementation of measures stipulated by the Prefect, to protect the health and safety of both the public and the environment.

F.2.5 Radioactive sources

The source manufacturer is required by the regulations to take back the source when its user no longer needs it or if the source has expired. The cost of these operations must be included in the price of acquisition of the source.

To allow application of this general principle, a system of mutual guarantees was set up by an association of source suppliers and manufacturers, so that the sources concerned by defaulting of one of the members can be taken back.

With the implementation of the new radiation protection regulations in France, consideration is currently being given to examining the benefits of adding financial guarantees to this system.

F.3 Quality assurance (Article 23)

Each Contracting Party shall take the necessary steps to ensure that appropriate quality assurance programmes concerning the safety of spent fuel and radioactive waste management are established and implemented.

F.3.1 Safety authority request concerning BNIs

The order of 10 August 1984, concerning the quality of design, construction and operation of basic nuclear installations, provides a general framework for the steps that the operator of any basic nuclear installation is required to take in order to design, obtain and maintain the quality of its installation and its operating conditions, such as to guarantee safety.

The order first of all stipulates the quality looked for by means of specified requirements, then the quality obtained through appropriate skills and methods, and finally the guarantee of quality by checks on compliance with the requirements.

The quality order also requires that:

- detected deviations and events be corrected thoroughly and preventive action be taken;
- appropriate documents provide proof of the results obtained;
- the operator supervise its contractors and check the correct functioning of the organisation adopted to guarantee quality.

Article 8 of the quality order requires that there be an internal unit, within each BNI operator, to examine quality-related tasks (see § F.2.1) independently of those who performed them. The effectiveness of the internal checks conducted by the operators is evaluated by the ASN through inspections in the various corporate support services.

F.3.2 Steps taken by the BNI operators

F.3.2.1 ANDRA quality assurance policy and programme

The ANDRA is covered by a solid legislative and regulatory framework which defines its role and what is expected of it: the law of 30 December 1991 lays down the broad outlines underpinning the activities of the Agency. The law in particular states that the Agency is responsible for the long-term management of radioactive waste and contributes to national policy concerning radioactive waste management.

The aim of the Agency is to carry out this radioactive waste management, or propose options for carrying it out, with a permanent concern for public service and protection of individuals and the environment, while complying with legal and regulatory provisions.

The Agency's proposals and actions are designed to set a three-fold example: scientific, environmental and social. The Agency involves the best scientific skills for conducting high quality research and projects, with the constant concern of protecting individuals and the environment. It can prove the thoroughness of its management and can provide the authorities and the public with all information they need for a completely transparent debate on radioactive waste management.

This Agency's mission includes three complementary duties, giving it a complete picture of radioactive waste management: industrial operator, research manager, responsible for radioactive waste information and inventory, and of the characteristics of this waste.

On the industrial side, the aim is to continue to improve exemplary operation of the existing repositories, with a permanent concern for safety and protection of individuals and the environment. In terms of research, the Agency is pursuing an active policy of knowledge acquisition, so that it is in possession of all the skills necessary for the design, assessment and implementation of management solutions. With regard to information, the Agency is working in two directions:

- the search for an even more exhaustive inventory of radioactive waste, in order to improve knowledge of the current situation and obtain reference scenarios for the future;
- greater public access to verifiable factual evidence concerning the status of radioactive waste, its location, the problems it raises, the solutions proposed or implemented and the management channels.

The ANDRA's quality policy is based on a set of requirements common to all the Agency's roles: consistency in the Agency's approaches, thoroughness, simplicity allowing greater transparency in ANDRA's actions, shared information, dialogue and explanations.

The ANDRA thus set up a quality and environment system meeting all the requirements of the ISO 9001 (quality, 1994 version) and ISO 14001 (environment) standards, as well as the provisions of the order of 10 August 1984 applicable to basic nuclear installations (Aube and Manche repositories, and study of new repositories). It had its organisation certified compliant with ISO 9001 and ISO 14001 by a certification organisation in April 2001. Through its continued efforts, monitored by internal audits and six-monthly external audits, the ANDRA will maintain these certifications of compliance with these standards and their future updates.

The ANDRA's contractors are monitored primarily through an association (law of 1901 on non-profit organisations) which brings together various companies in the nuclear sector, known as “group C” (see § F.3.2.2 and F.3.2.3). This association has drawn up a baseline of common requirements, evaluates the suppliers by means of audits conducted by qualified auditors and declares acceptance of their quality system for a 3-year period which can be renewed.

F.3.2.2 CEA quality assurance policy and programme

From the 1950s, procedures coming close to a "quality" approach were set up, particularly with regard to nuclear activities. The first CEA general quality manual dates from 1993. At present, the CEA is expanding and consolidating its existing "quality" processes, primarily by assimilating the guidelines set out in the 2000 version of the ISO 9000 standards, and by defining methods and reference frameworks so that the CEA's main activities can be based on an appropriate set of good practices. The quality, security and safety culture is seen as a priority means of implementing the multi-year contract between the State and the CEA (2001-2004).

The fundamental principles underlying this approach were formalised in 2001 in a new version of the quality manual, covering the various types of activities at the CEA (continuous activities, thematic actions, construction projects and research projects).

The CEA's main central quality actions concern setting up project-based management, identification of processes, control of their interfaces, and provision of accessible, updateable guides. The CEA is expanding the implementation of quality management systems and the various directorates are working towards certification (ISO 9001 and 14001), or accreditation of their laboratories (ISO 17025, good laboratory practices).

The Technological Research Directorate is preparing renewal of its ISO 9001 certification (design, production, delivery and maintenance) by incorporating the requirements of the 2000 version of the standard.

The Nuclear Power Directorate, which, in particular, is in charge of the CEA's fuel and waste processing and storage facilities, has obtained ISO 9001 (laboratories and processes) and ISO 9002 (transport of radioactive effluents) certification at Cadarache and Saclay. It is now looking to extend these certifications to the experimental study of irradiated fuels and materials and then gradually to all activities within the directorate.

Upstream of applied research, the fundamental research teams have continued their involvement in innovative approaches aimed at formalising and guaranteeing the quality of their work. The CEA is also taking part in the work done by the "Quality for Research" standardisation committee, set up by the French standards association (AFNOR) the first stage of which led to publication of a French standard which will constitute a reference for future European standardisation.

For all of its activities, the CEA is continuing and intensifying the quality assurance policy it set up under application of the order of 10 August 1984. With regard to the design, construction, operation and dismantling of basic nuclear installations assigned to management of radioactive waste, the CEA also uses ISO 9001 standard.

Implementation of this order and incorporation of the ISO 9001 standard into the management systems were evaluated in 1997 and then in 2001. This showed that the order was extensively implemented in the facilities, as well as in the support and supervision units, and highlighted good degree of control of the operating processes. Good practices were identified and made available to all units. Comments and nonconformities were revealed, justifying corrective actions.

The CEA's contractors are monitored primarily through an association (law of 1901 on non-profit organisations) which brings together various companies in the nuclear sector, known as group C (see § F.3.2.1 and F.3.2.3). This association has drawn up a baseline of common requirements, evaluates the suppliers by means of audits conducted by qualified auditors and declares acceptance of their quality system for a 3-year period, which can be renewed.

F.3.2.3 COGEMA quality assurance policy and programme

The managers of the COGEMA group are committed to a policy of environmental excellence and sustainable development. This commitment is a response in depth to various concerns within the company, such as quality, safety, security, environmental impact, economic results and social well-being.

This commitment is an extension of the other steps taken in these various fields, since the company was created, with the aim of satisfying the customers and partners of all types, and ensuring the continuity of the company. It is expressed in the terms of the following charter:

- constantly improve the group's knowledge of the environment and the environmental impact of COGEMA's activities;
- anticipate changes in regulations by setting discharge and release targets that are always lower than the limit values set by the authorities;
- implement human and material environmental management and hazard prevention resources tailored to the specific nature of each site;
- design installations and processes allowing constant optimisation of consumption, reduction of discharges, waste and detrimental effects and encouraging recycling of the materials and energy produced;
- develop environment analysis and monitoring practices to identify all the impacts and rank them so that those with the greatest significance for the environment and human health are dealt with as a priority;
- involve everyone working for COGEMA in this effort to achieve environmental excellence, so that they are all aware of the need to protect the environment on a day to day basis, through responsible working practices and attitudes;

- involve the customers, partners, subcontractors and suppliers of the group in this approach, by reinforcing hazard prevention and environmental protection aspects of their contractual and commercial relations;
- give free access to precise, clear and full information concerning COGEMA's activities, their impact on the environment and the means used to monitor and reduce them;
- dialogue with everyone concerning the environment, in order to compare experiences, understand the expectations of the public and the group's customers and identify new areas for progress;
- evaluate the economic and social aspects of the group's environmental performance.

In the field of quality, the first COGEMA quality assurance manual was published in 1978, two years after the company was created. It was added to over the years, leading to ISO 9000 certification of all the establishments concerned by reprocessing-recycling. This certification is periodically re-assessed.

The quality order of 10 August 1984 was incorporated into the procedures and appears as such in the quality assurance manual. It is a key element of the safety objectives.

Under application of this order, COGEMA monitors its contractors and subcontractors and, before selecting them, assesses their ability to meet the safety requirements. COGEMA in particular relies on the Group C files. This quality assurance consultation group in particular includes the ANDRA, the CEA, COGEMA, COMURHEX, EURODIF Production, MELOX and SGN. It pools the supplier evaluation expertise of its members and the quality assurance requirements are passed onto the contractors based on Group C specifications, which take account of the NF EN ISO 9000 series of standards, while adding the need to comply with the 1984 quality order.

Furthermore, with a view to total quality and continual progress, incorporation of the EFQM (European Foundation for Quality Management) management system model began in the mid-90s and is currently continuing.

Along the same lines, but in a more specific field (which nonetheless falls within the sustainable development category), an environment-related approach has been undertaken and led to ISO 14001 certification of all the establishments concerned by reprocessing-recycling.

Finally, in their own field, the discharge and environmental analysis laboratories at La Hague are accredited by the COFRAC (French accreditation committee) as compliant with the requirements of standard NF EN 45001 covering calibration and testing. This implies regular calibration of the detectors with secondary control standards connectable to the primary standards for cross-comparison with other laboratories, both national and international (independently of the regulatory cross-comparisons with the IRSN).

Among other actions specific to sustainable development, one should note the gradual implementation of progress indicators combining the concerns for quality, safety and the environment, and efforts made towards greater transparency. With regard to this last point, the creation of a web site concerning the La Hague plant should be noted, as should the site's extreme willingness to receive visits, COGEMA's participation in the La Hague special standing information committee and in the work performed by the North-Cotentin radio-ecology group (GRNC), publication of brochures, and so on.

F.3.2.4 EDF quality assurance policy and programme

The steps taken by EDF with regard to the quality of spent fuel management and waste management, as well as of its dismantling activities, are part of its general quality and safety organisation.

Within the context of its industrial vocation and its public service duty to produce electricity, it is up to EDF to guarantee that the design, construction and operation of its nuclear fleet are both safe and efficient, technically and economically. Quality policy helps to ensure this and can provide the proof needed to generate confidence and trust, which is a precondition to nuclear power becoming accepted by the community.

There are thus three objectives:

- to consolidate what has been achieved and improve the results wherever necessary;
- to encourage support of the stakeholders for the quality system, one of the essential preconditions to correct implementation;
- to obtain a quality system meeting the French regulatory requirements and international quality recommendations.

Design, construction and operation are the keys to correct working of the power plants. The quality policy primarily covers safety-related activities and relies on the following guidelines.

- Developing the EDF quality system on the basis of what has been achieved

The need to guarantee safety in the nuclear power plants led EDF to develop a quality system based on:

- personnel competence;
- work organisation;
- formalisation of methods.

Acquired experience will lead to development of the quality system regarding the following points:

- having a complete picture of all activities;
- prior reflection;
- the need to tailor quality system requirements to the activities of importance for safety, availability, cost control and human resources management.

- Using the EDF quality system as a professional tool

The fundamental responsibility for quality when carrying out an activity lies with the persons in charge of doing it. This is why their competence, experience and culture is vital to attaining the desired level of quality.

The quality system is the umbrella covering all these individual actions. It ensures overall quality and the corresponding quality assurance. It is based on the participants and provides them with methods, organisation and tools, with which they can enhance their know-how.

Within the framework of the quality system, the hierarchy has a key role; it must be heavily involved by explaining the issues, allocating resources, defining objectives and priorities and setting an example.

- Tailoring the EDF quality assurance requirements to the importance of the activities

Activities of importance to the issues of the nuclear power plants are identified. Each activity is analysed beforehand. This analysis concerns the problems inherent in the activity and the consequences (in particular for safety) resulting from the possible failures at each step in it.

This highlights the quality aspects essential to the activity, in particular the required level of quality, leading to the appropriate quality assurance provisions, in particular the pre-determined methods and procedures to be applied. These pre-determined provisions are a tool for use by the party concerned. By constantly questioning and suggesting improvements, a responsible player contributes to making this tool even better.

- Giving EDF the organisation and resources it needs

Attaining quality targets requires that the activities be clearly assigned and that the roles, responsibilities and co-ordination between the various players be defined at all levels within the company.

The human and technical resources, along with the methods and procedures, are adapted to the level of quality required.

To guarantee the quality of its services, EDF monitors the activities entrusted to its contractors. This monitoring in no way relieves the contractor of its contractual responsibilities, in particular those concerning implementation of quality assurance rules. The contracts between the principal and the contractors clearly define the responsibilities of each party and the applicable requirements.

- Guaranteeing EDF quality through appropriate checks

The quality of an activity depends primarily on those carrying it out. Conducting checks is a way of guaranteeing this quality. They concern compliance with the requirements defined during the prior analysis of and control over all activities and interfaces.

These processes are tailored to the importance of the activity and apply at all levels, from the individual person up to the system as a whole. As necessary, they include:

- self-checks;
- checks by another qualified person able to offer a critical view;
- checks conducted with sufficient distance and independence to ensure correct implementation of the quality system.

This arrangement contributes to defence in depth.

- Confirming quality at EDF through traceability

The attainment of quality is confirmed by documents produced at all stages in the activity, from prior analysis to subsequent report. Conservation of these documents ensures that the operations are traceable, in particular with respect to safety.

- Anticipating, preventing and progressing at EDF

To prevent defects and improve results, an experience feedback process is used. This approach is based on collection of deviations, analysis of them and a search for their root causes, as well as on validation of good practices and their widespread use. The experience of the EDF nuclear fleet is enhanced by incorporating experience from other operators.

As part of this approach, indicators highlight trends and enable preventive measures to be taken. The indicators in place must be few in number, determined according to the particular goal and defined with the participation of the parties concerned.

Periodic reviews allow taking stock of what has been achieved and defining the aspects on which the improvement effort is to be concentrated.

Implementation of monitoring by EDF

EDF in particular monitors:

- the transport chain, conducting audits and spot checks with the transporters;
- spent fuel reprocessing operations at COGEMA in La Hague.

F.3.3 Analysis by the ASN

Experience feedback of incidents or accidents occurring in nuclear facilities and the various inspection findings' reports enable ASN to analyse the malfunctions that have occurred and thus assess implementation of the quality order. Furthermore, an overall examination of the operators' quality and safety organisation is conducted regularly. This was the case for the CEA in 1999.

BNI maintenance operations are for the most part subcontracted to outside companies by the operators. This activity concerns about 40,000 people every year. While setting up this type of industrial policy is the choice of the operator, the Nuclear Safety Authority checks that under application of the ministerial "quality" order of 10 August 1984, the operators nonetheless exercise their responsibility for the safety of their facilities by implementing a quality process, in particular concerning monitoring of their contractors. The subject of "contractor monitoring" was in fact one of the inspection priorities in 2001 for basic nuclear installations other than power reactors. In particular, each facility in the fuel cycle was inspected on this topic and the la Hague site underwent 5 inspections on this topic. This corresponds to a total of 11 inspections on the subject of contractor monitoring, for the facilities in the fuel cycle.

Generally speaking, the nuclear industry pioneered quality assurance in France, thanks to the order of 10 August 1984 which requires that adequate measures be taken on this subject and there are now widespread quality references (in particular the ISO 9000 and ISO 14000 standards) in the industry. Nonetheless, it would seem that the requirements of the order of 10 August 1984 remain up-to-date and in certain areas even go further than the international standards (in particular with respect to operator monitoring of the operations performed by its contractors).

The ASN observed that quality assurance requirements are on the whole met by the main nuclear operators.

F.3.4 The case of ICPEs and mines

French waste legislation places responsibility for disposal with the party producing or in possession of the waste. It organises monitoring of the disposal channels by requiring submission of a declaration by certain producers, transporters and disposal facilities operators for waste having detrimental effects.

Like all special industrial waste, the radioactive waste produced by the ICPEs must be subject to special precautions at collection and storage (appropriate packaging and labelling), during shipment (compliance with regulations for the transport of dangerous goods) and processing (must be carried out in a facility authorised by legislation concerning installations classified on environmental protection grounds). For all these operations, the administration must be informed. A follow-up form (BSDI) must be issued and each intermediate operator must keep a copy of it. The processing centre must return the last page to the producer within one month, to confirm that the waste is effectively in its possession.

Any producer of special industrial waste (DIS) who sends a load of more than 100 kg of waste to a third party must transmit a follow-up form. This form accompanies the waste up to the destination facility, which can be a disposal facility, a grouping centre or a pre-processing facility. The producer must send a sample of its waste to the operator of the destination facility, to obtain its approval prior to shipment. The key data mentioned on the form are:

- the identity of the waste producer;
- the characteristics, quantities and destination of this waste;
- the means of transport and disposal of the waste;
- the identity of the firms concerned by these various operations.

F.3.5 The case of radioactive sources

The special licensing conditions for the manufacture, possession, distribution and use of radionuclide sources, which are included in the current regulations, provide for measures to identify their movements.

Responsibility for tracing these movements (acquisition, transfer, import, and export) lies with the IRSN, which notifies the ASN accordingly. This management is made easier by the use of dedicated software, of which the design and operation anticipate the implementation of quality assurance.

F.4 Operational radiation protection (Article 24)

1. Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility:

i) the radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account;

ii) no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection; and

iii) measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.

2. Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited:

i) to keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account; and

ii) so that no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.

3. Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility, in the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects.

F.4.1 Request of the Regulatory authority

All regulations concerning protection of workers and the public against radiation due to the use of radioactive material or other sources of ionising radiation are described in section E.2. The same section presents environmental protection regulations, in particular in terms of radioactive discharge permits and management of radioactive sources.

Provisions taken regarding the general environmental monitoring together with monitoring around BNIs as well as the measured releases are presented in appendix (see § L.6).

F.4.2 Presentation by BNI operators of radiation protection measures taken

F.4.2.1 Radiation protection and minimisation of effluents at the ANDRA

Radiation protection and minimisation of effluents are key areas of the ANDRA's environmental policy.

F.4.2.1.1 Radiation protection objectives

The ANDRA considers that for the public, the dosimetric impact of the disposal facilities in normal operation should be at a level as low as reasonably achievable and should not exceed a fraction of the regulation limit set by directive 96/29 Euratom of 13 May 1996 transposed by decree 2001-215 of 8 March 2001, that is 1 mSv/year. The ANDRA has set its target to 0.25 mSv/year. This guideline is consistent with the recommendations of the IAEA, the ICRP or the French basic safety rule applicable to the design of high level or long-lived waste disposal facilities.

With regard to workers, the ANDRA decided not only to apply European directive 96/29 but also to set a more ambitious target. Given the growing importance of the principle of optimisation and the experience feedback from the Aube repository, as early as the design stage, the ANDRA set itself the operational protection goal of not exceeding an annual dose of 5 mSv/year. This goal should be reached for the ANDRA personnel and the outside personnel working in the ANDRA facilities.

F.4.2.1.2 Surveillance by the ANDRA

Surveillance of the impact of the repositories operated by the ANDRA involves application of a surveillance plan proposed by the ANDRA and approved by the ASN. The surveillance goals concern 3 subjects:

- verification of the lack of impact;
- checking of compliance with regulatory requirements;
- detection of any anomaly as early as possible.

Radiological measurements are taken of the air, surface water (rivers, run-off water), underground water, rainwater, river sediment, flora and the food chain (milk for instance). The personnel in the facilities undergo individual dosimetric monitoring.

The surveillance results are periodically forwarded to the ASN. Both the Manche repository and the Aube repository publish quarterly brochures distributed to the public and to the press. They are presented to the local information committees of the installations.

In the Manche repository, which has now entered the surveillance phase, the maximum annual individual dose rate recorded on the personnel working in the facility in 2001 was below the detection threshold. It was 3.2 mSv in the operational Aube repository.

The ANDRA also completed radiological surveillance of the disposal facilities by surveillance of the physico-chemical quality of the water and by ecological monitoring of the environment.

F.4.2.1.3 Effluents and discharges from ANDRA's facilities

In order for the Manche repository to make the transition to surveillance status, the disposal structures were protected from rainwater by alternating layers of permeable and impermeable materials, in particular including a bituminous membrane. The result is a very significant reduction in the volume of water collected at the base of the disposal structures (by a factor of about 100 between 1991 and 1997); this water is then processed in the COGEMA La Hague plant.

Furthermore, as the regulatory process for transition to surveillance status is conducted in the same way as for the construction of a basic nuclear installation, the ANDRA submitted in 2000 a request for a radioactive discharge permit, at the same time as its authorisation application. This application dealt on the one hand with surface water (rainwater, water collected above the bituminous membrane) and its discharge into the river, and on the other with the water collected at the base of the structures, transferred to the COGEMA plant at La Hague. The discharge orders were issued on 11 January 2003 and constitute the regulatory reference system for the Manche repository.

With regard to the Aube repository, and given the very low level of radiological activity concerned by the effluents, the circular from the Central Service for Protection against Ionising Radiation (The radiation protection regulatory authority at that time) of 19 July 1991 defined the requirements concerning the activity of water leaving the facility's stormwater tank: 0.0008 Bq/l for alpha activity, 0.8 Bq/l for beta activity, 400 Bq/l for tritium. Since operations began, up to the end of 2001, the maximum values recorded have been 22%, 3% and 0.3 % of these limits respectively.

Changes to the regulatory picture, particularly the enactment of the decree of 4 May 1995 implementing the water law of 3 January 1992, led the ANDRA to submit an application for a non-radioactive discharge permit in 1997. After publication of the order of 26 November 1999 defining the general requirements for effluent discharge and/or intake of water, the ANDRA completed its dossier and in

June 2002 submitted an application for a liquid and gaseous radioactive discharge permit and a request for modification of the decree authorising the Aube repository.

F.4.2.2 Radiation protection and minimisation of effluents at CEA

The CEA attaches considerable importance to protecting workers, the public and the environment, from design of the facilities, through operation, to dismantling, paying particular attention to limiting exposure of workers and effluent discharges, and to monitoring their impact on man and his environment. To meet the discharge reduction targets and thus reduce their health impact, the CEA relies on making those in the operational chain more aware and more conscious, on implementing effluent treatment technologies that are as efficient as is socially and economically reasonable, and finally on permanent monitoring of effluent discharges and monitoring of the environment.

F.4.2.2.1 Radiation protection of workers

Steps to control external and internal exposure of CEA workers at the workstations are taken as of the design of the facilities and continue through their operational life and, for some of them, through to dismantling.

This approach is the result of applying the principles of justifying practices, minimising doses and the number of persons exposed, and limiting exposure to below predetermined dose targets. Every operation involving exposure to radiation is conducted in accordance with the ALARA optimisation principle.

The optimisation process concerns both the layout and fitting out of the premises. This layout is designed both to facilitate tasks and minimise task duration and avoid having to pass near or stay near radiation sources. It takes account of operational requirements and those linked to monitoring, maintenance and disposal of waste, whether process waste, contaminated materials or radioactive materials.

This optimisation process is associated with a work organisation providing for both classification and monitoring of the premises, along with classification, protection and supervision of the workers:

- classification of the work premises, defined to take account of the radiological hazard encountered and often determined as early as the design of the facilities, is checked and updated throughout operation of the facilities according to the results of radiological surveillance exercised at the workstation;
- classification of the workers for its part depends on the level of exposure liable to be received at the workstation. To limit this exposure, protective measures are taken, concerning on the one hand the installation of biological shielding, using the principle of defence in depth (several physical barriers between the radioactive source and the environment), and on the other the use of dynamic containment supplementing the static devices, by establishing a negative pressure cascade circulating air from the least contaminated areas to the most contaminated areas;
- radiation protection supervision of the workers is ensured by collective real-time measurement systems (external and internal exposure), by individual dosimetric monitoring and by medical supervision appropriate to the radiological hazard likely to be encountered.

The steps taken have in recent years enabled workers' exposure to be reduced on all CEA sites. The average annual dose per worker actually exposed (dose higher than the detection threshold) has gone from 2.1 mSv in 1992 to 1.0 mSv in 2001. In 2001, of 9200 monitored employees working in the CEA's facilities, only 6% received a measurable dose. For the same year, the maximum dose received by an employee working at the CEA is equal to 9 mSv and only 16 persons received a dose higher than 5 mSv. With regard to the risk of contamination, no internal exposure higher than $1/10^{th}$ of the annual limits was recorded in 2001.

Although the exposure levels are low, the optimisations process is currently continuing in the following directions:

- continued campaigns to increase personnel awareness of the ALARA approach;
- installation of direct read-out individual electronic dosimetry to encourage experience feedback and make it easier to use within the ALARA approach;
- determination of operational dosimetry objectives for the personnel and subcontractors;
- definition of working methods to formalise and generalise implementation of this approach.

F.4.2.2.2 Exposure of the public

The design of the biological shielding of the facilities adjoining zones accessible to company employees who do not normally work in regulated zones, or to members of the public, is evaluated on the basis of a level of exposure that is as low as reasonably achievable, below the regulatory limit set at 1 mSv per year.

The same applies to the public outside the perimeter fencing of the various CEA centres. The level of exposure is monitored both inside the site and at the fencing by a large number of periodically recorded dosimeters. These provisions are supplemented by real-time, continuous measurement of the dose rates by detectors installed in the measurement stations positioned around the CEA centres. All these continuous measurements are transmitted in real-time to the environment control centre in the facility concerned.

The values recorded with these provisions are approximately the same as the ambient natural background radiation level.

F.4.2.2.3 Reduction of effluent discharges

Discharge of radioactive effluents into the environment by the CEA's facilities is subject to the general regulations (see § E.2.2.4.3), and to the regulations specific to each site (inter-ministerial order), which define the limits authorised for discharges (annual and monthly limits, maximum concentration added to the receiving environment), discharge conditions and the environment monitoring procedures. Well before the first discharge permits are issued by the authorities (as of 1979), the CEA tackled the task of controlling its discharges of radioactive effluents into the environment, monitoring them and measuring their impact, while trying to keep them as low as possible.

A process of revising the decrees authorising discharges for the CEA's centres was begun by the Nuclear Safety Authority at the end of the 1990s. This should lead to a reduction in the centres' discharge permits and, for the new facilities, by the publication of authorisation orders per facility.

Before discharge into the environment, the gaseous effluents are treated by filtration and liquid effluents by physical and/or chemical separation. After purification and before discharge into the environment, a thorough check is conducted in accordance with the requirements of the regulations.

The discharges are monitored by the Radiation Safety Units (SPR) of the CEA centres, under the supervision of the Safety Authority. For at least the last twelve years, and on all the sites, radioactive effluent discharges have always been lower than the limits set by the ministerial orders.

Monitoring of liquid effluent discharges covers the activity of alpha, beta and gamma emitting radionuclides, typically measured by global counting, as well as that of tritium, measured by liquid scintillation.

Analysis of the results highlights a significant drop in all discharges over the last twelve years. At the end of 2001, liquid discharges of beta-gamma emitters and of tritium accounted for less than 5% and 8% respectively of current discharge permits. Alpha emitter discharges, which are over-evaluated because of the sensitivity limits of the measurement methods, stand at about 20% of the authorised limits.

Atmospheric discharges are monitored on the basis of the aerosols generally measured by global counting, of halogens measured by gamma spectrometry, and of tritium measured by scintillation after trapping in bubblers. Discharges of other gases, identified by spectrometry, are measured with an ionisation chamber.

In the same way as for liquid discharges, analysis of the results of the last twelve years shows a significant drop in discharges. The 2001 totals show tritium discharges of no more than 8% of the authorised limits, halogen discharges not in excess of 2% of the limits and aerosol discharges of less than 1%. Discharges of other gases, over-evaluated owing to the sensitivity limits of the methods used, represented less than 30% of the annual regulatory limit.

The dosimetric impact of the radioactive discharges remains very low. In highly penalising conditions, calculation of this impact using the year 2001 discharges as the source term, leads to annual values never in excess of 5 microsieverts for the reference group most exposed both to gaseous discharges and liquid discharges from the Saclay site. For the other CEA sites, the dosimetric impact is less than one microsievert, which should be compared with the reference values such as the regulation limit for the public (1 mSv/year) or the annual average dose equivalent resulting from natural radioactivity, which is about 2.4 mSv/year in France.

F.4.2.2.4 Environmental monitoring

Environmental monitoring, which is also carried out by the SPR in the CEA centres, under the supervision of the Safety Authority, contributes to checking that the potential impact on the environment of the discharges from the centres remains well below the regulatory limit values for the public, and below those evaluated using modelling of radioactivity transfers from the environment to man.

An environmental monitoring plan is defined by each centre and validated by the supervisory authorities, to monitor the influence of the discharges on the various environments.

Environmental monitoring includes the continual monitoring conducted on the releases from the gaseous and liquid discharge outfalls into the environment, but also that performed by the monitoring stations equipped with systems for continuous monitoring of the radioactivity in the water and air and the ambient gamma radiation. This alert function for real-time detection of any abnormal operation of an installation is combined with ex post measurements in laboratory, constituting the CEA centres discharge impact monitoring and control function.

The radioactivity measurements in particular concern the air (aerosols), surface water upstream and downstream of the site, underground water below the site and outside it, as well as vegetation, milk and the main crops in the region. They are carried out on representative samples at points selected using meteorological, hydrological and socio-economic criteria, but also on the basis of experience feedback. Monthly monitoring of these various environments involves checks through total alpha and beta counting and specific measurements by liquid scintillation (H-3, C-14...), gamma spectrometry (traces of fission or activation products) or by counting after selective separation (Sr-90).

