NUCLEAR RESEARCH FACILITIES AND VARIOUS NUCLEAR INSTALLATIONS

CHAPTER 14

This chapter presents ASN's appraisal of the safety of nuclear research installations and of installations not linked directly to the nuclear electricity generating industry. The installations in question are, essentially, those belonging to the civil part of the French Alternative Energies and Atomic Energy Commission, the CEA, (research reactors, material testing reactors, laboratories, nuclear material storage facilities, waste and effluent treatment plants, etc.), basic nuclear installations (BNIs) belonging to other research establishments (the Institut Laue-Langevin reactor) and some other BNIs (facilities producing radio-pharmaceuticals, particle accelerators, etc.) that are neither power reactors nor facilities involved in the nuclear fuel cycle (fuel production and reprocessing).

In spite of the wide diversity which characterises these installations – and the resulting need to bear in mind the specific nature of each of them when considering risks and hazards – the principles of nuclear safety that apply to them and ASN's actions in that regard remain identical.

1 THE FRENCH ALTERNATIVE ENERGIES AND ATOMIC ENERGY COMMISSION'S INSTALLATIONS

The French centres belonging to the Alternative Energies and Atomic Energy Commission (CEA) include BNIs devoted to research (experimental reactors, laboratories, etc.) as well as supporting installations such as waste storage facilities and effluent treatment plants. Research at CEA focuses on areas such as the lifetime of operating power plants, future reactors, nuclear fuel performance and nuclear waste.

Point 1|1 below lists the generic subjects which marked the year 2010. Point 1|2 describes topical events in the various CEA installations currently operating. The installations currently undergoing clean-out or decommissioning are dealt with in chapter 15 and those devoted specifically to the interim storage of waste and spent fuel are covered in chapter 16.

1|1 Generic subjects

ASN identifies generic subjects via inspection campaigns and analysis of lessons learned from operating experience, and consults CEA on these topics. This process can lead ASN to issue requests or to adopt a position after examination of the relevant file. Generic subjects on which ASN focused in 2010 were:
– management of nuclear safety and radiation protection;
– management of civil engineering works in installations under construction or being renovated;
– updating of internal authorisations system;
– progress on CEA's "major commitments" 1|1|2) and especially regarding commissioning of the MAGENTA installation which will replace the MCMF, the nuclear materials store at Cadarache.

On 5 November 2010, the ASN Commission gave a hearing to the CEA General Administrator, as in previous years. CEA took this opportunity to present the content of its "risk management" report published in June 2009, which highlighted reporting of information in case of a nuclear incident and management and monitoring of services. It also presented its new three-year plan for improving safety and security, with a strong focus on the prevention of occupational risks and the safety and radiation protection culture of CEA staff as well as of its partner organisations and service providers. ASN gave a detailed appreciation of safety at CEA and CEA presented an update on its major commitments in the area of nuclear safety, made official in 2007 after a request from ASN.

1|1|1 Management of nuclear safety and radiation protection at CEA

ASN monitors management of safety at CEA at several levels:
– working with the General Administrator, ASN verifies CEA's compliance with its major commitments, in particular with regard to planned new installations, upgrading of older installations and waste management, especially in terms of compliance with the specified time-frames, and handling of safety and radiation protection issues in CEA's overall management;
– with respect to the Nuclear Safety and Protection Division (DPSN) and the General and Nuclear Inspection Division (IGN), ASN develops a national global approach to "generic" subjects concerning several installations or centres; ASN also examines how the DPSN develops CEA's safety and radiation protection policy and assesses internal supervision work performed by the IGN;
– within the CEA centres, and as appropriate, ASN reviews the safety analysis files specific to each of the CEA BNIs, paying particular attention to their integration into the more general framework of CEA's safety policy. In this respect, it examines the conditions in which safety management is carried out; the main contacts are the directors of the centre and the head of the installation concerned;

In 2010, ASN examined CEA's nuclear safety and radiation protection management file, which was subject to evaluation by the Advisory Committees.

The examination showed that CEA had made considerable progress since the last examination on the same theme (1999), especially regarding the inclusion of human and organisational factors and the integration of safety and radiation protection into its projects. ASN noted actions under way to improve skills management and management of safety and radiation protection regarding services (setting up of an acceptance commission for companies involved in radioactive clean-up and a centralised base for supplier evaluation).

