Convention on Nuclear Safety

Second Review Meeting

Vienna - 15-26 April 2002

France's answers

to questions and comments received from other Contracting Parties on its 2nd report for the CNS

16 April 2002

Preamble

As of February 22, 2002, France has adopted a new organisation for the supervision of nuclear safety and radiation protection, which is described in the answer to Question Q.8.1. Except in this case, the answers to questions and comments received on the French second report for the Convention are provided along the former organisation as described in the report.

The questions are listed along the Articles of the Convention and, within each article, grouped by issues raised. The answer to each question is provided immediately under the related question.

General

Q.0.1	The report, structured in the three parts: regulation and legal basis, description of the actions taken by the utility, analysis and evaluation of these measures by the regulatory body - gives a good overview on the fulfilment of the obligations of the CNS in France.

Answer

France is thankful for this kind comment. This new presentation was adopted to respond to criticism received on the structure of its first report and to facilitate for the regulator and the operators to express their views.

Article 6: Existing nuclear installations - Planned activity to improve safety

Q.6.1	The Report states that the share of nuclear electricity in the total electricity generation is ~75%. Please advise us whether French NPPs are involved in the load following operation (daily, weekly, monthly, etc.)?

Answer by EDF:

The whole fleet of EDF reactor units really contribute to:

- The main frequency control of the power plant
- The secondary frequency adjustment (restoration of the rated frequency and compliance with cross-border power exchange conditions),
- The power grid follow-up (daily, weekly, monthly).

Q.6.2	Introduction: The report mentions that, at the international level EDF has been involved in finalising the European Utilities Requirement (EUR). Work to establish these requirements was initiated in 1992 in collaboration with the major nuclear power utilities in Europe. Issue B was published in 1996 and work is underway on the issue C. Please provide information on the content of issues B and C? (§3.3.4)

Answer by EDF:

As mentioned in the report (§3.3.4 - p. 18) revision C of EUR document volume 1 and 2 was issued by July 2001. This revision was set up on the basis of revision B issued in 1995. About 5000 proposals for modification were analysed, which mainly came from:

- conformity assessment with revision B of projects considered in the volume 3 of EUR document (BWR90/90+, EFP, EP1000, ABWR and SWR1000),
- comparison of revision B with EPRI-URD, IAEA safety standards, and French-German and Finnish design regulatory guides for future plants,
- comments from Safety Authorities from various European States on revision B,

Four chapters of volume 2 were completely rewritten:

- chapter 2.3 "grid requirements": the average requirement level was lowered, reflecting the views of power suppliers on the European electricity market instead of that of national grid managers. Only what is strictly needed for connecting a NPP on very high voltage European grid is now required. Plant design could be simplified, but it will have to be disconnected from the grid in non-frequent situations.
- chapter 2.10 "Instrumentation & Control and man-machine interface": the chapter was rewritten as a functional specification allowing various technical solutions,
- chapter 2.11 "layout rules": the specifications were rewritten much more precisely to allow the development of standard models meeting the needs of all European operators,

- chapter 2.13 "constructibility": this chapter was revised to take into account all envisaged organisation scheme in Europe for the construction of new plants.

Other chapters have kept their structure from revision B, but a lot of minor changes have been introduced. As regards safety related chapters:

- improvements adopted for chapter 2.1 "safety requirements" mainly aimed at clarifying the text. Some more significant changes (for instance replacement of the verification of the combination Design Basis Earthquake + LOCA by a stronger Seismic Margin Assessment approach or adjustment of the "Severe Accident Safe State" definition) did not modify fundamental safety options of revision B,
- chapter 2.9 "containment system" remained very close to that of revision B. The functions of the various pressure monitoring systems in the primary containment were rewritten in a more logical way without changing the requirement level: overpressure protection systems, filtered containment venting, long term venting after an accident.

Finally, the whole set of chapters of revision C was subject to a rigorous consistency review before publication.

Q.6.3	What is the French policy on plant life management? Is there a systematic approach that is being used to manage ageing-related problems in French NPPs?

Answer by EDF:

As regards ageing of its nuclear power plants, EDF has set up a plant lifetime programme, which includes operating feedback and considers operating as well as maintenance issues. Synthetically it comprises two parts:

- ageing management, so as to offer proof that installations subjected to the different ageing consequences remain within the design conditions (or within the reassessed conditions taking into account operating feedback)
- industrial management of lifetime, which corresponds to economical optimisation by the operator of its investments with the constraint to maintain its installations at the required level of safety.

As regards ageing management, the approach consists in defining the components to be monitored and to set up the list of sensitive components. The corresponding ageing control programmes for these sensitive components are defined and implemented. In addition the whole available knowledge related to ageing mechanism and consequences is gathered in a database, which helps defining actions to undertake. This approach allows taking into account the progress in knowledge and to control ageing consequences.

Answer by ASN:

The French policy on plant-life management is clearly linked to ageing problems. The French regulatory approach for ageing management must be very strict as a possible generic effect could arise from the fact that all power reactors are based on a single design. The main lines of action are as follows:

- To make sure that the operators incorporate ageing in their general operating strategy,
- To identify pieces of equipment that cannot be replaced (the pressure vessel and the containment building) and those that can be replaced (in fact all other pieces of equipment such as Steam Generators, I&C, etc.),
- To impose that component replacement takes into account:
  - The technical aspects: feasibility of the replacement, availability of components, specific tools and methods necessary for replacing a component, etc.,
  - The non-technical aspects: components no longer manufactured, competencies of sub-contractors for the replacement activities, etc.

- To request the operators to develop their strategy according to a defence-in-depth approach at the different stages of the life of a reactor:
  - Design stage with particular attention to:
    - Material selection, construction dispositions, aiming at limiting ageing effects,
    - Safety demonstrations to include end-of-life material characteristics,
    - Surveillance means to verify the predicted characteristics (e.g. pressure vessel),
    - Possible re-assessment of the design due to an unpredicted behaviour,
  - Monitoring during the operating life time through:
    - Periodic surveillance, preventive maintenance, ten-yearly outages, conformity verifications, analysis of operating incidents: all contribute to detect ageing phenomena,
    - Understanding the phenomena, evaluating their kinetics, monitoring their development, with the objective of verifying that the installations stay within the design assumptions,
    - Requests of proactive actions such as improving the surveillance plans, identifying parts of a reactor liable to be affected by a new degradation phenomenon or developing new surveillance methods for an early detection of defects become they become noxious: all these actions are aiming at anticipating the possible developments, awaiting degradations to occur being felt too passive an attitude,
  - Management of modifications and replacement of components:
    - This third line of defence-in-depth necessitates anticipation so as to reduce the delivery time and adequately prepare the interventions,
    - This strategy must also take into account the possible obsolescence of some components and the loss of technical competencies to perform the interventions.

Based on the above approach for ageing management, the French approach to lifetime management is as follows. The French regulatory system is such that the operating authorisations have no time limit. On the other hand, the ASN can ask for a safety review at any time. This can be a conformity check, i.e. a comparison of the safety of a plant to its initial licensing conditions, or a safety re-assessment, i.e. a comparison of the safety of a plant with updated study results and the situation at more recent installations. In practice, safety reviews are requested every ten years. In 2001, the ASN notified to EDF that the 30-year outages would be key milestones aiming at:

- Accurately determine the exact state of the reactors,
- Analysing EDF's ability to safely operate each individual reactor beyond its 30-year outage, in particular with due consideration to the ageing phenomena.

Thus the 3rd ten-yearly outages will provide the ASN with a comprehensive diagnosis of the ageing situation of each individual reactor. The ASN requested EDF to develop a working programme including:

- The preparation of the 3rd ten-yearly outages,
- A demonstration for each reactor of EDF's ability to operate it safely beyond 30 years,
- The establishment for each reactor of a detailed programme for managing ageing phenomena beyond 30 years.

Q.6.4	The scheduled activities to improve safety (page 129) are quite general and without any fixed terms. In this respect, we can't see what was done to improve safety since the last review meeting.

Answer by ASN:

The activities listed in conclusion of the report are all ongoing activities and they generally cannot have a fixed term as the overall objective in France is to improve safety; for the issues already mentioned, the following can be added:

- Improving consideration given to human factors and organisational problems by the operator:
  The improvements made since 1998 are presented in the report under Article 12 (§ 12.4 - p. 56) and work is continuing (see also answer to question Q.12.12)

- Making progress with radiation protection monitoring in order to reach the same level as that obtained in nuclear safety:

  In that field the major change is the new organisation of nuclear safety and radiation protection, which is enforced as of 22 February 2002 and is presented in answer to question Q.8.1.

  As regards nuclear power reactors, the ASN continued the process it had begun in 1998, to ensure radiation protection improvements during maintenance work, in particular with application of the requirements of the Ministerial Order of November 10, 1999. This Order requires that the operator reports on the dosimetric impact of the maintenance operations it intends to carry out. These provisions in particular concern work which is to be carried out on a number of reactors and for which there is all the more a reason to develop automated methods. In tandem, the ASN continued the action started following the incidents and dysfunction, which occurred in 1998 and 1999. In concrete terms, these actions led to:
  - EDF initiating production of a "radiation protection baseline", like that which exists for safety, giving a formalized collection and/or explanation of the regulatory requirements and EDF internal specifications applicable to radiation protection on the sites. The first part of these plans will come into force in 2002,
  - EDF examining the relevance of the radiation protection training given to personnel working in the nuclear power plants, including in the radiation protection departments.
- Ensuring better consideration of environmental issues, in particular by lowering limits when renewing release permits:

  The improvement made are presented in the report under Article 15 (§ 15.1.3 - p. 77). New release permits, including lower limits, were issued for one plant in 1999 and for 4 others in 2000; work is continuing for renewing all the release permits downwards by 2006.
- Anticipating ageing problems, in particular thoroughly preparing the third ten-yearly outages:

  Progress on this topic and ongoing work are presented in answer to question Q.6.3.
- Issuing regulatory texts to formalise requirements and practices which are currently enforced in an informal way:

  An interministerial order was issued on 31 December 1999, which sets general requirements applicable to Basic Nuclear Installations as regards environmental protection. This order supplements release permits specific to each installation and sets, in addition to general rules as regards incident and accident prevention, objectives in fields such fire protection, noise protection or accidental water pollution.

Q.6.5	Paragraph 2.4 on page 10. Referring to the large leak in the residual heat removal system of Civaux-1, we are very concerned with the root cause of this event and the findings, replacement action from the checking requested by French Safety Authority on similarly designed mixed zones of the heat removal system for all French PWRs, especially for Gravelines 5 & 6.

Answer by ASN:

On May 12, 1998, water leakage at an estimated 30 m^3/h was detected on the residual heat removal system (RRA) of the Civaux-1 reactor. During reactor outages, this system circulates a minimum water flow through the primary system, in order to ensure cooling of the fuel in the reactor core. It comprises two redundant channels. When the N4 series was being designed, an arrangement different from that installed on the 900 MWe and 1300 MWe series reactors was adopted.

The Civaux-1 leak resulted from a through-crack on a bend weld in the hot and cold water mixing zone of one of the RRA channels. Expert examination of the damaged pipe section and checks conducted on other RRA systems in the N4 series reactors and the RRA circuits of reactors of other plant series evidenced a thermal fatigue phenomenon in certain mixing zones.

Consequently, EDF modified the RRA circuits on the N4 series in order to minimise the thermal fatigue risks. The Safety Authority also asked the operator to present documents justifying the durability of the new RRA system design throughout the expected reactor lifetime. To this end, a

programme of tests, expert assessments, complementary analyses (mechanical and thermal hydraulic) and research and development was launched by EDF. A design review of the entire RRA system was also carried out by the operator.

The RRA system investigations were also extended to cover the 900 MWe and 1300 MWe series. To this end, the Safety Authority asked the operator to check the RRA system mixing zones prone to thermal fatigue, on all the reactors in the nuclear power plant population, followed by replacement of defective pipe sections. The inspection and replacement programs had been completed on virtually all reactors by the end of the year 2000.

The results on these plant series show less deterioration than that evidenced on the reactors in the N4 series. EDF was nonetheless asked to keep the removed piping sections for subsequent expert assessment, in particular to improve knowledge of how thermal fatigue cracks initiate and propagate. The checked reactors of the 1300 MWe series had operated for nearly 10 years, while those of the 900 MWe series had been operating for about 20 years.

At the request of the Safety Authority, EDF put in place a program on all the RRA systems in the power plant population to supervise their operating conditions, and restricted their operation at high temperatures in order to reduce the risks of thermal fatigue.

The main results of the program as a whole were presented at the session of the Advisory Committee for Reactors which met in May 2000. The ASN then asked EDF to implement periodic surveillance of the RRA system mixing zones, taking account of the anomalies observed on the various plant series. EDF was also asked to define and propose construction and operating solutions for the N4 series designed to significantly reduce thermal stresses.

The ASN also asked the operator, with respect to all safety-related systems, to examine the mixing zones liable to experience thermal fatigue and to propose a surveillance program for these zones, appropriate to the risks identified.

Further to the first non-destructive and destructive examinations of the RRA system mixing zones, it appeared that the available non-destructive examination methods were not always capable of the appropriate detection sensitivity and accuracy. This resulted in a systematic replacement of all mixing zone pipings for all reactors, including those of the Gravelines 5 and 6 reactors.

Article 7: Legislative and regulatory Framework

Q.7.1	The Parliamentary Office for Assessment of Scientific and Technological Options (Chapt. 7.1.3. of the Report) is in charge of informing the Parliament of the consequences of scientific or technical decisions and to examine the way in which nuclear installation safety and security are supervised. This « control of the control » comprises deputies and senators. On what scientific and technical support, advice and expertise may rely this Office in case of need for help on specific topics? If expertise is given, are those experts independent from ASN, EDF, IPSN, CEA or any other body involved in nuclear safety matters?

Answer by ASN:

The Parliamentary Office for Assessment of Scientific and Technological Options is a political forum and its members are political representatives in charge of informing the deputies and senators of the political implications of the decisions taken by the Government. The expression "control of the control" is not to be understood in a technical sense, but in its political sense: thus, the Parliamentary Office does not request technical evaluations to be performed by expert organisations.

Q.7.2	(§7.2.1) Article 7 (also related to Article 9). Is the principle that the prime responsibility for safety lies with the operator, explicitly laid down within the regulatory framework?

Answer by ASN:

Although it does not make use of the exact expression cited in the above question, the French regulatory framework clearly establishes the prime responsibility for safety of the operator, as evidenced below.

The law 61-842 of August 2, 1961 (App. 2 in the Report) states, in its Article 1, that "… industrial premises … shall be so constructed, operated or used as to satisfy the requirements stemming from implementation of the present law aimed at preventing atmospheric pollution and odours liable to inconvenience the population, compromise public health or security …". In addition the same law states, in its Article 8, that "The provisions of Articles 1 to 7.1 are applicable to all types of pollution caused by radioactive substances."
Decree 63-1228 of December 1963 (App. 2 in the Report) states, in its Article 3, that "a basic nuclear installation may not be set up without prior authorisation", the application of which shall be accompanied by documents, mainly a safety analysis report and a danger analysis. Regulation leaves the operator free of selecting the appropriate technical options, provided its complies with the safety objectives set by the Safety Authority.