This regulatory monitoring is supplemented by annual programs conducted on various compartments of the environment, such as sediments, aquatic flora and fauna, during which more sensitive analyses than operational monitoring are employed, or other physico-chemical parameters are used.

Analysis of the radio-ecological measurements confirm that there is no significant impact by current discharges from the CEA's civilian centres on their environment, with the main exception of tritium. This tritium, partly attributable to old activities, can be detected in underground water below a few sites and in their immediate vicinity, or in the receiving environment just downstream of the liquid effluent discharge, but in concentrations which have dropped significantly in recent years and are generally below 100 Bq/l.

It is sometimes detected in vegetation downwind of the prevailing winds around atmospheric tritium discharges, but is only very rarely detected in milk.

In the aquatic and terrestrial environments, and with the exception of sediments in which traces of artificial radionuclides can be measured, no artificial radionuclide other than tritium is detected at levels higher than one becquerel per litre or one becquerel per kilogram of material.

F.4.2.2.5 Information and competence

All the results are transmitted to the supervisory authorities and are published in monthly and annual reports made available to the public (web site "www.asn.gouv.fr", videotext "36.14 MAGNUC" or in brochures published by the CEA). All CEA sites maintain regular contacts with their local authorities and with the local information committee, whenever there is one.

Accreditation of the CEA's environment monitoring laboratories by the COFRAC (French accreditation committee) is a further guarantee of the credibility of the measurements made by these laboratories, which also take part in a number of cross-comparisons organised by the ASN or by other national and international bodies.

F.4.2.3 Radiation protection and minimisation of effluents at COGEMA

F.4.2.3.1 Radiation protection and releases

F.4.2.3.1.1 Exposure of the workers

Control of worker exposure has always been one of COGEMA's main responsibilities. When the facilities currently in service on the La Hague site were designed in the early 1980s, the design limit for the workstations was set at 5 mSv/year, in other words one quarter of the limit stipulated by Europe 15 years later. It was clear at the time that this dose was due only to external exposure as work was only carried out in zones with no permanent contamination.

Experience shows that this target was easily reached, as the average individual exposure of the personnel working in the La Hague plant in 2001 was as low as 0.072 mSv (for COGEMA personnel and subcontractors), the maximum dose recorded being 5.4 mSv.

These results were obtained using the following means:

- upstream, by designing efficient and reliable process equipment, this result being achieved through extensive R&D programmes;
- making widespread use of remote control of operations;
- conventionally, by installing shielding (biological protection) appropriate to all foreseeable operating and maintenance situations;
- ensuring extremely stringent containment of the facilities: a minimum of two complete physical barriers are placed between the radioactive materials and the environment. The chemistry equipment is completely welded and enclosed in leaktight cells, while mechanical equipment is fitted with dynamic containment systems (negative pressure, air curtains) and placed in closed cells in which the mechanical penetrations to the working zones were particularly closely designed. Dynamic containment supplements the static arrangements, by establishing a negative pressure cascade ensuring that air circulates from the least contaminated to the most contaminated zones. Ventilation is by a number of complete and separate systems, depending on the level of contamination of the ventilated premises, so as to avoid contamination backing up in the event of a ventilation malfunction. The process equipment in particular is ventilated by a completely separate network, including for the atmospheric discharge chimney. All these means ensure that the premises can be kept operational in conditions of cleanness that rule out internal exposure;

- taking account at the design stage of all maintenance operations, which leads to the equipment being designed on the basis of these operations, in particular so that consumables (pumps, valves, measurement sensors, etc.) can be replaced remotely, without any breach in containment and with full biological protection (use of mobile equipment replacement casks).

F.4.2.3.1.2 Exposure of the public

The provisions adopted limit exposure around the buildings to values which are practically indistinguishable from the natural background radiation level. Visitors moving around inside the site cannot therefore receive doses which exceed the dose limits recommended at national level.

Moreover, the same apply to the public outside the site perimeter fencing.

The radiation level is monitored inside the site and at the fencing by a large number of regularly checked dosimeters (15 on the fence), supplemented by eight stations at the perimeter fence which permanently monitor the dose rate. Finally, continuous measurements are taken in five neighbouring villages. All the continuous measurements are transmitted to the site's environment control centre.

F.4.2.3.1.3 Minimising releases

The construction measures adopted for normal operation and to counter any external hazards (earthquake, falling object, flooding, explosion, etc.) rule out unplanned and uncontrolled releases.

F.4.2.3.2 Impact of discharges

Reducing discharges and their impact has always been one of the prime concerns of the CEA, and then COGEMA, jointly with the authorities. The choice of site in particular was led by this concern.

Discharge permits have always been issued on the practical basis of dose constraints far lower than the health regulatory limits. Furthermore, the process installations can only be authorised if they are safe enough to ensure that the risk of an uncontrolled release is kept at a very low level. Very low probability events must nonetheless be considered as part of a "beyond design" approach, whenever their consequences are potentially high, and steps must be taken to limit them. In these conditions, we can consider that the risk of exposing an individual to doses exceeding the nationally prescribed limits owing to discharges, is extremely low.

The principles adopted are the following:

- use of a stringent containment system to prevent losses, as mentioned above;
- optimisation of processing of by-products, the main priority being to recycle them as much as possible in the process, with the second priority, for those which cannot be recycled, being to send them whenever reasonably possible for processing as solid waste (preferably with vitrification, or failing which with compacting and/or cementing). The remainder is discharged either into the atmosphere or the sea, depending on what is technically possible, preferably where the impact on the reference groups is minimal;
- when selecting various options, taking account of worker exposure and the hazards caused to the population and to the workers.

In application of these principles, the effluents are collected and then processed as far as possible to recover all reagents, purify them and if necessary convert them to be able to recycle them in the process, with the rest being concentrated and sent with the radionuclides contained to solid waste, mostly disposal by vitrification, which is the most compact and effective means of packaging radionuclides. Some parts of the process which produce effluents that can be neither vitrified nor concentrated (such as certain laboratory samples) were modified in order to eliminate production of radioactive effluents.

For example, all the aqueous solutions used to rinse the structural elements of fuel assemblies (top and bottom end-pieces and cladding debris) are recycled in the dissolution solution prepared with highly concentrated nitric acid, itself recycled, concentrated and purified by evaporation after the other products (fission products, uranium and plutonium) have been extracted from it during the process. This is also the case with solvent and thinner, which are cleaned of their radioactivity and the degradation products they contain by vacuum distillation in a special evaporator. The residue in this case cannot be vitrified and is packaged as solid waste by encapsulation in cement, after being calcined in a dedicated unit. This is a first and extremely important way to reduce the volume and activity of the effluents.

For solutions which cannot be recycled, the old effluent management process was based on sorting according to activity level. High level effluents were all sent for vitrification, while intermediate and low level effluents were collected and sent separately to the STE3 effluent treatment station, without breaking down the batches, whatever the origin, acidity and chemical content (insofar as it was compatible with the STE3 equipment and process). The very low level effluents, which normally receive no activity and are thus known as "V" effluent, standing for "to be verified", were stored, checked in batches to verify that their activity was indeed lower than the prescribed threshold, then filtered and discharged into the sea, between the radioactive effluent discharge periods, which have to take place during periods of strong tidal currents.

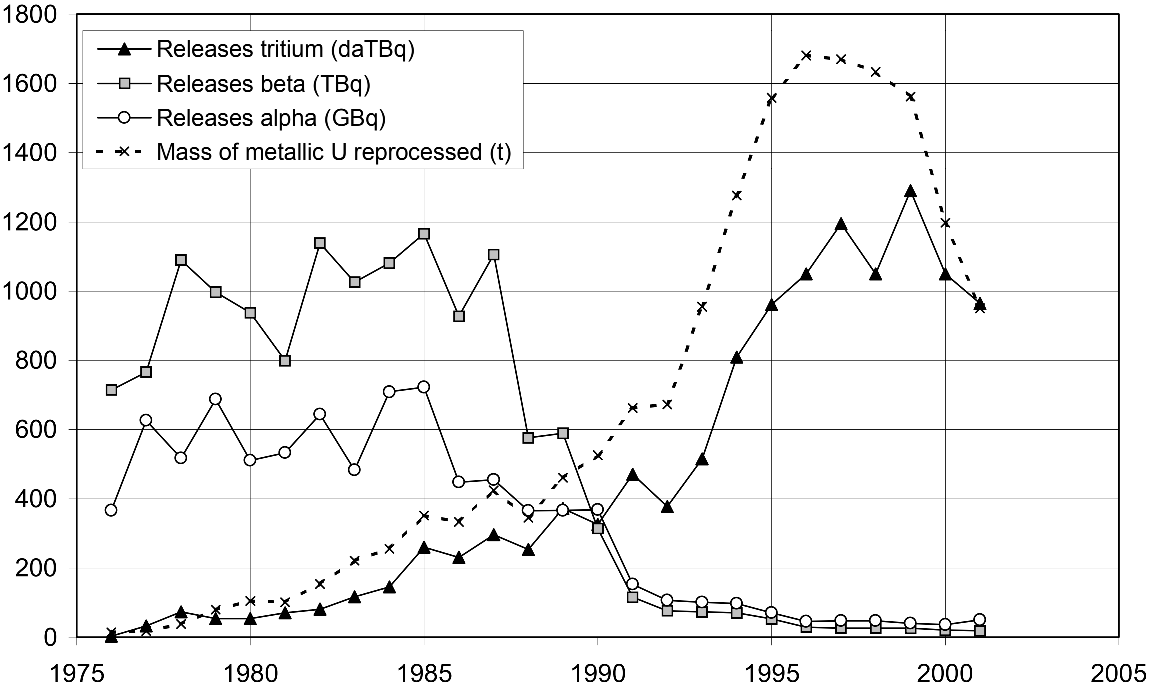
As part of the "new effluent management" policy, as it is known by the operator, high level effluents are still sent for vitrification. The difference lies in the intermediate and low level effluents, which are now collected on the basis of their acidity, with acid effluents on one side and bases on the other. Instead of being sent to the effluent treatment station for sorting according to activity level, they are concentrated in dedicated evaporators installed that could be installed in such a way that operation did not have to be halted. Most of the products which are fed into the acids and bases evaporators exit in the form of distillates which are virtually free of contamination and can then be considered "V" effluents and discharged as such. The residual concentrate contains the entire radioactivity and thus becomes high level effluent (but of far smaller volume than the initial effluent), and is sent for vitrification with the other high level effluents. This is a second and also very important ways to reduce the activity and volume of effluents, and also that of the solid waste.

These technical developments were made possible in UP 2-800 and in UP 3-A thanks to significant improvements resulting from a new implementation of the process in these plants. This led to a substantial reduction in the quantity and activity of effluents (improved decontamination factors). This reduction enabled the effluents to be concentrated in evaporators of reasonable size, which could then be fitted into the free space in the plants. It was impossible to use this type of arrangement in the old plants which employed far less efficient processes and process equipment.

The case of analysis laboratory effluents is a particular one. The activity they contained accounted for a large part of alpha activity and a small part of beta-gamma activity of the effluents before volume reduction was employed. Once most of the reduction mechanisms were in place, the proportion of beta-gamma activity they contained also became significant. The most important measures taken to deal with were to develop new on-line analysis techniques, which no longer required samples to be taken from the process, thereby eliminating one source of effluent, and also to develop plasma torch chromatography, which requires only very small samples and employs no unusual reagents, which also eliminates another part of the effluent stream. A few analyses of remaining plutonium solutions were the cause of the high alpha activity of the analysis laboratory effluents. Installation of a special plutonium recovery unit on this stream led to a significant reduction in the alpha activity discharged by the laboratory.

Following improvements to the control of the STE3 process which have been implemented since 1989 and which led to substantial reductions in discharge activity, implementation of the principles described above since 1991 has led to significant discharge reductions concurrent with a reduction in the volume of solid waste, as instead of being encapsulated in bitumen or cement, the radionuclides are sent for vitrification which is compatible with far higher level concentrations. In this way, discharges were not reduced at the cost of increased solid waste volumes, but simultaneously with improved compactness of this waste.

Discharges at sea from COGEMA La Hague plant since commissioning



The result of measures taken is particularly noticeable for discharges at sea (see figure above), which had risen appreciably during the period in which light water reactor fuels were being reprocessed in the old facilities. The impact of these discharges is now at a very low level, well below that required by regulations and international recommendations and by health considerations. In any case, the impact corresponding to gaseous and liquid discharges has never exceeded the current dose limits for the public (and therefore certainly never exceeded those which were applicable at the time). Application of the Best Available Technology (BAT) principle, nonetheless means that the reduction process must be continued, taking account of progress made in similar processes or operations, developments in scientific and technological knowledge, the economic feasibility of the new techniques and the time needed to implement them, as well as the nature and volume of the discharges considered.

The calculated impact values were confirmed by a particularly exhaustive study conducted by the 60 experts of the North-Cotentin radio-ecology group which, at the request of the government, examined all discharge values and more than 50,000 analysis results from samples taken from the environment by various bodies, and by the North-Cotentin 2000 exercise which revealed that environmental marking from the plant discharges was insignificant when compared with natural radioactivity and the fall-out from Chernobyl disaster and atmospheric testing of nuclear weapons, levels which were already very low.

F.4.2.3.3 Control of releases

Limiting the risk of release at the source makes it unnecessary to attempt to mitigate the effects, especially as the feasibility of this has yet to be proven. There is no justification for placing decay buffers on potential emission sources as the releases cannot concern radionuclides with high toxicity and very short half-life, as these have practically all disappeared through radioactive decay during the first months of decay on the reactor site, before being sent to the reprocessing site.

F.4.2.4 Radiation protection and minimisation of effluents at EDF

F.4.2.4.1 Radiation protection of workers

Any action to reduce the doses received by the personnel must begin with clear knowledge of the individual doses. The doses received by the workers can result from internal contamination or from external exposure to radiation. EDF's policy, referred to as the "clean power plant" policy, means that cases of internal contamination are rare and never serious. Most of the doses received can thus be attributed to external irradiation, and that is the targeted area for reduction. This policy and its results make a whole and it is therefore not possible to isolate the part strictly related to spent fuel and radioactive waste management: the following presentation deals then with the entire operation of nuclear power plants.

To better optimise and reduce the doses received by the exposed persons, EDF in 1992 launched the ALARA 1 policy. Major gains were then achieved with the collective dose dropping from 2.4 man.Sv per year and per reactor in 1992 to 1.08 in 2000 and 1.02 in 2001. This reduction is also the consequence of actions taken to limit the individual dose to 20 mSv per year as of 1999.

To continue to progress, EDF has launched a new ALARA programme, implementing the optimisation principle as a whole, in particular relying on development of quality-based radiation protection management.

This approach is based on three areas of progress:

- Reducing contamination of the systems

  Contamination of the systems is one component of exposure, the control of which must also contribute to reducing doses during operation and outages. This leads to action being taken to optimise the operating factors, in particular through chemical treatment and filtration.

- Preparing maintenance work by optimising the doses

  The process is the following:

  - make a forecast exposure evaluation for operations in controlled zones, in terms of collective and individual dose;
  - rank these operations according to the exposure (low, significant or high);
  - perform an optimisation analysis of these operations, varying according to the potential exposure;
  - set a collective and individual exposure target for each operation, resulting from this optimisation analysis;
  - conduct real-time monitoring of collective and individual exposure of these operations and analyse any deviations;
  - implement experience feedback with analysis of deviations and of good practices which will be of use for future operations.

  Preparation of the activities must include individual and collective exposure evaluation, with the analysis level depending on the potential exposure of the operation. The optimisation phase consists in lowering the previously evaluated doses.

  For work sites with an exposure issue, preparation of the activities must include an analysis of the site by a pair comprising a person with radiation protection qualification and a person responsible for design. The operation is examined phase by phase, workstation by workstation, to determine the most appropriate protection, tools and working methods. Individual and collective dose targets are set after optimisation.

The individual dose target is the indicator enabling the persons involved to detect any dosimetric deviation.

Optimisation is an iterative process as subsequent analysis of the work done allows further optimisation of future work.

The operational dosimetry put in place by EDF in the early 1980s and which became mandatory with the decree of 24 December 1998, amending decree 75-306 of 28 April 1975, allows real-time monitoring of the exposure of the workers involved during an operation and visualisation of any deviation from the targets set.

- Using and distributing experience feedback

  The second ten-yearly inspections for the 900 MWe plant series are also an opportunity to look closely at work sites with high potential exposure in order to learn lessons. Optimisation is an iterative process and subsequent analysis of how this work is done should lead to further optimisation of future work, while taking account of the economic and social criteria which constitute the other aspect of optimisation.

  To limit the doses which are received by the workers, EDF has anticipated the reduction in the annual limit to 20 mSv since 1999. Furthermore, exposure management alarm thresholds have been set at 16 and 18 mSv, allowing precise monitoring of persons approaching the future limits, in order to avoid any overshoot.

- Implementation of an ALARA approach to transports

  To optimise the exposure related to transport of radioactive materials, EDF employs an ALARA approach. In particular for shipment of spent fuels, the available data are used by the operators in charge of removal operations, but also by the designer in order to define the tools associated with the new casks.

F.4.2.4.2 Radiation protection of the public

EDF is committed to environment management certificated in accordance with the international ISO 14001 standard. This proactive approach comprises a number of objectives: continual improvement, control of impacts and prevention of pollution, combined with commitment to comply with the regulations. The new environmental regulations for basic nuclear installations, applicable in the short term, imply considerable and complex implementation work. These two approaches, one regulatory and the other voluntary are highly complementary and are mostly leading to the same actions.

The aim is certification of the 19 nuclear sites in operation by the end of 2004. The approach is devolved: each site conducts its own certification project with the corporate level providing support through pooled resources, and also handles follow-up and reporting.

F.4.2.4.3 Effluent discharges

The regulations concerning discharge of radioactive effluents comprise:

- general texts (decree of 4 May 1995 on discharge of liquid and gaseous effluents and water intake by BNIs, order of 26 November 1999 setting general technical requirements concerning BNI water intake and discharges, order of 31 December 1999 setting the general technical regulation aiming at preventing and limiting detrimental effects and hazards caused by BNI operations, etc.);
- specific ministerial orders for each site.

The general regulations in particular define:

- the procedures for obtaining discharge permits;
- the discharge standards and conditions;
- the role and responsibilities of the manager of the nuclear site.

The orders specific to each site in particular set:

- the limits not to be exceeded (authorised annual limits, maximum concentrations added to the receiving environment);
- the discharge conditions;
- the methods of the environmental monitoring programme.

The concentration limits are associated with annual total activity limits set not for reasons of public health and safety, but for reasons of good management. For a given type of reactor, these limits depend on the installed power. They obviously meet the previous health criteria with an acceptable margin, including for the larger sites.

This regulatory framework also implies implementation of the principle of optimisation, the aim of which is to reduce the impact of radioactive discharges to a level which is "as low as reasonably achievable, having considered economic and social factors ". This approach was integrated into the design of the facilities (installation of effluent treatment stations, etc.) and is reflected by stringent management of effluents during operation.

These measures led to a very significant reduction in discharges of liquid effluents, excluding tritium, (factor 100) which were originally the main contributor to impact on the environment and on health (dose).

The substantial reduction in liquid effluents except tritium observed for a number of years means that nowadays the dosimetric impact of the discharges from a plant is chiefly attributable to discharges of tritium and carbon 14.

The dosimetric impact of radioactive discharges nonetheless remains extremely low as it does not exceed about 0.001 mSv per year. This value is well below the natural exposure level in France (2.4 mSv per year) and the limit set for the public (1 mSv per year). It is also lower than the "triviality" level set at 0.01 or 0.03 mSv per year by international organisations such as the ICRP and IAEA. This level is defined as being a value below which the hazard, if it exists, is considered to be negligible.

F.4.2.4.4 Environmental monitoring

Environmental monitoring includes continuous environmental monitoring and measurements of radioactive and non-radioactive discharges into the environment. The environment begins at the exit from the controlled zone. Monitoring of site roads and monitoring of radioactivity on leaving the site, are thus part of this subject.

Environmental monitoring is a regulated activity, the quality of which is supervised.

Environmental monitoring by the operator involves 3 technical functions:

- alert function;
- monitoring function;
- follow-up and analysis function.

The alert function means that any environmental anomaly is notified rapidly. It concerns any variation in a measurement which can be directly linked to operation of the power plant.

At EDF, the alert function concerns releases monitoring and continuous recording of the ambient gamma radiation around the plant, automatic chemical monitoring of the receiving environment, for riverside power plants, and the radioactivity check gates at the site entrance and exit.

The monitoring function ensures that the regulations are complied with. It compares a parameter with a criterion. The monitoring function corresponds to the checks stipulated by the discharge permits and the checks on the presence of radioactivity on the roads.

The scientific follow-up and analysis function is used to observe and predict changes. It monitors a parameter which changes slowly and which is generally linked to an integrating phenomenon. The follow-up function comprises radio-ecological studies (ten-yearly, annual reviews, special studies, helicopter surveillance, etc.), and hydro-ecological campaigns.

These technical functions are combined with the task of communicating with the authorities and with the public.

Keeping of regulation registers (effluents and environment) is entrusted to a single service which reports directly to the plant manager and is functionally independent from the services responsible for requesting permits for and carrying out the discharges.

Particular efforts have been deployed by EDF to standardise radioactivity measurements in the environment and cross-compare the results from the nuclear power plant laboratories, under the supervision of the primary laboratory (Henri Becquerel national laboratory). This effort must be continued at an international level.

Every year, radio-ecological follow-up is carried out on all operating nuclear sites. It is part of a follow-up programme defined in a framework agreement with the IRSN. This follow-up covers the whole nuclear fleet since 1992 and offers a picture of the impact of the facilities in terms of both space and time.

A ten-yearly review, comparable to the "point zero" at the time of commissioning the first unit of a site, is also conducted. All the sites have now conducted their first ten-yearly review and the second series began in 1998 (Fessenheim in 1998, Bugey in 1999, Tricastin and Gravelines in 2001).

Analysis of the radio-ecological follow-up results confirms the absence of any impact of atmospheric discharges on the terrestrial environment.

In the aquatic environment, radionuclides from liquid discharges from the power plants are detected as traces in the sediments and aquatic flora in the areas closely downstream of the discharge point.

F.4.3 Dosimetric follow-up of workers and environmental monitoring

F.4.3.1 The case of BNIs

The dosimetric follow-up review for the year 2001, for the personnel working in the BNIs, is presented in the following table:

Company	Number of persons monitored	Sum of doses (Man.Sievert)	Doses > 20 mSv
EDF	20,757	12.17	-
CEA	7,791	0.91	-
COGEMA	5,283	0.33	-
INP (Orsay + Strasbourg)	3,701	0.05	-
CERN	2,697	0.34	-
ANDRA + subcontractors	254	0.02	-
Other contractors	43,493	28.76	12
Total	83,722	42.56	12

The provision for and the results of environmental monitoring around BNIs are presented in appendix (see § L.6).

F.4.3.2 The case of ICPEs and mines

The dosimetric follow-up review for the year 2001, for the personnel working in the other facilities monitored, is presented in the following table:

Company	Number of persons monitored	Sum of doses (Man.Sievert)	Doses > 20 mSv
Hospitals - Doctors	109,949	11.11	68
Dentists	24,985	0.88	1
Veterinarians	3,938	0.19	3
Conventional Industries	23,955	19.26	27
Research	7,522	0.14	0
Others	5,092	0.31	0
Total	175,441	31.89	99

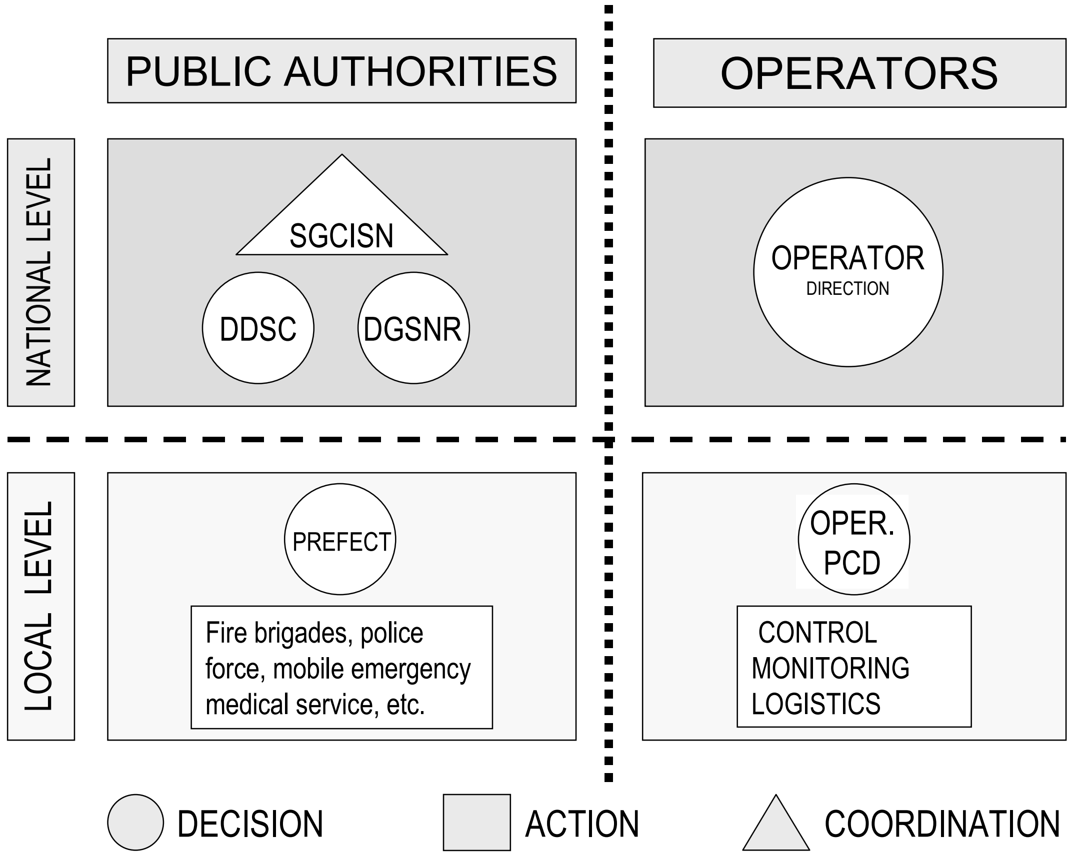
F.5 Emergency preparedness (Article 25)

1. Each Contracting Party shall ensure that before and during operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested at an appropriate frequency.

2. Each Contracting Party shall take the appropriate steps for the preparation and testing of emergency plans for its territory insofar as it is likely to be affected in the event of a radiological emergency at a spent fuel or radioactive waste management facility in the vicinity of its territory.

F.5.1 General emergency preparedness for BNIs

The preparedness of the public authorities for a possible incident or accident is set by directives issued by the Prime Minister, concerning nuclear safety, radiation protection, public order and civil security, as well as by the emergency plans stipulated in decree 88-622 of 6 May 1988. The preparedness of the public authorities, as at 31 March 2003, and that of the operator in the event of an accident in an EDF reactor are presented in the following diagram. A similar degree of preparedness is implemented when dealing with another nuclear operator.



With regard to information of neighbouring states in the event of a radiological emergency, this is the subject of the Convention on Early Notification of 26 September 1986 ratified by France in 1989. In addition, bilateral Conventions have been signed with the authorities of bordering countries.

F.5.1.1 Preparedness at the local level

Only two parties are authorised to take operational decisions in an emergency situation:

- the operator of the nuclear facility in which the accident has occurred, who must implement an organisation and resources such as to control the accident, evaluate it and limit the consequences, protect persons on the site and alert and regularly inform the public authorities. This arrangement is defined beforehand in the on-site emergency plan (PUI) that the operator is required to prepare;

- the Prefect of the department in which the facility is located, who is responsible for deciding on the necessary measures to protect the population and property threatened by the accident. He acts within the framework of an offsite emergency plan (PPI) which has been specifically prepared for the facility in question. In this respect, he is responsible for co-ordinating the resources committed in the PPI, both public and private, material and human. He informs the population and the elected representatives.

F.5.1.2 Preparedness at the national level

The ministries concerned join efforts to advise the Prefect on the measures to be taken, in particular by providing him – in the same way as the operator – with information and recommendations likely to give him a clearer picture of the status of the facility, the severity of the incident or accident, and possible developments. The main actors, as at 31 March 2003, are the following:

- Ministry for the interior: the Directorate for Civil Security and Defence (DDSC) which has the support of the Interministerial emergency management operational centre (COGIC) and the Nuclear Risk Management Support Team (MARN), to provide the Prefect with the human and material reinforcements needed to protect persons and property;
- Ministry for health, for protection of persons against the effects of ionising radiation, Ministry for industry and Ministry for the environment, for the safety of nuclear facilities: the DGSNR, with the technical support of the IRSN. The minister for industry also co-ordinates communication at a national level in the event of an incident or accident affecting a nuclear facility under his supervision, or occurring during transport of nuclear materials;
- the Secretary General of the interministerial commission for nuclear security (SGCISN), who is responsible for permanently informing the President of the Republic and the Prime Minister, for co-ordination when necessary of the action by the ministries concerned, and for collection and synthesis of information to ensure the notifications and information stipulated by international conventions on the need to notify third party countries in the event of a radiological emergency.

F.5.1.3 The emergency response plans

F.5.1.3.1 The general principle

There are two types of emergency response plans:

- the on-site emergency plan (PUI), drawn up by the operator, which is designed to return the facility to a safe status and limit the consequences of the accident. It specifies the preparedness and the resources to be deployed on the site. It also comprises steps for rapidly informing the public authorities;
- the off-site emergency plan (PPI), drawn up by the Prefect, which is designed to provide short-term protection of the population if threatened, and to support the operator with outside response resources. It specifies the roles and duties of the various services concerned, the information and alert diagrams and the material and human resources.