1|1|2 Monitoring of CEA's compliance with its main nuclear safety and radiation protection commitments

In 2006, ASN stated that it wanted to see effective monitoring of CEA's compliance with its safety and radiation protection

commitments, by means of an efficient control tool that offered transparency for the nuclear regulator, in particular with regard to the decision-making process. CEA therefore presented ASN in 2007 with a list of twenty major safety and radiation protection commitments.

These commitments in particular include:

For the Cadarache site:
– inclusion of specific site effects in the seismic risk.

For experimental reactors:
– upgrading of CABRI and construction of its new water loop, which should be completed in 2011;
– the MASURCA safety review, including major seismic conformity and fire protection work.

For the laboratories:
– the renovation work and in particular the seismic reinforcement work on the LEFCA subsequent to its periodic safety review; this work, with the exception of the drain to prevent soil liquefaction, is now mostly completed;
– compliance with the deadline for commissioning of MAGENTA, designed to replace the MCMF.

For waste storage and processing installations:
– removal from storage of certain wastes and effluents and ensuring of their safe condition in other installations (PEGASE, ZGEL, STEDS) ;
– commissioning of the installations scheduled to replace the older ones, in particular STELLA and AGATE.

CEA reports to ASN on compliance with these commitments, on a formal, regular basis during meetings. During the hearing of the CEA Administrator, ASN restated that it considers the major commitments approach to be worth pursuing.

1|1|3 Internal authorisations

An internal authorisation system has been in place at CEA since 2002. Its authorisation was renewed by decision 2010-DC-0178 of 16 March 2010. Thereby, ASN allows the CEA centre directors – with the assistance of the centre safety units and, where applicable, safety commissions – to apply this "internal authorisations system" to certain operations that are sensitive from the safety and radiation protection viewpoints, but which do not compromise an installation's safety case. ASN has monitored the system regularly since its introduction and has found it to be globally satisfactory.

1|1|4 Periodic safety reviews

Many current CEA installations began operating in the early 1960s. The equipment in these installations, of older design, may now be timeworn. Furthermore, it has been subject to modification on several occasions, sometimes without any overall review of its safety. In 2002, ASN informed licensees that it considered a review of the safety of the older installations to be necessary every 10 years. This provision is now contained in the 13 June 2006 Act on transparency and security in the nuclear field (TSN Act). The periodic safety reviews for CEA's installations have been scheduled according to a calendar approved by ASN. All of the installations are to be reviewed by 2017 at the latest, then every 10 years.

In 2005, ASN also detailed its expectations with regard to the safety reviews of CEA installations, in terms of responsibility, content and schedule, in the form of an ASN guide (SD3-CEA-05). These measures will be integrated into an ASN decision concerning all BNIs. This decision is currently in the advisory review stages.

The periodic safety reviews often entail extensive upgrading work in areas where safety regulations and requirements have changed significantly, in particular regarding compliance with seismic loading requirements, fire protection and containment. ASN oversees all the work and requalification procedures, in accordance with principles and a schedule that it itself approves. Finally, after the periodic safety reviews, ASN can define requirements pursuant to the TSN Act of 13 June 2006 on transparency and nuclear safety.

In 2010, ASN examined the conclusions of the safety review of the ORPHÉE installation, on which the Advisory Committee for reactors had already expressed its opinion. ASN will pronounce on its continued operation in the near future.

In 2010, CEA also submitted its safety review of the EOLE and MINERVE installations; this will be examined in 2011 and submitted for an opinion from the Advisory Committee for reactors.

1|1|5 Monitoring of sub-criticality

An incident notified on 6 October 2009 in the ATPu facility, currently being decommissioned (see chapter 15), indicated that CEA should further intensify its efforts on criticality risk prevention. In 2010, as part of the feedback procedure, ASN asked CEA to conduct investigations in all of the installations concerned by criticality risk.

1|1|6 Management of sealed sources of ionising radiation

At the request of ASN, CEA updated its ionising radiation source management rules in 2007. The new rules, which apply in all CEA facilities, incorporate the regulations in force, in particular the fact that, since 2002, CEA has no longer enjoyed exemption from the need to hold a licence for possession and utilisation of sources of ionising radiation.

In 2007, CEA also submitted several files per centre, to extend the sealed source utilisation period beyond the regulation 10 years. Under the terms of the Government Order of 23 October 2009 on approval of ASN's decision establishing the technical criteria underlying the extension of the utilisation period of sealed sources, ASN requested CEA to provide additional information in support of its files. This information was supplied at the end of 2010 for some of the sources for which the situation is to be brought into compliance. CEA will have to proceed with administrative regularisation of all of the sources requiring extension of utilisation in 2011.