The "Quality" Order of August 8, 1984 (App. 2 in the Report) states, in its Article 1, that "the operator of a basic nuclear installation shall ensure that quality standards befitting the importance of their safety related functions, within the meaning of the decree of March 13, 1973, be defined, obtained and maintained for the following elements: structures, components and equipment, assemblies which combine them and installation operating conditions. For this purpose, the operator shall ensure that a system is set up to define the requisite quality level of the aforesaid elements, to obtain and maintain the level required, to check that the level is consistently achieved and to analyse and correct any possible deviations. This system involves a monitored set of planned, systematic actions, based on written procedures and giving rise to filed records. It must be so devised as to confirm that the quality level of the above elements has been obtained and maintained. It is set up at the design stage and extends throughout all the subsequent stages of existence of the Basic Nuclear Installation."

Q.7.3	§ 7.2.2.2 p. 24 - Does the Basic Safety Rules (RFS) cover not only Power Plants, but also Fuel Cycle Facilities (FCF)? If does not, do you have any plan to form the RFS for FCF?

Answer by ASN:

The Basic Safety Rules are either specific to nuclear power reactors or specific to other types of nuclear installations. The 40 published rules can be listed as follows:

- 23 rules deal with nuclear power plants, covering:
  - General principles related to protection against external hazards (5 rules),
  - General principles for design and implementation (3 rules),
  - Safeguards systems (2 rules),
  - Rules applicable to studies related to operation (3 rules),
  - General rules applicable to radiation protection evaluation (2 rules),
  - General rules related to several systems, structures or equipment (8 rules).
- 17 rules deal with other types of nuclear facilities, including fuel cycle facilities:
  - General principles related to protection against external hazards (3 rules),
  - General principles for design and implementation (2 rules),
  - Rules applicable to prevention of hazards (2 rules),
  - General design of basic systems (1 rule),
  - Production, monitoring, and processing of effluents and waste (6 rules).
  - Rules applicable to research reactors (2 rules),
  - Rule applicable to meteorological measurements (1 rule).

Q.7.4	The basic safety rules issued by the Nuclear Installation Safety Directorate (DSIN) are recommendations defining the aims to be achieved. They have from the legal view no regulatory status. (Chapt. 7.2.2.2 of the Report). The rules, codes and standards issued by operators are although not to be considered as regulatory documents (Chapt. 7.2.2.3 of the Report.) The decisions issued by the Safety Directorate aim to reach a certain consensus with the operators. Although this mechanism may work very well in most cases, what are the regulatory mechanisms and tools to impose decisions to an operator in order to comply with the instructions of the authorities? Is the Ministry of Environment and the Ministry of Industry involved in these regulatory mechanisms?

Answer by ASN:

The basic safety rules have no regulatory status in the sense that an operator is free not to apply a basic safety rule, provided he can demonstrate that he will reach the same safety objectives using a different route.

On the other hand, decisions issued by the ASN do not aim at reaching a certain consensus with the operators; complying with the obligations included in a decision is absolutely compulsory. There may have been some misunderstanding with the fact that many documents (among which basic safety rules and decisions) issued by the ASN are often discussed with the operators before being promulgated. But in all cases, after hearing the comments made by the operators, the ASN takes its responsibilities and issues these documents as it is felt most appropriate for safety.

Finally there are enforcement mechanisms which enable the regulator to go up to operating licence suspension for Basic Nuclear Installation. See also answer to question Q.7.8.

Q.7.5	As stated in Chapt. 7.3.1.5 of the Report, the Ministries for Health and Labour are responsible for the supervision of radiation protection. On the one hand, the OPRI is assisting the Ministry of Health and on the other hand the DRIRE is assisting the Ministry of Labour to fulfil their tasks. What are the tasks of either those technical bodies within the large of radiation protection? Are the competencies of the two bodies well defined within a legal text to avoid any overlapping? May in practice the attribution of the same competence to different technical authorities in the same field of work give rise to problems?

Answer by ASN:

There is hardly an overlap of competencies in radiation protection between the Ministry for Health and the Ministry for Labour. The regulations in force derive from European Directives. Whereas the Ministry for Health defines the maximum radiation levels for the population, the Ministry for Labour defines the maximum radiation levels for workers and takes part in verifying that these levels are respected, in particular through the inspections performed by the ASN.

Recognising that radiation protection supervision in France should be improved, the Government recently decided to put in place a new organisation, which is described as an answer to question Q.8.1 below.

Q.7.6	What are the numbers of inspections carried out by ASN during the last 5 years (planned/unplanned)? (page 29, article 7.3.2.1).

Answer by ASN:

The ASN carries out annually about 650 inspections, half of which are performed at nuclear power reactors. The number of unplanned inspections has increased over the recent years to reach about 20%. The number of inspections over the past five years is as follows:

Year	Power reactors inspections	Total number of inspections	Unplanned inspections (total)
1997	382	693	51
1998	350	674	68
1999	326	667	87
2000	360	678	118
2001	383	653	129

Q.7.7	§ 7.3.2.4 p.32 - It is reported that the ASN has been pursuing for several years diversification efforts for technical support, both from domestic and foreign organizations. What is purpose and significance of this diversification?

Answer by ASN:

There are several reasons for pursuing diversification efforts for technical support, all aiming at obtaining the best technical advice. For instance, it may be advisable to look for a second advice from an organisation, which, for a different field of the industry, already studied a specific problem: this is the case with fire protection, which is also to be addressed e.g. in the chemical and oil industry. Also, the temporary saturation of a team competent in a given field may lead to request advice from another technical support organisation.

Q.7.8	(§7.3.3) The report indicates that the Nuclear Safety Authority (ASN) has previously taken action to shutdown individual units and tranches of reactors. Does the legislative and regulatory framework allow ASN to prosecute the operating companies or individuals? Has this power to prosecute been exercised and with what effect?

Answer by ASN:

The Law 61-842 (App. 2 of the Report), through its Articles 5 to 7-1, and Decree 63-1228 (App. 2 of the Report), through its Article 12, allow prosecution of an operating company, although these provisions have seldom been used.

Q.7.9	What are the procedures to appeal against the ruling of ASN? (page 32, article 7.3.3.1).

Answer by ASN:

In France the general procedure for appealing against the ruling of an administration, such as the Nuclear Safety Authority, is to file a petition to the Administrative Court.

Q.7.10	(§7.1.3) National Report Reference Art. 7: Within the framework of audits open to the public a parliamentary commission studies the organisation of the safety measures in radiation protection at the utility and at the administration and verifies if the authorities have sufficient resources to fulfil their mission. This procedure is considered as a good practice.

Answer by ASN:

France is thankful for this kind comment.

Article 8: Regulatory Body

Q.8.1	(§8.1) Article 8, point 2, of the Convention stipulates that the regulatory body shall be effectively separated from any organisation concerned with the promotion or utilisation of nuclear energy. During the first Review Meeting, three years ago, the French delegation announced that, in the near future, legislative steps would be taken in order to assure the formal independence of the regulatory body from the promoter of nuclear energy (Ministry of Industry). It appears from the French national report that this reorganisation is not yet effective in practice. Could we get explanations about the current and future situation?

Answer by ASN:

Since 1973, the supervision of Basic Nuclear Installations has been entrusted to the Nuclear Safety Authority, originally known as the Central Service for the Safety for Nuclear Installations, which became, in 1991, the Nuclear Installation Safety Directorate (DSIN), the supervisory functions of which are extended on-site to the Regional Directorates for Industry, Research and the Environment (DRIRE).

The problems raised by nuclear activities are not however confined to nuclear safety problems: how to prevent accidents, how to minimize their consequences? They also involve a significant degree of radiation protection: how to minimize the undesirable effects of ionizing radiation on human health? But supervisory structures for radiation protection are far less developed in France than those for nuclear safety.

Radiation protection supervision began in France at the National Institute for Health and Medical Research (INSERM), where a Central Service for Protection against Ionizing Radiation (SCPRI) was set up and transformed by a decree of July 19, 1994 into a public institution, known as the Office for Protection against Ionizing Radiation (OPRI). The latter was placed under the joint supervision of the Ministers for Health and for Labour (currently under the sole responsibility of the Minister for Employment and for Solidarity). These ministers, with regard to radiation supervision, rather than developing their own departments, preferred to rely on the technical support offered by the OPRI: simply one bureau or part of a bureau was in charge of radiation protection problems at each Ministry, representing a staff of about ten people. The OPRI had a staff complement of about 190.

The nuclear supervision system, in the aggregate, has frequently been criticized. A report on the subject, dated July 7, 1998 and written by Mr. Le Déaut, deputy, on behalf of the Parliamentary Office for Assessment of Scientific and Technological Options, contained notably the following observations:

- There is no sufficiently distinct separation between supervisor and supervised: the IPSN, the technical support organization of the nuclear safety supervisor, the DSIN, is also to be found among those supervised, since it depends on the CEA, a nuclear installation operator, and itself operates several Basic Nuclear Installations in the framework of its safety research work,
- The means devoted to nuclear safety and to radiation protection are utterly disproportionate; radiation protection supervision, in the vast majority of cases, is subcontracted to the technical support organization, which is little equipped for on-site supervision,
- There is no link between nuclear safety supervision and radiation protection supervision, unlike provisions in other countries. This can hinder efficiency, since the problems considered are closely linked and the installations and activities to be supervised are, in many cases, the same.

In view of these observations, Mr. Le Déaut advocated separating the CEA and the ISPN and setting up an independent administrative authority responsible for both nuclear safety and radiation protection supervision.

After having considered this solution, the Government finally decided that nuclear safety and radiation protection supervision should be maintained within the conventional administrative system. The reform adopted comprises three main elements:

- The IPSN, a nuclear safety research and expertise organization, which already has activities in the radiation protection technical field, would be partenered with the OPRI, the radiation protection technical support organization, thus forming a new public institution of an industrial and commercial nature, the IRSN (Institute for Radiation Protection and Nuclear Safety).
- The correlative grouping of State supervisory departments for nuclear safety and radiation protection within a General Directorate for Nuclear Safety and Radiation Protection (DGSNR).

The first two aspects of this reform have been the subject of legal provisions, inserted in the law of May 9, 2001 setting up a French Agency for environmental health security. They are defined by the decree 2002-254 of February 22, 2002, setting up an independent public institution, placed under the supervision of the Ministers respectively for the environment, industry, research, health and defence, the Director for the prevention of pollution and risks at the Ministry for the Environment having been appointed government commissioner for this establishment. The vocation of the IRSN is to comply with expertise and research commitments in the fields of nuclear safety, the safe transport of radioactive and fissile materials, the protection of man and the environment against ionizing radiation, the protection and supervision of nuclear materials and products liable to be used for weapon manufacture and the protection of installations and transportation operations against malevolent acts.

Considering the particular sensitivity of activities carried on in the defence sector, the corresponding assignments are the subject of specific arrangements within the establishment concerned: a deputy director-general is specially assigned to these activities, provided in particular for this purpose with a defence nuclear expertise department. A specific guidance committee ensures compliance of the organization, the programme of activities and the budget in this area.

A special effort will moreover be made with regard to transparency (publication of IRSN research results) and ethics (a deontology committee will be instituted).

The third section of the reform is the subject of the decree 2002-255 of February 22, 2002 setting up the DGSNR. The DGSNR groups, apart from the worker protection aspect, the State departments dealing with nuclear safety supervision: the DSIN, and those dealing with supervision of the radiation protection of the population: the Radiation Bureau of the Directorate-General for Health at the Ministry for Employment and Solidarity, that part of the OPRI which, acting on behalf of this ministry, actually carried out supervisory, but not expertise activities, together with the Permanent Secretariate of the Interministerial Commission for artificial radio-elements (CIREA), to which the Ministry for Employment and Solidarity had delegated regulatory functions concerning the supervision of radioactive sources. The principle of the disappearance of this Commission, the arrangements of which are included in the Public Health Code, is provided for in article 5 of the order of March 28, 2001, concerning the transposition of European directives in the ionizing radiation protection field. It must be emphasized that the scope of the new General Directorate, in the radiation protection field, goes far beyond the 127 establishments currently classified as Basic Nuclear Installations: it will also cover the many installations classified on environmental protection grounds using or storing radioactive substances, radioactive sources used for industrial or medical applications, X-Ray equipment, together with possible natural radioactivity problems.

The previous functions of the ministers are not in fact affected by the reform: the ministers for Industry and for the Environment respectively remain competent in the nuclear safety supervision sphere and the minister for Health in the population radiation protection supervision field. For this reason, the DGSNR is placed under the authority of these three ministers and the decrees allocating their duties have been modified accordingly. Like the present DSIN, the DGSNR, for its administrative and budgetary affairs, is responsible to the Minister for the Economy, Finance and Industry.

One of the criticisms expressed with regard to the present system concerned the insufficiency of onsite radiation protection supervision. The setting up of a central authority would obviously not suffice alone to improve matters in this respect. For this reason, the decree explicitly includes, in the DGSNR tasks, the organization and promotion of all inspections related to radiation protection

supervision. Similarly, the DGSNR shall provide Guidelines, organize and supervise, within its field of competence, the activity of decentralized State services concerned. These inspections and services have, to a large extent, to be created or developed within existing services. At the current stage in the relevant discussions, it is envisaged to develop specialized radiation protection skills within the DRIREs, which are already accustomed to working for the DSIN in the nuclear safety field.

The above-mentioned decrees obviously only provide a framework, within which all has yet to be done. Suitable financial and human resources will be necessary if this new organization is to fulfil all that is required of it. However, it is worth noting that, even at this early stage, this supervision reform reveals the Government's determination to reinforce and coordinate nuclear safety and radiation protection supervision and that the new framework provided will enhance the efficiency of the resources to be developed in the years to come.

Q.8.2	§ 8.1 - Do you plan to change the position or change the independence of DSIN as the regulatory body in France in near future?

Answer:

See answer to question Q.8.1.

Q.8.3	What are the main considerations (reasons) for merging regulatory bodies in charge of nuclear safety and radiation protection including support organisations? (page 8, article 1.2)

Answer:

See answer to question Q.8.1.

Q.8.4	The Nuclear Installation Safety Directorate (DSIN) is placed on one hand under the authority of the Minister of Industry and on the other hand under the Minister of Environment. Nuclear safety issues may give rise to differences in appreciation, as the Minister of Industry intrinsically is a promoter of the nuclear industry, whereas the Minister of Environment promotes the protection of the environment. In case of completely opposite opinions of the two Ministers, what are the procedures foreseen in a decision making process of the DSIN? Do procedures exist for implementing a mediation process, or does the opinion of one Minister prevail in this decision making process?