F.5.1.3.2 The technical basis and countermeasures of the emergency response plans

The emergency response plans must be prepared in order to provide an appropriate response to accidents likely to occur in a BNI. This requires definition of a technical basis, that is adoption of one or more accident scenarios determining the envelope of possible consequences, in order to define the nature and scope of the resources to be deployed. This task is difficult, because real significant accidents are very rare, and the approach relies primarily on a theoretical and conservative approach leading to estimation of the source terms (that is the quantities of radioactive material released), then calculating their dispersal into the environment and finally, evaluating their radiological impact.

On the basis of the response levels defined by the Minister for health, it is then possible to define countermeasures in the PPI, in other words the population protection actions which would seem warranted to limit the direct impact of the release.

It should be noted that the offsite emergency plans only comprise emergency measures and do not in any way preclude steps that could be taken, if needed, in the longer term and over longer distances, such as foodstuff consumption restrictions or clean-up of contaminated areas.

F.5.2 The role and preparedness of the various players for BNIs

F.5.2.1 ASN duties in an emergency

In an accident situation, the DGSNR, with the support of the IRSN and assistance of the DRIRE concerned, has a three-fold duty:

1) to ensure the soundness of the measures taken by the operator;

2) to advise the Prefect;

3) to take part in circulation of information.

F.5.2.1.1 Monitoring of the actions taken by the operator

As in a normal situation, it is up to the ASN to supervise the operator of a facility where an accident has occurred. In this particular context, the ASN must ensure that the operator fully assumes its responsibilities to control the accident, limit the consequences and rapidly and regularly inform the public authorities, but does not take the place of the operator in the technical steps taken to deal with the accident. In particular, when several action strategies are available to the operator to control the accident, some could have important environmental consequences, and it is then up to the ASN to check the conditions in which the operator makes its choice.

F.5.2.1.2 Advice to the Prefect

The Prefect's decision on the steps to be taken to protect the population depends on the actual or foreseeable consequences of the accident around the site, and it is up to the ASN to inform the Prefect of its view on this subject, following the analysis conducted by the IRSN. This analysis concerns both a diagnostic of the situation (understanding of the situation of the facility in which the accident has occurred) and a forecast (evaluation of possible short-term developments, in particular radioactive releases).

The protective measures which could be recommended are typically the following:

- before release:
  - shelter;
  - evacuate the persons at risk;
  - take stable iodine in the event of imminent release (in case of a reactor accident).
- after release:
  - possible correction of any measures taken beforehand;
  - foodstuff consumption restrictions;
  - circulation restrictions.

F.5.2.1.3 Circulation of information

The ASN intervenes in information circulation in several ways:

- information of the media and the public: the ASN helps to inform the media and the public in a variety of ways (press releases, MAGNUC, press conference); it is important for this to be done in close co-ordination with the other communicating entities (Prefect, local and national operator);
- information of the authorities: the ASN informs its supervisory ministers and the SGCISN, responsible for informing the President of the Republic and the Prime Minister. In addition, the ASN also informs the Directorate General for Energy and Raw Materials (DGEMP) at the Ministry for industry;
- information of foreign safety authorities: without prejudice to application by the SGCISN of international conventions signed by France for the exchange of information in the event of an incident or accident likely to have radiological consequences, the ASN informs foreign safety organisations, in particular those with which mutual safety information agreements exist.

F.5.2.2 The ASN nuclear safety preparedness

F.5.2.2.1 Main components

In the event of an incident or accident occurring in a BNI, the DGSNR with the technical support of the IRSN and the nuclear safety and radiation protection departments of the DRIREs, activates the following organisation:

at the national level:

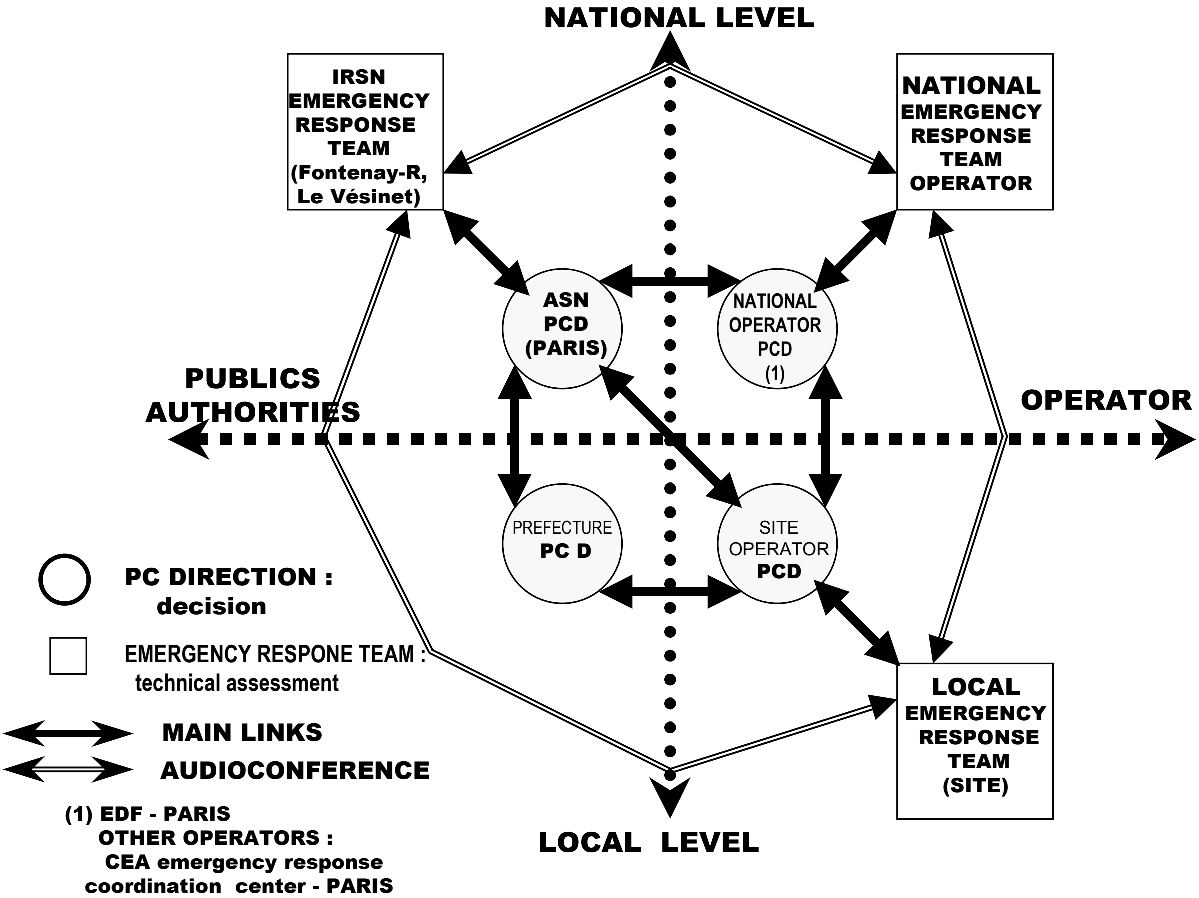
- a decision-making or management command post (called PCD DGSNR Paris), located in the DGSNR's nuclear emergency response centre and managed by the director general of the DGSNR or his representative. Its purpose is to adopt positions and take decisions, but to refrain from a technical analysis of the accident in progress. A spokesperson from the DGSNR, who is not the PCD manager, will be appointed to represent the DGSNR with the media;
- an information unit located close to the PCD of the DGSNR, chaired by a representative from the DGSNR;
- an analysis team headed by the director general of the IRSN or his representative. This team is present in the IRSN's technical emergency response centre (CTC) located in the Fontenay-aux-Roses nuclear research centre. One or more engineers can be delegated to it by the DGSNR. This team must work in close collaboration with the operator's technical teams, in order to reach common views on an analysis of the accident situation and anticipate how it will develop and what its consequences are likely to be.

at the local level:

- a local team at the prefecture, primarily comprising representatives from the DRIRE, the role of which is to assist the Prefect in his decisions and his communications, by providing him with explanations of use for technical understanding of the phenomena involved, in close collaboration with the PCD of the DGSNR;
- a local team at the affected plant site, also consisting of DRIRE representatives along with those of the DGSNR and IRSN if necessary, assisting the site PCD head. The role of this team is, without taking part in the operator's decisions, to ensure that it assumes its responsibilities in full and in particular that it correctly informs the public authorities. This role of this local task force is also to collect all information of use to the inquiry that will follow the accident.

The DGSNR and the IRSN have signed protocols with the main nuclear operators concerning the setting up of the emergency response organisation. These protocols designate those in charge in the event of an emergency and define their respective roles and means of communication.

The following diagram gives an overview of the planned safety organisation, together with the prefecture and the operator. It shows that the operator has a local management command post (PC) on the site, and a national management command post in Paris, each in contact with its own technical emergency response team. The various links shown on this diagram represent the exchange of information streams.



In addition, an organisation following the same pattern is set up between the communication units and the spokespersons in the command posts, to ensure that the information sent out to the public and the media is consistent.

F.5.2.2.2 The DGSNR emergency response centre

To ensure the success of its duties, the DGSNR has its own emergency response centre, the two main functions of which are:

- to alert ASN staff rapidly;
- to exchange information in reliable conditions with its numerous partners concerned.

This emergency response centre was used in a real situation for the first time on 28 and 29 December 1999 during the incident which occurred in the Blayais nuclear power plant, following the violent storm of 27 December 1999.

The ASN alert system enables swift mobilisation of personnel from the DGSNR and the nuclear safety and radiation protection departments of the DRIREs, as well as the IRSN engineer on call. This automatic system pages all the personnel equipped with a Biplus receiver, as soon as remote-triggered by the operator of the nuclear facility originating the alert. It also serves the personnel of the DDSC and the SGCISN.

The emergency response centre is equipped with several separate telecommunications networks. In addition, a videoconference link between the DGSNR emergency response centre and that of the IRSN at Fontenay-aux-Roses was set up in 1995.

F.5.2.3 Role and organisation of the operators in an emergency situation

F.5.2.3.1 General principles

The operator's emergency response organisation is designed to support the operation team in the event of an accident and performs the following roles:

- on the site, triggers the on-site emergency plan (PUI) ;
- off the site, mobilises accident experts from the national emergency response teams (ENC), to help the site managers;
- informs the public authorities which can, depending on the gravity of the situation, trigger the offsite emergency plan (PPI).

The PUI covers the initial phase of the event. Handling the longer-term consequences lies with post-accident management, which does not have a particular regulatory framework. The PUI includes the health and fire aspects (conventional PUI).

F.5.2.3.2 Special role and organisation of EDF

At the national level, a management team is in permanent contact with the plant manager and with the public authorities. A communication unit ensures that communications with the press and the public are reliable, rapid and continuous.

The organisation deployed, under application of the PUI, replaces the normal operating organisation, in order to deal with the specific obligations of this type of situation.

In the event of an accident in a nuclear power plant, the emergency response organisation is based on:

- a clear definition of the goals, according to the main possible scenarios;
- a precise distribution of duties and responsibilities to ensure that these goals are met;
- operating instructions giving each person a description of his or her contribution to the collective role of his or her command post;
- mobilisation of the appropriate skills, in other words trained and experienced personnel;
- available and operational equipment for mobilisation of the company's personnel (power plant and corporate levels), alerting external players, and communication between the various networks.

The planned EDF organisation comprises a local level and a national level. This organisation is structured into teams (or command posts) to cover the four main areas to be dealt with (assessment - decision - communication - action).

The safety and radiological PUI situations are situations in which the safety of the facilities is significantly affected and/or situations in which there is a risk of a release of activity within the facilities or into the environment and likely to lead to exposure of the persons working outside the controlled area or of the neighbouring populations.

The criteria for triggering a safety and radiological PUI are given in the operating instructions, the site protection instructions (aircraft crash onto the reactor building or fuel building) and the radiation protection alarm sheets. The organisation deployed in the event of a safety and radiological PUI is an umbrella organisation, in that it is able to deal with the consequences linked to conventional hazards (fire, personal injury, etc.), as well as the radiological consequences, whether real or simply potential.

Triggering the PUI is the responsibility of the manager on call, the plant manager or his representative. Nonetheless, a delegation system exists in the event of problems in reaching the local PCD manager on call.

F.5.2.4 The role of the ASN in preparing for emergency situations

F.5.2.4.1 Approval and monitoring of implementation of the PUI

Since January 1991, the on-site emergency plan, in the same way as the safety report and the general operating rules, has been part of the safety documents the operator is required to submit to the ASN at least 6 months prior to use of radioactive materials in the basic nuclear installation. In this context, the PUI is analysed by the IRSN and submitted to the standing group of experts concerned for its opinion.

Reviewing the updated PUI is the task of the nuclear safety and radiation protection departments of the DRIREs.

Finally, correct implementation of the on-site emergency plans is checked by the ASN during inspections.

F.5.2.4.2 Participation in elaboration of the PPI

Under application of the decree of 6 June 1988 concerning emergency response plans, the Prefect is responsible for drawing up and approving the offsite emergency plan (PPI). The DGSNR and the DRIRE concerned assist the Prefect by providing him with technical data based on the analysis conducted by the IRSN and taking account of the latest information concerning severe accidents and radioactive material dispersal phenomena, and ensuring consistency on this subject between the PPIs and the PUIs.

F.5.2.4.3 Emergency drills

Emergency response drills are a way of testing the organisations set up, of training the teams in analysing, acting, co-ordinating and communicating, and constantly improving whenever possible. They are also an opportunity for circulating information about the nuclear industry and hazard control.

National emergency response drills are organised at the rate of 6 to 10 per year by the Nuclear Safety Authority, and involve the public authorities, the operators and the technical support entities. Each drill is analysed with the various participants, leading to enhancement of experience feedback. There are two types of drills:

- primarily "nuclear safety" drills, which do not imply any real involvement by the population and mainly used to test the decision-making processes based on a completely open technical scenario;
- primarily "civil security" drills, involving actual implementation on a significant scale of the population protection counter-measures stipulated in the PPI (alert, sheltering, evacuation), based on a technical scenario built around predetermined criteria for the population.

During these drills, simulated media pressure, which is varied according to the circumstances to reflect the actual pressure exerted by the "real" media, is placed on the main parties involved in the drills in order to test their ability to communicate.

F.5.3 Emergency preparedness for non-BNI accidents

F.5.3.1 Emergency preparedness for a radioactive material transport accident

In the event of a transport accident occurring in France and leading to triggering of a radioactive materials transport special emergency response plan (PSS-TMR), the ASN has the same duties as during an accident in a BNI. However, its operator monitoring duties are then applied to the consignor, the shipper of the packages involved and possibly the transport forwarding agent.

In order to progress in the field of transport accident emergency response, a "transport" drill involving COGEMA Logistics and all the public authorities, in particular the Yonne prefecture, was carried out in 2002.

The ASN also takes part in an interministerial working group tasked with drafting a guideline circular for the prefects to help with drawing up the PSS-TMR.

F.5.3.2 Preparedness for radiation accident in ICPEs or mines

F.5.3.2.1 General requirements

In the case of facilities subject to licensing, regulation of the ICPEs requires that a hazards assessment be conducted. The hazards assessment must comprise:

- a list of the potential hazards posed by the facility in the event of an accident, with a description of the accidents likely to occur, whether of internal or external origin. The nature and scale of the possible consequences of an accident must also be described;
- a presentation of the measures such as to reduce the probability and consequences of an accident;
- a precise presentation of the nature and preparedness of the private emergency response resources available to the licence applicant, or to which it will have certain access in order to counter the effects of a possible incident or accident in view of the public emergency response resources of which it is aware.
- for installations likely to cause major hazards, the data needed by the Prefect to draw up an off-site emergency plan.

Hazard assessments are tools for guiding safety investments and lead to definition of on-site and off-site emergency plans. They also allow definition of the perimeters to be used in town planning documents.

The content of the hazard assessment must be commensurate to the level of the hazards of the facility and the foreseeable consequences of an incident or accident on the environment in general. In the case of installations subject to declaration, the nature of the hazards means that there is no point in conducting a hazard assessment and generally implies the absence of special provisions for management of accident situations. The Prefect sets the technical requirements to be met on the basis of standard orders. Through a special order issued in the light of the ICPE Inspectorate report, the Prefect may reinforce the general requirements should they appear insufficient.

F.5.3.2.2 Provisions for mines

Large mining companies such as HBL and Potasse d'Alsace have grouped together in organisations such as DICAMINE in order to set up emergency response plans suitable for intervention in mining works in relation with civil security services and fire brigades services. Their interventions apply to every type of serious incident and to severe accident as soon as workers are affected.

F.5.3.3 Response to a radiological hazard

In the case of an uncontrolled event likely to cause a radiological hazard due to present or past nuclear activity on a private site (plant, laboratory, hospital, residence, land) or a public area, it is necessary to take steps to halt all risk of human exposure to ionising radiation. In these situations, responsibility for implementing the protective measures lies with the owner of the site, with regard to the safety of the persons on the site, and with the Prefect with regard to the safety of persons in the public domain. The ASN's role is to supervise the owner and advise the Prefect regarding the steps to be taken to prevent or mitigate the effects of radiation on persons and on the environment.

The response comprises two phases: safety and then clean-up. Ensuring human and environmental safety, under the responsibility of the Prefect advised by the ASN or the responsibility of the owner, supervised by the ASN, includes first aid, marking out of the zone, containment of the radioactive sources and communication. The purpose of clean-up is to return to a normal situation in particular by removing the sources to a duly authorised facility. This may require use of the expertise of the IRSN or other body.

F.6 Decommissioning (Article 26)

Each Contracting Party shall take the appropriate steps to ensure the safety of decommissioning of a nuclear facility. Such steps shall ensure that:

- *i) qualified staff and adequate financial resources are available;*
- *ii) the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;*
- *iii) the provisions of Article 25 with respect to emergency preparedness are applied; and;*
- *iv) records of information important to decommissioning are kept.*

F.6.1 Safety authority request for BNIs

After their operating period, BNIs undergo a series of clean-up and conversion operations such as to enable them to be finally shutdown and then dismantled. The work done will, depending on the final status of the installation, lead administratively either to the creation of a new BNI, or to decommissioning from a BNI to an ICPE subject to licence or declaration, or even a return to the public domain, if needed, subject to appropriate constraints.

The experience accumulated with the initial dismantling operations, mainly on small installations (pilot facilities, research reactors) led in 1990 to clarification of the regulatory framework governing the end of a BNI's life. The current texts require the operator to give thought to the future of its installation and then to the organisation of the steps involved in final shutdown and dismantling. The aim is to ensure that the safety status of the installation is satisfactory at all times, even after operations have ceased, taking account of the specific nature of dismantling.

The ASN considers that the current dismantling operations should be exemplary. They are an opportunity for the operators to define and implement a dismantling strategy on the one hand (level of dismantling to be attained, schedule of operations) and a management policy for the large quantity of radioactive waste generated (in particular very low level), on the other. If seen through to completion, they should also be demonstrations of the technical and financial feasibility of complete dismantling.

The technical provisions applicable to the installations to be finally shut down must obviously comply with the general safety rules, particularly with regard to external and internal exposure of the workers to ionising radiation, to criticality, to production of radioactive waste, to the discharge of effluents into the environment and to measures to reduce the risks of accidents and minimise their effects.

There are several possible schedules for gradually keeping a shut down facility to a satisfactory safety status.

The dismantling schedule and method is chosen by the operator, who must then prove to the ASN that the measures it envisages will guarantee safety at all times. The operator must also justify the final status targeted after dismantling the installation, in particular on the basis of a radiological and chemical impact assessment.

F.6.2 Measures taken by BNI operators

F.6.2.1 Clean-up and dismantling of CEA facilities

The CEA recently revised its strategy, in order to speed up the dismantling of shut down facilities, which can be summarised as follows:

- initiate radioactive clean-up as of final shutdown of the facility, then continue with dismantling to a level corresponding to IAEA level 3, excluding civil engineering work;
- entrust project management to specialised companies (for example COGEMA);

- complete dismantling of the facilities and radioactive clean-up of the Fontenay-aux-Roses research centre in 2010 and that in Grenoble in 2015.

The number of facilities to be dealt with, about thirty during the decade 2001–2010, makes the programme a very large one, with the total cost of the works being estimated by the CEA at 5,000 M€. To cover this, a dedicated fund controlled by the supervisory authorities was set up in 2002, and it releases about 140 M€ to these operations per year for the first years.

The variety of facilities to be cleaned up limits the transferability of experience from one facility to the next. The age of the design, sometimes combined with how long ago shutdown took place (for example, ELAN IIB at La Hague, where clean-up operations have resumed in 2002, had its final shutdown in 1973), can slow down and complicate the methodological approach. This is why, for the past ten years or so, a facility can only enter the final shutdown phase once its operators have restored it to good order and have completed transmission of information to the new team which is to prepare dismantling.

The lack of disposal solutions or processing facilities for certain waste produced by dismantling (VLLW waste, special waste such as oils, solvents, graphite or sodium) is also an obstacle these operations.

F.6.2.2 Measures taken by COGEMA

The mainly institutional nature of COGEMA's equity (see § F.2) guarantees the continuity of its human and financial resources needed for decommissioning of facilities. The dismantling of industrial units in the back end of the fuel cycle at the expense of AREVA is currently estimated at 2,800 M€. Financial reserves intended to cover these operations are being defined jointly with the supervisory authority and regularly added to, until expiry of the contracts held.

The provisions related to radiation protection and release control apply to all activities within the facilities, without exception. The discharge permits in particular are granted for each site as a whole. The decommissioning activities are thus by definition subject to these provisions. If some operations lead to discharge levels higher than during the operation of the facility, or of a different type, then a supplementary discharge permit must be obtained.

The provisions concerning emergency preparedness are also applicable during the decommissioning phase. The periodic review of these provisions, subject to approval by the Nuclear Safety Authority, enables them to be adapted to particular decommissioning situations if necessary.

Application of quality assurance requirements to facility design and modification activities as well as to operation demands stringent traceability of all sizing, design and construction documents and of all events concerning these facilities. Measures are taken to ensure that the corresponding archives are conserved (back-up, redundancy, etc.).

As regards experience feedback, although no COGEMA facility has yet been decommissioned in the administrative sense of the term on the La Hague site, many parts of workshops have undergone significant process modifications, requiring complete clean-up of the premises in which the new equipment was installed. This is for example the case with the plutonium shop in the UP 2-400 plant, MAPu, in which the purification and conversion processes have been replaced once and the conditioning process replaced twice.

Furthermore, the ELAN IIB (industrial unit for production of radioisotopes) and AT1 (pilot reprocessing plant for fast reactor fuel) shops, both located in the La Hague site, are currently being decommissioned, with AT1 having reached total clean-up level (no more radiological constraints). Although these are facilities which belong to the CEA, with decommissioning operations being performed by CEA personnel, COGEMA is involved as the nuclear operator of the site. The experience feedback from decommissioning of these facilities could be put to good use when subsequently decommissioning COGEMA facilities.

F.6.2.3 Measures taken by EDF

There are a total of eight first-generation EDF reactors, today all shut down:

- 6 natural uranium gas-graphite technology reactors (GGR) in Chinon, Saint-Laurent and Bugey;
- the Brennilis heavy water reactor, built and operated jointly with the CEA;
- the PWR reactor at Chooz A.

To these eight reactors should be added the Superphenix fast neutron reactor in Creys-Malville, today shutdown.

Until very recently, the generic strategy chosen by EDF was that of immediate level 2 dismantling of its power reactors. This strategy mainly consists in extracting the fissile material, removing the easily dismantled parts, minimising the containment zone and reorganising the external barrier. Complete dismantling, referred to as level 3, was envisaged after several decades of containment, to take advantage of the natural decay in radioactivity. This type of approach can however have drawbacks. It can in particular lead to a gradual loss of knowledge about the facility, as operators depart, which can be prejudicial to the dismantling operations. The ASN wanted EDF to take another look at this strategy and assess the feasibility of reducing the time taken to initiate work able to lead to complete dismantling.

After an initial evaluation submitted to the ASN in November 1999, EDF decided to revise its strategy for the Brennilis reactor, by undertaking to finish dismantling of the reactor rapidly, after completion of the partial dismantling currently in progress.

In January 2001, EDF chose to adopt a new dismantling strategy for all its nuclear facilities which have been finally shut down (Brennilis, Bugey 1, Saint-Laurent A, Chinon A, Chooz A and Superphénix), based on level 3 dismantling of the reactors in advance without the waiting period. This new strategy provides for complete dismantling of the reactors by the year 2025. The corresponding human and financial resources were mentioned earlier in F.2.

When combined with the creation of an engineering unit devoted to dismantling of the facilities, these measures guarantee that the resources are adequate, that the documentation is traced and stored and that these operations can be carried out in good conditions.

F.6.3 Analysis by the ASN

The implementation in more than twenty cases of the regulatory framework stipulated in 1990 for final shutdown and dismantling of basic nuclear installations has highlighted the need for adaptation. The current procedure covering decommissioning of BNIs is cumbersome and has a number of undesirable effects. It encourages the operators to split up the dismantling projects, which can only impede overall project consistency. It also mainly deals with power reactors and takes little account of the specific nature of laboratories and plants.

Thought was being given to this subject by the ASN, which has led to a 2003 revision of the currently applicable texts (see § E.2.2.4.6).

The coming years will be put to good use for an in-depth analysis of the dismantling strategies and scenarios proposed by the operators. In particular, following the ASN's requests, technical-economic analyses initiated by EDF led it to make a significant change in its dismantling strategy, by opting for complete dismantling of its first-generation reactors, without a waiting period. Consequently, the ASN asked for summary documents presenting EDF's general view concerning the dismantling of its 9 reactors, along with the corresponding technical back-ups (safety of each installation, management of corresponding waste, in particular graphite, organisation in place, maintaining levels of competence, description of the targeted final status). These documents will be submitted to the Advisory committee for laboratories and plants for examination.

With regard to the CEA's installations, the same approach will be applied: a comprehensive dossier on complete dismantling of the CEA's installations is expected in 2003 and will be submitted to the Advisory committee for laboratories and plants for examination.

Finally, COGEMA will soon be presenting its position regarding the schedule of dismantling operations of the UP 2-400 plant it envisages on the La Hague site in the coming years.

F.6.4 The case for ICPEs and mines

F.6.4.1 The case for ICPEs

The conditions for clean-up of a site after the end of operation of an installation classified on environmental protection grounds, can be included in the authorisation order. In the case of facilities subject to declaration, the conditions for cleaning up the site after operation must be specified in the impact assessment supplied at the time of the declaration.

When activities cease, the ICPE regulations stipulate that the operator must give the Prefect at least one’s month notice of the end of operations. In the case of waste storage facilities, licensed for a limited period, notice must be given at least six months before the licence expiry date.

For installations subject to declaration, notice must indicate the site clean-up measures taken or envisaged.

For installations requiring a licence, the operator must enclose with the notification a dossier comprising the up-to-date map of the land within the facility perimeter, and a memorandum on the site status, which must specify the environmental protection measures taken or planned.

This memorandum covers:

- removal or disposal of the hazardous products and waste present on the site;
- depollution of the facility site and any polluted underground water;
- landscaping of the facility site into its environment;
- as necessary, monitoring of the impact of the facility on its environment.

The operator must return the site to a condition such that there is no hazard or inconvenience for the neighbourhood or the environment. If the clean-up work has not been included in the authorisation order or requires clarification, the ICPE Inspectorate may suggest that the Prefect issue a supplementary order setting the requirements for clean-up of the site.

The Prefect must be informed of performance of the clean-up work as stipulated in the authorisation decree or any supplementary order. The ICPE inspector confirms the conformity of the work in a report.

If the ownership of the land is transferred, the buyer must be informed that an ICPE subject to licensing had been operated on the land and must be informed of any pollution problems that could remain on the site.

F.6.4.2 The case for mines

The end of operation of a mine is marked with a double procedure: the declaration of final cessation of work which comes under the prefectoral authority and the renunciation to the concession which is promulgated by the Ministry for mines. The aim of these procedures is to remove the operator from the mining authority supervision as soon as he has complied with all its commitments.

However, if the enactment of the cessation of work and then the renunciation to the concession allow no more prosecution of the operator under the special mining regulation, the responsibility of operators and concessionaires toward third parties remains indelible. Since the law of 30 March 1999 as regards the disappearance or the failure of those responsible, the State is the warrant of compensation for damages, it is now surrogate in victim's rights against the responsible.

The enactment of the final cessation of radioactive material operation work has, in most case (COGEMA's concessions in Haute-Vienne or in Loire departments), imposed to the operator a monitoring of all the parameters requested during the operation. Considering that maximum limits were not reached for several months, supplementary orders, in particular for Haute-Vienne COGEMA sites, have cancelled the monitoring requirements. For the Bois-Noirs mine, the predominance of radioactive pollution hazard being covered by its ICPE status, the mining regulation orders are only to accompany the orders taken under ICPE regulation, considering in addition the overlapping of some installations, including for water treatment.

Section G – SAFETY OF SPENT FUEL MANAGEMENT (Articles 4 to 10)

G.1 General safety requirements (Article 4)

Each Contracting Party shall take the appropriate steps to ensure that at all stages of spent fuel management, individuals, society and the environment are adequately protected against radiological hazards.

In so doing, each Contracting Party shall take the appropriate steps to:

- *i) ensure that criticality and removal of residual heat generated during spent fuel management are adequately addressed;*
- *ii) ensure that the generation of radioactive waste associated with spent fuel management is kept to the minimum practicable, consistent with the type of fuel cycle policy adopted;*
- *iii) take into account interdependencies among the different steps in spent fuel management;*
- *iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;*
- *v) take into account the biological, chemical and other hazards that may be associated with spent fuel management;*
- *vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;*
- *vii) aim to avoid imposing undue burdens on future generations.*

G.1.1 Safety Authority requests

In France, any spent fuel management facility is a BNI or part of a BNI. The various fuel management facilities are therefore subject to the general safety provisions in force, which have been described in detail in section E (§ E.2.2). Article 3 of decree 63-1228 of 11 December 1963 states that the operator must "submit a safety analysis report containing a description of the facility and the operations to be performed in it, the inventory of hazards of whatsoever origin that it entails, an analysis of the measures taken to prevent these hazards and the measures such as to reduce the probability and consequences of accidents". These analyses in particular cover criticality, removal of residual heat, protection of individuals, chemical hazards and minimising the generation of waste.