Furthermore, in 2010, CEA forwarded its used sealed source management strategy which will be considered by ASN within the more general framework of the strategy for management of radioactive wastes and effluents produced by CEA's civil nuclear installations.

1|1|7 Revision of water intake and discharge licences

The process to revise the CEA Saclay water intake and effluent discharge licenses, which began in July 2006 under decree 95-540 of 4 May 1995, was completed in 2009 with the publication of the decisions of 15 September 2009 and their approval by orders of 4 January 2010. A correction appeared in France's Official Journal of 24 April 2010 (correction to tritium limit).

The water intake and effluent discharge on the Cadarache site were covered by three government orders of 25 April 2006 and orders of the *préfet* dated 12 August and 12 September 2005, allowing consistent regulation of all radioactive and chemical discharges from the centre. In 2009, CEA asked for a number of changes to be made to these orders, relating in particular to the new facilities in the centre. Although the changes concerned were not significant, the corresponding impact assessment was nonetheless the subject of a local debate organised by the licensee over a one-month period. This approach, implemented for the first time on an experimental basis, reflects the desire for transparency on the part of ASN and the licensee. It supplements the administrative consultations required by law. The approved decision, setting limits for liquid and gaseous effluent discharges from CEA's Cadarache installations, was signed on 5 January 2010, approved 9 March 2010 and appeared in the Official Journal of 2 April 2010.

With regard to the Marcoule site, the file modifying the BNIs' discharge licenses (which currently cover all the liquid discharges from the site) was submitted at the beginning of 2009 to ASND. The purpose of the modification is the reduction of discharges. The same applies for the ATALANTE facility. These files were completed in September 2010 by an overall impact assessment of the discharges from the CEA sites and from the CENTRACO and MÉLOX installations, for which the authorisations have been or soon will be amended.

1|1|8 Assessment of seismic hazards

ASN devotes constant attention to the potential seismic risk. This risk is especially re-assessed during the periodic safety reviews conducted on each installation, in order to take account of scientific progress in characterising the risk and of changes in the design rules.

In 2003, ASN asked CEA to improve its knowledge of the seismic risk for the Cadarache centre, by initiating a programme to study any particular site effects. In response, CEA presented a study program run jointly with the Laue Langevin Institute of Grenoble, with the collaboration of several international partners and experts. The results of this research were transmitted to ASN in 2009 and are currently being examined in order to determine the operational applications. In 2010, together with IRSN and the licensees concerned, ASN also completed an overall study of how the seismic risk is addressed on the Cadarache nuclear site. The same exercise is under way for the Marcoule site. In parallel with this, ASN also organised two one-day meetings on seismic risks in nuclear installations in the south of France, the first on 4 February 2010 in Marseille, the second on 7 December 2010 in Avignon. The aim of the meetings was to present the approach adopted to knowledge of and consideration given to seismic risks in nuclear installations. These events, open to the public, to people from the voluntary sector and to professionals, brought together 200 participants from widely differing backgrounds.

In addition, a study at the Cadarache nuclear site of the general resources that would come into play in case of seismic disturbance, established by CEA at ASN's request, is currently the object of examination initiated in the latter part of 2009, in order to determine whether the resources are adequate and appropriate.

1|1|9 Management of civil engineering projects

A number of projects for the construction of new installations or renovation of existing ones continued during the course of 2010, in particular at the Cadarache centre. To monitor progress on the construction of the installations in question, CEA, at ASN's request, sends ASN a quarterly update of the works schedule, including a presentation of the planned annual progress of operations as well as details for the coming quarter. This document makes it possible to identify activities or particular points that ASN wishes to include in its monitoring, by survey, during inspections.

The inspections carried out by ASN in 2010 focused on taking account of the requests and comments made after the review inspection conducted jointly with ASND in May 2010 or the subject of construction/civil engineering in the AGATE, CABRI, LEFCA, MAGENTA and RJH installations.

These inspections confirmed the motivation of the teams involved, the introduction of project management dedicated to site control and the frequent recourse to technical inspection companies in certain phases of operations.

Furthermore, the internal checks made by CEA on project management and in relation to outside companies were the subject of new requests from ASN in 2010 (formalising or stipulation of approach adopted for second level checks and internal hold points).