Answer by ASN:

In France, when two ministries have different views on a given subject that cannot be reconciled, it is up to the Prime Minister services to impose a final decision.

Q.8.5	Article 8. How are discrepancies in nuclear safety policy between the Ministry for the Environment and the Ministry of Industry, also responsible for nuclear energy development, solved? How is ASN decision making process affected?

Answer:

See answer to question Q.8.4.

Q.8.6	What is the status of the technical support organisation (IPSN) of the Safety authority in connection with its cooperation with the French nuclear power operator EDF?

Answer by IRSN:

IRSN (former IPSN) carries out expertise and research activities in the following fields:

- The safety of nuclear installations;
- The safety of transport of radioactive and fissile materials;
- The protection of the man and the environment against the ionizing radiation;
- The control of nuclear materials;
- The protection of the nuclear installations and transport of radioactive and fissile materials against the acts of malevolence.

As such, IRSN brings a technical support to the DGSNR (former DSIN) and to public authorities and services that make request it.

The French nuclear operator EDF has the prime responsibility of the safety of its installations, under the control of the public authorities. To obtain the necessary authorizations, it transmits to DGSNR files in which it specifies the arrangements it retained and brings the corresponding justifications.

IRSN intervenes, at the request of DGSNR, to provide a critical technical advice on these arrangements and justifications. Of course, IRSN does not write any part of the safety demonstrations, which remain entirely the responsibility of the operator EDF. Nevertheless, before giving an advice to DGSNR on a file, IRSN holds detailed technical discussions with EDF.

On another hand, IRSN carries out co-operations with EDF in the field of safety research in order to develop knowledge to better appreciate some safety issues; EDF and IRSN remain free of the use of the data thus gathered.

These co-operations are subject to deontology rules, which were approved by the IPSN Steering Committee. IRSN also remains free to carry out research that designers or operators would not consider useful.

The contribution of EDF to the IRSN safety research activities is about 10 millions of euros on a total budget of 250 millions of euros for the institute.

Q.8.7	§ 1.4 p.8 - It is reported that EDF and the CEA collaborate on nuclear research and development activities, and mainly, as regards nuclear safety, with the IPSN. EDF and the CEA belong to side of promotion or utilization of nuclear energy, while the IPSN belongs to regulatory side. How is effective separation ensured in this collaboration?

Answer by IRSN:

The Institute for Protection and Nuclear Safety (IPSN) and the services of the Office for Protection against Ionising Radiation (OPRI) in charge of expertise and measurement activities are now merged into the Institute for Radioprotection and Nuclear Safety (IRSN) which is a public establishment independent of the CEA. This ensures now a clear distinction between activities related to the promotion of nuclear energy and activities related to the control by the public authorities.

In the field of research, IRSN still relies on competencies of the CEA in the form of scientific collaborations (possibly including EDF) or in the form of services (achievement of tests, development of computer codes...).

In addition, some research activities of IRSN are cofinanced by EDF in order to jointly develop knowledge to better appreciate some safety issues. These co-operations are subject to deontology rules which were approved by IPSN Steering Committee. EDF and IRSN remain free of the use of the data thus gathered. The contribution of EDF to the safety research activities of IRSN is about 10 millions of euros on a total budget of 250 millions of euros for the institute.

IRSN remains free to carry out research that designers or operators would not consider useful.

Q.8.8	§ 8.2.1 p. 40 - It is reported that the IPSN (IRSN) will be classified as a public institution of an industrial and commercial character. 1) What does an industrial and commercial character mean? 2) If it means that the IPSN receive any jobs from other than the ASN or any jobs having no relation to safety regulation, how is the effective separation of safety regulation ensured?

Answer by IRSN:

The Institute for Protection and Nuclear Safety (IPSN) and the services of the Office for Protection against Ionising Radiation (OPRI) in charge of expertise and measurement activities are now merged into the Institute for Radioprotection and Nuclear Safety (IRSN) which is a public establishment in charge of research and expertise activities related to the risks associated to the use of nuclear energy and radioactivity.

This public establishment managed by a General Manager (named by decree) which reports to a Board chaired by a President also named by decree. Regarding deontology, to day, IRSN applies the deontological rules which were approved by the IPSN Steering committee.

The “industrial and commercial” character of IRSN means that contractual relations with national and international partners are bounded by the private law and not by the public law. The private law is more adapted to relations with partners for research and expertise activities.

With this status, IRSN is able to sell services, for example, in the fields of dosimetry (supply and reading of dosimeters), of biological analyses (medical, toxicological and radiotoxicologic analyses), but also in the fields of the safety of non-nuclear installations and of the safety of nuclear installations abroad (PHARE and TACIS programmes or by the EBRD).

Nevertheless, it has to be noted that to date 85 % of the resources of IRSN are public resources and the contribution of co-operations with EDF in the field of safety research and radiation protection is about 10 millions of euros on a total budget of 250 millions of euros for the institute.

Q.8.9	(§8.1.4) Experienced staff are needed to ensure that nuclear installations are regulated proactively rather than just by reacting to incidents. How does the Nuclear Safety Authority (ASN) ensure that its staff are not only suitably qualified but are also experienced in the activities being inspected?

Answer by ASN:

The ASN inspectors are highly qualified engineers with a special training on nuclear safety and radiation protection issues and regulations. In addition, technical experts from the IRSN, who have a broad experience (10 to 30 years) in nuclear safety, generally assist the inspectors. Approximately one third of the inspectors themselves have many years of experience in nuclear safety.

A formalised training system is in place at the ASN, with several identified grades of inspectors. An accreditation committee is in charge of certifying the inspectors at their respective grade. Also, as indicated in §7.3.2.1.2, some inspections, due to their technical content, can only be performed under the leadership of a senior inspector.

Q.8.10	Article 8. One of the most difficult challenges in assessing the safety performance at a nuclear power plant is to recognize the early signs of declining safety performance, before conditions become so serious that regulatory sanctions must be imposed or, worse, a serious incident or accident occurs. In this connection, it is widely known that a good approach is to have senior resident inspectors who can observe the day-to-day operations of the plant. 1) What is the role of resident inspectors in the regulatory framework? 2) What is the size (number) of resident inspectors per reactor or site? 3) What are the major activities of resident inspectors? 4) What are the requirements for the qualification of resident inspectors?

Answer by ASN:

The general framework for inspection is described in §7.3.2 of the report. As mentioned along Articles 7 and 8 of the report, the ASN comprises a central administration department (DSIN) and regional offices (the Nuclear Installation Departments (DINs) of the DRIREs). One of the main tasks of the DINs is performing the necessary inspections at the plants located within their territory, most of the time together with DSIN inspectors. The DINs offices (in total about 100 inspectors) are located in large cities in the vicinity of the plants. This allows a day-to-day interaction between the inspectors and the plants without resorting to resident inspectors, which the ASN does not favour as this concept may lead to personal relations with operator's staff that could be detrimental to an effective supervision of safety.

As mentioned in the answer to question Q.8.9, the ASN has put in place a stringent system of training on nuclear safety and radiation protection for all DIN and DSIN inspectors.

Se also answers to question Q.8.1.

Q.8.11	§ 8.1.4.2 p. 40 - It is reported that audits of various Safety Authority units are implemented. 1) More information would be appreciated to understand how these audits are implemented, such as method, audit items, number of auditors in a team and duration of audits. 2) Are there any criteria in evaluating the results of the audits? 3) Through the internal audit carried by internal inspectors instead of third party audit, how does ASN ensure the objectivity of the audits?

Answer by ASN:

The internal audits performed within the ASN are usually implemented by a team of three staff members external to the unit. Their main objective is to check the working methods of a given entity against the ASN Quality Assurance documents.

Q.8.12	(§8.2) How does ASN ensure that it keeps full control over all assigned responsibilities if 80% of its basic technical review work is performed outside the agency (the ASN)? This question is based on page 38 of the French national report where it is stated that in the year 2000 ASN budget amounted to 91 million Euros and that of this amount 73 million Euros (80.2%) was spent on "safety analyses, studies or expert appraisals entrusted to outside experts, mainly the IPSN".

Answer by ASN:

France is of the opinion that their is no link between keeping full control of all responsibilities assigned to the ASN and the fact that a large part of its budget is devoted to technical review work performed by external organisations. The role of the ASN is take regulatory decisions based on technical evaluations: whether these evaluations are performed within the ASN or by external organisations with which the ASN places contracts is of secondary importance.

Additionally the budgetary presentation of the report is misleading: the main point is that, in terms of number of staff, there are about 240 persons working in the ASN (among which about 50 seconded by the IPSN to the ASN), against the equivalent of 350 full-time persons working in

expertise tasks. So the ASN may keep its own technical competence, and may master, on the basis of the expertise contracted outside, the technical decisions to be taken.

Article 9: Responsibility of the licence holder

Q.9.1	Please explain the relationship between the "licence holder" and the "operator", with regard the responsibility for nuclear safety. Is the EDF Executive Committee the licence holder and the responsible organisations or this has been delegated to the NPP management? If yes to what extent (page 43, article 9).

Answer by EDF:

The answer to the question is given in § 10.2 which indicates that the authorisation to operate a plant is given by the Ministers for Environment and Industry through the ASN, to the EDF Group as a whole, but that the nuclear operator's responsibility has to be considered at three levels:
1) EDF Executive Committee
2) EDF Energy Branch
3) Director of the NPP

Q.9.2	Who is liable for nuclear damage (the utility, NPP)? Please describe the liability regime.

Answer by EDF:

In France, as a Contracting party to the Paris Convention on civil nuclear liability, the nuclear utility (EDF or CEA for reactors) is liable for the damages caused by malfunction of its facility up to a fixed financial amount. Beyond this limit the government is responsible up to the maximum amount agreed within the Convention on civil nuclear liability.

Article 10: Priority to Safety

Q.10.1	§10.2 p.45 - What is the influence of an individual NPP on the Guide Plan, if all Guide Plans are consistent with each other? Who decides on the performance levels to be reached? Is it possible that in one organisation different performance levels exist for different plants?

Answer by EDF:

The Nuclear Power Generation Division fixes the Guide Plan of each EDF NPP. The consistency within guide plans is obtained by defining each one from the generic aspects of the series and the average values of performance indicators of the corresponding plants. Each guide plan is established after having taken into consideration the specific situation of the plant (series type, local special features, etc.). Each Guide plan is the result of a contract between the Nuclear Power Generation Division and each NPP; therefore various situations can lead to some differences between NPP without contradicting the overall consistency.

Q.10.2	§10.2 p.46 - What is the competence of the plant manager? Is he responsible for nuclear safety in his plant?

Answer by EDF:

In France the responsibility for nuclear safety of NPP relies on the Chairman of EDF. The operational implementation of the nuclear safety policy leads to two level of responsibility:

- The Director of the Nuclear Generation Power Division,
- The plant managers of each NPP.

Q.10.3	§10.2 p.46 - What kind of independent inspection is performed in France? What is the task of the Nuclear Inspectorate of EDF?

Answer by EDF:

The Nuclear Safety Authority (see § 8, p 35-36) is organising and implementing inspections at NPPs and at corporate level on behalf of the French Government.

Furthermore, every year, France welcomes one OSART mission per year invited by the French Government and Peer-Reviews (one every year) invited by EDF and conducted by WANO (see § 19.5, p. 127).

The role of the Nuclear Safety General Inspectorate is to report directly at EDF president level, on how nuclear safety and radiation protection are managed by the Company. More precisely, its specific goal is to check whether due allowance is made to the previous key issues, through an independent insight into the system.

Inside EDF's Nuclear Power Plant Operation Division, the Nuclear Inspectorate performs inspection on NPPs and at corporate level to check the compliance with safety requirements; it reports directly to the head of the Power Generation Division.

Q.10.4	§10.3 p.47 - Please clarify the competence of different persons in the CEA related to the Nuclear Safety of the Phénix NPP?

Answer by CEA:

Within CEA, DSNQ is a functional unit, which advises the Top Manager on safety policy matters. Operational units and installations apply the defined policy.

For Phénix, the Safety Quality Unit analyses and prepares the safety reports, which are transmitted, to the Safety Authorities by the director of the VALRHO site after approval by the Phénix department head.

The Nuclear Safety Unit works for the site director and is in charge of monitoring safety in all nuclear installations at the site.

Q.10.5	(subsection 10.2, page 47, paragraph 4) mentions the use by the Utility (EDF) of a safety indicator called "quality tools". Could you please illustrate this indicator with specific examples?

Answer by EDF:

The main "quality tools" developed by the Nuclear Power Generation Division for the use of each NPP are document guide for risk analysis, self-assessment and self-diagnosis. These guides provide the operator with a list of generic questions to be answered and issues to be analysed in front of an event or anomaly.

Article 11: Human and financial resources

Q.11.1	National Report Reference Art. 11.1: Although article 11 covers the availability of sufficient financial and human resources for the needs of nuclear safety, the analysis of ASN is limited to the financial capacities of the utility. How the ASN intends to inspect the aspect of sufficient human resources for a safe operation?

Answer by ASN:

As indicated in the report the "Quality Order" of August 1984 has provision for the supervision of human resources. Currently there is no significant trouble with the operators on that field. However the ASN is currently working at having a better system for supervising human resources.

Q.11.2	(§2.6 + §11.2) With the commitment by the power generator to reduce the electricity production costs by at least 20% before 2002, does the Nuclear Safety Authority (ASN) have any formal method of regulating the power generator to ensure that adequate manpower resources are retained with the commensurate level of expertise and competence?

Answer by ASN:

The ASN is conscious that reducing the production costs could be performed at the expense of safety. This is the reason for paying particular attention to the management and organisation of each NPP and of EDF's Headquarters Offices (see answer to question Q.11.1).

Q.11.3	§ 11.2.1 p. 49 - EDF's development, which was helped by the liberalisation of European energy markets, is the result of a policy of rapid expansion through external growth. How does the nuclear regulator monitor the processes of the liberalisation of European energy markets and their impact on the operation of the NPPs to assure that nuclear safety is not deteriorating in this competitive environment?

Answer by ASN:

The ASN plays no regulatory role in the liberalisation process of energy markets.

See also answers to questions Q.11.1 and Q.11.2.

Q.11.4	§ 11 p. 49-51 - When developing and incorporating into France's regulation the European criteria for deregulation of the electricity industry. How will this incorporation affect the financial resources to carry on safety related activities in the nuclear installations?

Answer:

EDF has stated that budgetary arbitration, which might arise from the consequences of opening the electricity markets to competition, will be decided neither to the detriment of industrial assets (the fleet of nuclear power plants), nor to the detriment of nuclear safety. The EDF Chairman very officially announced this position before the EDF Council for nuclear Safety.

The nuclear operator has to allocate sufficient resources to guarantee the safety level of NPPs which is the basic condition to maintain wide open the nuclear option. Safety aspects are considered in every investment option in order to take the relevant decisions. As far as normal operation is concerned, a “safety versus availability observatory” guarantees that the right choices are made.