G.1.2 Safety policy of the BNI operators

G.1.2.1 CEA Safety policy

The CEA's research activities lead it to operate 43 civilian basic nuclear installations (BNI) of various types: research reactors, research and expertise laboratories, facilities related to management of effluents and waste (including storage), and facilities currently being cleaned-up and dismantled.

Smooth running of the activities in the facilities requires perfect control of safety, consisting in preventing the dispersal of radioactive materials and limiting worker exposure to radiation. To ensure this, a succession of lines of defence, comprising either physical barriers (equipment, containment, etc.) or organisational means (inspection methods, procedures, etc.) are placed between the radioactive substances and the personnel and environment.

Along with security, of which it is a component, nuclear safety is the CEA's number one priority. It uses thorough methodological principles shared by all: pessimistic scenarios for risk analysis, definition of stringent measures to prevent them and limit the consequences of a hypothetical accident, quality organisation ensuring that the measures decided on are correctly implemented, and so on.

This priority must be reflected in the decisions made and the action taken in this direction. This attitude constitutes what is referred to as the "safety culture". The CEA in particular incorporates this culture into its organisation of responsibilities, which in 2001 was restated in a general instruction note concerning the organisation of nuclear safety, and into its decision-making mechanisms. The personnel concerned are inculcated with this culture through their training, their team spirit and their management. This attitude and this organisation guarantee that the diagnostics are made, explained and taken into account in the decisions. The objectives' contracts are an essential tool in formalising the conclusions, by which all parties are bound.

The nuclear safety organisation set up in the CEA is based on a continuous line of responsibility.

The CEA chairman takes the steps necessary for implementing legislative, regulatory and special requirements and provisions applicable to the activities involving a nuclear hazard, as well as for organising nuclear safety in the CEA.

He is assisted by the nuclear safety and quality director and is supported by the other functional directors in charge of preparing the general management's decisions, and the Strategic Nuclear Security Committee, a body tasked with preparing the decisions of the general management concerning objectives, strategic guidelines and operations in terms of nuclear security.

Under the authority of the CEA chairman, nuclear safety skills and responsibilities are distributed between the operational units, the support resources and a supervisory function.

At each management level, each operational unit defines nuclear safety policy within the framework of that defined by the general management, and supervises implementation of it. It makes the necessary choices and presents the Strategic Nuclear Security Committee with draft strategic decisions concerning all questions related to nuclear safety. It implements nuclear safety resources and procedures for the units under its authority. Through delegation, the facility managers ensure the nuclear safety of the activities, facilities and materials placed under their authority.

At each level, the managers of each operational unit organise internal "first level" monitoring of the activities, facilities and materials placed under their authority, in order to guarantee nuclear safety.

The managers of the operational units receive support from a network of expertise in the various safety fields, logistical support and methodology and operational support provided in each CEA centre.

The "second level" monitoring function consists in checking the effectiveness and adequacy of the organisation, resources and actions taken by the operational unit managers, and their internal supervision, against the nuclear safety objectives. The monitoring function is performed by entities separate from those constituting the operational units. It takes place at general management level within the CEA and in each centre.

The CEA has set up a system of internal authorisations based on submission of an authorisation application file by the unit manager to the director of the centre in which the facility is installed. The director then asks for the opinion of his centre's supervision function and, if necessary, that of a safety committee convened by himself and which comprises permanent members and experts consulted according to the specific nature of the operation examined. These members and experts are appointed by the chairman.

G.1.2.2 COGEMA Safety policy

Nuclear safety is COGEMA's absolute priority.

From design up to final shutdown of the facilities, everything possible is done to protect man and the environment from the potential hazards linked to the use of nuclear materials. This aim is incorporated into the general approach described in § F.3.2.3, from which it is inseparable.

Safety monitoring is performed on a daily basis. It is organised according to three complementary levels:

- on each site, the facility managers are responsible for strict compliance with the safety rules;
- the group has set up a general Inspectorate comprising high-level experts responsible for inspecting each nuclear facility within the group;
- the regulatory authority regularly checks the group's nuclear facilities. In 2002, the ASN conducted no less than 53 inspections on the La Hague plant alone.

G.1.2.3 EDF Safety policy

Responsibility as nuclear operator within the EDF Group lies with three main levels: the chairman, the director of the Energy Branch and the director of the Nuclear Power Generating Division (DPN), in charge of operating the entire nuclear fleet, and the directors of each nuclear power plant (CNPE).

The priority given to safety within EDF is based on:

- a company policy, the latest version of which was published in 2000, which places safety and radiation protection at the heart of the company's concerns and priorities;
- a system of operational safety management, the main principles of which were defined in 1997, and a quality management system compliant with the “quality” order of 1984.

The guiding principles of the safety management system aim to attach particular importance to:

- strict compliance with safety and radiation protection requirements, and the corresponding provisions;
- known and shared aims which, going further than the requirements, reflect the desire for progress and performance in the company in the field of safety;
- the responsibility of all parties involved, based on the recognition that man is one of the key links in the safety chain and a prime mover in achieving progress;
- clear and unambiguous safety responsibilities;
- the various inspection and verification systems, designed to measure the effectiveness of the safety management system and correct any possible deviations or drift.

EDF considers that achieving progress in the field of safety and competitiveness, which legitimates nuclear production of electricity, depends on ensuring that all those involved are fully aware of these two issues, hence the choice of a policy of decentralisation while guaranteeing consistency.

This policy is based on the development of a an approach involving hazard analysis, prior consideration and motivation of the parties concerned, in addition to an approach involving application of centralised decisions and a system of inspection and verification implemented within each DPN entity.

The personal responsibility of each person involved implies the right of expression, the ability to criticise and a system of recognition; hence the creation of conditions favourable to the development of a safety culture and in particular the reporting commitment[2] and the duty to warn[3].

---

[2] **Reporting commitment**: every person must have a questioning attitude in the performance of his activity and must warn his superiors if an order or specification is such as to impair the quality of the activity.

[3] **Duty to warn**: any event which a person feels to have safety implications more serious than those considered by his immediate superiors must be notified by this person to an entity with responsibility for safety within EDF (the head of the

Surveillance of an activity within an entity is the responsibility of each management level within the entity. Apart from monitoring by the operational levels, verifications are performed by independent entities. In the field of safety, the Safety and Quality Task force (MSQ) in the nuclear power plants, the Nuclear Inspectorate (IN) in the DPN, the Nuclear Affairs Delegation in the Energy branch, the General Inspectorate for Nuclear Safety (IGSN) are these independent entities, acting on behalf of the site director, the DPN director, the Energy Branch director and the chairman of the EDF group respectively. Safety comparisons and analyses are regularly conducted at these various levels, conducted by the entity manager: on-site technical safety group, operational nuclear safety committee at DPN level, nuclear safety council reporting to the EDF group chairman.

With regard to the safety indicators and management tools, the following in particular are employed:

- annual safety reviews in each nuclear power plant and the associated reporting to the DPN director;
- overall safety assessments by the Nuclear Inspectorate and the corresponding cross-comparisons;
- the annual report from the IGSN to the chairman of EDF;
- a number of "quality tools", such as risk analysis, self-assessment and self-diagnostic;
- regular monitoring of indicators such as:
  - general conformity of operation and maintenance with the specifications;
  - quality of alignments;
  - reduction in scram number;
  - fire prevention.

All the activities and facilities involved in the handling and storage of spent fuel are considered to be safety-related and dealt with in the same way as the rest of the facility, in accordance with the principles recalled in G.2.2.

nuclear power plant's safety task force, the director delegated to nuclear safety within the DPN, the head of EDF's general Inspectorate for nuclear safety).

G.2 Existing facilities (Article 5)

Each Contracting Party shall take the appropriate steps to review the safety of any spent fuel management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility.

G.2.1 Safety authority requests

In order to take account of both the effect of time on the facilities and changes in safety expectations, the ASN requires that in addition to the permanent analysis of experience feedback, the operators conduct periodic safety reviews of their basic nuclear installations, at regular intervals (see § E.2.2.3.1.2).

This provision is included in the regulatory texts (see § E.2.2), as article 4 of the decree of 19 July 1990, amending the basic decree of 11 December 1963, introduced an article 5 which notably stipulates that the ministers for the environment and for the industry "may jointly and at any time ask the operator to conduct a periodic review of the safety of the installation".

The periodic safety review comprises a study phase, the aim of which is to go over the safety analysis of an installation by comparing it with more recent technologies and using new analysis methods and tools (codes, probabilistic safety assessments, etc.). This study phase can lead to modifications enabling to improve the level of safety of the installations, in particular the older ones.

G.2.2 Safety review of the installations by BNI operators

G.2.2.1 Safety review by the CEA

The periodic safety review of the CEA's facilities takes place either at the initiative of the CEA, in particular at an important stage in the life of the facility (significant change in its operation for instance) or at the request of the Nuclear Safety Authority.

The periodic safety review of a BNI consists not only in analysing experience feedback and changes made to the facility since the previous review, but also in analysing the effects of the operating time (ageing) on the equipment and structures and in taking account of up-to-date knowledge and safety practices. It consists of a new and complete review of the safety of a BNI, which should factor in the future situation (changing functions and lifetime) of the facility.

The periodic safety review leads to an improvement plan which includes on the one hand the implementation of modifications (structures, equipment, operating rules, etc.) and exceptional maintenance and overhaul work, as well as housekeeping and clean-up operations, and on the other, revision of the operating documentation.

For its periodic safety reviews, the CEA uses a project type organisation. Given the issues and resources involved, all envisaged or planned periodic safety reviews are the subject of multi-year scheduling for each facility (in a sliding 15-year plan) which takes account of a basic frequency of about ten to fifteen years, but also the important modifications planned and as applicable the expected end-of-life date of the facility.

When conducting the approach adopted by the CEA, the prime objective of the periodic safety review is to assess the safety level of the facility by incorporating all experience feedback (dosimetry, effluents, waste, events, etc.) and by identifying deviations from the safety reference system in force and from current safety and radiation protection regulations and practices.

The second objective is to take appropriate counteraction measures to:

- bring the facility to a level which is as safe as reasonably achievable, consistent with its remaining lifetime and according to the estimated cost of any changes, in the light of the safety issues;
- reduce subsequent exposure of operating personnel to a level that is as low as reasonably achievable, focusing particularly on the most exposed workstations;
- reduce detrimental effects on the environment (discharges and waste) to a level that is as low as reasonably achievable, concentrating in particular on eliminating the production of waste without disposal channels, limiting discharges into the environment, promoting internal recycling processes and reinforcing the safety of interim storage areas incorporated into the facility.

The periodic safety review of a facility is based on a new safety analysis which covers the whole BNI. This means that the CEA's strategy for the facility must first of all be clarified in terms of defining the future functions and operating roles of the facility, as well as their anticipated duration.

The safety level assessment of the existing facility allows identification of all material or organisational aspects to be modified or implemented to meet the general safety objectives and the goal of improving safety on the occasion of the periodic safety review of the facility.

The operator proposes measures to upgrade the safety of its facility, consisting in strengthening certain lines of defence, or in adding new ones. They are given shape in requirements concerning safety-related elements (systems and equipment or operating rules).

The upgrade measures proposed then undergo a safety review prior to implementation, presenting the safety and radiation protection principles and objectives linked to the prevention of hazards related to the modifications.

The conclusions of the periodic safety review are presented to the Nuclear Safety Authority, which issues its opinion before the modifications are made, and before the modified facility safety demonstration. The facility's safety reference system is updated.

G.2.2.2 Safety review by COGEMA

As requested by decree 63-1228 of 11 December 1963 (see § E.2.2), COGEMA submits a safety analysis report, a PGSE (facility general safety programme), RGE (general operating rules) and the PUI (on-site emergency plan), prior to commissioning of each facility. These documents define the operating envelope of the facility on the basis of the safety analyses conducted. They cover actual operation, maintenance, surveillance and periodic testing. They are approved by the ASN and constitute the reference system for the operation which has to be performed in compliance with. Any change to these documents must be authorised by the ASN, after examining a technical dossier submitted by the operator, containing the updated safety analyses.

The safety analyses are reconsidered, to take account of experience feedback, and lead to updating of the operating documents, incorporating:

- the modifications made to the facilities since the previous update. Important modifications were approved by the ASN prior to implementation, based on presentation of a technical dossier. The update then consists in integrating this technical dossier into the safety analysis report;
- anomalies or incidents which have occurred in the facility since the previous update and which could have led to preventive modifications to the facilities or operational changes;
- possible improvements in knowledge, whether arising from independent work (improved seismic or metallurgical data, for example) or from anomalies detected in other nuclear facilities.

The periodic safety review is thus in some ways permanent, leading to updating of operating documents whenever necessary. The procedures employed are identical to those of the initial authorisation (examination of the file by the ASN's technical support, examination by the Advisory group of experts concerned and ASN decision with formal notification of the authorisation accompanied by any additional technical specifications to be applied).

G.2.2.3 Safety review by EDF

G.2.2.3.1 EDF periodic safety review process for existing facilities

In order to take account of the effect of ageing on the facilities, updating expectations in terms of safety and new available data, and in addition to permanent analysis of experience feedback, EDF conducts periodic safety reviews for each plant series, at regular intervals. For the reactors, this periodic review process, which includes a conformity check on each unit with their standard status, as compliant with the safety requirements, is implemented in conjunction with the ten-yearly inspections on the nuclear steam supply systems specified for pressure vessels (order of 1974).

The first periodic review of this type was initiated in 1988 for the older reactors in the nuclear fleet, at Fessenheim and Bugey (CP0 plant series). This in particular involved an analysis of these units by comparison with the CP1-CP2 plant series, to obtain an overall safety level comparable to that of the units of the CP1-CP2 900 MWe plant series. The periodic safety review was then conducted on the CP1--CP2 series and then on the 1300 MWe series, prior to performance of the second ten-yearly outages using a approach approved by the Nuclear Safety Authority.

This approach comprises three phases:

- a description of the safety reference system comprising a set of rules, criteria and specifications applicable to a plant series;
- a demonstration of the conformity of the standard status of the unit with the safety reference system, and then a check on the conformity of the units with the standard status;
- an assessment to ensure that the safety reference system is up to date and complete, based on examination of all safety-related lessons, with identification of any modifications that need to be made to the plant series standard status, during the ten-yearly outage (VD).

This approach allows clear identification of the safety requirements applicable to a given plant series and ensures conformity of the reactors with this reference system. It also highlights the safety aspects requiring further analysis, in particular on the basis of French or foreign experience feedback and up-to-date knowledge and know-how. This analysis can lead to a change in the reference system, corresponding to a new reference status, with updating of the "VDn edition" safety analysis report and incorporation of the corresponding modifications.

G.2.2.3.2 Description of the safety reference system

For example, for the 1300 MWe plant series, the safety reference system ahead of the VD2 (second ten-yearly outage) corresponds to the 1998 edition of the safety reference system (RDS). Similarly, for the 900 MWe plant fleet, the safety reference system ahead of the VD3 (third ten-yearly outage) corresponds to the VD2 edition of the RDS.

G.2.2.3.3 Conformity check by EDF

Conformity of the facilities with the safety requirements is one of the major issues involving the responsibility of the nuclear operator, at several levels.

First of all, at the design stage, the designer defines a reference facility (plant series) meeting these requirements and builds it in accordance with pre-determined rules allowing verification of conformity of the facilities, until confirmation of industrial commissioning.

Then, during operation, the operator (the DPN) ensures that the facilities are kept in conformity with the applicable safety requirements, relying on organisational measures defined by the quality manual using supervisory procedures that are permanent (implementation of the technical operating specifications, etc.) or periodic, using periodic tests and the basic preventive maintenance programme, and taking account of experience feedback from events and incidents having occurred during operation, along with analysis of relevant operational experience data. The DPN receives support from the Nuclear Engineering Division regarding engineering and technological matters, in all areas linked to maintaining safety over the time.

During the periodic safety review, EDF identifies the issues requiring:

- additional analysis concerning the safety demonstration for the reference power plant;
- specific checks to be applied to actual units, supplementing the existing surveillance measures. For the VD2 outages, these checks consist of a "conformity check" programme and a "supplementary investigation" programme (PIC).

The conformity check programme consists of a set of specific checks or targeted actions covering topics related to the safety requirements (classification of safety-related equipment, qualification for accident conditions, extreme cold, earthquake resistance, flooding risk, risk of high-energy pipe break, etc.) and in certain areas allowing definition of a "reference level" for the status of the facilities (e.g. civil engineering). Implementing this programme leads to identification of deviations which are dealt with according to their importance for safety, to establishing the degree of conformity of the units, but also contributes to revealing lessons of use in strengthening control of the conformity of the facilities, with the aim of ensuring that it is lasting. Responsibility for this is given to each NPP, with strategic co-ordination by the NPP senior management and a project team run by an operational pilot.

The corresponding checks were conducted during the period 1997-2000 on the 900 MWe plant series, using initial experience feedback from the first-off sites in the series (Tricastin and Fessenheim). They began in early 1999 on the 1300 MWe plant series (first-off sites in the series at Paluel and Cattenom) with the end of checks deadline set for late 2002 for the P4 series and late 2003 for the P’4 series.

The supplementary investigation programme corresponds to non-destructive testing (NDT) spread over several units and carried out during the ten-yearly outages. Its aim is to confirm the validity of the scenarios (degradation modes) on which the basic preventive maintenance programmes (PBMP) are based (this programme is currently being implemented on the 900 MWe plant series and definition work is under way for the 1300 MWe plant series).

G.2.2.3.4 Safety reference system evaluation by EDF

All new data, whether resulting from national or international experience feedback, or specific studies, are examined and the most sensitive points are looked at in terms of their impact on the level of safety within the plant series. When it would appear that their benefits are high enough and clearly outweigh their drawbacks, changes are made to the safety reference system. If necessary, verification studies can be repeated.

Probabilistic safety assessments may be used, in particular when searching for and analysing accident precursors or ranking the main contributor to risk and evaluating the level of safety.

For example, evaluation of the safety reference system following the VD2 on the 900 MWe plant series (CP0, CP1-CP2) was initiated in 2001 with a view to preparing the VD3.

G.2.2.3.5 Thematic reviews by EDF

The thematic reviews in particular include the technical review initiated by EDF into criticality hazard control, following the Tokai-Mura accident.

This review led EDF to the conclusion that the criticality risk was on the whole well under control for the spent fuel storage and transport phases.

G.2.2.3.6 Transport safety

Following problems encountered regarding compliance with transport cleanness limits, EDF undertook a project review which led to a number of quality assurance recommendations and measures concerning implementation of transport regulations.

These rules constitute the "Transport reference system":

- responsibility of the consignor, in particular for the quality of checks and shipment documents;
- qualification of the shippers used by EDF;
- declaration, analysis and experience feedback from transport incidents in case of deviations;
- creation of local and national transport security advisers, in compliance with the regulations.

Taken as a whole, these measures led to a higher guarantee of spent fuel transport cleanness. In addition, EDF is taking part in the co-ordinated research programme conducted by the IAEA in this area, in order to better evaluate the hazards and potential impacts of surface contamination aspects.

G.2.3 Analysis by the ASN

The ASN requires a periodic safety review of each BNI about every ten years. The periodic safety review comprises two elements:

- a check on the conformity of the facility with its design;
- a re-assessment of safety in the light of new knowledge and changes in regulations.

Depending on the result of the periodic safety review, the ASN may authorise the facility to continue to operate or may restrict its use or lifetime, and may even demand closure of the facility within a given time. The periodic safety review programme for spent fuel storage facilities was thus conducted along these lines. This in particular led the CEA to plan construction of new facilities to replace the older ones, by the year 2015.

G.3 Siting of proposed facilities (Article 6)

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed spent fuel management facility:

i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime;

ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment;

iii) to make information on the safety of such a facility available to members of the public;

iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.

2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 4.

As mentioned at the beginning of this report as well as at the beginning of this section G, spent fuel management facilities are part, in the French regulatory framework, of a broader category of facilities known as basic nuclear installations (BNI), the definition of which is specified in paragraph E.2.

Any new facility would thus be subject to BNI general regulations which, with regard to siting, has been presented in detail in paragraph E.2.2.2.

At present, there are no new siting plans for a spent fuel management facility.

G.4 Design and construction of facilities (Article 7)

Article 7 : Each Contracting Party shall take the appropriate steps to ensure that:

i) the design and construction of a spent fuel management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a spent fuel management facility are taken into account;

iii) the technologies incorporated in the design and construction of a spent fuel management facility are supported by experience, testing or analysis.

As mentioned at the beginning of this report as well as at the beginning of this section G, spent fuel management facilities are part, in the French regulatory framework, of a broader category of facilities known as basic nuclear installations (BNI), the definition of which is specified in paragraph E.2.

The description of the general regulations for BNIs, which include spent fuel management facilities, with regard to their design and their construction, has been given in paragraph E.2.2.3.2 for the procedures, in paragraph E.2.2.5 for technical rules and in paragraph E.2.2.4 for releases.

As regards technical provisions for dismantling a basic nuclear installation, the appendix to the decree 73-278 of 13 March 1973 indicates that these are to be described in a separate chapter of the safety analysis report, which has to be provided in support to the application for authorisation decree as mentioned in paragraph E.2.2.3.2.1.

The measures taken by the operators to comply with these regulations have been presented in paragraph G.2.2, which deals with existing facilities.

The Nuclear Safety Authority ensures of the implementation of the regulation through assessment and inspections that it performs according to the terms which have been presented in paragraphs E.2.2.6 and E.2.2.7.

G.5 Safety assessment of facilities (Article 8)

Article 8 : Each Contracting Party shall take the appropriate steps to ensure that:

i) before construction of a spent fuel management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

ii) before the operation of a spent fuel management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

As mentioned at the beginning of this report as well as at the beginning of this section G, spent fuel management facilities are part, in the French regulatory framework, of a broader category of facilities known as basic nuclear installations (BNI), the definition of which is specified in paragraph E.2.

The description of the general regulations for BNIs, which include spent fuel management facilities, has been given in paragraph E.2.2.3.1, with regard to their safety assessment.

In particular, the appendix to the decree 73-278 of 13 March 1973 indicates that a preliminary safety analysis report has to be provided in support to the application for authorisation decree. This text indicates also that a provisional safety analysis report be provided in support to the application for pre-commissioning authorisation and finally that a final safety analysis report be provides in support to the application for commissioning, as mentioned in paragraph E.2.2.

The measures taken by the operators to comply with these regulations have been presented in paragraph G.2.2, which deals with existing facilities.

The Nuclear Safety Authority ensures of the implementation of the regulation through assessment and inspections that it performs according to the terms which have been presented in paragraphs E.2.2.6 and E.2.2.7.

G.6 Operation of facilities (Article 9)

Each Contracting Party shall take the appropriate steps to ensure that:

i) the licence to operate a spent fuel management facility is based upon appropriate assessments as specified in Article 8 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

ii) operational limits and conditions derived from tests, operational experience and the assessments, as specified in Article 8, are defined and revised as necessary;

iii) operation, maintenance, monitoring, inspection and testing of a spent fuel management facility are conducted in accordance with established procedures;

iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a spent fuel management facility;

v) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

vi) programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;

vii) decommissioning plans for a spent fuel management facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.

G.6.1 The authorisation process

The description of the general regulations for BNIs, which include spent fuel management facilities, has been given in detail in paragraphs E.2.2.4 and E.2.2.5, with regard to the operating authorisation.

G.6.2 BNI operator practices

G.6.2.1 CEA operational safety practices

Authorisations are issued to the CEA in accordance with the procedures described in paragraph E.2. Operations are conducted in conformity with the general and specific regulations, as described in paragraph G.2.2.2. The quality and continuity of technological and engineering support are guaranteed by the quality undertakings described in § F.3.2.2 and by the human and material resources described in paragraph F.2.2.2. With regard to decommissioning, the practice was described in paragraph F.6.

The safety reference systems for the CEA's facilities comprise a safety analysis report describing the radioactive materials used, the facility itself and its environment, the provisioned safety measures, general operating rules also drawn up by the operator, along with technical requirements imposed by the Safety Authority: these reference systems define operating domains authorised by the Safety authority, beyond which operation must not deviate. The basic documents of the safety reference system are supplemented by a set of procedures and operating instructions drafted by the operators and designed to describe operations in the field which are consistent with the safety reference system and its operating domain.

Incidents occurring in the CEA's facilities are declared to the Safety Authority in real-time. These incidents are then analysed, involving identification of their root causes and definition of the corrective and preventive actions to be put in place to prevent them happening again. In 1999, the CEA set up a "central experience file" giving all parties concerned access to the same information on incidents, along with an incident analysis guide drafted to harmonise the incident reports, help with their assessment and codify the results. By analysing the incident reports, the CEA draws conclusions of use for improving the safety of its facilities, identifying generic safety weak points, defining targeted areas of progress and ensuring their dissemination as extensively as possible.

G.6.2.2 COGEMA operational safety practices

Authorisations are issued to COGEMA in accordance with the procedures described in section E.2. Operation is carried out in conformity with the general and specific regulations, as described in § G.2.2.2. The quality and continuity of technological and engineering support are guaranteed by the quality undertakings described in § F.3.2.3 and by the human and material resources described in § F.2.2.3 enabling COGEMA to maintain its industrial know-how in the subsidiaries under its control. In terms of decommissioning, practices were described in section F.6.

Significant safety incidents are declared to the ASN and other national authorities within 24 hours, in accordance with the requirements (see § F.2.2.7). Also in accordance with the requirements, an incident report comprising an initial analysis is sent to the ASN within two months. If the analysis requires further time, an additional analysis is submitted subsequently.

Use of quality assurance procedures ensures the traceability of operational data, which are examined in real-time to check that safety requirements are met and if necessary, to make the necessary modifications (see § G.2.2.2).

Decommissioning plans are drawn up as and when necessary, before operation ceases, when final shutdown of a facility is envisaged. In addition to the benefit gained from the latest available technologies at the time of decommissioning, it is also desirable to have access to the operators' knowledge of the life of the installation when drawing up this plan and, in those primarily chemical facilities, when carrying out the majority of clean-up operations, generally conducted using the normal process reagents and maintenance procedures.

G.6.2.3 EDF operational safety practices

The authorisations are issued to EDF in accordance with the procedures described in section E.2. Operation is carried out in conformity with the general and specific regulations, as described in § G.2.2.2. The quality and continuity of technological and engineering support are guaranteed by quality undertakings described in § F.3.2.4 and by the human and material resources described in § F.2.2.4. With regard to decommissioning, practices were described in section F.6.

It should be added that a comprehensive description of provisions taken by EDF in operational safety were recently provided in France’s second report under the Convention on nuclear safety about its Article 19 (see reference in § L.7.1).

G.6.3 Analysis by the ASN

Through its analysis, inspection and possible penalties system, the ASN permanently ensures that the operators comply with the general regulations for BNIs, which include spent fuel management facilities and which, with regard to their operation, are presented in paragraphs E.2.2.4 and E.2.2.5.

G.7 Disposal of spent fuel (Article 10)

If, pursuant to its own legislative and regulatory framework, a Contracting Party has designated spent fuel for disposal, the disposal of such spent fuel shall be in accordance with the obligations of Chapter 3 relating to the disposal of radioactive waste.

In France today, no spent fuel is officially designated for final disposal. However, it is envisaged that certain spent fuel elements will not be reprocessed and, within the framework of programmes defined by the law of 30 December 1991 on radioactive waste management (see § B.4.1), studies into the possibility of disposal in deep geological formations for high level, long-lived waste are also examining the possibility of direct disposal of spent fuel.

Section H – SAFETY OF RADIOACTIVE WASTE MANAGEMENT (Articles 11 to 17)

H.1 General safety requirements (Article 11)

Each Contracting Party shall take the appropriate steps to ensure that at all stages of radioactive waste management individuals, society and the environment are adequately protected against radiological and other hazards.

In so doing, each Contracting Party shall take the appropriate steps to:

i) ensure that criticality and removal of residual heat generated during radioactive waste management are adequately addressed;

ii) ensure that the generation of radioactive waste is kept to the minimum practicable;

iii) take into account interdependencies among the different steps in radioactive waste management;

iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;

v) take into account the biological, chemical and other hazards that may be associated with radioactive waste management;

vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;

vii) aim to avoid imposing undue burdens on future generations.

H.1.1 Safety Authority request concerning BNIs

In France, all basic nuclear installations are likely to manage radioactive waste. For this reason, they are subject to the currently applicable general safety requirements, described in detail in paragraph E.2.2.

Thought is currently being given, in particular further to the Parliamentary Office for assessment of scientific and technological options (see § E.3.3.1) report in 2000 on "The consequences for public health and the environment of nuclear waste disposal facilities", to setting up a national plan for radioactive waste management. In the context of an open debate with the public as a whole, this plan could lead to a clearer understanding of all the ramifications of radioactive waste management in France.

On certain subjects, however, there are a number of initiatives providing an overview of the radioactive waste picture: an annual inventory has been published by the ANDRA for the last ten years, identifying all the sites on which radioactive waste is present, including polluted sites. New work is currently under way, following a decision by the Government as a result of a proposal made by the chairman of the ANDRA, in the framework of a mission that he was assigned in 1998, into an inventory of potential radioactive waste, which would take account of all the waste that will inevitably be generated by the existing facilities (the notion of "pending" waste). This predictive inventory work should be completed in 2004 and then periodically brought up to date (see also § D.3.1.4).

In addition, the ASN has an overview of all radioactive waste disposal problems, in particular given the fact that it directly supervises most of the concerned installations.

H.1.2 Steps taken by BNI operators

H.1.2.1 Steps taken by the producers CEA, COGEMA, EDF

Waste management in basic nuclear installations comprises the following main phases:

- "waste zoning" (see § B.4.5);

- collection;
- sorting;
- characterisation;
- treatment;
- storage;
- shipment.

Management of waste, be it radioactive or conventional, is in conformity with French regulations covering the disposal of waste and recovery of materials. Collection is a sensitive phase in waste management in nuclear facilities.

Waste is collected selectively, either directly during normal operation, or by personnel on the work sites. As of the collection phase, the physical management of radioactive waste must be clearly segregated at all levels from that of conventional waste.

Sorting operations take particular account of the specific nature of the treatment, packaging, transport, disposal or recycling channels applicable to the waste. Waste is generally sorted according to its physico-chemical state (pre-characterisation), which in particular involves isolating waste which is prohibited for surface disposal (or needing a pre-processing to join this category), separating compactable or incinerable waste from that which is not and, more specifically for radioactive waste, segregating it according to its level of activity and radiochemical composition.

Once sorted, the waste undergoes qualitative and quantitative characterisation: mass, properties and physico-chemical composition, possible radioactive content, and so on. This characterisation is necessary for compliance with the existing regulations and resulting technical specifications, in particular with regard to treatment, packaging, disposal and recycling processes.

Waste is only shipped for disposal or recycling to industrial facilities that are authorised to receive such waste. However, the aim is to dispose of waste through these channels as early as possible, in order to minimise interim storage on the production sites. Special provisions apply to the transport of radioactive waste in accordance with transport regulations.

Traceability of the steps involved in waste management must be guaranteed, from characterisation up to their place of disposal or recycling.

The channels for melting metal waste and incinerating solid incinerable and liquid waste have been operational since 1999. They can handle low-level waste (steel, clothing, and items resulting from maintenance or dismantling) prior to surface disposal.

Finally, the management of each type of waste is described and analysed in the "waste survey files" conducted by each production site, in order to look for ways to improve and optimise, and establish a reference system. These "waste surveys" are currently being completed prior to submission to the director of the DGSNR in accordance with the order of 31.12.1999, section V, articles 20 and 21.

H.1.2.2 Transfer of waste to CENTRACO and to the ANDRA

The radioactive waste shipment programmes are drawn up and monitored after discussion by all entities concerned and notification of the shippers, with due regard to the different disposal channels available: melting and incineration at CENTRACO, disposal at the Aube repository. The quality of these transports is monitored.

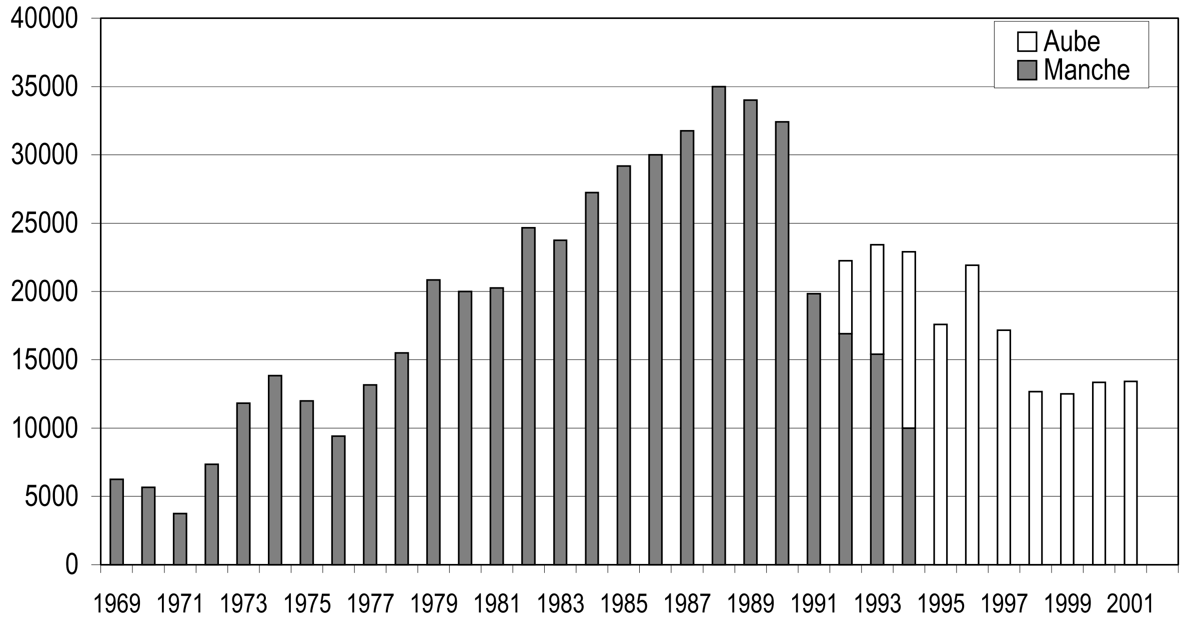
H.1.2.3 Measures taken by the ANDRA

The radiation protection goals of the ANDRA were described in paragraph F.4.2.1.1. They are based on current regulations and set dose criteria that are as low as achievable, in particular for the long-term, corresponding to a fraction of the maximum dose allowed by the current regulations.

With regard to the hazards related to the potential chemical toxicity of the waste, and in compliance with the recommendations of basic safety rules III.2.e and III.2.f, the ANDRA asks the producers to quantify the presence in the waste of elements covered by the regulations applicable to special industrial waste or water quality regulations. These elements are then the subject of disposal impact assessments. Specific action is also undertaken to reduce their quantity in the packages delivered, in particular with respect to lead.

Reducing the volume of waste delivered is an objective common to the waste producers and to the ANDRA. This enables the size of the repository to be reduced and is chiefly obtained by efficient packaging processes (compacting, incineration) and by control of the materials brought into the regulated areas of the facilities. The following graph shows the evolution of deliveries of packages of low and intermediate level and short-lived waste since 1969.

Waste volumes (m3) delivered to the Manche and to the Aube repositories



After a regular rise in deliveries, corresponding to expansion of the French nuclear power programme, which peaked in 1988 with 35,000 m^3 delivered, the stream of packages then fell to a value comprised between 10,000 and 15,000 m^3 per year in about fifteen years, due to the new waste management policies of the producers. Consequently, the operating life of the Aube repository, initially planned for about thirty years, should continue for at least fifty or so.

As regards the links between the various steps in radioactive waste management, one must first of all point out that prior to opening of a repository, the ANDRA lays down specifications applicable to the waste and the waste packages, setting the conditions to be met by the waste and waste packages before they can be accepted in the repository. The constraints set by the ANDRA are designed to guarantee the short, medium and long-term safety of the repository and constitute a reference system for the waste producers when defining a new type of package. They in particular concern the prevention of biological, chemical, fire and criticality hazards. During operation of the facility, the "approval process" run by the ANDRA is implemented for each type of waste package proposed by the producer, in order to guarantee that this type of package complies with the ANDRA's specifications.

This approach was applied for low and intermediate level, short-lived waste received by the Manche repository. It is used in the Aube repository, with the design of the packages being based on the ANDRA specifications, consistent with basic safety rule III.2.e. Any type of waste package received in the Aube repository must have been approved prior to disposal.

An appropriate process, but similar in nature, will be employed for the future very low level waste repository.

For high level waste or intermediate long-lived waste, which is covered by the law of 30 December 1991, the waste packages are designed with reference to basic safety rule III.2.f. The ASN also asks the ANDRA for its opinion before authorising manufacture of a new type of package. Finally, as part of its studies, the ANDRA asked the waste producers to supply "data packages" summarising the characteristics of each type of package produced or for which production is planned. These data packages are the inputs for the disposal feasibility studies.

For the planned disposal of waste containing radium, waste containing graphite or tritiated waste which is not yet packaged, the ANDRA is examining the most appropriate means of packaging at the same time as it is defining the disposal concepts. This work involves close co-operation between the ANDRA and the waste producers.

H.1.3 The case of ICPEs and mines

In France, the last uranium mine closed down in 2001. The mining industry therefore no longer produces new waste, but the public and the environment must be protected from the waste produced in the past, particularly the mining tailings and the ore processing residue repositories. These repositories are installations classified on environmental protection grounds.

For industrial, research and medical activities taking place outside the BNI regulatory framework, the general principles for waste management, explained in law 75-633 of 15 July 1975 (article L.541 of the Environment Code) apply: prevent or reduce waste production and toxicity, in particular by acting at the product manufacture and distribution stage, by reusing the waste, by recycling or by any other steps designed to obtain reusable materials or energy from the waste.

A circular from the minister for health dated 9 July 2001 specifies the steps to be taken into account when managing waste and effluents resulting from medical care-related activities and industrial and research activities. In addition, requirements may be applied on a case by case basis by the ICPE Inspectorate, as and when necessary. Thought is being given to general requirements concerning the correct management of radioactive waste generated by these activities.

H.2 Existing facilities and past practices (Article 12)

Each Contracting Party shall in due course take the appropriate steps to review:

i) the safety of any radioactive waste management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility;

ii) the results of past practices in order to determine whether any intervention is needed for reasons of radiation protection bearing in mind that the reduction in detriment resulting from the reduction in dose should be sufficient to justify the harm and the costs, including the social costs, of the intervention.

H.2.1 Regulatory Authorities' request

With regard to the existing facilities, whether ICPEs or BNIs, a periodic safety review is made possible by the regulations. A frequency of about 10 years is used for the periodic reviews of the BNIs and the most hazardous ICPEs.

With regard to ICPEs, it is possible at any moment to update the order authorising the installation by means of additional orders (in practice this takes place at least every ten years for the more important ICPEs). These additional orders are passed after proposal by the ICPE Inspectorate and after recommendation from the local health council.

For the BNIs, given the potential hazard of the products they contain, the periodic safety review is conducted more systematically and extensively. In the particular case of the older waste interim storage sites, this type of review showed that improvements were necessary.

H.2.2 Measures taken by the BNI operators

H.2.2.1 Measures taken by the ANDRA

The Manche repository was operated from 1969 to 1994. During this period, both regulations and safety principles changed. The first editions of the basic safety rules I.2 and III.2.e dated from 1982 and 1985. The ANDRA concentrated on adapting its operating methods to changes in the regulations. For past practices, which no longer complied with current regulations, the ANDRA checked that they were still compatible with the safety objectives, during the periodic safety reviews. In particular, a complete safety review was conducted in 1995 in view of the transition of the Manche repository to the surveillance phase, which was analysed in accordance with currently applicable procedures for creation of a basic nuclear installation and which also involved a public inquiry. This review was brought up to date in 1999 following an investigation ordered by the French government into the situation of the Manche repository. It will again be updated in 2004 on the basis of experience feedback from the first ten years of surveillance of the repository.

For the planned fifty years of operation of the Aube repository, a similar upgrade process is followed. In particular the authorisation decree will be updated to take account of changes in effluent regulations (see § F.4.2.1.3), and the safety assessment produced in 1996 and 1997 following the first five years of operation of the repository will be updated in 2004.

H.2.2.2 Measures taken by the CEA

Old waste falls into the same categories as current waste, but owing to its age and the diversity of the storage conditions, there are particular problems with recovery, characterisation and treatment. This chiefly concerns:

- solid waste, generally placed in drums stored in shafts, cells or pools;

- solid waste buried underground in various forms (in bulk under a vinyl envelope, in metal drums, in concrete hulls);
- aqueous and organic liquid waste, contained in vessels, cylinders or drums.

After undergoing specific processing, they will pass through the normal channels.

The programme for recovery of this waste concerns on the one hand the "denuclearisation" of the Fontenay-aux-Roses and Grenoble centres (see § F.6.1.2.1), and on the other clean-up of BNI 56 in the Cadarache centre and BNI 72 in the Saclay centre. The aim is, after sorting of the waste, to send it either to the Aube repository, or to the future CEDRA interim storage facility, in Cadarache. All of these operations must be completed in 2015.

H.2.2.3 Measures taken by COGEMA: recovery of the old waste from La Hague

Unlike what happened for the new UP 2-800 and UP 3-A plants, some of the waste produced during operation of the UP 2-400 plant was stored pending final packaging.

Some facilities already in operation will be able in the future to handle most of the waste from UP 2-400.

Research and development work has been conducted into processing of the sludge from the STE2 shop, in particular to determine the recovery and transfer procedures. The recovery and packaging process proposed by COGEMA is to incorporate this sludge into bitumen, based on the process employed in the STE3 shop.

COGEMA envisages processing the hulls and end-pieces contained in the HAO silo and the S1, S2 and S3 pools, by compacting in the ACC shop. An initial step consists in characterisation of these hulls and end-pieces for subsequent recovery, sorting and transfer of the waste to the packaging units.

COGEMA is currently developing a mechanical system for recovering the waste from silos 115 and 130 and is working on characterisation of this waste. The studies should end in about 2005 and recovery operations should begin in about 2010.

H.2.2.4 Measures taken by EDF

H.2.2.4.1 Packaging and disposal of waste on the operating EDF sites

For several years, the EDF nuclear power plants have been forced to store waste, whether or not packaged, in their own facilities, because it cannot be shipped to the processing or disposal channels for the following reasons:

- some channels are as yet only at the engineering stage (waste containing asbestos, lead), and certain process developments had to be abandoned owing to technical or administrative problems;
- other channels were only recently created (CENTRACO commissioned in 1999) and have been unable to handle both current production and existing stocks;
- still others (surface disposal in the Aube repository), for which the technical specifications have changed, can no longer accept certain old packages;
- finally, various regulatory changes have led to changes in certain practices (halt in disposal of waste considered to be "non-radioactive" in the conventional waste disposal channels) or blockage of certain packages on the production sites (transport criteria not met).

Overall, interim storage on the 19 EDF nuclear power plant sites comprises about 6,000 m^3 of waste packages encapsulated in a hydraulic or organic binder or simply compacted (concrete containers for the more radioactive and metal or plastic drums for the others) and about 10,000 tonnes of liquid and solid waste, generally of very low and low level, packaged in containers, crates or metal tanks, which owing to a lack of space in the auxiliary buildings for fuel (BAC) and the effluent treatment building (BTE) had to be stored outdoors.

Of the actions initiated in 1998 both nationally and locally, we can as at mid-2002 mention the following:

- removal of waste with fire potential (oils, low-contamination solvents) from the BAC and BTE buildings to the "VLLW areas" outside these buildings (this has now been completed);
- elimination of waste storage in controlled areas inside the nuclear auxiliary building, fuel building and reactor building, except for small quantities of waste in transit between the place in which it was generated and the BAC or BTE buildings (this has now been completed);
- establishment of a long-term "VLLW area" reference system containing constructive provisions validated by the ASN (standard dossier produced) and the creation of this type of facility on each EDF site in conformity with the ASN decision of 10 November 2000 (action in progress);
- monitoring and traceability of all waste stored, by strengthening the site organisations accordingly;
- reduction of the quantities of concrete hulls present in the BAC and BTE buildings, by optimisation of the entire "shipment" process, taking account of the need for removal to the Aube repository as early as possible (action in progress);
- a combined search with the ANDRA (delivery, repackaging) for the means (development of specific packaging) of removing the old packages.

Other actions have been initiated at the corporate level, such as:

- the search for disposal channels for particular waste: neon tubes, sludge, lead (action in progress);
- providing the sites with computational methods for refining the radiological inventories of certain waste (action in progress);
- supporting the sites in their "waste surveys" (nearing completion).

H.2.2.4.2 Packaging and disposal of waste on EDF sites in dismantling situation

Correct dismantling of the 9 shutdown EDF reactors requires strict management of the waste produced by these operations and the availability of processing channels for this waste.

EDF estimates that the current dismantling of the 9 shutdown reactors will produce 700,000 to 800,000 tonnes of waste. Most of this, some 500,000 to 600,000 tonnes, will consist of cleaned concrete and rubble, which will mainly be used to fill the excavations left in the site by the facilities once dismantled. The remaining 200,000 tonnes constitute nuclear waste for which the disposal channels either exist or have to be created. They can be divided into:

- 130,000 to 140,000 tonnes of very low level waste, for which a VLLW disposal facility should be opened in the Aube department in 2003;
- about 50,000 tonnes of low or intermediate level waste, for which the Aube repository is available;
- nearly 20,000 tonnes of graphite for which a channel and disposal solution need to be developed with the ANDRA and the Safety Authority by 2008-2010 to allow dismantling of the GGR reactors;
- about 1000 to 2000 tonnes of intermediate level, long-lived waste, which will be stored pending opening of a repository able to take them.

Through the creation of an engineering unit dedicated to dismantling, EDF has acquired the skills it needs to define and implement the various packaging and disposal channels for the various types of waste to be produced by the dismantling of its reactors.

H.2.2.4.3 Relations with the ANDRA concerning packaging and disposal of waste

To enable the stock of waste stored on the sites to be disposed of, EDF actively supports the ANDRA's development of new disposal channels for the very low level waste (VLLW short-lived) and for the graphite waste.

The VLLW disposal facility should be operational in mid-2003, and should then be able to take the stocks stored in the nuclear power plants (in particular part of steam generator bleeding system resins and active carbon) as well as from the facilities being dismantled (in particular the lagging, earth, rubble and scrap from Brennilis, Chinon and Creys-Malville). On-line disposal of VLLW waste produced by operation and dismantling would be possible in these conditions as of 2005.

Specific disposal of low level long-lived graphite waste resulting from dismantling of the GGR reactors belonging to EDF (Saint-Laurent, Bugey, Chinon), and to CEA (Marcoule) is currently being examined by the ANDRA.

H.2.3 Analysis by the ASN for BNIs

For the facilities in operation, the principle of the periodic safety review (see § G.2) guarantees that the safety of the facilities has been examined in the light of the most recent knowledge and regulations.

The waste repositories, which are no longer in operation, retain their ICPE or BNI status and are thus subject to the same requirements. In particular the condition of the facility is periodically reviewed and if justified, the need for a possible intervention is examined.

A national inventory of polluted sites is kept up to date and the need for any intervention is examined in the light of the potential health consequences and the priority that must be given to the polluted sites as a whole (chemical or radioactive).

As a result of their previous activities, whether industrial or research, COGEMA, the CEA and EDF have stored radioactive waste on certain sites (La Hague, Saclay, Marcoule, Cadarache, Chinon, le Bugey, Saint-Laurent-des-Eaux). This interim storage took place in accordance with the regulations and rules of good practice applicable at the time. The lack of or the age of the packaging of this waste and the initially envisaged lifetime of these storage facilities, combined with the ever-stricter safety requirements since then, means that this waste must be recovered for lasting packaging.

Current or future actions are therefore of several types:

- study of new processing and packaging methods;
- precise characterisation of the old waste;
- implementation of processing and packaging facilities conforming to current facility and packaging safety criteria; these could be new facilities or renovated facilities, such as the CEA's effluent processing stations;
- recovery of the waste by installing specific processing equipment or facilities (La Hague sludge recovery facility, recovery of hulls and end-pieces from silo HAO, recovery of waste from silos 115 and 130, equipment for processing old waste from the Cadarache storage "trenches" and vaults);
- deployment of storage facilities designed for a lifetime compatible with the development of long-term solutions which will follow-on from research work into the management of high level or intermediate level and long-lived radioactive waste.

The ASN ensures that these large-scale programmes do not drift beyond their planned time-frame of several decades.

Among the old waste, the ASN is particularly interested in that for which there is currently no appropriate disposal channel. To examine these questions, the High Commissioner for atomic energy (at present the Defence nuclear safety and radiation protection director) and the director for the safety of nuclear installations (at present the DGSNR) set up a joint working group in 1997 at the request of the minister for industry, bringing together the waste producers, the ANDRA and the other entities concerned. This group is examining possible solutions for disposal of the following waste:

- tritiated waste which contains tritium hard to contain inside a waste package. Its disposal in the Aube repository could only be envisaged if the quantity of tritium present in the packages is low or if the tritium is effectively contained. In 2000, the CEA on the one hand looked at a particular package type able to contain the tritium and on the other developed a tritium measurement method with a sufficiently low detection threshold. Depending of the result of these studies the delivery of certain tritiated waste could be envisaged to the Aube repository. Future of this waste requires however thorough thoughts.
- graphite waste containing a large proportion of long-lived radionuclides, making it impossible to dispose of it in the Aube repository. For this waste, the ANDRA is currently looking at several final disposal designs.

Pending recovery of the waste, the ASN ensures that the often ageing facilities in which it is stored are adequately supervised and sufficient counteraction measures are taken to meet current safety criteria. In the more problematical cases, it may be necessary to find an alternative facility.

With regard to management of the sources covered by the authorisations issued by the ASN, they are permanently monitored by their owner, who must at all times be able to state where they are by means of an inventory, whenever requested by the Authority. For sealed sources, this monitoring is backed up by an annual examination of the conditions of use of the sources by an accredited organisation, with the results of this examination being sent to the Authority, to back up a permit renewal application. The traceability of sources, which are contained in a national inventory held by the IRSN, is partly based on the periodic production of a record of their movements drawn up by their suppliers (see § F.2.5 and section J. for sources' end-of-life).

H.2.4 The case of old non-BNI waste

Current policy and practices concerning this waste are presented in the general framework in paragraphs B.4 and B.5.

H.3 Siting of proposed facilities (Article 13)

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed radioactive waste management facility:

i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime as well as that of a disposal facility after closure;

ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment, taking into account possible evolution of the site conditions of disposal facilities after closure;

iii) to make information on the safety of such a facility available to members of the public;

iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.

2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 11.

H.3.1 Nuclear Safety Authority request concerning BNIs

For radioactive waste management facilities, which are basic nuclear installations, the general BNI regulations apply and their description regarding siting has been presented in paragraph E.2.2.2.

H.3.2 Measures taken by the BNI operators

H.3.2.1 Measures taken by the ANDRA

The characteristics of the environment of a repository site are essential data, as the geological environment constitutes a containment barrier for the repository which comes into play when the integrity of the artificial barriers (waste package, repository structure) can no longer be guaranteed. This situation is examined more closely when evaluating the long-term impact of the repository, which is included in the files submitted to back up applications for authorisation decrees and which are the subject of a public inquiry, in conformity with the regulations.

This inquiry took place in 1986 before the Aube repository was created, in 2000 before the Manche repository entered the surveillance phase and in 2002 before the very low level waste repository could be created in Morvilliers.

The Aube repository has a local information committee (CLI) and the Manche repository a surveillance committee (CSCM) on which the elected representatives from the communes adjoining the repositories have seats. The VLLW waste repository will have an equivalent structure. The ANDRA periodically presents the safety reviews from the repositories to these committees, with attendance by representatives of the local DRIRE.

In addition, notification to ASN of safety-related events in a repository are simultaneously forwarded to the chair of the relevant committee and to the elected representatives of the communes in which the sites are located.

Information brochures are regularly published by the ANDRA and distributed to the local residents. Finally, the public can obtain information on safety questions from the visitor reception buildings in each repository.

Finally, for creation of the Aube repository, a dossier concerning discharges from the repository was submitted on 23 May 1991 to the European Commission under article 37 of the Euratom treaty covering discharges, and received a favourable opinion on 12 November 1991. This dossier will be updated as part of the examination of the liquid and gaseous radioactive discharges permit request filed in June 2002 (see § F4.2.1.3).

In the same way, the transition of the Manche repository to the surveillance phase was considered as the creation of a new basic nuclear installation and hence, a dossier was transmitted to the European Commission for this repository on 29 March 2000 under the same article 37 of the Euratom treaty on discharges, and received a favourable opinion on 19 October 2000.

H.3.2.2 Measures taken by the CEA

The future CEDRA facility to be built on the Cadarache site will comprise an interim storage facility capable of taking existing stocks plus 30 years of current production and a processing unit for repackaging the drums of old waste. Prior to the public inquiry, the CEA conducted an extensive information campaign in the local communities, through meetings of the Cadarache local information committee. The facility creation authorisation application was submitted to a public inquiry in the summer of 2002. After a favourable opinion from the Inquiry Commissioner, the authorisation decree was under preparation at the beginning of 2003.

H.3.3 Analysis by the ASN concerning BNIs

The ASN ensures total compliance with the relevant regulations through examination of the dossiers submitted by the operators.

H.3.4 The case of ICPEs and mining waste

Environmental acceptability is the guiding principle of the regulations applicable to classified installations on environmental grounds. The requirements must ensure that any hazard to the vicinity is eliminated and that the environment is protected. The approach followed must thus be based on environmental sensitivity.

In the case of installations subject to authorisation, in accordance with European directives, the authorisation application must comprise an impact assessment, the aim of which is to analyse the impact of the project on the environment. Its content must be commensurate with the scale of the planned works and the foreseeable consequences. The impact assessment must comprise:

- an analysis of the initial status of the site and the environment, in particular concerning natural resources, material goods and the cultural heritage likely to be affected by the project;
- an analysis of the direct and indirect, temporary and permanent effects of the installation on the environment;
- the reasons for which, in particular in the light of environmental concerns, the project was chosen from among the possible solutions;
- the measures envisaged by the applicant to eliminate, restrict and if possible remedy any inconveniences created by the installation.

The authorisation application must also comprise a hazard analysis. It in particular contains a description of the accidents which could occur, in particular under the effect of foreseeable external causes given the planned location, and a presentation of the hazards that could be posed by the installation in the event of an accident.

The content of the hazard and impact assessments, and all aspects of the authorisation application file, are made public and submitted to the populations concerned by the project within the framework of a public inquiry.

As regards to mining residues, the general regulation for extractive industry lays down special rules for the management of radioactive products having an uranium content higher than 0.03%. In practice, few mine tailings are concerned by this rule since at some times when uranium reached a high price, most of the ores with a content higher than 0.03% was lixiviated. The only case where this limit is exceeded would be a repository for uranium ore at 0.07% in Lodève.

H.4 Design and construction of facilities (Article 14)

Article 14 : Each Contracting Party shall take the appropriate steps to ensure that:

i) the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a radioactive waste management facility other than a disposal facility are taken into account;

iii) at the design stage, technical provisions for the closure of a disposal facility are prepared;

iv) the technologies incorporated in the design and construction of a radioactive waste management facility are supported by experience, testing or analysis.

H.4.1 The BNI case

For the radioactive waste management facilities, which are basic nuclear installations (BNI), the general regulation for BNIs, as specified in paragraph E.2, applies.

The description of the general regulations for BNIs, which include radioactive waste management facilities, with regard to their design and their construction, has been given in paragraph E.2.2.3.2 for the procedures, in paragraph E.2.2.5 for technical rules and in paragraph E.2.2.4 for releases.

As regards technical provisions for dismantling a basic nuclear installation, the appendix to the decree 73-278 of 13 March 1973 indicates that these are to be described in a separate chapter of the safety analysis report, which has to be provided in support to the application for authorisation decree as mentioned in paragraph E.2.2.3.2.1.

The Nuclear Safety Authority ensures of the implementation of the regulation through assessment and inspections that it performs according to the terms which have been presented in paragraphs E.2.2.6 and E.2.2.7.

H.4.2 The Case of ICPEs

For the radioactive waste management facilities, which are installations classified on environmental protection grounds (ICPE), the general regulation for ICPEs applies and its description, as regards to design and construction, has been given in paragraph E.2.3.1.

The Regulatory Authority ensures of the implementation of the regulation through assessment and inspections that it performs according to the terms which have been presented in paragraphs E.2.3.2.

H.5 Safety assessment of facilities (Article 15)

Article 15 : Each Contracting Party shall take the appropriate steps to ensure that:

i) before construction of a radioactive waste management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

ii) in addition, before construction of a disposal facility, a systematic safety assessment and an environmental assessment for the period following closure shall be carried out and the results evaluated against the criteria established by the regulatory body;

iii) before the operation of a radioactive waste management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

H.5.1 Safety Authority request concerning BNIs

For radioactive waste management facilities, which are basic nuclear installations, the general BNI regulations apply and their description, in terms of safety assessment, has been presented in paragraph E.2.2.3.1.

In particular, the appendix to the decree 73-278 of 13 March 1973 indicates that a preliminary safety analysis report has to be provided in support to the application for authorisation decree. This text indicates also that a provisional safety analysis report be provided in support to the application for pre-commissioning authorisation and finally that a final safety analysis report be provided in support to the application for commissioning, as mentioned in paragraph E.2.2.

H.5.2 Measures taken by BNI operators

H.5.2.1 ANDRA practices

For the Manche and Aube repositories, which are basic nuclear installations, the ANDRA has complied and continues to comply with the applicable regulations.

For creation of the Aube repository, the safety and environmental assessments concerned not only the operating phase, but also the surveillance phase not exceeding 300 years, and the post-surveillance phase. The design of the disposal structures and the specifications applicable to waste packages take account of the modifications necessary for transition of the repository to the surveillance phase.

As mentioned in paragraph H.2.2.1, the preparation for transition of the Manche repository to the surveillance phase was carried out using the same provisions as for creation of a new BNI.

The periodic safety reviews for the radioactive waste disposal facilities have been presented in paragraph H.2.2.1.

H.5.2.2 Practices of the other operators

Radioactive waste management facilities are basic nuclear installations in the same way as spent fuel management facilities and are thus subject to the same regulations. Consequently, the practices of the CEA, COGEMA and EDF - which possess both types of installations - in terms of safety assessment of radioactive waste management facilities, are identical to those used for spent fuel management facilities, described in paragraph G.2.2.

H.5.3 ASN analysis concerning BNIs

Radioactive waste management facilities are not covered by specific regulations among BNIs. Their impact and safety are assessed prior to granting of their authorisation decree (see § E.2.2). In the case of disposal facilities, the long-term safety of the facility is part of the safety demonstration made as of the design and authorisation of the facility.

H.5.4 The case of ICPEs and mining waste

The assessment of the design choices made by the operator and the assessment of the impacts and hazards associated with an installation classified on environmental protection grounds that is subject to authorisation or with a mining waste repository, are analysed during examination of the results of the impact and hazard assessments (see § F.5.3.2 and § H.3.4).

The objective followed by operators and people in charge of administrative supervision has always been to prevent from leaving remaining excessive long-term constraints for site monitoring or maintenance.

H.6 Operation of facilities (Article 16)

Each Contracting Party shall take the appropriate steps to ensure that:

i) the licence to operate a radioactive waste management facility is based upon appropriate assessments as specified in Article 15 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

ii) operational limits and conditions, derived from tests, operational experience and the assessments as specified in Article 15 are defined and revised as necessary;

iii) operation, maintenance, monitoring, inspection and testing of a radioactive waste management facility are conducted in accordance with established procedures. For a disposal facility the results thus obtained shall be used to verify and to review the validity of assumptions made and to update the assessments as specified in Article 15 for the period after closure;

iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a radioactive waste management facility;

v) procedures for characterization and segregation of radioactive waste are applied;

vi) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

vii) programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;

viii) decommissioning plans for a radioactive waste management facility other than a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body;

ix) plans for the closure of a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility and are reviewed by the regulatory body.

H.6.1 Safety Authority request concerning BNIs

For radioactive waste management facilities, which are basic nuclear installations, the general BNI regulations apply and their description in terms of operation has been presented in paragraph E.2.2.4.