See also answers to questions Q.11.1, Q.11.2 and Q.11.3 about the ASN position.

Q.11.5	§ 11.4 p. 51 - It is reported that it is by checking that the operator satisfies all its requests that the Safety Authority makes sure the operator has capacity to operate its installation successfully. 1) How does the Safety Authority make sure the operator has appropriate human resources? 2) What kind of activities does the ASN take to ensure appropriate human resources of the operator?

Answer:

See answer to question Q.11.1.

Q.11.6	§11 - Has financing scheme for the radioactive waste including spent fuel disposal and the decommissioning of nuclear power plants been agreed upon and regulated?

Answer by EDF:

For the French operators, spent fuel management and nuclear power plant decommissioning are the subject of two different approaches:

- For spent fuel the reprocessing option has been chosen. Expenses related to reprocessing are financed from a special credit set up by the operator. Supervision and physical protection are governed by regulatory texts,
- As regards decommissioning, the operator sets up tailored financial credits based upon a decommissioning reference cost. In this framework, the operator is the subject of a double supervision by the French government, which concerns, on the one hand at the technical level, the cost estimate and, on the other hand at the financial level, the setting up of the financial balance of the company. The period of time for installation decommissioning is the full responsibility of the operator, which manages it according to the various constraints it has to deal with (safety, environment, investment laid out and industrial organisation).

Article 12: Human factors

Q.12.1	§ 2.7 p. 11 - It is reported that deterioration in human and social relations and lack of operational stringency gave rise to a succession of incidents at the Dampierre plant and EDF implemented a set of corrective measures and the Nuclear Safety Authority decided on a period of reinforced surveillance for the plant. 1) What is the cause of the succession of incidents? 2) What kind of corrective measures are taken by EDF and the Nuclear Safety Authority?

Answer by EDF:

The EDF internal Nuclear Inspection team identified at the Dampierre site in Spring 2000 a set of weaknesses affecting operation. These findings established the cause of some events declared by the plant, none of which directly affecting safety, but whose number was higher than the average value. Among the causes identified, the following are to be highlighted:

- Recent re-organisations had temporarily weakened the decision processes and were not fully understood by the staff,
- A difficult social climate was prevailing.

Corrective actions were decided on the following items:

- Clarify the responsibilities,
- Reinforce on-site controls (increased presence of managers in the field, immediate corrective actions for all deviations, even for the less significant ones, etc.),
- Frequent reminders of the requirements in order to promote a change in staff behaviour,

- Recruitment of additional staff, together with the corresponding training,
- Recognition of good practices.

These actions are bearing fruit and the site results are improving, notably since 2001, which led the ASN to discontinue the reinforced surveillance regime put in place.

Answer by ASN:

After having noticed important dysfunction at the Dampierre NPP, the Nuclear Safety Authority decided to put the plant under reinforced surveillance in September 2000, up to the solution by the operator of this dysfunction. Considering the progress made by the plant and the improvement of the rigor in operation, the Nuclear Safety Authority discontinued the process on 10 January 2002. However the ASN considers that the plant must still continue to improve quality and relationship management, continue to recruit and train staff for operation, enhance the rigor in the technical specifications application and improve risk analysis when preparing maintenance operations.

Q.12.2	§12.1 p.53 - How does the regulatory body supervise the appropriateness of operator training as well as manager knowledge and experience?

Answer by ASN:

Article 7 of the "Quality" Order of August 8, 1984 (App. 2 in the Report) states that "The human and technical resources together with the organisational provisions implemented for the performance of a quality related activity must be adapted to this activity and enable compliance with the defined requirements." Training is the responsibility of the operator. ASN inspectors make random checks of the content of the staff training booklets during inspections.

Q.12.3	§ 12.1 p. 53 - “Changes in organization must not be prejudicial to installation safety. Therefore, the operator must maintain teams that are large enough to ensure in the long-term all functions such as operation maintenance, engineering or internal assessment, including in case of technical contingencies, incidents or accidents. …” Could you please explain the regulatory regime which provides that the provisions mentioned in the statement are obeyed? Are the changes in the organizational structure subject of regulatory control and approval?

Answer by ASN:

The regulatory regime is explained in the answer to question Q.12.2.

The changes in organisational structure shall comply with the requirements of the authorisation Decree and of Decree 63-1228 (App. 2 of the report). The changes have not to be approved by the regulator, however important changes in operator staffing are reviewed by the regulator.

Q.12.4	§12.2 p.54 - Has an assessment of the plant operating instructions been made regarding Human Factor aspects?

Answer by EDF:

An assessment of the N4 plant operating instructions has been performed regarding Human Factors aspects. A dedicated team has been established in charge of studying ergonomic and technical aspects.

Two phases have mainly been considered:

- weaknesses The prototype phase (relying upon S3C simulator) for which the Human Factors aspects were checked and analysed under normal, incidental and emergency operating situations,

- The N4 series commissioning and starting phases: during these phases, all operator actions (including the use of operating instructions) have been analysed.

Answer by ASN:

ASN approves some operating procedures such as those in incidental or accidental conditions (state oriented approach) after analysis by its Technical support organisation IRSN which has a human factor expert team.

Q.12.5	§12.2 p.54 - What are the improvements in the man-machine interface as revealed by experience feedback from the N4 reactor series? (see subsection 12.2.1)

Answer by EDF:

The computerised operator workstations and operation system give the operators the possibility of an easy and safe operation without any equivalent nowadays, by the user friendly access to a reliable information, thanks to appropriate dialogues. All the consulted operators appreciate the computerised operation concept and they consider the system very friendly and easy to master.
The global quality of operation is first enhanced by the systematic validation of all needed information, and secondly by the on-line help provided to the operators by the computerised formats and procedures.

The operators particularly emphasise the following items:

- the global overview of the plant given by the mural mimic, which allows a coordination of the whole team and a common knowledge of the plant state,
- the "task oriented" design of all formats (monitoring/control), which allows a good understanding of the circuit configuration and parameter values before or during controls,
- the non-specialisation and the easy access to the whole display set for the different team members, thus giving the same knowledge of the plant state and the possibility for external people (such as maintenance technicians) to have access to detailed information without disturbing the operators,
- the quick and direct access from a display to the ancillary information, as access to the technical data sheet for each displayed component or links with other adequate functional displays. The operators appreciate the possibility to obtain real time up-dated information and this is an important improvement compared to conventional control rooms,
- the information validation and consistency for which the shape or colour display can change according to the different status,
- the direct access to the alarm sheets which clearly explain the causes and consequences of the default, the procedure to follow and provide the operators with the needed information and controls. This particularly enhances the rapidity of understanding and action,
- the monitoring provided by the computer system. It gives the possibility of using the computer either for a special monitoring (monitoring of an analog value for example) or for monitoring of the operator actions (through the operating procedures for example),
- the computerised procedures improve the global quality of operation in a lot of areas. These vary from easier operator procedure management to the absolute respect of the prescribed actions:
  - With the internal navigation system, an operator is able to easily obtain the correct page or procedure. In an emergency situation, the system presents automatically, after request, not only the right page but shows where something happened. For example, in plant start-up phase, with paper-based procedures, an operator had to manage lots of books,
  - As all actions to be performed on the process are described, possibility is given to launch the correct actions and check their realisation automatically, the real time operation is very close to the prescribed one and no definitive operator deviation has been observed; when a deviation occurs, it is shown on line and the operator is able to determine its origin and to correct his decision if needed.

Q.12.6	§ 12.2.1 p. 54 - "training is being decentralized in the form of local systems to develop skills and a Professional training Department is being set up in each region; ..." § 12.4.2 p. 57 - "In December 2000, EDF presented the DSIN with an initial summary of the changes initiated in 1999 to ensure better control and monitoring of the policy of decentralization to the nuclear sites and the new actions envisaged. ..." It seems that it has been concluded that the human factor deserves plant specific approach. Could you please explain how it will influence on the maintaining the concept of standardized plants in France? It could be expected that variations in human factor treatment in different plants would invalidate the integrated safety analysis and assessments.

Answer by EDF:

The training and initial qualification programmes have highly benefited from the number of NPP series, both with a centralised approach of training needs and with the optimisation of national response operation within the centralised training centres.

The NPP human factors policy is stated in a national and local action plan, which ensures a consistent implementation even if local approaches can however be given to respond specifically to local issues.

This action plan was endorsed by the Nuclear Power Generating Division (DPN) management team in October 2001 and is progressively implemented since that endorsement.

This plan of actions is in line with the Management through Quality by various items of the global national approach:

- a continuous scrutiny by the management team,
- staff involvement with, for instance, a network of human factors local consultants and national specialists putting into discussion various issues raised from the field.

  This network organises every year several meeting days for all its members in order to discuss the national directions of the NPP population, that combines to bring about a homogeneity in the global human factors approach at EDF.

  Methods and tools are supported at the national level for an implementation at the local level (for instance, the safety management levers).

In addition to the existing provisions, which will continue to be optimised and updated, the DPN aims at organising competencies' management closer to the field. That is the purpose of the implementation of local organisations for competencies' development, in order:

- to respond to specific needs of each team, for instance by training scenarios on simulator corresponding to the team experience,
- to give a sense of responsibility at every management level on competency development,
- to go past the strict framework of training and to develop suitable responses (on-the-field training, shadow training, etc.),
- to improve cooperation between trainers and managers.

In order to facilitate this approach, the DPN and the Central Training Unit have decided to implement a simulator (with its training team) on every NPP together with the overhauling of existing simulators.

For training non-directly related to the process, trainers will also be regionally established.

In addition, as regards events analysis, EDF has developed and implemented since the end of year 1998 at every site, an event analysis guide, which presents the detailed event analysis method including the human factors analysis together with the training associated with this method.

Q.12.7	§ 12.3 p. 56 - A working group was set up by CEA to determine the future content of the specific human factors chapters of Safety Analysis Reports. What are the main results from this group?

Answer by CEA:

The CEA working group did not yet concluded on how to include "Human Factors" in the safety analysis reports. However, it recommended two actions, which have already been taken:

- the publication, by the Nuclear Safety Unit of DSNQ, of a guide explaining how to take into account Human Factors in periodic safety analysis reviews of the CEA installations,
- training courses on "Human Factors" for all CEA managers of nuclear installations.

Q.12.8	§ 12.3 p. 56 - " setting up a working group to determine the future content of the specific human factors chapter of Safety Analysis Report," Is the new SAR chapter going to be introduced also for the existing plants? What will be the main scope of this Chapter 18 (as following the 17 chapter of US-SAR?) What would be the regulatory requirements for this new Chapter?

Answer by CEA:

The word "chapter" was not adequate in the report. Within CEA, reflection is pursued on the best way for including Human Factors elements in the Safety Analysis Reports (chapters related to organisation and operation, and to training and qualification). These reflections and actions are specific to the CEA.

The first step focuses on the "Human Factors" contents of the documents transmitted to the Safety Authority in the frame of the periodic safety reviews of the CEA installations.

Answer by EDF:

This issue concerns future nuclear power plants, but might also concern existing plants. Indeed, in France the reassessment of the safety reference system for each series is performed every ten years together with the corresponding backfitting.

Within these reassessment frameworks, the contents of the safety analysis reports are updated and the table of contents may be modified. Should a specific chapter on Human Factors be added, this would be done on the occasion of such ten-yearly reassessments.

Q.12.9	§ 12.4.1 p. 56 - It is reported that the ASN adopt a new approach and two action lines were defined. More information would be appreciated about the new approach and two action lines.

Answer by ASN:

These two lines are described in §12.4.1 of the report:

1. introducing human factor in the safety baseline that led the operator to integrate human and organisational factors into safety considerations,
2. changing the supervision methods i.e. use of operating staff interviews rather than only reviewing documents.

Q.12.10	§ 12.4.1 p. 56 - " New concrete measures were also defined and are being gradually implemented for example the more regular use of operating staff interviews, in particular during meetings or inspections further to incidents". In which cases and how deeply go the regulatory investigations of the events? What methods are used? Is the PSA used during the event investigation as regard of event safety significance and corrective measures assessment?

Answer by IRSN:

EDF set up, at the local level, a tool (called " observatory of safety / availability) to study real situations with conflict between safety and operation. This tool is included in a box of tools called " levers of management " which includes organisational practices of the operator. Other tools are: self-diagnosis, self-evaluation, risk analysis, operational communication.

IRSN, as technical support of DGSNR, mainly assesses incidents on the basis of specific reports of the operator related to these incidents. When incidents have a "human factors" component, IRSN work consists in assessing whether the tools previously described are well implemented and if they are well adapted. In complement, IRSN develops specific tools able to give elements to the correct operation of an organization.

A probabilistic assessment of operating events (precursor analysis) has been systematically carrying out in France since 1994 by the utility for serious incidents and independently by IRSN for selected events. When the conditional core melt frequency (CCMF) is higher than 10^{-6} the event is considered as a precursor. If the CCMF is higher than 10^{-4}, a prompt definition of corrective measures and an assessment of their efficiency are required.

Q.12.11	Article 12.4.1 Regulatory analysis of EDF human factors policy, Page of Report 57. The description at paragraph 4 of page 57 introduces that the Safety Authority continued its assessment on EDF's two tools to improve attitudes and working methods. In order to determine the adequacy of EDF's method used for the analysis of the organizational and human factors in the origin of incidents, what are the major activities or processes and technical criteria of the regulatory body?

Answer:

A first aspect of the question is related to the guideline elaborated by EDF as a support for plant's staff who are involved in the analysis of events or incidents occurring at the plant. A new version is expected to take more into account the human and organisational factors, especially the last ones. Some conclusions were drawn-up by IRSN from the examination of this guideline. In 2001, a more general evaluation was done by IRSN on the feedback experience process, especially how EDF (and plants) integrate human and organisational factors in the general feedback experience process, and how the results of this process is used by headquarter human factors department of EDF. For this evaluation, the IRSN examined EDF documents, and made interviews and visits at several plants. The experience feedback is an important topic that is constantly examined by IRSN (all incidents reports are considered from the human and organisational point of view), and there is a constant requirement to EDF to increase the quality of incidents reports in that field. An improvement of these reports has been noted for several years, but progress is still expected.

A second aspect of the question relates to one of the six EDF tools for improving the management of safety (see §12.2.2 of the report) on the NPPs. Each year, the ASN, together with the IRSN, inspects several NPPS on the management of safety. During these inspections, these tools are generally considered. But no general investigation has been performed on this specific tool. The use of these six tools depend on the NPPs, some NPPs focus more on self-evaluation, etc. As these tools have been introduced quite recently in NPPs, we have not yet evaluated them and asked EDF to make a review of how these tools are used and applied on site and what conclusions could be drawn up from this experience on the general human factors policy of EDF for improving management of safety. Such an evaluation might be required in the future by the ASN.