H.6.2 Measures taken by BNI operators

H.6.2.1 ANDRA operational safety practices

For its installations covered by the BNI regulations, the ANDRA follows the procedures described in paragraph E.2. They in particular apply to commissioning of these facilities and to the declaration of events significant to safety.

The general operating rules (RGE) define the normal envelope within which the repositories are operated. They are established by the ANDRA in conformity with the general regulations, the regulations specific to each facility (in particular the authorisation decree) and the technical requirements notified by the ASN. The RGE are subject to formal approval by the ASN.

Environmental monitoring plans are also drawn up by the ANDRA and stipulate the measurements taken in or around the repositories to check their impact and the frequency of these measurements. They are the subject of critical examination by the ASN prior to their implementation.

These steps are taken not only in the operating Aube repository, but also in the Manche repository, now in the surveillance phase.

Generally speaking, all the activities performed by the ANDRA, in particular operation, maintenance and surveillance of the disposal facilities, are carried out according to established procedures, in conformity with the quality system set up by the ANDRA (see § F 3.2.1). The organisation of the Agency aims to maintain the necessary scientific and technical skills in all areas related to the safety of its facilities (see § F2.2.1).

At least every six months, the ANDRA transmits to the ASN a report on the operations carried out in the disposal facilities. These reports describe the origin and quantities of waste packages delivered and disposed of and the main significant operational events. Monthly environmental monitoring bulletins are issued containing the measurement results and annual analysis reviews.

Finally, the ANDRA produces an annual summary of the package approvals it has issued, enclosing the corresponding back-up dossiers in accordance with the process described in paragraph H.1.2.1. These dossiers mention the waste characterisation procedures employed by the producers to meet disposal safety needs. The ANDRA produces reports on the quality of packaging of this waste, for each of the waste production sites. These reports contain information gathered during process audits conducted by the ANDRA in the waste producers' facilities (about sixty audits per year), during computer checks on the specifications of each package to be delivered, during checks on the packages delivered to the Aube repository and finally, during destructive and non-destructive tests performed on delivered packages.

All this information is used when updating the safety documents, in terms of both the short-term safety and the medium to long-term safety of the disposal facilities. It may lead to changes in the operating conditions.

The experience acquired with the Manche repository currently in the surveillance phase, is helping with preparation for the transition to surveillance of the Aube repository, although this should not happen for about another fifty years (see § H.1.2.3).

H.6.2.2 CEA, COGEMA and EDF practices

Radioactive waste management facilities are basic nuclear installations, in the same way as spent fuel management facilities, and are thus subject to the same regulations. Consequently, the practices of the CEA, COGEMA and EDF – which possess both types of facility – in terms of the operational safety of radioactive waste management facilities, are identical to those employed for spent fuel management facilities, described in paragraph G.5.2.

H.6.3 ASN analysis concerning BNIs

The provisions described in paragraph E.2.2 concerning BNI regulations aim to meet the objectives of article 16. Supervision of the steps taken by the operators, in particular through frequent inspections and periodic safety reviews, enables guaranteeing that the regulations are implemented.

H.6.4 The case of ICPEs and mining waste

In the case of installations classified on environmental protection grounds, the steps to be taken for operation, maintenance and monitoring as well as any required at the time of cessation of operation, are set by technical requirements incorporated into the Prefect's order (see § E.2.3.1).

With regard to mining waste, since all the facilities have ceased their operation, practices concerning their closure are presented in paragraph H.7.2.

H.7 Institutional measure after closure (Article 17)

Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility:

i) records of the location, design and inventory of that facility required by the regulatory body are preserved;

ii) active or passive institutional controls such as monitoring or access restrictions are carried out, if required; and

iii) if, during any period of active institutional control, an unplanned release of radioactive materials into the environment is detected, intervention measures are implemented, if necessary.

H.7.1 The case of waste from BNIs or ICPEs

In France, the first disposal facility to enter the surveillance phase (final closure as defined under the terms of the Convention) is the Manche repository, described in paragraph B.5.4.1.

The ANDRA applied for the corresponding authorisation in 1995. Following the public inquiry into this application, which led to a favourable opinion, a commission was tasked by the Government with assessing the situation of the Manche repository and submitting its opinion on the impact of the repository on the environment. The ANDRA was then asked to submit a new application taking account of the recommendations of this commission.

In September 1998, the ANDRA therefore submitted a new application for authorisation to make the transition to the surveillance phase, supplemented in 1999. The safety documents produced to back up this application were submitted to the ASN, which officially approved them in January 1999.

At the request of the ASN, the ANDRA in December 1997 also submitted a discharge permit application, revised in 1999.

These two applications were submitted to the public inquiry from 2 February to 17 April 2000 (inquiry extended until 17 May in the case of the application for authorisation to make the transition to the surveillance phase). The Inquiry Committee issued a favourable opinion on 6 June 2000 concerning each of these applications, but with three reservations concerning the transition to the surveillance phase. These reservations respectively concerned the extension to ten years of the first surveillance phase of the repository, examination of reinforced monitoring resources in the proximity of the structures with the highest potential hazards, and implementation of a programme of inspections and maintenance of the drains collecting the water circulating through the facility.

After the public inquiry, jointly with the various ministerial services concerned and taking account of the recommendations of the public Inquiry Committee, the ASN prepared a draft authorisation for transition to the surveillance phase, amending the initial authorisation decree of 1969, and a draft discharge authorisation order. The draft decree was examined in early 2001 by the Inter-ministerial BNI committee and submitted at the end of 2002 to the Manche department health council. The discharge authorisation order and the decree authorising the transition to the surveillance phase were issued on 11 January 2003.

H.7.2 The case of mining waste

The objective pursued by the operators and people in charge of the administrative supervision has always been to prevent from remaining excessive constraints on long-term site monitoring or maintenance.

Sites redevelopment were up to now designed such as after a five to ten years monitoring period, the surveillance of these sites may be very light. Mine tailings, the uranium content of which is lower than 0.03% are therefore used to cover more active residues coming from chemical processing.

Concerning the Bois Noirs site, the lasting solution is still under study; it concerns in priority chemical treatment residues, and to a lesser extent, water overflowing the mining works.

Section I – TRANSBOUNDARY MOVEMENT (Article 27)

1. Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.

In so doing:

i) a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorized and takes place only with the prior notification and consent of the State of destination;

ii) transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized;

iii) a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste in a manner consistent with this Convention;

iv) a Contracting Party which is a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met prior to transboundary movement;

v) a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.

2. A Contracting Party shall not licence the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal.

3. Nothing in this Convention prejudices or affects:

i) the exercise, by ships and aircraft of all States, of maritime, river and air navigation rights and freedoms, as provided for in international law;

ii) rights of a Contracting Party to which radioactive waste is exported for processing to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin;

iii) the right of a Contracting Party to export its spent fuel for reprocessing;

iv) rights of a Contracting Party to which spent fuel is exported for reprocessing to return, or provide for the return of, radioactive waste and other products resulting from reprocessing operations to the State of origin.

For France, transboundary movement of spent fuels and radioactive waste primarily concern the spent fuel reprocessing operations performed in the La Hague plant on behalf of German, Japanese, Belgian, Swiss and Dutch customers.

France is committed to the principle whereby each nuclear power plant operator is responsible for the waste it generates, a principle it has implemented in the law of 30 December 1991. Article 3 of this law states that "disposal in France of imported radioactive waste, even if reprocessed in France, is prohibited beyond the technical time-frame required by this reprocessing".

The reprocessing contracts with the foreign nuclear power companies thus comprise a clause stipulating return of the waste to their country of origin. This waste is packaged in a form allowing safe transport and interim storage offering protection of both the environment and public health. These contracts are reinforced by inter-governmental agreements guaranteeing return of the waste. France ensures that the countries of destination of the waste abide by the obligations of § 1 of article 27 of the Joint Convention.

With regard to the organisation of transboundary movements, France abides by the comprehensive international, European and national regulations regarding safety, transport, security, physical protection and public order.

It in particular abides by directive 92/3 Euratom, transposed into French law by a decree of 22 September 1994, corresponding to the obligations of the Convention. On this point, and as early as 1994, the French authorities went further than the provisions of this directive and anticipated those of the Joint Convention (article 27, § 1, i) by requiring the consent of the State of destination, even if outside the limits of the European Community.

Transboundary movements with European countries mainly uses rail. Sea routes are used for Japan as port infrastructures appropriate to the level of nuclear safety required have been built on both sides. No significant incident compromising safety, security or radiation protection has been notified in recent years during these transports.

It should be noted that in compliance with § 2 of article 27 of the Joint Convention, France has never authorised a shipment of spent fuel or radioactive waste to a destination situated south of latitude 60 degrees south.

France is particularly committed to compliance with all aspects of the provisions of article 27 of the Joint Convention concerning transports. It voluntarily supplements them through a policy of transparency, comprising an exchange of information and dialogue, in particular with the general public and society as a whole. It in particular applies these maritime transport provisions to coastal states along the shipping routes, along with diplomatic information campaigns.

Section J – DISUSED SEALED SOURCES (Article 28)

1. Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.

2. A Contracting Party shall allow for reentry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources.

J.1 Regulatory request

The general regulatory framework for sources is described in paragraph E.2.4.2. Sealed sources are returned to the supplier once no longer used or no later than ten years after the date of initial signature by the IRSN on the corresponding supply form, barring official prolongation of the utilisation licence.

This prolongation is in particular to be assessed on the basis of the source construction process, the quality of its construction and the conditions in which it has been used, as well as according to the extent to which the condition and leaktightness of the source can be checked.

J.2 The role of the CEA

The CEA manages the sources it uses. As a supplier of sources, it manages those returned to it by industry, hospitals, etc., as well as those entrusted to it by the public authorities (in cases in which the manufacturer has disappeared). This leads to a wide variety of sources, which sometimes have to be recovered from remote countries and which often require characterisation owing to the lack or inadequacy of the documentation normally associated with a source.

The inventory of the CEA's radioactive sources is monitored via a database supplied with data by the units in possession of the sources. This database now indicates the status of the source (in use or disused) and the disposal channel or interim storage conditions pending a final appropriate disposal solution (for example deep geologic disposal). It also indicates that a significant number of declared radioactive objects are not sources as defined by the regulations, but waste that has to be dealt with in appropriate management channels, after an internal decommissioning procedure to be specified.

The CEA disused source strategy is thus comparable in its spirit to that defined for management of radioactive waste.

Section K – PLANNED ACTIVITIES TO IMPROVE SAFETY

K.1 National measures

K.1.1 Objectives of the Nuclear Safety Authority

France is committed to constantly improving the safety of its spent fuel management facilities and its radioactive waste management facilities. With this in mind, the priority goals of the Authorities are the following:

- to promote the achievement of a national radioactive waste management plan, to be drafted jointly with all parties concerned and with the public as a whole, covering all waste categories and identifying those which do not yet have an appropriate disposal channel.
- to encourage resolute continuation of research into final management solutions for waste currently without a disposal channel;

In addition, as regards BNIs, the goals of the Nuclear Safety Authority deal with the following:

- to ensure continued recovery of old waste stored in unsatisfactory conditions;
- through regulatory texts, to formalise requirements and administrative practices as yet not covered, in order to maintain the Safety Authority's clear and strong position once market deregulation increases the economic pressure on the operators;
- to ensure that activities related to the safety of spent fuel management and waste management continue to be dealt with on an equal footing with activities related to the safety of reactors, on the one hand through implementation of the “quality” order and on the other by promoting development of the safety culture around these activities;
- to improve consideration of human factors and organisational problems by the operators, as these problems are often the cause of incidents;

K.1.2 Objectives of the operators

In 2001, the ANDRA signed a contract with the State consolidating the general framework of its actions and defining the goals to be achieved during the period 2001 to 2004. Safety is directly and indirectly at the heart of these goals:

- to increase operational safety requirements, on the one hand by making the personnel and contractors more aware of the issues and on the other by improving systems and procedures;
- to construct and then operate new operational disposal solutions (commissioning of the very low level waste repository in 2003, defining in 2003 safe designs for disposal of waste containing radium and graphite waste);
- to propose management channels for waste generated by small nuclear producers which today has no management solution, by continuing development of interim storage likely to offer complete coverage of needs by 2004;
- to continue inventory improvement work, as well as definition of specifications and quality control of packages so as to allow the management of package types which are not currently covered.

The other operators do not have such a formal framework for their undertakings, comparable to this contract with the State. Nonetheless, as mentioned earlier, they are committed to providing an in-depth response to a variety of concerns, such as quality, safety, security, environmental impact, economic results and social well-being. These were expressed in paragraph F.3.2, which deals with quality.

K.2 International co-operation measures

K.2.1 Co-operation between the safety authorities and their technical support

The regulatory aspects of safety and radiation protection lead to numerous exchanges and extensive international co-operation. Within international organisations the national safety authorities compare their approaches and methodologies to define safety goals which benefit from shared experience learned from operation of nuclear facilities in the various countries.

The international actions of the French Nuclear Safety Authority (ASN) have grown both with international organisations, such as the International Atomic Energy Agency (IAEA), the OECD's Nuclear Energy Agency (NEA), the European Union and nuclear regulators' associations (INRA, WENRA, FRAREG), and within the framework of ongoing bilateral agreements with more than about fifteen foreign Safety Authorities.

In the field of the safety of radioactive waste management and spent fuel management, international relations activities by the IRSN, the Safety Authority's technical support organisation, are mainly organised around the following areas of development:

- comprehension of the processes governing transfers of radioactive materials in the geosphere and reaching a consensus on technical questions;
- development of international co-operation on subjects concerning spent fuel and deep geologic disposal of radioactive waste;
- research into deep earthquakes and their consequences on the circulation of underground water;
- studies into the prediction of seismic movements (mainly within European projects such as "Dissemination of Strong Motion Data", PRESAP, simulation of strong motion predictive maps, and CORSEIS);
- development of instrumentation resources;
- assistance to the Eastern European countries (European Phare / Tacis programmes and EBRD projects concerning the safe disposal of waste from the Chernobyl plant).

Within a bilateral framework, the IRSN is developing co-operation with the Swiss NAGRA organisation to conduct studies into underground work for geologic disposal of high-level, long-lived waste. Under IRSN agreements with the Japanese JNC and JAERI organisations, work on the safety of waste disposal is under way or under preparation. Similarly, co-operation is planned with the Ukrainian SSTC and Russian SEC-NRS bodies to improve waste and spent fuel management. Participation in an Armenian project, submitted to the ISTC, is also envisaged in order to define a possible underground disposal site.

Work to expand knowledge and to perfect assessment tools is also being done at an international level. The IRSN took part in the European BORIS programme to study the injection of liquid effluents into the sub-soil in Krasnoyarsk, the European BENCHPAR programme for cross-comparison of methods to model thermal-hydro-mechanical effects in deep geologic formations and international working groups set up to draft technical recommendations, guides and standards for radioactive waste and spent fuel. As an example, we could mention the IAEA's methodology guide for the use of historical and archaeological data on earthquakes, and the "Clay-Club" group of experts of the NEA's Radioactive Waste Management Committee (RWMC) for management of radioactive waste and deep geologic disposal.

K.2.2 Co-operation between operators

K.2.2.1 ANDRA international co-operation

The international aspect is an important part of the ANDRA's activities, as thinking about radioactive waste management cannot simply be considered at a national level. It is essential to compare the ANDRA's approach with those adopted abroad and to benefit from experience feedback from foreign partners, but also to mobilise high-level scientific expertise in the Agency's programmes and projects. In this respect, the ANDRA has set itself a number of goals:

- to promote contacts and co-operation with its foreign partners. The ANDRA is committed to presenting its projects and methods internationally, in order to compare them with those from other countries concerned by the subject. It therefore integrates its research activities into projects with its European partners, in particular through joint research and development programmes. It opens up its programmes and facilities to its foreign partners, for example the Meuse-Haute-Marne laboratory working on deep geologic disposal of high-level, long-lived waste. In 1996, it had its low and intermediate level, short-lived waste management approach assessed by the IAEA (WATRAP exercise);
- to be present on the leading international organisations: European co-ordinating bodies, OECD/NEA, IAEA;
- to maintain a scientific, technical, economic watch, which is a structured activity within the ANDRA;
- to conduct occasional skills valorisation missions.

K.2.2.2 CEA International co-operation

As an organisation for scientific and technical research in the nuclear field, the CEA is developing its activities in all areas concerned, in particular safety; these activities lead to numerous international co-operation programmes.

In terms of the safety of its own facilities, it is participating in the European Commission's community research programme as well as the work done by the NEA and the IAEA into spent fuel and radioactive waste management. It has also set up regular exchanges with several similar foreign organisations: these exchanges concern on the one hand operational experience from the facilities (particularly in Great Britain and Belgium) and in particular the lessons learned from incidents (with in addition to these two countries, the United States of America and Japan), and on the other, research into packaging and the long-term behaviour of the waste packages.

K.2.2.3 COGEMA International co-operation

Owing to its particular activity, COGEMA does not officially work together with foreign partners on safety related topics.

K.2.2.4 EDF International co-operation

The first area for EDF's international co-operation is exchange of experience. Twinning operations between French nuclear power plants and foreign power plants constitute the main framework for these exchanges and allow direct exchange of information between operators of different cultures, working in different environments. These exchanges for example concern specific activities such as the quality of unit outages or radiological cleanness and contribute to the circulation of information concerning the management of safety and competitiveness.

A second area concerns collaboration with international institutions. With regard to the IAEA, EDF takes part in work performed on safety standards and incident analysis (IRS) and is involved in OSART missions to assess the safety of nuclear facilities, both in France and abroad. With regard to WANO

(World Association of Nuclear Operators), EDF is also a participant in the Peer-Reviews (both in France and abroad) along with the other programmes, particularly those concerning experience feedback, technical meetings and performance indicators, with sharing of databases. EDF also keeps informed of the work of the NEA, the EPRI, INPO, NRC, etc.

A third area concerns consulting and services for other operators, co-operative agreements (South Africa, China) and assistance in various technical fields (training, engineering, chemistry, etc.), twinning arrangements and partnerships (Eastern Europe).

Section L – ANNEXES

Among the facilities concerned either by spent fuel management or by radioactive waste management, such as it is presented in section D, the major ones, which all belong to the basic nuclear installation category, as defined in paragraph E.1.1, are distributed on the French territory as shown on the following location map.

Location of basic nuclear installations in France

Among the BNIs will be mentioned the two repositories for LILW-LL referred to in this report:

- The Manche repository, located at Digulleville close to Beaumont - La Hague (50)
- The Aube repository, located at Soulaines (10)

L.1 Spent fuel management facilities as at 31/03/2003

L.1.1 Facilities generating spent fuel

Spent fuel is generated or likely to be generated in the following basic nuclear installations:

BNI No.	NAME AND LOCATION OF THE INSTALLATION	Operator	Type of installation	Declared on :	Authorised on :	Official Gazette (O.G.) of :	REMARKS
18	ULYSSE (Saclay) 91191 Gif-sur-Yvette Cedex	CEA	Reactor	27.05.64			
24	CABRI and SCARABÉE (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Reactors	27.05.64			
39	MASURCA (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Reactor		14.12.66	15.12.66	
40	OSIRIS - ISIS (Saclay) 91191 Gif-sur-Yvette Cedex	CEA	Reactors		08.06.65	12.06.65	
41	HARMONIE (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Reactor		08.06.65	12.06.65	
42	EOLE (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Reactor		23.06.65	28 and 29.06.65	
67	HIGH FLUX REACTOR À (RHF) 38041 Grenoble Cedex	Max von Laue Paul Langevin Institute	Reactor		19.06.69 05.12.94	22.06.69 06.12.94	Modification to perimeter : decree of 12.12.88 (O.G. of 16.12.88)
71	PHÉNIX POWER PLANT (Marcoule) 30205 Bagnols-sur-Cèze	CEA	Reactor		31.12.69	09.01.70	
75	FESSENHEIM NUCLEAR POWER PLANT (reactors 1 and 2) 68740 Fessenheim	EDF	Reactors		03.02.72	10.02.72	Modification to perimeter : decree of 10.12.85 (O.G. of 18.12.85)
78	BUGEY NUCLEAR POWER PLANT (reactors 2 and 3) 01980 Loyettes	EDF	Reactors		20.11.72	26.11.72	Modification to perimeter : decree of 10.12.85 (O.G. of 18.12.85)
84	DAMPIERRE NUCLEAR POWER PLANT (reactors 1 and 2) 45570 Ouzouer-sur-Loire	EDF	Reactors		14.06.76	19.06.76	
85	DAMPIERRE NUCLEAR POWER PLANT (reactors 3 and 4) 45570 Ouzouer-sur-Loire	EDF	Reactors		14.06.76	19.06.76	
86	BLAYAIS NUCLEAR POWER PLANT (reactors 1 and 2) 33820 Saint-Ciers-sur-Gironde	EDF	Reactors		14.06.76	19.06.76	
87	TRICASTIN NUCLEAR POWER PLANT (reactors 1 and 2) 26130 Saint-Paul-Trois-Châteaux	EDF	Reactors		02.07.76	04.07.76	Modification to perimeter : decree of 10.12.85 (O.G. of 18.12.85)
88	CENTRALE NUCLÉAIRE DU TRICASTIN (reactors 3 and 4) 26130 Saint-Paul-Trois-Châteaux	EDF	Reactors		02.07.76	04.07.76	Modification to perimeter : decree of 10.12.85 (O.G. of 18.12.85)
89	BUGEY NUCLEAR POWER PLANT (reactors 4 and 5) 01980 Loyettes	EDF	Reactors		27.07.76	17.08.76	Modification to perimeter : decree of 10.12.85 (O.G. of 18.12.85)
92	PHÉBUS (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Reactor		05.07.77	19.07.77	Modification : decree of 07.11.91 (O.G. of 10.11.91)
95	MINERVE (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Reactor		21.09.77	27.09.77	
96	GRAVELINES NUCLEAR POWER PLANT (reactors 1 and 2) 59820 Gravelines	EDF	Reactors		24.10.77	26.10.77	
97	GRAVELINES NUCLEAR POWER PLANT (reactors 3 and 4) 59820 Gravelines	EDF	Reactors		24.10.77	26.10.77	
100	ST-LAURENT NUCLEAR POWER PLANT (reactors B1 and B2) 41220 La Ferté-St-Cyr	EDF	Reactors		08.03.78	21.03.78	
101	ORPHÉE (Saclay) 91191 Gif-sur-Yvette Cedex	CEA	Reactor		08.03.78	21.03.78	
103	PALUEL NUCLEAR POWER PLANT (reactor 1) 76450 Cany-Barville	EDF	Reactor		10.11.78	14.11.78	

BNI No.	NAME AND LOCATION OF THE INSTALLATION	Operator	Type of installation	Declared on :	Authorised on :	Official Gazette (O.G.) of :	REMARKS
104	PALUEL NUCLEAR POWER PLANT (reactor 2) 76450 Cany-Barville	EDF	Reactor		10.11.78	14.11.78	
107	CHINON NUCLEAR POWER PLANT (reactors B1 and B2) 37420 Avoine	EDF	Reactors		04.12.79	08.12.79	Modification : decree of 21.07.98 (O.G. of 26.07.98)
108	FLAMANVILLE NUCLEAR POWER PLANT (reactor 1) 50830 Flamanville	EDF	Reactor		21.12.79	26.12.79	
109	FLAMANVILLE NUCLEAR POWER PLANT (reactor 2) 50830 Flamanville	EDF	Reactor		21.12.79	26.12.79	
110	BLAYAIS NUCLEAR POWER PLANT (reactors 3 and 4) 33820 Saint-Ciers-sur-Gironde	EDF	Reactors		05.02.80	14.02.80	
111	CRUAS NUCLEAR POWER PLANT (reactors 1 and 2) 07350 Cruas	EDF	Reactors		08.12.80	31.12.80	Modification to perimeter : decree of 10.12.85 (O.G. of 18.12.85)
112	CRUAS NUCLEAR POWER PLANT (reactors 3 and 4) 07350 Cruas	EDF	Reactors		08.12.80	31.12.80	
114	PALUEL NUCLEAR POWER PLANT (reactor 3) 76450 Cany - Barville	EDF	Reactor		03.04.81	05.04.81	
115	PALUEL NUCLEAR POWER PLANT (reactor 4) 76450 Cany - Barville	EDF	Reactor		03.04.81	05.04.81	
119	SAINT-ALBAN - SAINT-MAURICE NUCLEAR POWER PLANT (reactor 1) 38550 Le Péage-de-Roussillon	EDF	Reactor		12.11.81	15.11.81	
120	SAINT-ALBAN - SAINT-MAURICE NUCLEAR POWER PLANT (reactor 2) 38550 Le Péage-de-Roussillon	EDF	Reactor		12.11.81	15.11.81	
122	GRAVELINES NUCLEAR POWER PLANT (reactors 5 and 6) 59820 Gravelines	EDF	Reactors		18.12.81	20.12.81	Modification to perimeter : decree of 10.12.85 (O.G. of 18.12.85)
124	CATTENOM NUCLEAR POWER PLANT (reactor 1) 57570 Cattenom	EDF	Reactor		24.06.82	26.06.82	
125	CATTENOM NUCLEAR POWER PLANT (reactor 2) 57570 Cattenom	EDF	Reactor		24.06.82	26.06.82	
126	CATTENOM NUCLEAR POWER PLANT (reactor 3) 57570 Cattenom	EDF	Reactor		24.06.82	26.06.82	
127	BELLEVILLE NUCLEAR POWER PLANT (reactor 1) 18240 Léré	EDF	Reactor		15.09.82	16.09.82	
128	BELLEVILLE NUCLEAR POWER PLANT (reactor 2) 18240 Léré	EDF	Reactor		15.09.82	16.09.82	
129	NOGENT NUCLEAR POWER PLANT (reactor 1) 10400 Nogent-sur-Seine	EDF	Reactor		28.09.82	30.09.82	Modification to perimeter : decree of 10.12.85 (O.G. of 18.12.85)
130	NOGENT NUCLEAR POWER PLANT (reactor 2) 10400 Nogent-sur-Seine	EDF	Reactor		28.09.82	30.09.82	Modification to perimeter : decree of 10.12.85 (O.G. of 18.12.85)
132	CHINON NUCLEAR POWER PLANT (reactors B3 and B4) 37420 Avoine	EDF	Reactors		07.10.82	10.10.82	Modification : decree of 21.07.98 (O.G. of 26.07.98)
135	GOLFECH NUCLEAR POWER PLANT (reactor 1) 82400 Golfech	EDF	Reactor		03.03.83	06.03.83	
136	PENLY NUCLEAR POWER PLANT (reactor 1) 76370 Neuville-lès-Dieppe	EDF	Reactor		23.02.83	26.02.83	
137	CATTENOM NUCLEAR POWER PLANT (reactor 4) 57570 Cattenom	EDF	Reactor		29.02.84	03.03.84	

BNI No.	NAME AND LOCATION OF THE INSTALLATION	Operator	Type of installation	Declared on :	Authorised on :	Official Gazette (O.G.) of :	REMARKS
139	CHOOZ B NUCLEAR POWER PLANT (reactor 1) 08600 Givet	EDF	Reactor		09.10.84	13.10.84	Postponement of commissioning : decrees of 18.10.1993 (O.G. of 23.10.93) and of 11.06.99 (O.G. of 18.06.99)
140	PENLY NUCLEAR POWER PLANT (reactor 2) 76370 Neuville-lès-Dieppe	EDF	Reactor		09.10.84	13.10.84	
142	GOLFECH NUCLEAR POWER PLANT (reactor 2) 82400 Golfech	EDF	Reactor		31.07.85	07.08.85	
144	CHOOZ B NUCLEAR POWER PLANT (reactor 2) 08600 Givet	EDF	Reactor		18.02.86	25.02.86	Postponement of commissioning : decrees of 18.10.93 (O.G. of 23.10.93) and of 11.06.99 (O.G. of 18.06.99)
158	CIVAUX NUCLEAR POWER PLANT (reactor 1) BP 1 86320 Civaux	EDF	Reactor		06.12.93	12.12.93	Postponement of commissioning : decree of 11.06.99 (O.G. of 18.06.99)
159	CIVAUX NUCLEAR POWER PLANT (reactor 2) BP 1 86320 Civaux	EDF	Reactor		06.12.93	12.12.93	Postponement of commissioning : decree of 11.06.99 (O.G. of 18.06.99)

L.1.2 Spent fuel interim storage or reprocessing facilities

The spent fuel is stored or reprocessed in the following basic nuclear installations:

BNI No.	NAME AND LOCATION OF THE INSTALLATION	Operator	Type of installation	Declared on :	Authorised on :	Official Gazette (O.G.) of :	REMARKS
22	PÉGASE/CASCAD TEMPORARY STORAGE FACILITY (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Radioactive substance interim storage facility	27.05.64	17.04.80	27.04.80	Former reactor decommissioned 19.12.75. Modification : decree of 04.09.89 (O.G. of 08.09.89)
33	SPENT FUEL REPROCESSING PLANT (UP 2 and AT1) (La Hague) 50107 Cherbourg	COGEMA	Radioactive substance transformation plant	27.05.64			Modification : decree of 17.01.74 (O.G. of 05.02.74) Change of operator : decree of 09.08.78 (O.G. of 19.08.78
47	ELAN IIB SHOP (La Hague) 50107 Cherbourg	COGEMA	Radioactive substance transformation plant		03.11.67	09.11.67	Change of operator : decree of 09.08.78 (O.G. of 19.08.78)
50	SPENT FUEL TEST LABORATORY (LECI) (Saclay) 91191 Gif-sur-Yvette Cedex	CEA	Facility using radioactive substance	08.01.68			Modification : decree of 30.05.00 (O.G. of 03.06.00)
55	ACTIVE FUEL EXAMINATION LABORATORY (LECA/STAR) (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Facility using radioactive substance	08.01.68			Extension : decree of 04.09.89 (O.G. of 08.09.89)
56	RADIOACTIVE WASTE INTERIM STORAGE UNIT (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Radioactive substance interim storage facility	08.01.68			
72	SOLID RADWASTE MANAGEMENT ZONE (Saclay) 91191 Gif-sur-Yvette Cedex	CEA	Radioactive substance interim storage or warehousing facility		14.06.71	22.06.71	

BNI No.	NAME AND LOCATION OF THE INSTALLATION	Operator	Type of installation	Declared on :	Authorised on :	Official Gazette (O.G.) of :	REMARKS
80	HIGH ACTIVITY OXYDE SHOP (HAO) (La Hague) 50107 Cherbourg	COGEMA	Radioactive substance transformation plant		17.01.74	05.02.74	Change of operator : decree of 09.08.78 (O.G. of 19.08.78)
91	SUPERPHÉNIX REACTOR 38510 Morestel	EDF	Fast neutron reactor		12.05.77 10.01.89	28.05.77 12.01.89	Modification to perimeter : decree of 24.07.85 (O.G. of 31.07.85) Postponement of commissioning : decree of 25.07.86 (O.G. of 26.07.86) Final shutdown and change of operator : decree of 30.12.98 (O.G. of 31.12.98)
94	IRRADIATED MATERIAL WORKSHOP (Chinon) 37420 Avoine	EDF	Facility using radioactive materials	29.01.64			Modification : decree of 15.04.85 (O.G. of 19.04.85)
116	UP 3-A PWR SPENT FUEL REPROCESSING PLANT (La Hague) 50107 Cherbourg	COGEMA	Radioactive substance transformation plant		12.05.81	16.05.81	Postponement of commissioning : decree of 28.03.89 (O.G. of 07.04.89). Modification : decree of 18.01.93 (O.G. of 24.01.93)
117	UP 2-800 PWR SPENT FUEL REPROCESSING PLANT (La Hague) 50107 Cherbourg	COGEMA	Radioactive substance transformation plant		12.05.81	16.05.81	Postponement of commissioning : decree of 28.03.89 (O.G. of 07.04.89). Modification : decree of 18.01.93 (O.G. of 24.01.93)
141	ONSITE SPENT FUEL STORAGE UNIT (Creys-Malville) 38510 Morestel	EDF	Radioactive substance interim storage or warehousing facility		24.07.85	31.07.85	Postponement of commissioning : decree of 28.07.93 (O.G. of 29.07.93). Change of operator : decree of 30.12.98 (O.G. of 31.12.98)
148	ATALANTE CEN VALRHO Chusclan 30205 Bagnols-sur-Cèze	CEA	Laboratory for actinide R&D and production studies		19.07.89	25.07.89	Postponement of commissioning : decree of 22.07.99 (O.G. of 23.07.99)

L.2 Radioactive waste management facilities as at 31/03/2003

L.2.1 The other basic nuclear installation generating radioactive waste

Apart from the basic nuclear installations, which manage radioactive fuels, mentioned in section L.1, radioactive waste is generated in the following BNIs:

BNI No.	NAME AND LOCATION OF THE INSTALLATION	Operator	Type of installation	Declared on :	Authorised on :	Official Gazette (O.G.) of :	REMARKS
19	MÉLUSINE 38041 Grenoble Cedex	CEA	Reactor	27.05.64			Finally shut down on 30.06.93
20	SILOÉ 38041 Grenoble Cedex	CEA	Reactor	27.05.64			Finally shut down on 23.12.97
21	SILOETTE 38041 Grenoble Cedex	CEA	Reactor	27.05.64			
25	RAPSODIE/LDAC (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Reactor	27.05.64			Finally shut down on 15.04.83
29	ARTIFICIAL RADIONUCLIDE FACTORY (Saclay) 91191 Gif-sur-Yvette Cedex	CEA (Oris-Industrie)	Radioactive substance fabrication or transformation plant	27.05.64			
32	PLUTONIUM TECHNOLOGY SHOP (ATPu) (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Radioactive substance fabrication or transformation plant	27.05.64			
43	LINEAR ACCÉLÉRATOR (Saclay) 91191 Gif-sur-Yvette Cedex	CEA	Particle accelerator		08.10.65	13.10.65	
44	STRASBOURG UNIVERSITY REACTOR 67037 Strasbourg Cedex	Université Louis Pasteur	Reactor		25.06.65	01.07.65	
45	BUGEY NUCLEAR POWER PLANT (reactor 1) 01980 Loyettes	EDF	Reactor		22.11.68	24.11.68	Modification to perimeter : decree of 10.12.85 (O.G. of 18.12.85). Finally shut down on 27.05.94. Final shutdown decree of 30.08.96 (O.G. of 07.09.96)
46	ST-LAURENT-DES-EAUX NUCLEAR POWER PLANT (reactors A1 and A2) 41220 La Ferté-Saint-Cyr	EDF	Reactors		22.11.68	24.11.68	Modification to perimeter : decree of 10.12.85 (O.G. of 18.12.85). Final shutdown decree of 11.04.94 (O.G. of 16.04.94)
48	SATURNE SYNCHROTRON (Saclay) 91191 Gif-sur-Yvette Cedex	CEA	Particle accelerator	17.02.67			Final shutdown decree of 08.10.2002 (O.G. of 15.10.2002)
49	HIGH LEVEL ACTIVITY DECREE (Saclay) 91191 Gif-sur-Yvette Cedex	CEA	Facility using radioactive materials	08.01.68			Extension : decree of 22.02.88 (O.G. of 24.02.88)
52	ENRICHED URANIUM SHOP (ATUE) (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Radioactive substance fabrication plant	08.01.68			
53	ENRICHED URANIUM AND PLUTONIUM WAREHOUSE (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Radioactive substance storage facility	08.01.68			
54	CHEMICAL PURIFICATION LABORATORY (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Radioactive substance transformation plant	08.01.68			
57	PLUTONIUM CHEMISTRY LABORATORY (LCPu) 92265 Fontenay-aux-Roses Cedex	CEA	Facility using radioactive materials	08.01.68			Cessation of production : 01.07.95
59	PLUTONIUM-BASED FUEL RESEARCH LABORATORY (RM2) 92265 Fontenay-aux-Roses Cedex	CEA	Facility using radioactive materials	08.01.68			Finally shut down on 31.07.82

BNI No.	NAME AND LOCATION OF THE INSTALLATION	Operator	Type of installation	Declared on :	Authorised on :	Official Gazette (O.G.) of :	REMARKS
61	ACTIVE MATERIAL ANALYSIS LABORATORY (LAMA) 38041 Grenoble Cedex	CEA	Facility using radioactive materials	08.01.68			
63	FUEL ELEMENT FABRICATION PLANT 26104 Romans-sur-Isère	FBFC	Radioactive substance fabrication plant	09.05.67			Modification : decree of 09.08.78 (O.G. of 08.09.78)
65	NUCLEAR FUEL FABRICATION PLANT 38113 Veurey-Voroize	SICN	Radioactive substance fabrication plant	27.10.67			
68	DAGNEUX IONIZING FACILITY Z.I. Les Chartinières 01120 Dagneux	IONISOS	Facility using radioactive materials		20.07.71	25.07.71	Increase in the maximum activity level of the ionizing source : decree of 15.06.78 (O.G. of 27.06.78). Change of operator : decree of 23.10.95 (O.G. of 28.10.95)
77	POSÉIDON –CAPRI IRRADIATION FACILITIES (Saclay) 91191 Gif-sur-Yvette Cedex	CEA	Facility using radioactive materials		07.08.72	15.08.72	
90	PELLET FABRICATION SHOP 38113 Veurey-Voroize	SICN	Radioactive substance fabrication plant		27.01.77	29.01.77	Modifications : decree of 15.06.77 (O.G. of 19.06.77), decree of 14.10.86 (O.G. of 17.10.86)
93	GEORGES BESSE PLANT FOR ISOTOPE SÉPARATION BY GAZEOUS DIFFUSION (Eurodif) 26702 Pierrelatte Cedex	EURODIF PRODUCTION	Radioactive substance transformation plant		08.09.77	10.09.77	Modification to perimeter : decree of 22.06.85 (O.G. of 30.06.85)
98	NUCLEAR FUEL FABRICATION UNIT 26104 Romans-sur-Isère	FBFC	Radioactive substance fabrication plant		02.03.78	10.03.78	
99	CHINON INTERRÉGIONAL WAREHOUSE 37420 Avoine	EDF	Storage of new fuel		02.03.78	11.03.78	Modification : decree of 04.06.98 (O.G. of 06.06.98)
102	BUGEY INTERRÉGIONAL WAREHOUSE 01980 Loyettes	EDF	Storage of new fuel		15.06.78	27.06.78	Modification : decree of 04.06.98 (O.G. of 06.06.98)
105	URANIUM HEXAFLUORIDE PREPARATION PLANT (COMURHEX) 26130 Saint-Paul-Trois-Châteaux	COMURHEX	Radioactive substance transformation plant				Classified up to 31.12.78
106	LABORATORY FOR THE USE OF ÉLECTROMAGNÉTIC RADIATION (LURE) 91405 Orsay Cedex	CNRS	Particle accelerator				Change of operator : decree of 08.07.85 (O.G. of 12.07.85). Modification : decree of 02.07.92 (O.G. of 08.07.92)
113	NATIONAL HEAVY ION ACCELERATOR (GANIL) 14021 Caen Cedex	GANIL Consortium	Particle accelerator		29.12.80	10.01.81	Modification : decree of 06.06.01 (O.G. of 13.06.01)
121	CADARACHE IRRADIATOR (IRCA) 13115 Saint-Paul-lez-Durance	CEA	Facility using radioactive materials		16.12.81	18.12.81	
123	LABORATORY FOR THE EXPERIMENTAL DESIGN AND FABRICATION OF ADVANCED NUCLEAR FUEL (LEFCA) (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Radioactive substance fabrication plant		23.12.81	26.12.81	
131	NUCLEAR FUEL FABRICATION PLANT 26701 Pierrelatte Cedex	FBFC	Radioactive substance fabrication plant		07.09.82	09.09.82	Change of operator : decree of 18.10.85 (O.G. of 26.10.85). Final shutdown and dismantling decree of 22.05.00 (O.G. of 25.05.00)

BNI No.	NAME AND LOCATION OF THE INSTALLATION	Operator	Type of installation	Declared on :	Authorised on :	Official Gazette (O.G.) of :	REMARKS
133	CHINON A1D 37420 Avoine	EDF	Radioactive substance interim storage or warehousing facility		11.10.82	16.10.82	Former reactor shut down on 16.04.73
134	URANIUM WAREHOUSE 13140 Miramas	COGEMA	Interim storage of substances containing uranium		16.11.83	19.11.83	
138	URANIUM PURIFICATION AND RECOVERY PLANT (Tricastin) 26130 Saint-Paul-Trois-Châteaux	SOCATRI	Factory		22.06.84	30.06.84	Modification : decree of 29.11.93 (O.G. of 07.12.93)
143	NUCLEAR MAINTENANCE UNIT (SOMANU) 59600 Maubeuge	SOMANU	Nuclear maintenance facility		18.10.85	22.10.85	
146	POUZAUGES IONIZATION UNIT Z.I. de Monlifant 85700 Pouzauges	IONISOS	Ionization unit		30.01.89	31.01.89	Change of operator : decree of 23.10.95 (O.G. of 28.10.95)
147	GAMMASTER IONIZATION UNIT M.I.N. 712 13323 Marseille Cedex 14	GAMMAS-TER	Ionization unit		30.01.89	31.01.89	
151	NUCLEAR FUEL FABRICATION PLANT (MELOX) BP 2 - 30200 Chusclan	COGEMA	Radioactive substance fabrication plant		21.05.90	22.05.90	Modification : decree of 30.07.99 (O.G. of 31.07.99)
153	CHINON A2 D 37420 Avoine	EDF	Radioactive substance interim storage or warehousing facility		07.02.91	13.02.91	Former reactor shut down on 14.06.85
154	SABLÉ-SUR-SARTHE IONIZATION UNIT Z.I. de l'Aubrée 72300 Sablé-sur-Sarthe	IONISOS	Ionization unit		01.04.92	04.04.92	Change of operator : decree of 23.10.95 (O.G. of 28.10.95)
155	TU 5 FACILITY BP 16 26701 Pierrelatte	COGEMA	Radioactive substance fabrication plant		07.07.92	11.07.92	Modification : decree of 15.09.94 (O.G. of 24.09.94)
156	CHICADE (Cadarache) BP 1 13108 Saint-Paul-lez-Durance Cedex	CEA	R&D laboratory		29.03.93	30.03.93	
157	TRICASTIN OPERATIONAL HOT UNIT (BCOT) BP 127 84504 Bollène Cedex	EDF	Nuclear maintenance facility		29.11.93	07.12.93	
161	CHINONA3 D 37420 Avoine	EDF	Radioactive substance interim storage or warehousing facility		27.08.96	31.08.96	Former reactor shut down on 17.03.93
162	MONTS D'ARRÉE EL4 D Brennilis 29218 Huelgoat	EDF	Radioactive substance interim storage or warehousing facility		31.10.96	08.11.96	Former reactor shut down on 31.07.85. Change of operator : decree of 19.09.00 (O.G. of 26.09.00)
163	ARDENNES NUCLEAR POWER PLANT CNA-D 08600 Givet	EDF	Radioactive substance interim storage or warehousing facility		19.03.99	21.03.99	Former reactor shut down on 17.03.93

L.2.2 Radioactive waste interim storage or processing facilities

Apart from the basic nuclear installations, which can store or process radioactive waste, mentioned in section L.1, radioactive waste is stored or processed in the following BNIs:

BNI No.	NAME AND LOCATION OF THE INSTALLATION	Operator	Type of installation	Declared on :	Authorised on :	Official Gazette (O.G.) of :	REMARKS
34	SOLID AND LIQUID WASTE TREATMENT PLANT 92265 Fontenay-aux-Roses Cedex	CEA	Radioactive substance transformation plant	27.05.64			
35	LIQUID WASTE MANAGEMENT ZONE (Saclay) 91191 Gif-sur-Yvette Cedex	CEA	Radioactive substance transformation plant	27.05.64			
36	SOLID AND LIQUID WASTE TREATMENT PLANT 38041 Grenoble Cedex	CEA	Radioactive substance transformation plant	27.05.64			
37	SOLID AND LIQUID WASTE TREATMENT PLANT (Cadarache) 13115 Saint-Paul-lez-Durance	CEA	Radioactive substance transformation plant	27.05.64			
38	SOLID AND LIQUID WASTE TREATMENT PLANT «STE2» (La Hague) 50107 Cherbourg	COGEMA	Radioactive substance transformation plant	27.05.64			Change of operator : decree of 09.08.78 (O.G. of 19.08.78)
66	MANCHE WASTE REPOSITORY (CSM) 50448 Beaumont-Hague	ANDRA	Radioactive waste repository		19.06.69	22.06.69	Start of surveillance period : decree of 10.01.2003 (O.G. of 11.01.2003)
73	SOLID RADWASTE INTERIM FACILITY 92265 Fontenay-aux-Roses Cedex	CEA	Stockage ou dépôt de substances radioactives		14.06.71	22.06.71	
74	IRRADIATED GRAPHITE JACKET INTERIM STORAGE FACILITY (St-Laurent-des-Eaux) 41220 La Ferté-St-Cyr	EDF	Radioactive substance interim storage or warehousing facility		14.06.71	22.06.71	Change of operator :decree of 28.06.84 (O.G. of 06.07.84)
118	STE3 SOLID AND LIQUID WASTE TREATMENT FACILITY La Hague 50107 Cherbourg	COGEMA	Radioactive substance transformation plant		12.05.81	16.05.81	Postponement of commissioning : decree of 27.04.88 (O.G. of 03.05.88)
149	AUBE WASTE REPOSITORY (CSA) Soulaines-Dhuys 10200 Bar-sur-Aube	ANDRA	Radioactive substance surface storage center		04.09.89	06.09.89	Change of operator : decree of 24.03.95 (O.G. of 26.03.95)
160	CENTRACO Codolet 30200 Bagnols-sur-Cèze	SOCODEI	Radioactive waste and effluent treatment		27.08.96	31.08.96	

L.3 Nuclear facilities in the process of being decommissioned

L.3.1 Reactors decommissioned or being decommissioned as at 31/03/2003

Plant and site	BNI No.	Startup	Final cessation of operation	Power rating (MWTh)	Last regulatory acts	Current status
EL2 Saclay	(formerly BNI 13)	1952	1965	2.8	Removed from BNI list	Sealed source
Chinon A1D (ex-Chinon A1)	133 (formerly BNI 5)	1963	1973	300	1982 : authorisation decree for containment of Chinon A1 and setting up of waste storage BNI Chinon A1D	Partially dismantled, transformed into BNI for storage of in situ waste (museum)
CESAR Cadarache	(formerly BNI 26)	1964	1974	0.01	1978 : removed from BNI list	Dismantled
ZOÉ Fontenay-aux-Roses	(formerly BNI 11)	1948	1975	0.25	1978 : removed from BNI list and classified on environmental protection grounds	Contained (museum)
PEGGY Cadarache	(formerly BNI 23)	1961	1975	0.001	1976 : removed from BNI list	Dismantled
PEGASE Cadarache	22	1963	1975	35	1980 : decree transforming the reactor into a radioactive substance storage facility (decree amended in 1989)	Partially dismantled, new radioactive storage substance facility
MINERVE Fontenay-aux-Roses	(formerly BNI 12)	1959	1976	0.0001	1977 : removed from BNI list	Dismounted at Fontenay and reassembled at Cadarache
EL 3 Saclay	(formerly BNI 14)	1957	1979	18	1988 : removed from BNI list and classified on environmental protection grounds	Partially dismantled, containment of remaining structures
NEREIDE Fontenay-aux-Roses	(formerly BNI 10)	1960	1981	0.5	1987 : removed from BNI list	Dismantled
TRITON Fontenay-aux-Roses	(formerly BNI 10)	1959	1982	6.5	1987 : removed from BNI list and classified on environmental protection grounds	Dismantled
RAPSODIE Cadarache	25	1967	1983	20 then 40		Dismantling proceeding
MARIUS Cadarache	(formerly BNI 27)	1960 at Marcoule, 1964 at Cadarache	1983	0.0004	1987 : removed from BNI list	Dismantled
EL-4D (ex-EL4) Brennilis	162 (formerly BNI 28)	1966	1985	250	1996 : decree authorizing partial dismantling of EL4 and setting up of waste storage BNI EL-4D	Partial dismantling proceeding
CHINON A2D (ex-Chinon A2)	153 (formerly BNI 6)	1965	1985	865	1991 : decree authorizing partial dismantling of Chinon A2 and setting up of waste storage BNI Chinon A2D	Partially dismantled, transformed into BNI for storage of in situ waste
MELUSINE Grenoble	19	1958	1988	8		Final shutdown work completed
CHINON A3D (ex-Chinon A3)	161 (formerly BNI 7)	1966	1990	1360	1996 : decree authorizing partial dismantling of Chinon A3 and setting up of waste storage BNI Chinon A3D	Partially dismantled, transformed into BNI for storage of in situ waste
ST-LAURENT A1	46	1969	1990	1662	1994 : decree authorizing final shutdown	Final shutdown work proceeding
CHOOZ AD (ex-Chooz A)	163 (formerly BNI A1, 2, 3)	1967	1991	1040	1999 : decree authorizing partial dismantling of Chooz A and setting up of waste storage BNI Chooz AD	Partially dismantled, transformed into BNI for storage of in situ waste
ST-LAURENT A2	46	1971	1992	1801	1994 : decree authorizing final shutdown	Final shutdown work proceeding

Plant and site	BNI No.	Startup	Final cessation of operation	Power rating (MWTh)	Last regulatory acts	Current status
BUGEY 1	45	1972	1994	1920	1996 : decree authorizing final shutdown	Final shutdown work proceeding
HARMONIE Cadarache	41	1965	1996	0.001		Final cessation of operation procedures in progress
SILOE Grenoble	21	1963	1997	35		Final cessation of operation procedures in progress
RUS Strasbourg	44	1967	1997	0.1		Final cessation of operation procedures in progress
SUPERPHENIX Creys-Malville	91	1985	1997	3000	1998 decree authorizing final shutdown	Final shutdown work proceeding

L.3.2 Other facilities decommissioned or being decommissioned as at 31/03/2003

Plant and site	BNI No.	Type of plant	Startup	Final cessation of operation	Last regulatory acts	Current status
LE BOUCHET	(formerly BNI 30)	Ore treatment facility	1953	1970	Removed from BNI list	Dismantled
ATTILA Fontenay-aux-Roses	57	Reprocessing pilot unit	1966	1975		Dismantled
LCPu Fontenay-aux-Roses	57	Plutonium chemistry laboratory	1966	1995		Dismantling proceeding
ELAN II B La Hague	47	Cs 137 source fabrication plant	1970	1973		Dismantling proceeding
AT1 La Hague	33	FBR fuel reprocessing	1969	1979		Dismantling proceeding
GUEUGNON	(formerly BNI 31)	Ore treatment facility		1980	Removed from BNI list	Dismantled
BAT. 19 Fontenay-aux-Roses	(formerly BNI 58)	Plutonium metallurgy unit	1968	1984	1984 : removed from BNI list	Dismantled
RM2 Fontenay-aux-Roses	59	Radio-metallurgy unit	1968	1982		Dismantling proceeding
LCAC Grenoble	(formerly BNI 60)	Fuel analysis	1968	1984	1997 : removed from BNI list	Dismantled
SATURNE Saclay	48	Accelerator	1958	1997	2002 : decree authorizing final shutdown and dismantling	Shut down
SNCS Osmanville	(formerly BNI 152)	Ionizer	1990	1995	2002 : decree authorizing final shutdown and dismantling	Dismantling proceeding
ATUE Cadarache	52	Uraniumm processing plant	1963	1997		Cleanup proceeding
ARAC Saclay	(formerly BNI 81)	Fuel fabrication	1975	1995	1999 : removed from BNI list	Cleanup completed
ALS Saclay	43	Accelerator	1965	1996		Final cessation of operationproceeding
FBFC Pierrelatte	131	Fuel fabrication	1983	1998	2000 : decree authorizing final shutdown and dismantling	Dismantling proceeding

L.4 Main legislative and regulatory texts

L.4.1 Laws and regulations

Decree 53-578 of 20 May 1953 – Decree on classification of premises in such a state as to be prejudicial to health or constituting a nuisance.

Law 61-842 of 2 August 1961 – Law on the prevention of atmospheric pollution and odours and amending the Law of 19 December 1917.

Decree 63-1228 of 11 December 1963 – Decree on nuclear facilities.

Decree 73-278 of 13 March 1973 – Decree creating the High Council for Nuclear Safety and a Central service for Nuclear Installation Safety.

Decree 75-306 of 28 April 1975 – Decree on the protection of workers against the hazards of ionising radiation in basic nuclear installations.

Law 75-633 of 15 July 1975 – Law on waste disposal and recovery of materials.

Law 76-663 of 19 July 1976 – Law on installations classified on environmental protection grounds.

Decree 77-1133 of 21 September 1977 - Decree implementing Law 76-663 of 19 July 1976 concerning installations classified on environmental protection grounds.

Law 80-572 of 25 July 1980 – Law on the protection and supervision of nuclear materials.

Ministerial order of 10 August 1984 – Order on the quality of design, construction and operation of basic nuclear installations.

Decree 86-1103 of 2 October 1986 – Decree on the protection of workers against the hazards of ionising radiation.

Decree 90-222 of 9 March 1990 – Decree supplementing the general regulation for extractive industries lay down by the decree 80-331 of 7 May 1980.

Law 91-1391 of 30 December 1991 – Law on research into radioactive waste management.

Decree 95-540 of 4 May 1995 – Decree on liquid and gaseous discharges from and water intake into basic nuclear installations.

Ministerial order of 11 March 1996 – Order setting the threshold above which facilities for preparing, manufacturing or transforming radioactive substances, as well as facilities aiming at storing, using or disposing radioactive substances, including waste, are considered as basic nuclear installations.

Inter-ministerial order of 26 November 1999 – Order laying down the general technical requirements concerning the limits and methods relative to intakes and discharges subject to authorisation, made by basic nuclear installations.

Ministerial order of 31 December 1999 – Order setting the general technical regulation intended for preventing and limiting detrimental effects and external hazards resulting from the operation of basic nuclear installation.

Ordinance 2001-270 of 28 March 2001 – Ordinance on transposition of community directives in the field of protection against ionising radiation.

Decree 2002-255 of 22 February 2002 - Decree amending decree 93-1272 of 1 December 1993 and creating a Directorate General for Nuclear Safety and Radiation Protection.

Decree 2002-460 of 04 April 2002 – Decree on the general protection of persons against the hazards of ionising radiation.

Decree 2003-296 of 31 March 2003 – Decree on the protection of workers against the hazards of ionising radiation.

L.4.2 Basic safety rules (RFS) within the scope of the Convention

- RFS-I.1.a – Inclusion of hazards related to aircraft crashes (7 October 1992).
- RFS-I.1.b – Inclusion of hazards related to the industrial environment and communication routes (7 October 1992).
- RFS 2001-01 – Determination of seismic movements to be taken into account for the safety of facilities (revision of RFS-I.1.c - 16 May 2002).
- RFS-I.2. – Safety objectives and design bases for surface facilities intended for long-term disposal of solid radioactive waste with short or intermediate half-life and low or intermediate specific activity level (8 November 1982 – revision of 19 June 1984).
- RFS-I.3.c – Criticality hazard (18 October 1984).
- RFS-I.4.a – Fire protection (28 February 1985).
- RFS-II.2. – Design and operation of ventilation systems in basic nuclear installations other than nuclear reactors (20 December 1991).
- RFS-III.2.a – General provisions applicable to the production, monitoring, processing, packaging and interim storage of various types of waste resulting from reprocessing of fuel irradiated in pressurised water reactors (24 September 1982).
- RFS-III.2.b – Special provisions applicable to the production, monitoring, processing, packaging and interim storage of high-level waste packaged in the form of glass and resulting from reprocessing of fuel irradiated in pressurised water reactors (12 December 1982).
- RFS-III.2.c – Special provisions applicable to the production, monitoring, processing, packaging and interim storage of low or intermediate level waste encapsulated in bitumen and resulting from reprocessing of fuel irradiated in pressurised water reactors (5 April 1984).
- RFS-III.2.d – Special provisions applicable to the production, monitoring, processing, packaging and interim storage of waste encapsulated in cement and resulting from reprocessing of fuel irradiated in pressurised water reactors (1 February 1985).
- RFS-III.2.e – Preconditions for the approval of packages of encapsulated solid waste intended for surface disposal (31 October 1986 – revision of 29 May 1995).
- RFS-III.2.f – Definition of goals to be set in the engineering and works phases for final disposal of radioactive waste in deep geologic formations, in order to ensure safety after the operational life of the repository (1 June 1991).

L.5 Organisation of the main nuclear operators

L.5.1 Organisation of the ANDRA

The ANDRA was created in 1979 within the CEA and transformed in 1992 into an independent establishment managed by a director general who has authority over functional and operational departments:

The functional departments include:

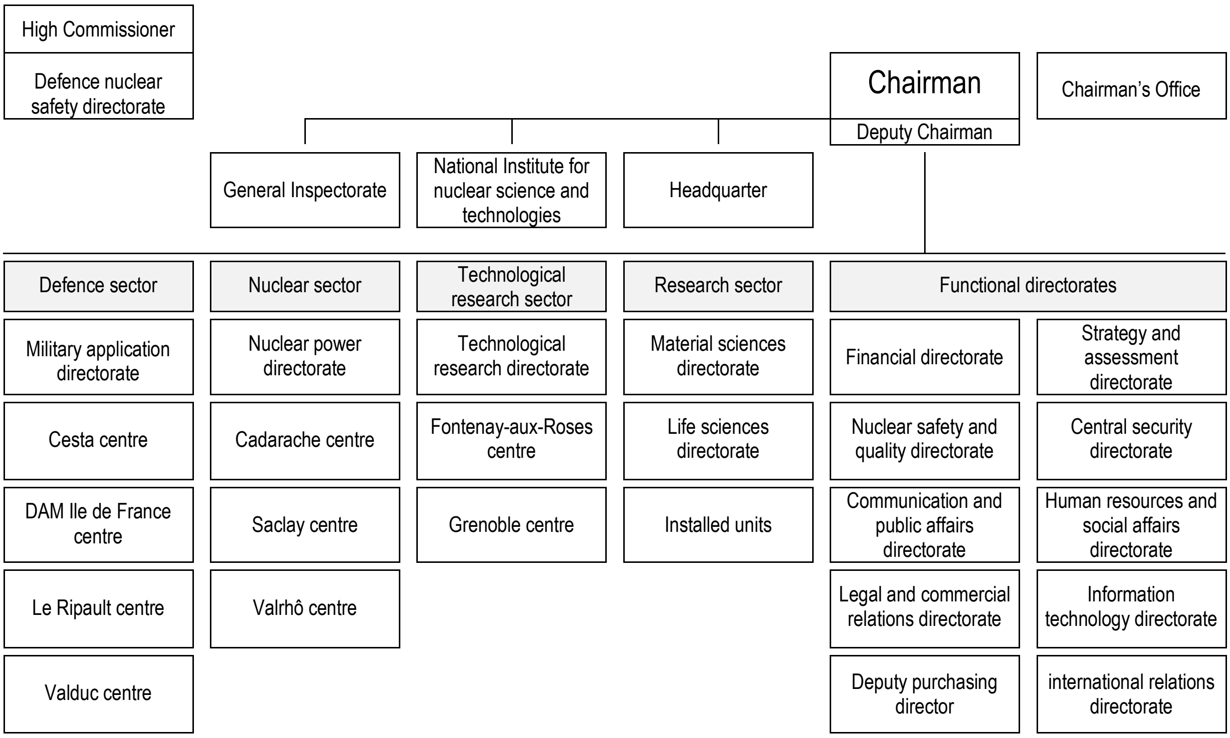
- General Secretariat responsible for buying, management, accounts and legal matters;
- Human resources department;
- Communication department.

The operational departments include:

- Safety, quality and environment department. This department sets guidelines for safety, quality and the environment, implement them and ensures that they are complied with by the other ANDRA units. It is also responsible for inventorying the radioactive waste present in the country;
- Projects department, in charge of the ANDRA projects: feasibility of high-level, long-lived waste disposal, design of repositories for waste containing radium, graphite waste and tritiated waste;
- Scientific department, supporting all the ANDRA activities. The specialities covered are in the fields of geology, hydrogeology, materials science, transfer of radionuclides to the biosphere and to man, as well as mathematical modelling;
- Industrial department, comprising a Customers branch in contact with the waste producers concerning waste for which there is an available management channel and a Surface repositories branch managing operational facilities (including VLLW repository and repository for waste containing radium). Apart from the traditional duties linked to operation of industrial facilities and facilities at commissioning stage (production, maintenance, etc.), the Surface repositories branch is responsible for radiation protection of the personnel working in them and for monitoring their environment. The Customers branch guarantees that the waste delivered is compliant with the specifications for acceptance by the facilities.