Q.12.12	§ 12.4.2 p. 57 - It is reported that the Safety Authority detected organisational and managerial weaknesses and asked EDF to implement corrective actions. More information would be appreciated about weaknesses detected by the Safety Authority and corrective actions implemented by EDF.

Answer:

The Safety Authority's observation and assessment since 1997 of the safety repercussions of EDF's decentralization policy and the relations between the nuclear sites and the centralized resources have highlighted four weak points, which gave rise in December 1998 to requests for corrective action by EDF. These weak points concerned:

- management of implementation of EDF Head Office requirements, stemming from EDF commitments in response to ASN requests and applicable by the sites,
- guidance provided to the sites by the EDF Head Office departments on dealing with safety matters,
- analysis and reactive assimilation of operating feedback,
- efficiency of the EDF nuclear plant population internal supervision system.

Without calling into question its decentralizing policy, which it considers as an advance towards better plant safety control since it reinforces the responsibility of site staff, EDF presented to the Safety Authority in October 1999 several steps aimed at better integrating this policy. These include notably:

- clarification of the safety reference system requirements applicable by the sites,
- clarification of responsibility sharing between Head Office and site staff in dealing with safety questions,
- reinforcement of Head Office guidance on national issues with strong safety implications, notably by setting up specific project management systems for analysis and decision stages,
- extending site assistance and supervision for the implementation of national provisions.

Q.12.13	§ 12.4.1 p. 57 - The Safety Authority seems not to be completely satisfied with the implementation of the human factors policy by EDF (inadequate involvement by plant senior managers, under-staffed structures, etc.). Which actions are planned by the Safety Authority in order to request EDF the improvement of the situation?

Answer by ASN:

As it is indicated later in the same paragraph of the Report, ASN has reacted to the deterioration it detected during inspection and EDF has initiated a vast improvement programme extending over four years.

Article 13: Quality assurance

Q.13.1	§13 p.59-63 - Has the Regulatory Body established a Quality Management system? On which approach or model is this system based? Are audits or external reviews regularly performed?

Answer by ASN:

The ASN has been developing its Quality Management system over the past 5 years. The approach is to produce documents detailing the regulatory actions to be performed in the various fields and, on this occasion, to question the past attitude in this respect, with the objective to obtain a more rational approach to regulatory supervision. The internal audits performed at the ASN are presented in the answer to question Q.8.11. No external reviews are performed at present.

Q.13.2	§13.1 & 13.4 p.59ss - Are the licensees' QA systems subjected to periodic reviews by the regulatory authority or by authorised external reviewers?

Answer:

The "Quality" order of August 8, 1984 (App. 2 of the Report) requires an internal independent review function. The effectiveness of the internal checks performed by the nuclear operator is evaluated by the ASN through inspections at the different sites and engineering services. In this respect, it is worth mentioning that the EDF internal check system is performed at three independent and complementary levels:

- - at the NPP level by local Safety and Quality organisations ,
- - at the Nuclear power generation Division level, by the Nuclear Inspectorate (IN),
- - at the national level, by EDF's general inspectorate for nuclear safety (IGSN).

Q.13.3	§ 13 p. 59-62 - What are the main regulatory requirements to the application of a Quality Assurance Programme on the decommissioning phase?

Answer by ASN:

The "Quality" Order of August 8, 1984 (App. 2 of the Report) has provisions concerning radioactive waste management (trackability) for Basic Nuclear Installations, including the decommissioning phase.

For effluent releases, orders taken along Decree 95-640 (see §7.3.1.4 and §15.1.3 of the report) are still in force during the decommissioning phase.

Q.13.4	(§13.4.1) The report states that most nuclear reactor maintenance work is subcontracted by EDF to outside firms. Please describe the process used by the Safety Authority to monitor the quality of sub-contractors?

Answer by ASN:

Most nuclear reactor maintenance work is subcontracted by EDF to outside firms. This work is mainly seasonal, as it is highly dependent on the schedule of plant outages, which are more numerous between March and November. In total, some 20,000 people are involved every year.

Although creating an industrial policy of this nature is a strategic choice that lies with the operator, the Safety Authority, in application of "Quality" ministerial order of August 10, 1984 is responsible for checking that EDF is at all times assuming its responsibilities for the safety of its installations through the creation of a quality monitoring of its external service companies.

In 2001, and in addition to the usual inspections, the Safety Authority has therefore set up specific site inspections performed by the DIN inspectors. These checks concern the quality of preparation and performance of the various operations and the inclusion of site-related risks concerning fire, contamination or irradiation. It is interesting to note that some DIN inspectors are also labour inspectors so these site visits give them an opportunity to check other aspects such as compliance with the working hours legislation.

As poor working conditions can also have safety consequences, the Safety Authority also collected in 2000 information from EDF concerning the surveillance of its outside service companies and their working conditions. This highlighted EDF’s problems with achieving the targets set out in its “progress charter” signed with the service companies, in particular to improve the visibility of their workload plans. Although one third of the orders with the service companies is placed more than two months in advance, another third is placed less than two months prior to the outage, with the balance being ordered after the outage starts. Things are therefore often left too late, which can lead to significant pressure on the personnel during a unit outage.

With regard to radiation protection, the actions of the Safety Authority are directed as much at the service companies as at the EDF staff. The results show a reduction both in collective and individual doses.

The findings of the site inspections and analysis of the initial data collected from EDF show that a close watch is still needed on the relations between EDF and its service companies.

Together with the Ministries for Health and Labour, the ASN also participated in the funding of an epidemiological survey of the population of workers performing work subcontracted by the nuclear power plants.

Q.13.5	(p.62, paragraph 3 of subsection 13.4.1) notes some problems in the relationships between EDF and outside service companies involved in maintenance activities as identified by ASN. What are these problems and what actions are being taken to resolve them?

Answer by EDF:

During 1999, EDF met the problem of finding enough workers in some specialized tasks for maintenance, mainly in the welding area. This led EDF to organise this part of maintenance by taking in account the number of welders who could work simultaneously in EDF power plants.

But, before the fall of 2000, EDF realised that the same problem was to concern other specialities, such as non destructive controls, and some professions where the number of workers was not yet considered to be a problem (scaffolding, cleaning, heat-insulating, electricity, ...).

EDF concluded that a basic reason was the economic recovery in France, and the fact that maintenance in nuclear power plants has turned less attractive in comparison with construction and maintenance in other industries, both for workers and for companies.

To tackle these difficulties, four types of actions were undertaken:

- A better global scheduling of all the outages in France, taking in account the maximum number of workers available in each area and each profession. A specialised team has been set up in the Operational Technical Unit (UTO) for this purpose.
- A better and earlier information of the outside service companies, to let them forecast the availability of the workers, and adjust their organisation; currently, the technical and commercial documents must be sent by EDF to the outside companies at least 4 months before each outage.
- A greater responsibility given to the outside companies in their tasks (more contracts written in terms of objectives, instead of means).
- A large study of working conditions at EDF NPPs, to improve them and make them more attractive to workers.

See also answer to question Q.13.4.

Q.13.6	§ 13.1 - How do you monitor the results of QA application with respect the risk assessment of NPP?

Answer by EDF:

The deviations detected by the EDF internal check system for nuclear safety are registered and the corresponding mitigation actions are the subject of a follow-up.

The other entities possibly concerned by these deviations and actions are informed either directly or through the operating experience feedback system.

Answer by ASN:

As regards QA the regulation which applies is the "Quality" order of August 1984 (§13.1 - p. 59). There is no specific supervision; the issues, which could be discovered by a counter analysis made by the IPSN, are dealt with on a case by case basis.

Q.13.7	Article 13.4, Analysis by the Regulator, Page of Report 62. Please give the explanations in detail on regulators' tools to evaluate the quality status of the EDF and CEA whether it conforms to quality order requirements.

Answer by ASN:

The Regulator's tools for evaluating the quality status of the nuclear operators are the analysis of operating feedback experience and inspections. These tools are mainly used if it appears that a lack of quality is implied in an event related to safety.

Article 14: Assessment and verification of safety

Q.14.1	§ 14.1.4.2 p. 64 - It is reported that the purpose of the conformity assessment carried out on PWR is to check plant conformity on a limited number of topics. 1) What are the limited topics? 2) What criteria were used to select the limited topics?

Answer:

The operator proposes the topics for the conformity assessment programme, then they are reviewed by the experts of the Advisory Committee for nuclear reactors (presented in Art 8 of France's report).

In accordance with the basis conformity assessment programme, checks have to be made on the units to ensure that the installations comply with the rules in force regarding:

- classification of items of equipment as being important for safety,
- qualification of items of equipment for accident conditions,
- electrical protection devices,
- component supports and anchors in concrete - protection against high energy pipe rupture,
- fire protection,
- earthquake considered as an event,
- civil works and protection against internal flooding,
- protection against extreme cold weather,
- risk of external flooding on specific areas.

In addition to the basic programme, there is an additional investigation programme which concerns the primary circuit and the main steam system and feedwater flow control system of the secondary circuit. It especially concerns the equipment not covered by the Basic Preventive Maintenance Programme such as:

- the tanks of the auxiliary feedwater system and the reactor cavity and spent fuel pit cooling and treatment system, and
- the pipes of the auxiliary feedwater system, the safety injection system, the residual heat removal system and the component cooling system.

This additional programme allows to be sure that the checks made during the first 10-yearly outage give a guarantee for about 30 years. It concerns checks performed on welded joints and on pipes for verifying, with ultrasound, gamma radiography or camera, they remain in suitable condition. Defaults, which are searched for are: weld metal cracking, erosion-corrosion, local corrosion, vibration fatigue and corrosion under the thermal insulation.

Q.14.2	§ 14.1.4.1 p. 64 - A conformity assessment is done where several topics are included. Why is it focused on the six topics included (flooding, seismic protection, software, probabilistic safety assessments, and criticality risk and fire protection)? Are those topics obtained from the operating experience, or coming from other activities?

Answer:

See answer to question Q.14.1.

Q.14.3	(§14.1.3) A ten yearly reactor outages is identified for pressure vessel inspection and re-qualification. However, the reassessment of a reactor, to take account of ageing and modern standards, is stated to be at regular intervals for each standardised series and is carried out by the licensee. Is it proposed that the reassessment will follow the ten yearly outage?

Answer by EDF:

The French regulation for in-service surveillance of the primary and secondary circuit pressure components (Order dated November 10, 1999) requires their complete re-qualification at most every 10 years. For each component, it implies performing, under the responsibility of the operator, a complete check, a hydrotest and a check of all safety devices.

The operator must check, at least before each complete re-qualification, the appropriateness of the reference documents (performance analysis, surveillance conditions, checks, etc.) and provide its opinion on the ability of the components to appropriately fulfil their functions at least over the next 10 years, taking into account the corresponding evolution of the material properties.

In a broader perspective, the 10-yearly re-assessment of the applicable safety reference level (performed at the same time as the complete re-qualifications) is performed in constant interaction between the operator and the Safety Authority, for all reactors in a given series. It notably includes a thorough analysis of the experience feedback, of the safety status of the plants and may lead to modifications to the operating procedures or to the installations.

Answer by ASN:

As in France nuclear reactors are built according to a few successive series, the safety reassessments are performed for a first-of-a-kind reactor inside a series and then concern a certain number of reactors. An element of this safety assessment is the feedback of review of individual plants of each series. In practice the safety reassessment of a series extends over several years up to the next 10-yearly outage of older plants. Then the modifications requested by the safety reassessment are performed either during the next 10-yearly outage, either during next outages in case they were requested after its completion (See also answer to question Q.14.7).

Q.14.4	(§14.1.3) To what extent does the Nuclear Safety Authority (ASN) review this work and make decisions for continued operation of individual plants, particularly in the area of changing standards and obsolescence of equipment?

Answer:

This issue is essentially related to the ageing issue: see the answer to question Q.6.3.

Q.14.5	(p.64, paragraph 1 of subsection 14.1.4.1) mentions the "regular intervals" as regards the periodicity of NPP safety reviews. What is this periodicity and who specifically establishes the dates/intervals of operating NPP safety reviews?

Answer:

See answer to question Q.14.3.

Q.14.6	§ 14.1.4.1 p. 64 - EDF conducts a safety review of each standardised NPP series, in addition to permanent analysis of operating feedback. The purpose is to reconsider the safety analysis of a series of reactors by comparison with a more recent series and using new analysis, methods and tools. The analysis yields to modifications to be implemented known as the “VD2”. In order to clarify the report, a brief summary of main modifications included in the “VD2” would be of interest. Is there any relationship between this set of modifications and the result of the reassessment mentioned above?

Answer by EDF:

There is a relationship between the status of the safety analysis report and the content of the modification batch corresponding to the second ten-yearly outage (VD2), however the relationship is not direct. Actually the list of modifications within the batch VD2 is the subject of an EDF document sent to the Safety Authority. The list itself is not included in the safety analysis report, only the first chapter of the safety report refers to it.

The safety analysis report (VD2 release) gives safety requirements corresponding to a safety reference system and yields to the proof that these requirements are complied with by the fact that plants take into account the modifications included in the modification batch VD2.

As an illustration the main modifications related to the safety review within the 900 CPY series second ten-yearly outage are give hereafter:

- continuous monitoring of the dirt content of the exchanger water servicing/intermediate exchangers,
- containment pressure measurement up to severe accident condition (supplementary pressure transducer),
- isolation procedure on chemical and volume control system discharge in case of a loss of the intermediate exchanger,
- K3 qualification of valves (include VELAN and ARGUS),
- upgrade and K3 qualification of TOR and ANA transducers,
- checking of structural integrity of equipment non seismically classified,
- protection for vented and non vented buildings against very cold weather,
- mitigation of consequences of water overflow within the auxiliary building and intermediate exchanger building,
- upgrade and K3 qualification of main steam lines outlet bunker,
- further seismic qualification of some steam generator piping of the auxiliary feedwater system,
- remote control of valves on low flow piping system for LPIS pumps in re-circulation conditions,
- mitigation of ATWS: diversification of emergency shutdown breaker,
- leaktightness of null flow return piping in recirculation safety injection - spray system towards spent fuel pit cooling and treatment system,
- modification of line support for LHP and LHQ (diesel generator systems) for pipes over 2 inches diameter,
- improvement of venting of safety injection and containment spray system,
- monitoring of demineralized water storage tank level,
- elimination of common mode LH, functional redundancy for auxiliary feedwater,

- mitigation of diaphragm strain on safety injection system 001 DI to 003 DI and 008 DI to 010 DI,
- Redesign of the chemical and control volume system discharge surge line.

Q.14.7	§ 14.1.4.1 p. 64 - In order to take into account plant ageing effects and new trends in the perception of safety problems, the DSIN asked that, in addition to permanent analysis of operating feedback, EDF conduct a safety review of each standardised series, at regular intervals. Safety reassessment is performed for the first in each series of reactors and seems to be similar in scope as Periodic safety review, only that PSR is done for a particular NPP. Do you perform or plan to perform also PSR? Or is your opinion that application of safety assessment performed on one reactor in the series to each of the NPPs in series is enough?

Answer by ASN:

Periodic Safety Reviews are performed for each series in a generic way, however they use the results and observations obtained from checks performed at every individual reactor.

The French approach to Periodic Safety Reviews can be summarised into four steps:

- The first step in a Periodic Safety review is to determine the applicable safety reference base;
- The second step is the "conformity check", specific to France: the operator verifies that each reactor complies with its applicable safety reference base, and, if necessary, corrects the deviation;
- The third step is to perform the safety reassessment with updated requirements based on experience feedback, new R&D results, PSA results, comparison with more recent plants, etc;
- The fourth step is to implement the modifications resulting from the step three.

This give to these PSR a high value because they take advantage of a larger database than those performed on a single reactor. (See also answer to question Q.14.3)

Q.14.8	(§14.1.5) To what extent are probabilistic safety assessment tools being used to identify areas of plant design where safety gains can be made based on increased levels of redundancy, diversity, or safety categorisation?

Answer by EDF:

Probabilistic safety assessment (PSA) as used by EDF as help for designing both existing reactors and future reactors.

For reactors into operation, PSA allows to assess the global safety level of NPPs and to highlight issues for which changes in design as well as in operation can be assessed or even considered necessary as a matter of safety. In particular PSA is used at the occasion of a Periodic Safety Review, on the one hand to update the assessment of the series safety level with the standard unit implementation status, on the other hand to highlight and prioritise the main components of risk, so as to define, if needed, improvements in relation to their appropriateness. In the case where modifications would be envisaged, PSA allows to assess the advantages and drawbacks of the various envisaged solutions. The demonstration that the finally adopted modifications are adequate has to be brought by an analysis of their impact on the contributors to risk and on the global core damage frequency.

For future plants, the development of PSA will occur along with the clarification of the deterministic design so as to make improvements, if needed, during the plant design or construction stage. Qualitative and quantitative assessment of the main contributors to risk will allow identifying axes for safety improvement of the future reactor, notably:

- the definition of provisions in addition to the deterministic design, which are needed to decrease the frequency of certain accidental sequences and to mitigate their consequences on containment failure,

- the implementation of possible specific requirements which will allow to reach a higher equipment or system reliability level,
- the design of operating guidelines and the operating staff training programmes taking into account the operating actions that are the most sensitive to human errors.

Answer by ASN:

The ASN considers probabilistic safety assessments (PSAs) as a useful tool to supplement the deterministic analyses, which have to be performed in any case. They have been used quite extensively, mainly to improve safety and to aid in ranking safety problems by order of importance. Examples of PSA utilisation in France are:

- highlighting the importance to risk of accident scenarios liable to occur during reactor shutdown states,
- for reassessment of the list of multiple failure events (complementary operating conditions) and verification of the related procedures,
- during the safety reassessments, for identification of sequences that have a high contribution to core melt frequency, in order to define the necessary modifications,
- as a complement to the deterministic design studies for EPR,
- for verification of the plant unavailability time limits authorized in technical specifications,
- to optimize maintenance,
- to select the incidents to be analysed in depth,
- to assess the risk when a non-conformance is discovered.

PSA provides information on the level of risk. It is one of the tools that can be used to take risk-informed decisions, but not the only one. In France, there are many reasons why the PSAs of pressurized water reactors can be deemed to be satisfactory. However, the experience gathered in this field suggests that regulators as well as utilities should be aware of the limitations of PSAs.

Q.14.9	How are individual plant and site specific issues considered in Probabilistic Safety Assessments?

Answer:

As mentioned in answer to question Q.14.7, EDF performs a reference PSA for each operating reactor series, the principle of which being described in answers to the questions above. This PSA has to be consistent with the status of reactor operation and modification implementation and has to be updated in a timely manner, at least at the end of each periodic safety review. At present, three PSA models are available for the 900 MWe, 1300 MWe and N4 series, a specific model for the CP0 series is currently in development, to take into account the particular features of these reactors as compared to the other 900 MWe reactors.

The relatively high number of reactors within each series provides a unique opportunity to have a very comprehensive database (reliability data and initiating event frequency) and then to obtain high quality results. This generic approach is satisfactory for risk assessment to the extent that only internal initiating events are considered. The development of models specific to a unit would be justified only for studying external aggression (earthquake, flooding,…) and would suppose the existence of reliable data on a significant period of time.

France does not intend to perform either plant specific or site specific PSAs. However probabilistic assessments can be performed, on a case by case basis, as support to a safety analysis report or to an incident analysis.

See also answer to question Q.14.7

Q.14.10	§ 14.1.5.4 p. 65 - One of the objectives of the Basic Safety Rule is to define areas in which PSA can contribute to decision-making. Is it expected to use PSA for risk informed and performance based applications?

Answer by ASN:

In France, PSA is considered as a tool among others to assess safety issues. It is not envisaged to only regulate nuclear installations based on PSA.

See also answer to question Q.14.8

Q.14.11	(§14.1, §14.2, §16.1.3) Is the probability and acceptability of a particular scenario used as prerequisite to determine the design basis accident? If so, what probabilities are considered?

Answer by ASN:

In France, the definition of the design basis accident does not rely on a single probability but on a list of reference accident scenarios consistent with international practices in which the probability for the design basis accident is 10^{-6} / year for core melt frequency for a given scenario.

Q.14.12	§ 14.2.2 p. 68 - All new facts, whether they result from experience feedback in France and abroad or from special studies, are examined and the most sensitive issues are assessed with regard to their impact on the level of safety of reactor series. When it is apparent that they are sufficiently important and that this importance far outweighs any other disadvantage there may be, the safety requirement reference base is modified. Is PSA used to perform this assessment? Does it mean that this "reference base" can be modified accordingly? Who is responsible for that?

Answer by EDF:

The performance of a Periodic Safety Review (PSR) consists of:

- making sure that reactor units remain in conformance with the safety requirement reference system (taking into account the possible changes in sites environment, the unit status and the operating conditions),
- assessing the safety requirement reference system in the light of the most recent regulatory texts and design and operation rules, taking into account the progress in knowledge (R&D, operation feedback experience).

Depending on the conclusions of this safety review, improvements of the safety level (reassessment of the safety requirement reference system and related modifications) and/or unit upgrading (in case of non-conformance with the safety requirement reference system) can be decided. PSA is used during the PSR, particularly to update the assessment of the series safety level with the reference unit implementation status.

The global PSA is one of elements of the safety level assessment. It has to take into account the recent operating experience together with new knowledge and changes in design or operation, which are included into the standard plant status. It allows in particular to assess the safety level and to compare it with what it was at the end of the previous review, taking into account the modifications of the system characteristics (equipment reliability for instance) and operation practices.

Answer by ASN:

It has to be pointed out however that, in France, PSA is a tool used in safety assessment, but not systematically, together with engineer judgement before deciding upon a modification of the safety reference system. Modifications of the safety reference system have to be approved by the Nuclear Safety Authority.

See also answer to question Q.14.8.

Q.14.13	To what extent do you use performance indicators to assess the safety performance of a licensed reactor? What indicators are used?

Answer by ASN:

The ASN does not use performance indicators to assess safety performance. The ASN examines at the operator assessment and make its own assessment on topics on which its attention has been particularly raised.

Q.14.14	(Article 8). Is the performance based and risk informed approach to regulation applied? If so: a) What performance indicators are used by the regulator? b) How is risk information included in the regulatory decision making process?

Answer by ASN:

France does no apply the performance based and risk informed approach to regulation. The ASN is very reluctant to using performance indicators: as soon as they are known, their value decreases considerably because the operators may focus their attention on the performance indicators and not on safety as a whole.

See also answer to question Q.14.8.

Q.14.15	How does the regulator use the risk assessment data; for example in planning inspections, developing inspection procedures, developing technical specifications, and evaluating incidents?

Answer by ASN:

PSA is used as a one tool among others to assess the severity of an event, but not for the other matters listed.

See also answer to question Q.14.8.

Q.14.16	How does the operator of the facility use the risk data? (See same question to the regulator)

Answer by EDF:

Probabilistic Safety Assessments (PSA) were historically used as a help to the safety analysis of generic issues (peculiar to a series). The use of PSAs for resolving operating issues at the site level became more recently widespread (since 1997) and they mainly deal with the following items:

- analysis of potential event consequences, allowing to allocate resources to solve events with a high importance,
- help to intervention preparation and to risk analysis (including request for waiver); the main contribution from PSA deals with the choice of the reactor state for the intervention and of the remedial measures to be implemented,
- help to decision taking on the line to adopt in case of hazard (notably admission of deviation), in addition to deterministic analysis, the PSA contribution dealing with the period of time before putting back the unit into conformance and the need of transitional measures.

Probabilistic assessments are performed, on sites' request, by a dedicated support team located within the national engineering units. The spreading of PSA competence and the availability on the sites of computer tools is not currently envisaged.

Q.14.17	How is guaranteed that the staff who monitor safety are not influenced by production needs?

Answer by EDF:

The day-to-day implementation of the safety principles is performed by the operating teams and by the maintenance teams. They rely on the Operating Technical Specifications, which guarantee operation in compliance with the safety reference system. In addition, the possible deviations would be detected by the internal check system and corrected by the operating staff.

EDF considers that the competition between safety and productivity is solved at the origin by the compliance with the Operating Technical Specifications, therefore ensuring priority to safety over productivity. (See also answer to question Q.11.4)

Q.14.18	What arrangements are there to ensure that the station Safety Analysis Report is updated following plant modifications, result of research or revision of standards?

Answer:

EDF has considered the updating principles of nuclear power plants' Safety Analysis Reports (SAR). A complete update of the reference safety analysis report is performed only after completion of a periodic safety review. This is in accordance with the necessity for a stable safety reference system applicable to a series between two consecutive safety reviews. To a given plant corresponds a plant reference status (Status N) to which is associated a series and site safety analysis report (SAR N).

Modifications implemented to plants from a series result from operating experience feedback or from requirement changes (e.g. plant periodic safety review). These modifications concern standard installations of the series or site specific installations (e.g. pumping station).

The implementation of these modifications is performed by batch (generally during ten-yearly outages). The impact of modifications on the content of the SAR (series or site) is examined and identified. These elements lead to an update of the SAR - series and site - (SAR N+1). To this update corresponds the new plant reference status (Status N+1) defined after the implementation of the batch of modification.

Between two batches of ten-yearly modifications, if (for instance) operating feedback with high consequences at stake shows the necessity of a specific modification, the same approach is used and elements, which affect the content of the SAR, are identified. These elements are included in a specific volume IV added to the plant applicable SAR (series and site). Once the modification is implemented on its plant, the operator confirms its applicable statute. This approach allows keeping the conformity of the plant status with the applicable SAR. It also allows, due to the limited number of such situations, not to produce a complete update of the SAR, which is normally foreseen every ten years.

These principles were approved by the ASN.

Q.14.19	It is well known that in France great emphasis is given also to the area of severe accidents and BDBAs. Please, could some comment on work done in this area be provided? For example, the regulatory decision to go ahead with installation of PARs has been taken – on what grounds and considerations?

Answer by ASN:

Regulatory decision has been taken after separate and joint studies performed by the IPSN and by the German GRS. The risk of containment failure by over pressure due to hydrogen combustion in case of severe accident was to be excluded.

See also answer to questions Q.14.18 and Q.18.1.

Q.14.20	Paragraph 14.2.2 on page 68. Referring to the assessment of the safety reference base after the second ten years inspection of 900Mwe reactor series (CP0, CP1-CP2): when will this assessment be completed?

Answer:

The assessment of the safety reference base for the 900Mwe reactor series will be completed at the end 2002, while the second ten-yearly outages will continue for several years.

Q.14.21	Article 14, Page of Report 64. What is your strategy for using Periodic Safety Review results in the plant life extension?

Answer:

See answer to question Q.6.4.

Article 15: Radiation protection

Q.15.1	(§15.1, §7.7.1, §8.1) While deciding the siting and/or construction of nuclear facilities, are the acceptance criteria for exposure to members of the critical group of population at emergencies (up to design basis accident) identical to dose limits for members of the public at normal operation? If different, provide specification.

Answer by ASN:

Yes, up to the design basis accident, they are identical in France, that is 1 mSv (see also answer to question Q.15.3). In case of beyond design accidents, off site emergency plans provide a dose limit for sheltering set at 10 mSv and a limit for evacuation set at 50 mSv.

Q.15.2	§ 15.2.1 p. 78 - To reach the objective of 1 man.Sv/year in 2001, EDF launched a new ALARA approach involving the optimisation principle as a whole …..... What is the range of annual doses for workers in the French NPP and what are the collective doses per energy produced?

Answer by EDF:

As indicated in the report (§ 15.5 and appendix A-4-1), the individual doses to EDF and sub-contractors personnel in 2000 were all below 20 mSv. The average of annual individual dose for all workers (EDF employees and contractors) in French NPPs was about 2.1 mSv in 2001.

The average of annual doses was nevertheless different depending on the job, for example in 2001:

- 7.0 mSv for insulation workers,
- 3.6 mSv for welders,
- 3.2 mSv for mechanical workers,
- 2.9 mSv for general services,
- 2.2 mSv for inspections,
- 1.5 mSv for Radiation Protection team,
- 0.9 mSv for electricians,
- lower than 0.9 mSv for other categories.

The range of all these annual individual doses was 0 to 19 mSv (EDF target is nobody above 20 mSv/12 months). At the end of 2001, nobody was above 20 mSv/12months, 4 workers were between 18 and 20 mSv/12 months and 88 workers between 16 and 18 mSv/12months.

In 2001, the mean collective dose per energy produced was around 1.24 mSv per MW.year produced for all EDF operating reactors.

The collective dose per energy produced for each type of reactor is:

- around 0.4 to 0.6 mSv/MW.year for the best 1300 MWe reactors, and
- around 2 mSv/MW.year for the best 900 MWe reactors.

In 2001, the mean annual collective dose for all EDF NPPs was 1.02 mSv (the 1300 MWe reactors had a annual collective dose around 0.6 Sv and the 900 MWe reactors around 1.2 Sv).

Q.15.3	§ 15.2.2.2 p. 80 - "Nonetheless, the dose related impact of radioactive releases remains extremely low at less than around 1 µSv/year. This is well below the natural exposure level in France.....". Are there any dose constraints set up, related to gaseous and liquid releases? The compliance with this values is far more interesting as comparisons with annual dose due to natural background.

Answer:

The dose limit for the public related to releases is presented in the same paragraph of the report and is set to 1 mSv/year, which correspond to the European regulation (Directive 96/29).

In France there is no specific dose limit or constraint for liquid or gaseous NPP releases. On the other hand, the French regulation sets activity limits for releases and it is verified that the dose associated with these limits is far below the regulatory dose limit (see answer to question Q.19.2).