L.5.2 Organisation of the CEA

The CEA, a public research agency created in 1945, reorganised its operational resources in 2001, based around four new "sectors" corresponding to its leading areas of activity, as illustrated in the following organisation chart: nuclear power sector, technological research sector, fundamental research sector and defence sector. Each sector has resources (general management, directorates, specific functional resources), enabling it to develop, plan and monitor all its activities.



The nuclear facilities and activities, which are the subject of this Convention, were grouped into the nuclear power sector (Nuclear power directorate), for all aspects concerning the civilian nuclear industry.

L.5.3 Organisation of COGEMA

The main activities of COGEMA, created in 1975 from former CEA units and now part of the AREVA group are front-end and back end of the nuclear fuel cycle.

The COGEMA's organisation scheme on January, 1st, 2003 is illustrated by the following chart:

CHAIRMAN AND CHIEF EXECUTIVE OFFICER (CEO)

EXECUTIVE COMMITTEE

CORPORATE FUNCTIONS

- -Environment
- -Purchasing
- -Sustainable Development and Continuous Progress
- -Human Resources
- -Dismantling and waste management project
- -Strategy
- -Communication Information Systems
- -Safety – Security – Health
- -Finance
- -International Marketing and Sales
- -Research and Development
- -Legal Affairs

OPERATING COMMITTEE

- -Members of the Executive Committee
- -Business Unit Directors
- -Senior Vice Presidents of Corporate Functions
- -Directors of the Group's Major Industrial Sites and Plants

MINING-CHEMISTRY-ENRICHMENT SECTOR	REPROCESSING-RECYCLING-LOGISTICS SECTOR	SERVICES SECTOR
Mining B.U.	Reprocessing B.U.	Engineering B.U.
Chemistry B.U.	Recycling B.U.	Nuclear Instrumentation B.U.
Enrichment B.U.	Logistics B.U.	Consulting and Information Systems B.U.
		Mechanical Systems B.U.
		Nuclear Clean-up B.U.

B.U. = Business Unit

The "General Inspectorate for nuclear safety" function is under the authority of Safety-Security-Health Corporate Director.

L.5.4 Organisation of EDF

EDF, created in 1945, is the major company producing electricity in France and the only one operating nuclear power plants. Within the various divisions and units of its Energy branch, EDF assumes responsibility for managing operating waste and spent fuels. Main division of the Energy branch related to nuclear power are described hereafter.

The Nuclear Power Generating Division (DPN)

The Nuclear Power Generating Division has responsibility as nuclear operator of the operational sites, up to final shutdown. The DPN is the project owner for all generic actions. In this respect it bears the related costs which, with regard to waste, in particular include the fixed costs of the "pre-processing" (mobile units and CENTRACO) and disposal (Aube repository) facilities. The Director of the DPN is the chief contact of the DGSNR director, in particular in the field of waste management for the operating nuclear fleet.

The nuclear power plants (CNPE)

In accordance with the law of 1975, the CNPEs are responsible for their waste (from the place of production up to its destination) and for the quality of the packages they manufacture. They are required to implement the doctrine drawn up for the entire nuclear fleet and to use generic approvals, whenever available. They ensure that the approvals specific to their situation are consistent with the existing national provisions. They inform the central units, the CAPE (Corporate Operating Fleet Support) and UTO (Corporate Technical Support Department) of any problems encountered in waste management and ask for their assistance with setting up a new channel or adapting an existing channel to a new type of waste.

The corporate operating fleet support (CAPE)

The Environment group of the Corporate Operating Fleet Support is in charge of policy and runs the strategic phase of the operating waste management business on behalf of the DPN. It draws up operating waste doctrine (internal directives, instructions, etc.) and provides the CNPEs with the methodological support (waste zoning, waste surveys, interim storage, regulations, channels, etc.) needed to implement the doctrine. It is EDF's technical representative in its dealings with the ANDRA, and the DPN's technical support in its discussions with the authorities.

The corporate technical support department (UTO)

The GVD service of the Corporate Technical Support Department is in charge of operational activities linked to nuclear waste, that is:

- contractual relations with the suppliers of products (packaging, hulls, drums) and materials (dry loads) as well as with SOCODEI for packaging of the waste (packages for the ANDRA, CENTRACO, mobile units);
- management of common packaging resources (mobile units, MERCURE, etc.);
- package approvals, developments, incorporation of experience feedback, obtaining new general approvals.

The UTO also handles control rod assembly dismantling operations.

The corporate chemical and metallurgical laboratories (GDL)

The Corporate Chemical and Metallurgical Laboratories are in particular in charge of assisting the sites with radiological measurements likely to affect the environment (effluents, radiological environment monitoring).

The Nuclear engineering Division (DIN)

The Nuclear Engineering Division is in charge of defining, designing and building the effluent processing and waste packaging facilities in the CNPEs. The DIN is also responsible for facility dismantling operations, as mentioned earlier, and a dedicated engineering department was created for this purpose.

The Nuclear fuel Division (DCN)

The Nuclear Fuels Division draws up strategies concerning the back-end of the cycle and disposal of nuclear waste. It manages the contracts for uranium supply and enrichment, for manufacture of UO_2 and MOX fuels, as well as the spent fuel transport, delivery, interim storage and reprocessing contracts signed with COGEMA. It also organises quality monitoring of these activities under the terms of the quality order of August 1984.

The DCN in particular negotiates and manages the CNPE operating waste transport and disposal contracts. To do this, and based on data supplied by the CNPEs and centralised by the DPN, it sends contractual delivery forecasts to the Aube repository and organises rail and road waste transports, jointly with the DPN. The DCN is responsible for the economics and financial management aspects of the agreements signed with the ANDRA.

L.6 Monitoring the environment

L.6.1 Monitoring stations

L.6.1.1 Teleray network (ambient gamma dose rate)

The ambient dose rate is monitored by the Teleray network comprising stations continuously measuring the ambient gamma radiation and situated around the country in 78 prefectures or sub-prefectures, 38 nuclear sites, 17 airports, 4 IRSN laboratories and 9 mountain peaks. This network also comprises 21 recorders abroad and in the overseas territories.

L.6.1.2 Measurement stations and reference stations

Radioactivity monitoring concerns the atmosphere, water, soil, plant life and the food chain. Apart from the 7 reference stations spread around the country and located far from the nuclear sites, the measurement stations are located near the nuclear sites, industrial sites or urban centres, on the major rivers and along the coastline. Their locations are as shown on the following map.

The measurements taken in the reference stations comprise about 3000 annual samples, specified as follows.

Environment	Sampling	Analysis
Atmosphere	Integrating dosimeter (6-monthly)	Ambient γ radiation
Aerosols	Filter (daily)	Total β (daily), γ spectrometry (monthly)

Environment	Sampling	Analysis
Rainwater	Collector 0,2 m^2 (monthly)	Total β, γ spectrometry, ^{3}H, ^{90}Sr
Soil	Depth 20 cm (quarterly)	Total β, γ spectrometry, ^{90}Sr
Plant	Harvest 6m^2 (monthly)	Total β, γ spectrometry, ^{90}Sr (annual mix)
Animals	Milk (2-monthly) Bone (quarterly)	Total β, γ spectrometry, ^{89}Sr, ^{90}Sr Total β, ^{90}Sr (annual mix)

L.6.1.3 atmospheric monitoring

Apart from the measurements in the 7 reference stations, monitoring of the atmosphere is performed by 35 stations near the nuclear sites and 27 stations near cities. It comprises some 23,000 samples and 46,000 measurements annually, specified as follows.

Environment	Sampling	Analysis
Atmosphere	Teleray recorder (continuous) Integrating dosimeter (6-monthly)	ambient γ radiation
Aerosols	Filter (daily)	Total β (daily), γ spectrometry (monthly)
Rainwater	Collector 0,2 m^2 (monthly)	Total β (daily), γ spectrometry

L.6.1.4 Water monitoring

Water monitoring concerns rainwater (28 nuclear sites, 16 weather stations, 7 reference stations), mineral and mains water (nationwide), underground water (dumps and ionisation centres), river water (23 nuclear sites, 6 mining sites, the 5 main rivers), seawater (5 nuclear sites and all coastlines) and waste water (Achères sewerage plant). It comprises about 2,700 samples annually and 8,000 measurements, specified as follows.

Environment	Sampling	Analysis
Rainwater	Nuclear sites : weekly Others : monthly	Total β, ^{3}H (monthly) + γ spectrometry,^{90}Sr (others)
Drinking water	Monthly to annual	Total β, total α + K, ^{226}Ra, U (mines) + γ spectrometry, ^{3}H, ^{90}Sr (Rhone valley)
Main waters	For health approval	Total α, Total β, K, ^{3}H, ^{90}Sr, ^{222}Rn, ^{226}Ra, U
Mineral water	For health approval	Total β, K, ^{3}H, ^{90}Sr, ^{222}Rn, ^{226}Ra, U, Th
River water	Rivers : continuos + quarterly Mines : monthly	Total α, total β, K, ^{3}H, γ spectrometry + ^{131}I Total α, total β, K, ^{226}Ra, U (monthly)
Underground water	Ionisation centres : monthly Dumps : 6-monthly	Total α, total β, K, γ spectrometry Total β, K, ^{60}Co, γ spectrometry
Seawater	Nuclear sites : continuous Coasts : monthly	Total β, K, ^{3}H, γ spectrometry (monthly) K, ^{3}H, γ spectrometry (6-monthly)
Wastewater	Achères (Paris) : continuous	Total β, K, ^{125}I, ^{131}I (weekly)

L.6.1.5 Food-chain monitoring

Food-chain monitoring includes milk (90 departmental co-operatives, 29 nuclear sites and 7 reference stations), wheat (290 silos in 84 departments and 26 nuclear sites), particular foodstuffs (fish, honey, bovine thyroids) and food served in three canteens. It comprises some 1,800 samples and measurements annually, specified as follows.

Subject	Sampling	Analysis
Milk	Co-operatives : bi-annual Others : monthly	γ spectrometry β (Sr + Lanthanides), γ spectrometry
Wheat	Departmental silos (annual) Nuclear sites (annual)	γ spectrometry, total β, Ca, K, ^{90}Sr, ^{226}Ra, U γ spectrometry
Fish	National market (weekly) 2 types (flats and rounds)	γ spectrometry + total α, total β, K, Ca, ^{90}Sr (annual)
Honey	5 sites including 2 nuclear (annual)	γ spectrometry
Bovine thyroid	2 abattoirs (weekly)	γ spectrometry + ^{131}I
Food and drink	Consumed in 3 canteens for 7 days (monthly)	Total β, Ca, K, ^{90}Sr, U, γ spectrometry ^{226}Ra (annual)

L.6.1.6 Fauna and flora monitoring

Monitoring of the flora and fauna primarily concerns aquatic species along the coastline, but also terrestrial flora around the reference stations and one nuclear site. It comprises about 300 samples and 1,700 measurements annually, specified as follows.

Subject	Sampling	Analysis
French coastline	- Molluscs (annual) - Crustacean (annual) - Algae (annual) – Marine plants (annual)	Total α, total β, K, ^{90}Sr, γ spectrometry ditto + ^{210}Po, U, ^{238}Pu, ^{241}Am ditto ditto + U, Th
Seine Bay	- Molluscs (annual) - Crustacean (annual) - Fish (annual)	Total α, total β, Ca, K, ^{90}Sr, Th, γ spectrometry ditto + ^{210}Po, U, ^{238}Pu, ^{226}Ra ditto
Channel and North Sea	- Fish (annual)	Total α, total β, Ca, K, ^{90}Sr, γ spectrometry
Terrestrial plants	7 reference stations and 1 nuclear site (monthly)	Total β, γ spectrometry β (Sr + Lanthanides), ^{90}Sr (6-monthly)

L.6.1.7 Monitoring around the nuclear sites

The radioactive discharges around the nuclear sites are monitored by the operators, in accordance with the regulatory specifications described below. These provisions represent a general minimum requirement but, depending on the situation, the operators may be asked to take more measurements, in particular around the COGEMA site at La Hague.

The principle of regulatory monitoring of the environment of a BNI slightly differs depending on whether it is a power reactor or a plant or a laboratory. The types of measurements associated to each environment monitored are presented in the two following tables.

L.6.1.7.1 Regulatory monitoring of the environment of a nuclear power plant

The principle of regulatory monitoring of the environment around a power reactor can be summarised as follows.

Environment monitored	Samples and checks required of the operator by regulation
Air at ground level	- 4 stations for continuous sampling of atmospheric dust on a fixed filter with daily measurement of the total β - 1 continuous sample under the prevailing wind with weekly measurement of atmospheric tritium - continuous sample under the prevailing wind with quarterly measurement of atmospheric carbon 14
Rain	- 1 station under the prevailing wind (monthly collector) with total β and tritium measurements on monthly mix
Ambient γ radiation	- 4 stations at 1 km with continuous measurement and recording (10 nGy/h to 10 Gy/h) - 10 integrating dosimeters around the site perimeter (monthly reading) - 4 stations with continuous measurement at 5 km (10 nGy/h to 0.5 Gy/h)
Plants	- 2 grass sampling points (monthly check) - Main agricultural crops (annual check) Measurements: total β, γ spectrometry
Milk	2 sampling points (monthly check) with β measurement (excluding ^{40}K)
Liquid discharges reception environment	- Samples at mid-discharge into the river or after dilution in cooling water (case of coastal power plants), with measurement of total β, potassium and tritium - Continuous sampling from the river or after dilution in the cooling water (case of coastal power plants) with weekly tritium measurements - Bi-monthly samples at sea (coastal power plants only) with measurement of total β, potassium and tritium - Annual samples of sediments, aquatic fauna and flora with measurement of total β, γ spectrometry
Underground water	- 5 sampling points (monthly check) with measurement of total β, potassium and tritium

L.6.1.7.2 Regulatory monitoring of a CEA or COGEMA site

The principle of regulatory monitoring of the environment around a plant or a laboratory can be summarised as follows.

Environment monitored	Samples and checks required of the operator by regulation
Air at ground level	- 4 stations with continuous sampling of atmospheric dust on fixed filter, with daily measurement of total β - 1 continuous sample with weekly measurement of atmospheric tritium
Rain	- 2 continuous sampling stations including one under the prevailing wind with weekly measurement of total β and tritium
Ambient γ radiation	- 4 stations with continuous measurement and recording - 10 integrating dosimeters around the site perimeter (monthly reading)
Plants	- 4 grass sampling points (monthly check) - Main agricultural crops (annual check) Measurements: total β, γ spectrometry
Milk	1 sampling point (monthly check) with β measurement (excluding ^{40}K)
Liquid discharges reception environment	- At least weekly sampling of the water of the receiving environment with measurement of total α, total β, potassium and tritium - Annual samples of sediments, aquatic fauna and flora with γ spectrometry
Underground water	- 5 sampling points (monthly check) with measurement of total α, total β, potassium and tritium

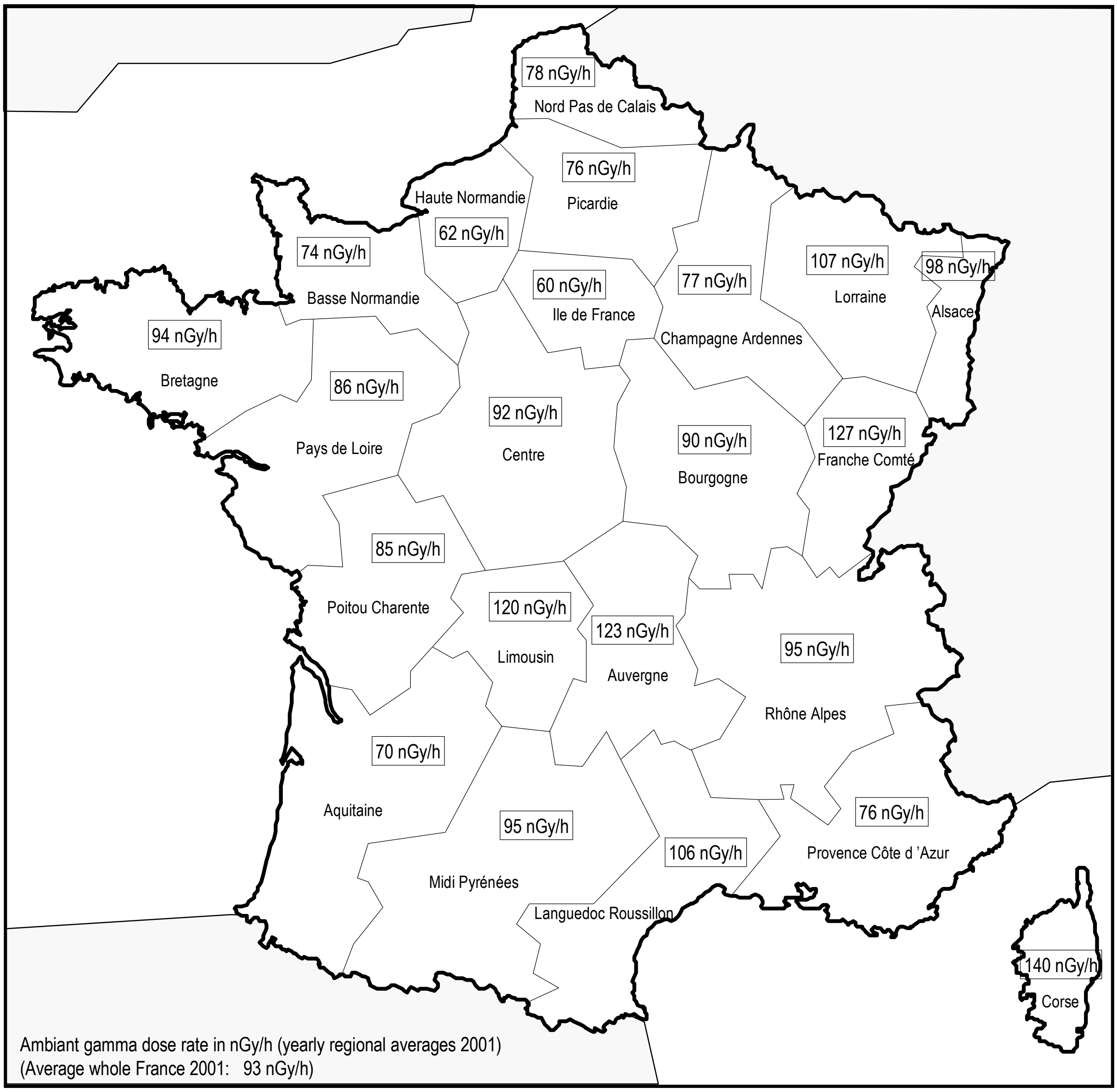
L.6.2 Measurements in the environment around nuclear sites

L.6.2.1 Ambient gamma dose rate around the country

The mean ambient gamma dose rate for 2001 is established in the following way:

France (prefectures)	French mountain peaks	Nuclear sites	Paris area
93 nGy/h	135 nGy/h	80 nGy/h	60 nGy/h

For the same period, the regional breakdown is as follows (1 mGy/year = 114 nGy/h):



L.6.2.2 Gaseous discharges from nuclear sites in 2001

Gaseous release of the main basic nuclear installations are given, together with their corresponding authorised limits in the following tables, according to the radioactive product categories defined in the permits in force in 2001.

- Limits and values of gaseous releases from EDF sites with original permit

In these permits, set up for nuclear power reactor sites from 1974 specifications, gaseous releases are merged in two categories and their values are only checked against a given measurement threshold, which is here provided.

Site	Rare gas + tritium		Halogen + aerosols	
	Limit	Release	Limit	Release
	(TBq)	(TBq)	(GBq)	(GBq)
Le Blayais	2220	< 17	74	< 0.08
Le Bugey	2590	< 14	111	< 0.12
Cattenom	3300	< 54	110	< 0.63
Chinon	2300	< 34	75	< 0.81
Chooz	330	< 9.9	11	< 0.13
Civaux	330	< 9.6	11	< 0.07
Creys-Malville	220	< 6.2	5	< 0.015
Cruas-Meysse	2300	< 27	75	< 0.23
Dampierre-en-Burly	2220	< 19	74	< 0.08
Fessenheim	1480	< 5.2	111	<0.04
Golfech	1650	< 20	55	< 0.13
Gravelines	3400	< 19	110	< 0.14
Nogent-sur-Seine	1650	< 11	55	< 0.20
Penly	1650	< 16	55	< 0.13
Le Tricastin	2220	< 31	74	< 0.08

- Limits and values of gaseous releases from EDF sites with revised permit

In these new permits, set up from 1995 specifications for nuclear power reactor sites on the occasion of their renewal, gaseous releases are now differentiated in five categories, one of which being C14 also measured.

Site	Rare gas		Tritium		Carbon 14		Iodine		others	
	Limit	Release	Limit	Release	Limit	Release	Limit	Release	Limit	Release
	(TBq)	(TBq)	(TBq)	(TBq)	(TBq)	(TBq)	(GBq)	(GBq)	(GBq)	(GBq)
Belleville-sur-Loire	45	2.04	5	2.02	1.4	0.429	0.8	0.184	0.8	0.027
Flamanville	45	12.9	5	2.77	1.4	0.696	0.8	0.212	0.8	0.021
Paluel	90	2.24	10	2.81	2.8	0.871	1.6	0.174	1.6	0.011
Saint-Alban	45	1.30	5	4.64	1.4	0.428	0.8	0.0136	0.8	0.008
Saint-Laurent-des-Eaux	36	0.41	4	0.46	1.1	0.328	0.8	0.0042	0.8	0.0012

- Limits and values of gaseous releases from COGEMA La Hague site

The current permit for 2001 included the following four categories (It has to be mentioned for the future that categories have been subdivided and limits decreased on the occasion of its renewal by order of 10 January 2003).

Site	Rare gas		Tritium		Halogen		Aerosols	
	Limit	Release	Limit	Release	Limit	Release	Limit	Release
	(TBq)	(TBq)	(TBq)	(TBq)	(GBq)	(GBq)	(GBq)	(GBq)
COGEMA La Hague	480000	227000	2200	61.8	110	4.45	74	0.241

- Limits and values of gaseous releases from CEA sites

The current permits include two or four categories depending on the Centres.

Site	Rare gas		Tritium		Halogen		Aerosols	
	Limit	Release	Limit	Release	Limit	Release	Limit	Release
	(TBq)	(TBq)	(TBq)	(TBq)	(GBq)	(GBq)	(GBq)	(GBq)
Grenoble	10	0.097	20	0.26	3	0.007	0.3	0.00029
Saclay	750	57.8	550	43.4	20	0.257	40	0.0924
	Rare gas + tritium				Halogen + Aerosols			
	Limit (TBq)		Release (TBq)		Limit (GBq)		Release (GBq)	
Cadarache	555		< 150		18.5		< 0.093	

L.6.2.3 Liquid discharges from nuclear sites in 2001

Liquid release of the main basic nuclear installations are given, together with their corresponding authorised limits in the following tables, according to the radioactive product categories defined in the permits in force in 2001.

- Limits and values of liquid releases from EDF sites with original permit

In these permits, set up for nuclear power reactor sites from 1974 specifications, gaseous releases are merged in two categories

Site	Tritium		Others	
	Limit	Release	Limit	Release
	(TBq)	(TBq)	(GBq)	(GBq)
Le Blayais	111	47	1480	2.4
Le Bugey	185	28	2035	1.9
Cattenom	160	110	2200	1.0
Chinon	110	39	1500	1.4
Chooz	80	39	222	0.7
Civaux	80	16	222	1.7
Creys-Malville	15	0.005	250	0.01
Cruas-Meysse	110	40	1500	0.90
Dampierre-en-Burly	111	35	1480	2.2
Fessenheim	74	23	925	1.3
Golfech	80	49	1100	0.60
Gravelines	166	53	2180	5.9
Nogent-sur-Seine	80	53	1100	1.8
Penly	80	45	100	1.1
Le Tricastin	111	43	1480	1.5

- Limits and values of liquid releases from EDF sites with revised permit

In these new permits, set up from 1995 specifications for nuclear power reactor sites on the occasion of their renewal, liquid releases are now differentiated in four categories, one of which being Carbon 14 also measured.

Site	Tritium		Carbon 14		Iodine		Others	
	Limit (TBq)	Release (TBq)	Limit (GBq)	Release (GBq)	Limit (GBq)	Release (GBq)	Limit (GBq)	Release (GBq)
Belleville-sur-Loire	60	49	400	8.6	0.1	0.036	25	1.39
Flamanville	60	58	400	12	0.1	0.023	25	1.15
Paluel	120	100	800	74	0.2	0.080	50	7.17
Saint-Alban	60	56	400	8.4	0.1	0.007	25	0.82
Saint-Laurent-des-Eaux	40	26	300	19	0.3	0.011	30	1.65

- Limits and values of liquid releases from COGEMA La Hague site

The current permit for 2001 included the following four categories (It has to be mentioned for the future that categories have been subdivided and limits decreased on the occasion of its renewal by order of 10 January 2003).

Site	Tritium		Alpha emitters		Others		Including strontium 90 + cesium 137	
	Limit (TBq)	Release (TBq)	Limit (GBq)	Release (GBq)	Limit (TBq)	Release (TBq)	Limit (TBq)	Release (TBq)
La Hague	37000	9650	1700	50.9	1700	28.8	220	1.85

- Limits and values of liquid releases from CEA site

Current permits concern four Centres and include three categories.

Site	Tritium		Alpha emitters		Others	
	Limit (TBq)	Release (TBq)	Limit (GBq)	Release (GBq)	Limit (GBq)	Release (GBq)
Cadarache	1.85	0.133	0.37	0.027	3.7	0.135
Fontenay-aux-Roses	0.20	0.00033	1.0	0.003	40	0.013
Grenoble	0.50	0.00065	0.10	0.0006	1.0	0.0022
Saclay	7.4	0.121	0.74	< 0.165	37	1.47

In view of these results, the ASN is confirmed in its policy of revising in decrease the release permits, following the general principal of environment protection, by make them in closer relation with the only necessary needs for facilities' operation.

L.7 References

L.7.1 Documents

/1/ Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management (JC), September 1997.

/2/ Guidelines regarding the form and structure of national report to be submitted for the Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management, JC-SFRW/PREP/FINAL/DOCUMENT 3, 13 December 2001.

/3/ Public Health Code (in French)– Journal officiel de la République française[4] (Official Gazette)

/4/ Environment Code (in French) – Journal officiel de la République française

/5/ Protection contre les rayonnements ionisants – Textes législatifs et réglementaires (Protection against ionising radiations – laws and regulations) – Recueil n°1420 - Les éditions du Journal officiel, February 1992 (in French).

/6/ Sûreté nucléaire en France - Législation et réglementation –(in French – The nuclear safety in France – Laws and regulations) - Recueil n°1606 - Les éditions du Journal officiel, 4th edition, May 1999 (in French).

/7/ Nuclear Safety in France in 2001 - Annual report of the Nuclear Safety Authority, March 2002.

/8/ Nuclear Safety and Radiation Protection in France in 2002 - Annual report of the Nuclear Safety Authority, March 2003.

/9/ Où sont les déchets radioactifs en France? (Where are located radioactive wastes in France?) – 9th report by the ANDRA national observatory, November 2002 (in French).

/10/ Convention on Nuclear Safety – Second national report on the implementation by France of the obligations of the Convention, September 2001.

L.7.2 Web sites

The above mentioned documents, or most of their content, are available, as well as other relevant information related to this report, on the Web. Should be mentioned in particular the following Web sites:

Légifrance: www.legifrance.fr

ASN: www.asn.gouv.fr

ANDRA: www.andra.fr

CEA: www.cea.fr

COGEMA: www.cogema.fr

EDF: www.edf.fr

IAEA: www.iaea.org

[4] A large number of legislative and regulatory texts are available on the following web site : www.legifrance.fr

L.8 Main abbreviations

ANDRA	National agency for radioactive waste management
AREVA	Holding company owning COGEMA
ASN	French Nuclear Safety Authority
BNI	Basic Nuclear Installation
CEA	French Atomic Energy Commission
CENTRACO	Centre for processing and packaging low level waste
CIINB	Inter-ministerial Commission for Basic Nuclear Installations
CIREA	Inter-ministerial committee on artificial radionuclides (no longer exists)
CNPE	Nuclear power plant (EDF)
COGEMA	Compagnie générale des matières nucléaires (nuclear fuel company)
DARPMI	Directorate for regional action and small and medium-sized enterprise
DGEMP	Directorate general for energy and raw materials
DGSNR	Directorate general for nuclear safety and radiation protection
DPN:	Nuclear power generation division (EDF)
DPPR	Directorate for the prevention of pollution and risks
DRIRE	French regional directorate for industry, research and environment
DSNR	Nuclear safety and radiation protection departments of the DRIREs
EDF	Electricité de France
EU	European Union
GCR	Natural uranium gas-graphite reactor
HLW	High level waste
IAEA	International Atomic Energy Agency
ICPE	Installation classified on environmental protection grounds
ICRP	International Commission on Radiation Protection
ILW	Intermediate level waste
INES	International Nuclear Event Scale
IPSN	CEA's Institute for protection and nuclear safety (now incorporated into the IRSN)
IRSN	French Institute for radiation protection and nuclear safety
LL	Long-lived
LLW	Low level waste
MOX	Mixed uranium and plutonium oxide fuel
NEA	Nuclear Energy agency of the OECD
OPRI	French Office for protection against radiation (now incorporated into the IRSN)
PPI	Offsite emergency plan
PUI	On-site emergency plan
PWR	Pressurised water reactor
REX	Experience feedback
RFS	Basis safety rule
RGE	General operating rules
SL	Short-lived
SOCODEI	Subsidiary company of EDF and COGEMA operating the CENRACO facility
STE	Technical operation specification
VLLW	Very low level waste
WENRA	Western European Nuclear Regulators' Association