Q.15.4	(§15.1, §15.2, 15.5) Is the effect of releases from nuclear facilities under normal operation evaluated as regard the exposure to critical groups of population in their vicinity? If so, specify the models used and how they reflect changes of the actual weather situation throughout the year.

Answer by IRSN:

Releases from nuclear facilities under normal operation are evaluated with the same models as for accident conditions (Gaussian solution of the transport-diffusion equation). However concentration and deposits computations and subsequent exposure computations are performed for all various conditions likely to occur on the site and results are weighted by the annual frequency of occurrence of weather conditions in the various areas surrounding the site.

Q.15.5	Operators are responsible for the external individual dose monitoring of exposed workers. The results of this monitoring have to be sent to OPRI (Chapt. 15.5.1.1) charged to verify the monitoring data and to keep the results in a central register. OPRI is organising intercomparisons for the French laboratories working in the field of individual dose monitoring. Do the laboratories need a formal approval of the competent authorities? Is an official accreditation procedure foreseen in the French legislation for these laboratories? Are defined quality standards imposed?

Answer:

In accordance with a Decree from April 1975 amended, the nuclear operators EDF and CEA are authorised to perform, under their own responsibility, the dosimetric surveillance of their workers. They are subjected to a periodic accreditation process. On the occasion of the renewal of the accreditation, OPRI issues a technical recommendation after having reviewed the results of an inter-comparisons among the laboratories. The Ministry in charge of Health then issues an Order, currently valid for three years.

The dosimetric surveillance of contractors is performed either directly by OPRI or by another accredited laboratory.

Q.15.6	(§15.5 + App 4.3) Please provide information on the gaseous releases trends at Civaux and Creys-Malville, and the liquid release trends at Chooz and Civaux?

Answer:

The graphic representation given in appendix of the national report (percentage of annual permit) is misleading. The main reason for differences in the effluent release trends (as compared to the authorised limit) for Civaux, Chooz (the newest reactors) and Crey-Malville (liquid metal reactor) with other French nuclear power plants is that the limits for the release permits have been set to a value 5 times lower than the limits for other reactors.

In addition in should be mentioned that in 1997-2000 Civaux and Chooz were in the start-up stage and Creys-Malville entered its decommissioning stage.

Article 16: Emergency preparedness

Q.16.1	§16.1.3.2, 16.7.2 p.87 - Could you give some information on the previous and the future emergency reference levels to be implemented?

Answer by ASN:

The former intervention levels were derived from the recommendation 40 of the ICRP.
Based on later recommendations of the ICRP, the Ministry for Health defined in a circular letter dated March 10, 2000 a single dose of radiation replacing the former upper and lower limits, which were shown, through emergency drills, to be a source of confusion when it was necessary to take a decision. Three intervention levels, associated with calculated doses, have been defined:

- Sheltering for an estimated dose in excess of 10 mSv,
- Evacuation for an estimated dose in excess of 50 mSv,
- Stable iodine tablet ingestion for an estimated dose to the thyroid in excess of 100 mSv.

These levels are aiming at simplifying the implementation of the off-site emergency plans. However, in case of a real accident, these limits would obviously not be the only elements considered in view of taking an operational decision.

Q.16.2	(§16.1.3, §16.7) Is the emergency planning zone in the vicinity of nuclear power plants specified as a special area with predefined actions for a severe (beyond design basis) accident? If so, what criteria are used to define this emergency planning zone?

Answer by ASN:

The criteria used to establish the off-site emergency plans are as follows:

- Evacuation in a 5 km radius zone should be possible within 24 hours,
- Sheltering in a 10 km radius zone should be possible within 24 hours.

The reference accident is a loss of primary coolant associated with penalising conditions. The implementation of the protection measures is compatible with the so-called S3 source term.

The new off-site emergency plans take into account fast-developing accident situations, but their consequences are small compared to the reference scenario. For such cases, the off-site plans include [reflex] phases with [reflex] counter-measures. In the case of nuclear power plants, these measures involve sheltering and broadcasting information inside a 2-km radius zone.

Q.16.3	§ 16.1.3.2 p. 87 - "Absorption of stable iodine in addition to sheltering in cases where the release comprises radioactive iodine" What is the strategy for delivering iodine tablets?

Answer by ASN:

As of 1997, the population in the vicinity of a NPP received a notification for withdrawing iodine tablets from chemist's offices. The emergency drills, performed since this first distribution campaign, have shown the distribution to be insufficient. Thus the Government passed an order in November 2001, requesting the Prefects to use more efficient distribution means (including door-to-door distribution) and to build up stocks in each of the departments so as to allow for a better protection of children and youngsters against radioactive iodine beyond the off-site emergency plan radius.

Q.16.4	Article 16, Chapter of Report 16.1.3, Page of Report 87. Regarding the public protection measures, which Emergency Response Organization has the responsibility for Evacuation Time Estimates within Emergency Planning Zone? (ie. Central government, local Government, Licensee)

Answer by ASN:

The only person in charge of deciding public protection measures is the local Prefect, who is the local representative of the Government. The ASN is in charge of providing advice to the Prefect on the actual situation and on its possible evolution. The responsibilities of the licensee only extend to the safety of its installation: in case of an accident, its main objective is to bring its installation back to a safe and stable situation.

Q.16.5	Article 16, Chapter of Report 16.2.1.3, Page of Report 88. Does your country have a Joint Public Information Center for nuclear emergencies? (The Joint Public Information Center operated by regulators and licensees is an official facility where the news media is briefed by a spokesperson on the events in the emergency).

Answer by ASN:

In France, there is no Joint Public Information Centre co-operated by the regulators and the licensees. In case of an accident, each actor (licensee, regulatory body, Prefect) is in charge of providing information to the public according to its responsibilities. France is not in favour of a unique official information centre and is strengthened along these views as the media usually request more than one source of information.

Q.16.6	Article 16, Chapter of Report 16.4, Page of Report 93. How far is the Local Management Emergency Response Center from the plant? If it is located within the Emergency Planning Zone, what are the design requirements? (ie. Shielding, Ventilation, Inhabitabilities, etc.)

Answer by EDF:

The Local Management Emergency Response Centres are located within each plant site, outside the industrial buildings, at a few hundred meters from the closest reactor unit. It is autonomous from the remaining part of the site. It is equipped with a diesel generator able to provide power for the building and with all what is needed for the life of on-call teams (water, food, washroom). The walls are made of full agglomerated concrete so as to provide protection against radiation; filtered ventilation provides protection against contamination. On-call teams can monitor and decontaminate themselves.

In addition, there is an off-site sheltering building able to receive the whole staff working on the site. It is located at about ten kilometres from the site and is built with material currently used for dwellings. The whole plant staff can be there monitored and decontaminated.

Q.16.7	Q8: CNS Article 16. What are the requirements of emergency communication system for the Emergency Response Facility (Emergency Operation Facility, Technical Support Center, Operational support Center, Environmental Lab.) ?

Answer by ASN:

As mentioned is the report (§ 16.1 - p. 85) the regulatory requirements concerning emergency plan appear in Decree 88-622 of May 6, 1988, and they include a communication system. The technical specifications of the resulting communication system between the different actors at the operator level and at the regulatory and governmental level, as illustrated in the diagrams given on page 90 of the report, developed with the time since that decree. The principle was to define the information to be exchanged, the type and redundancy of the communication network and the guidelines for operating this communication system. The implementation of the system was the result of requests from the regulator and answers from the operators.

Q.16.8	(§16.4) The Severe Accident Management Guidelines (SAMG) are to be applied in the event of a accident. What is the basis of the SAMG?

Answer by EDF:

The implementation of SAMG is required in the case the accidental situation can no longer be controlled by the implementation of accidental operating procedures and when it is developing towards core melt, at a time when these latter procedures are no longer suitable, due to the new physical phenomena which might occur during the accident sequence and to the likely loss of instrumentation located into the containment building.

Entering the SAMG induces a change in operating priorities: in accidental operating procedures, priority is given to saving core integrity, while in the SAMG priority is given to protecting the containment and to avoid or delay potential releases.

The aim of the SAMG is to define in advance the whole set of actions to implement on each system to prevent any early containment failure and to insure the best achievable confinement of the radioactive products. The system operation strategies rely, as achievable, on instrumentation within the reactor building.

Operating provisions adopted in the SAMG allow either to prevent situations, which are source of unacceptable releases, or to mitigate their consequences in order to make them compatible with emergency planning response constraints and to insure a satisfactory protection level for the population.

Q.16.9	§16.7.3 p.100 - Preventive distribution of iodine: The chapter addresses further improvements necessary (for preventive distribution); in the last sentence of the paragraph the “inefficiency of the method adopted” is stated. Could you give further explanation of the background of these findings and on the possible improvements considered?

Answer:

See answer to question Q.16.3.

Q.16.10	The article 16, clause 2 establishes that “Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, ……the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response." Regarding the early notification of the occurrence of events, we consider that international and bilateral agreements in force between neighbouring countries provide reliable arrangements. As far as information for the emergency planning is concerned, it should be considered that the degree of preparedness and the emergency features to be arranged are matters of national policy, which defines the level of risk to be protected against, and then the probability of the events to be included in the emergency plan, taking into account the effectiveness of the safety features of the single considered plant. For example, the Italian policy is to include in the national emergency plan transboundary accidents, taking into account sequences with severe core degradation. It should also be considered that appropriate emergency response requires, besides early notification, information on the evolution of the event as soon as it becomes more precise. Moreover, also the level of this information depends to some extent from the degree of preparedness selected by the single State. In the light of the above considerations, the provisions taken or planned for providing information complying with the article 16, clause 2, of the Convention should be clarified, as well as the practical procedures with which neighbouring countries can obtain data considered necessary. Such data could for instance include: - Core inventories at equilibrium (which are not available, as they may strongly depend on the decision to load fuel of advanced design) - Available Emergency Features (e.g.: in Containment Spray Systems, Hydrogen management systems) and their effectiveness, peculiar Severe Accident Management Systems’ characteristics (such as containment purge and filtration devices) - Results of probabilistic safety studies, if any.

Answer:

France is thankful for these long comments. France is a Contracting Party to the Convention on Early Notification of a Nuclear Accident and to the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. Also, France has signed bilateral agreements with all neighbouring countries liable to be affected by an accident occurring at a French NPP.

Article 17: Siting

Q.17.1	How is ASN carrying out periodic siting issue reassessments as called for in Article 17?

Answer by ASN:

This issue is discussed in Chapter 14 of the report under the heading "reassessment by topics".
For flooding, reassessment was launched following the Blayais event after the December 1999 storm. For seismic protection, there is a continuous update of the earthquake database, which induces reassessment depending of the results of this update.

Q.17.2	(§14.2.3 + §14.4.3) In December 1999 at Blayais NPP an external flooding happened that affected some safety systems. What measures were taken to avoid such incidents? Are there programs for site parameters surveillance in order to prove the suitability of the design bases in relation with those site factors with greater uncertainty?

Answer:

Immediately after the exceptional December 1999 storm, which created with the high tide a strong water surge in front of the plant, leading to a partial flooding of the Blayais NPP, an extensive programme for the reassessment of flooding hazard protection design rules was initiated.
The outcome was the elaboration by EDF of a policy for a reinforced protection against this hazard including not only the lessons from the Blayais event, namely the need for protecting estuary sites from surge effects, but also other phenomena likely to cause flooding: lapping of rivers, torrential rains, drainage basin deterioration, ground water level change, intumescence phenomena, etc. This new policy was presented to the ASN who agreed on its principle. It should serve as a basis for the revision of the corresponding technical regulation.

Detailed studies are being completed and the change in policy in that field will notably lead EDF:

- to build protection dykes at some sites which have not any,
- to define a precise protected area for nuclear island buildings infrastructures and links with the pumping station preventing any water intrusion towards equipment important for safety,
- to strengthen, if needed, essential cooling water and power supply protection,
- to complete the Basic Preventive Maintenance Programme for civil engineering works,
- to modify some operating procedures by including temporary (pending work completion) or definitive warning systems, notably on coastal sites or in estuaries, based on the monitoring of the weather and hydrometry conditions,
- to reassess every ten years the protection level of each site, based upon updated weather and hydrometry data.

EDF has taken the following practical provisions at the Blayais site:
The first step, completed in May 2000, consisted of works and provisions for enabling the restart of the affected units (cleanup, various verifications, first protection works for the site based on the event feedback).

The second step concerns completing works aiming at improving defence against flooding hazard:

- Gironde river side: raising of the existing dyke and implementation of an anti-surge wall (completed in February 2001),
- Marsh side: raising of the dyke because of possible flooding from marsh in case of Gironde river overflowing upstream and downstream the site (works will be completed at the end of 2002).

In parallel, the plant alert and safe shutdown procedure in case of flooding risk has been revised. This procedure is now based on surveillance of wind likely to induce important swell on the Gironde river.

EDF has taken the following practical provisions for all other sites. EDF is committed to perform a set of studies, the general objective of which is the reassessment of the protection of each NPP against external flooding hazard. This reassessment includes three steps:

- the first step consists of setting up, for each site, an appraisal of current protection against flooding hazard as compared to the reference design, and, if needed, to undertake urgent back-fitting works,
- the second step consists of upgrading the initial methodology for assessment of external flooding hazards together with methods for site protection (physical as well as alert systems),
- the third step consists of reviewing for each site, by applying the new methodology, the characterisation of the various flooding hazards and whether the initial protection provisions were adequate. If needed protection works and alert systems will be implemented on the sites.

At the beginning of 2002, the new methodology for assessing flooding hazards was defined and presented to the ASN, who approved it. Studies on each site are in progress and should be completed by mid 2003. Supplementary protection works are foreseen on some sites.

Q.17.3	Paragraph 2.4 on page 10. Referring to the partial flooding of Blayais NPP site which led to the launching of a programme to reassess nuclear site protection against extreme weather conditions: 1) For this reassessment, which safety standards and guides were used? 2) Did French Safety Authority request EDF to perform flooding PSA for CPY (900Mwe) units? What is the timetable for this program? 3) Did French Safety authority intend to revise French safety standards related to Plant Safety under extreme weather condition?

Answer:

1/ See answer to question Q.17.2.

2/ France does not use PSA for flooding event because data are not sufficient and PSA are not relevant for events with a frequency below 10^{-3}.

3/ The Basic Safety Rule for flooding protection will be revised after the work presented in 1/ is completed.

Q.17.4	Article 17 Siting, Page of Report 103. When is the re-evaluation for the site-related items important to the safety of the nuclear facilities required? If it is re-evaluated, what are the criteria for the population (especially density and distribution) and man-made hazards (for example, aircraft crash)?

Answer by ASN:

The reassessment is performed at the same time as the periodic safety reviews (they are done for reactor series in a generic way and they include site aspect consideration). There is no criteria for the population (however population data are regularly updated in the off-site emergency plans). Current site data are compared to standards in force.

Article 18: Design and construction

Q.18.1	§ 18 p. 105-107 - What is the status of passive autocatalytic recombiners implementation?

Answer by EDF:

The ASN asked EDF to install hydrogen passive autocatalytic recombiners at all French operating PWR units. The industrial implementation process, including the assessment of the capacity and the distribution of the recombiners, is currently in progress.

This decision follows the studies on the French PWR containment strength capability to a combustion of the hydrogen which would be released in case of a severe accident. These studies have shown that the containment could withstand the combustion of the best estimate amount of hydrogen likely to be released in case of a severe accident. However, as a result of a defence in depth approach, it was decided to implement passive autocatalytic recombiners.

From a technical viewpoint, the choice for passive autocatalytic recombiners was made because:

- the devices are entirely passive, which is the best guarantee for operation during a severe accident,
- the devices are modular and easy to install in an existing reactor,

- there is no interaction with the normal unit operation nor any known harmful effect in case of a severe accident,
- they allow, by removal of the released hydrogen, to cope with accident sequences amongst the most dangerous.

Q.18.2	(§ 18 p. 105-107)- To what level of detail is the Nuclear Safety Authority (ASN) involved in safety assessment in order to influence the design of a plant before initial construction or modification is permitted to start?

Answer by ASN:

Before the design and construction of each new reactor series, the Nuclear Safety Authority issued a "letter of option" stating the main lines of the safety objectives to be met by the future nuclear power plants.

The design itself has to be performed with the use of codes, which are recognised by the ASN. These codes, going much more in the details, each one in its field, than the general letter of option, are the way by which a significant level of detail is assessed by the regulator and its technical support organisation.

Article 19: Operation

Q.19.1	(§19) - In present, France operates total of 59 power units. The report provides little information on the operational results in terms nuclear technology and safety, and it only provides the environmental impact in Attachment. We would like to have overview of operational criteria relevant to nuclear safety for past years

Answer by EDF:

Each year, EDF publishes the nuclear power plants operating results, which include the main global internationally accepted indicators. This information is available on the Internet site: http://nucleaire.edf.fr

In addition, EDF uses the WANO indicators, which comprise the requested information, however these indicators remain the property of WANO members.

However a list of major safety improvements achieved on NPP is given in the answer to question Q.14.6.

Answer by ASN:

France is very reluctant to use performance indicators to measure safety (see answer to questions Q.14.13 and Q.14.14). As regards progress made concerning safety, the main points are presented in answer to question Q.6.4.

Q.19.2	§19.2.2 p.115 - Do the Safety Specifications contain only technical limits for physical parameters, as mentioned in the report? Where are the limits for environmental impacts (e.g. radiological emissions, cooling water temperature) specified?

Answer:

Safety specifications set activity limits on circuits with a radiological risk, in particular intermediate systems likely to be contaminated. The specifications set also the fixed radiation protection channels aiming at monitoring the systems.

Limits for environmental impact are drawn from Decree 95-540 related to effluent releases and water intake and presented in §7.3.1.4 and § 15.1.3 in the report. Orders specific to each site are then published to define the specific limits.

Q.19.3	§19.2.3 p.116 - Are other strategies for maintenance than preventive maintenance allowed, e.g. performance-based maintenance?

Answer by EDF:

The optimisation of the maintenance programme is a constant concern for EDF, which examines how to take into account the experience feedback and studies new concepts such as optimising maintenance through reliability.

Other approaches such as the "performance based" approach are also considered but, to date, they were not submitted to the ASN for approval.

Answer by ASN:

In France, performance-based maintenance is at an early stage of discussions.

Q.19.4	subsection 19.2.8 gives no information on the quantitative indicators of generated radwaste and on the methods of their processing. Please, provide brief information on this matter.

Answer by EDF:

EDF has indicated on several occasions the amount of radioactive waste generated by its nuclear power plants, notably in the framework of WANO inter-comparisons. The European association UNIPEDE has defined an internal indicator, which "represents the low activity solid radioactive waste volume, after processing and final packaging in view of their disposal, over a given period of time". However this indicator did not allow comparisons between the pressurised water reactors in the world. Indeed, the operators within countries not having a final disposal centre, having no option but waste storage on their site, used to report only on a tiny part of generated radioactive waste. Then this indicator, apparently in the absence of a possible definition's change towards a consensus, was frozen since end of year 2000.

However it can be noted that, according to the above mentioned definition, EDF would have reported for the year 2001 an amount of generated radioactive waste around 95 m^3 per reactor (average on 56 reactors).

As regards implemented processes for packaging waste resulting from technology used, the following can be mentioned:

- combustible and low activity waste (oils, solvents, plastic materials, wood, clothes, etc.) are sent to the incineration unit CENTRACO (SOCODEI company) located near Marcoule. The resulting ashes and slag are put into concrete and packaged into metallic drums, which are later definitively disposed of at the Aube disposal Centre operated by ANDRA,
- non combustible waste (rubbles, laggings) are packaged in metallic drums and directly sent to the Aube disposal Centre,
- waste made of low contaminated metal scrap are sent to the melting unit CENTRACO. The ingots produced are disposed of at the Aube Centre,
- radiating waste (dose rate higher than 2mGy/h) are packaged in concrete containers, inside which they are locked with mortar.

As regards implemented processes for packaging waste resulting from treatment technique, the following can be mentioned:

- low activity ion exchange resins are either incinerated in the CENTRACO unit or packaged into metallic drums (as of the end of 2002) for direct disposal at the Aube Centre,
- medium activity ion exchange resins are die-cast into epoxy and packaged in concrete containers for direct disposal at the Aube Centre. Two mobile machines allow to perform this processing on all EDF sites,

- evaporator concentrates and sludge are either incinerated in the CENTRACO unit or packaged into metallic drums after mixture with mortar for direct disposal at the Aube Centre,
- medium activity water filters are locked with mortar into concrete containers and directly disposed of at the Aube Centre,
- low activity water filters are packaged into metallic drums and directly disposed of at the Aube Centre.

In addition it has to be mentioned that all metallic drums directly sent by EDF sites to the Aube Centre are compacted upon their arrival using a high capacity press. Taking into account that the UNIPEDE indicator considers only final packages' volume at the disposal conditions, decrease in volume given by the compaction, the incineration or the melting are actually taken into account, even if these treatments have been performed outside waste generation sites (see the UNIPEDE indicator definition above).

Q.19.5	(§19.4) What actions stemming from the analyses completed by IPSN, primarily the analysis of operating guidelines, are implemented?

Answer by ASN:

Operating guidelines analysed by IRSN deal with incident and accident operation, which progressively moved from an event-oriented approach to a state-oriented approach (APE). Implementation of APE procedures on French plants is not yet completed. In 1989, the ASN authorized adoption of APE operation for the 1300 MWe/P'4 series of reactors, subsequently extended in 1996 to cover the 1300 MWe/P4 series, followed by the N4 reactor series as of initial startup.

In 1998, the ASN authorized adoption of the APE procedures for the CPY series of reactors. The first application of these procedures to this series, on the Tricastin-1 and 2 reactors, was subject to ASN authorization, in view of the issues at stake. During the course of 2000, only Tricastin-3 and –4 were authorized to switch to APE operation as the problems encountered with simplifying measurement of the saturation temperature margin of the primary system water under accident conditions (see below) are delaying the transition to APE operation of the other reactors of the CPY series. The inspections conducted by the ASN in 2000 on the Tricastin site, concerning the ability of the staff to implement this type of operation in an accident situation, demonstrated problems with handling this instrumentation and operator training and qualification shortcomings.

As regards the 900 MWe/CP0 series, the ASN authorized in 1999 adoption of the APE procedures for the Fessenheim reactors. The switch to APE operation for Bugey, the other plant of this series, was authorized from the end of 2000. The conditions under which these transitions took place have been checked in 2001 during a series of dedicated inspections.

Q.19.6	§19.4.1 - p. 123 - It is reported that the findings of the inspections show that EDF's organization is still experiencing teething troubles and the sites are having difficulty in handling the sudden surge of new responsibilities in fields where the local engineering resources are inadequate. What are the teething organizational troubles?

Answer:

There is a misunderstanding: the sentence in the report was related to specific organisation on the site to manage fuel related controls and testing (decentralised from national level). As explained in the text local fuel engineering was not sufficiently staffed and trained at that time.

Q.19.7	The first sentence of subsection 19.4.3.2 (p.124) says that "When an operator feels that it is unable … or does not wish to comply strictly with Technical Operating Specifications…". Please, explain the meaning of this sentence.

Answer by ASN:

When an operator anticipates that it wishes voluntarily and temporarily not to strictly comply with the Technical Operating Specifications (TOS), for instance when implementing a modification or performing maintenance work not foreseen in the TOS, he may request a waiver. This implies for him to characterise the deviation with respect to the TOS, to justify the safety gain of such a deviation, to provide a safety analysis justifying the acceptability in terms of safety of this situation and to define the possible compensatory measures. Based on this analysis, the ASN may decide to grant the waiver, specifying all the applicable terms (limit in time, etc.).

Q.19.8	(§19.5) Article 19 states that "Programmes to collect and analyse operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organisations and regulatory bodies". How does France take into account the operating experience of non-French nuclear power plants? How does France share its operating experience with international organisations?

Answer by EDF:

As regards the engineering and design aspects, the operation feedback of foreign countries' NPPs is collected and taken into account through different information channels which are:

- the publications and fora of international or foreign organisations such as WANO, IAEA, NRC or EPRI,

  As far as WANO is concerned, EDF, as a member of this association, utilises experience, which is synthesised, gathered and transmitted by this organisation. A systematic analysis of the synthesis reports SOER and SER enables to draw possible lessons for the EDF plants or for future reactors. In addition the review of each event report together with requests from other members on specific issues, through the WANO Internet, supplements this information.

  As regards IAEA, collecting possible lessons goes through the use of the safety standards and through the systematic analysis or reports from the "Incident Reporting System" (IRS).

  Finally a systematic analysis of the "Information Notices" and of the "Regulatory Safety Issues" from the NRC and the review of EPRI publication supplements this international experience feedback.
- the secondment of EDF staff to international or foreign organisation: WANO, IAEA, EPRI,
- the bilateral cooperation with foreign NPP designers or operators.

As regards the operational aspects, the operation feedback of foreign countries' NPPs is collected and taken into account through different information channels which are:

- partnership contracts for the secondment of staff (South Africa, China, Eastern Europe),
- correspondent staff placed at foreign plants (Farley and Tihange) or in international organisations (WANO, INPO, IAEA, EPRI, FROG),
- participation to various events (twinnings, Peer Reviews, OSART missions, other technical support programmes, workshops, international conferences with nuclear partners),

The resources thus mobilised spread within EDF the international experience feedback, which is valuable for the French power plants.

An international network (seconded staff, correspondents and limited contributors) issues periodic reports or mission reports together with spontaneous information it receives. Using the information on the current status of French plants and depending upon requests for information that it receives, the network can also proceed to collecting information related to current priority issues. In addition EDF performs a systematic review of the international databases, which are at its disposal.

The information thus gathered is introduced in the processing system for operating event feedback of French NPPs through the following analytical grid:

- periodic selection of major deviations,
- assessment of risks and issues,
- possible request for additional information,
- in the case of important events, alert with proposal for solution,
- periodic information towards the concerned NPPs.

As regards the export of French plant operating experience feedback, essential events are selected and their analysis is transmitted to EDF partners and to the international grids through the previously mentioned information channels.

Q.19.9	(§19.5) The report provides a long list of IAEA and WANO missions (Page 127-8) completed at French nuclear plants. However, the report does not include any information on recommendations obtained from those missions to improve safe and reliable operation of French NPPs..

Answer:

It was difficult to list in the national report all the recommendations, suggestions, good practices or good performances stated in all IAEA and WANO mission reports. However, this type of information could easily be obtained.

If the WANO reports are restricted to the members of the association (WANO confidentiality policy), they can be obtained if the utility is a WANO member.

As far as the IAEA reports are concerned, the reports of all OSART missions in France are made public and can be obtained either from the French Government or from the IAEA after the 6-month period of restriction. Also, the last six reports concerning France are available on the ASN website (www.asn.gouv.fr).

Q.19.10	Article 19, Chapter of Report 1.5, Page of Report 113. National report states that incidents are rated according to INES systematically. Who is responsible for rating the scale? How do you communicate to the public or media on that matters?

Answer by ASN:

All incidents occurring at French nuclear installations are systematically rated on the INES scale. The operators usually propose the ratings but, in any case, they are finally determined by the ASN. All events rated INES 1 and above are systematically reported on the ASN web site (www.asn.gouv.fr) and on the electronic viewdata magazine MAGNUC (based on the "Minitel" system, used by the ASN since 1987) in addition to press releases. All events rated INES 2 and above are also reported to the international community.

Q.19.11	Article 19, Part D, Page of Report 119. Article 19.2.5 describes EDF's operation of "Engineering Team" which comprises corporate and plants engineering department representatives. The engineering team mentioned here most likely seems to perform "Watching and Anticipating" activities applicable to plant issues. Some more detailed description on this "Engineering Team" is needed about; such as, its location of organization, function and responsibility of each subordinate unit, number of personnel and detailed job description.

Answer by EDF:

The "Watching and Anticipating" function aims at:

- an early detection of potential problems for the plants so as to render them harmless, to minimise their consequences and to identify remedial actions,
- the detection of opportunities to be seized as they may lead to performance improvements.

It is organised along five lines of action:

- event experience feedback: the aim is to identify all events occurring at French and foreign plants liable to necessitate a particular action in order to minimise their consequences,
- potentially sensitive issues: the aim is to identify threats that may have been overlooked or insufficiently treated,
- innovation: identify opportunities liable to lead to improvements through sharing of information,
- topical watch function: the aim is to identify at an early stage any fundamental problem, transverse issues, or problems representing a high potential risk or liable to lead to performance improvements,
- technology watch: the aim is to assess the available technology and the evolution of the needs so as to detect threats and opportunities in the fields identified by the decision makers, mixing the views developed inside and outside the Company.

The implementation of all these lines requires nuclear engineering resources, including R&D resources. The results constitute inputs to solve day-to-day problems and deal with normal projects.

The first two lines are managed by the central services of DPN. The experience feedback team (about 10 engineers) is in constant contact with the event experience feedback teams. The performance watch team (about 10 engineers) is more oriented towards the other lines, notably the potentially sensitive issues.

Q.19.12	Article 19, Chapter of Report 2.7, Page of Report 120. National report mentions that equipment data are stored in “database” and examined periodically. Please explain the “database” in more detail.

Answer by EDF:

The common database includes the operating feedback experience for each plant with the following information:

- event identification data,
- an event summary,
- synopsis of safety analysis, maintenance and operation,
- one page of comments,
- standardised information related to the failures and their consequences in terms of safety.

This database is accessible at each EDF NPP and gathers EDF operating feedback experience over more than 20 years.

A part of this information is accessible to the ASN.