1|1|10 Research reactor cores and experimental systems

The cores of some experimental reactors are regularly modified, owing to the experiments conducted in them. Others are fitted with specific experimental systems for carrying out certain types of experiments. One of the issues for ASN is to allow the regular performance of new experiments, while ensuring that they take place in appropriate conditions of safety.

The design, performance and irradiation licensing conditions for the experimental equipment have in recent years been extensively discussed by ASN and CEA. This led to the creation of a technical guide defining a number of requirements (in January 2007).

In 2011, ASN intends to analyse application of the approach developed in the guide, based on the case of an experimental device for the OSIRIS reactor recently the subject of a safety review, to a device from amongst those that will be irradiated in the future Jules Horowitz reactor at Cadarache and that is currently in the design stages.

1 | 2 Topical events in CEA research facilities

In addition to the generic subjects presented above, the main subjects relating to CEA installations in operation that were the focus of ASN's attention in 2010 were the following:
– conducting of end-of-life tests on PHÉNIX reactor;
– safety reviews for ORPHÉE and OSIRIS installations;
– completion of renovation work on the CABRI installation and continued construction of the Jules Horowitz reactor;
– commissioning of the MAGENTA installation;
– prevention of soil liquefaction at LEFCA;
– start of operations to remove radioactive effluent contained in the HA4 vessel at Saclay.

1 | 2 | 1 CEA centres

a) Cadarache centre

The Cadarache Centre is located at Saint-Paul-lez-Durance, in the Bouches-du-Rhone *département*. It employs about 4,500 people (all contractors included) and occupies a surface area of 1,600 hectares. As part of CEA's strategy of specialising its centres as "centres of excellence", the Cadarache site deals mainly with nuclear energy. It comprises 20 BNIs, including two for the industrial operator AREVA (ATPu and LPC), while two others are used for IRSN research programmes (CABRI and PHEBUS). The purpose of these Cadarache centre installations is R&D to support and optimise existing reactors and to design new generation systems. The Cadarache centre also plays a part in launching new projects, as it will house the future Jules Horowitz experimental reactor, for which the decree authorising its building was published in 2009. The international ITER installation – scheduled to be commissioned in 2018, on the proviso that its request for authorisation (DAC) is accepted – will be built close by.

In recent years, ASN has noted progress in safety management at the Cadarache centre. Although these efforts need to be continued, ASN observed that the safety unit has adopted a more critical view of the safety of the site's installations and of the necessary priorities. ASN also observed that the Administrator General's "major commitments" were being implemented in the centre and satisfactorily assimilated by the staff, despite the difficulties sometimes encountered. Particular vigilance will however be required with regard to supervision of service providers, especially given the increasing use being made of subcontracting. ASN observed the vulnerability of the centre's electrical installations. Their renovation is under way and sufficient efforts will be needed if this is not to fall behind schedule.

The construction of new facilities and the renovation of older installations, currently in progress at the centre, will also be a key issue for CEA in the coming years. ASN will continue to exercise close monitoring and control over this point.

b) Saclay centre

The Saclay centre is located about 20 km from Paris in the Essonne *département*. It occupies an area of 223 hectares, including the Orme des Merisiers annex. In 2006, CEA head offices moved from their Paris premises and relocated at CEA Saclay.

This centre has been devoted to material sciences since 2005 and therefore plays an active role in the Saclay plateau development, as part of the Île-de-France master plan for regional development and land planning master plan.

The centre's activities range from fundamental research to applied research in a wide variety of fields and disciplines, such as physics, metallurgy, electronics, biology, climatology, simulation, chemistry and ecology. The purpose of applied nuclear research is to optimise the operation and safety of the French nuclear power plants and to develop future nuclear systems.

The centre also houses an office of the National Institute for Nuclear Science and Technology (INSTN), whose role is training, and two industrial companies: Technicatome, which designs nuclear reactors for naval propulsion systems; and CIS bio international, specialising in medical technologies, especially radioactive marking of molecules, manufacturing of products used in nuclear medicine for therapy and imaging and in vitro medical diagnosis and molecular screening (see point 3.2).

The ASN decision of 15 September 2009 on the authorisations for discharge of gaseous effluents, whether radioactive or not, was approved in 2010 by the ministers responsible for ecology and industry (Government Order of 4 January 2010).

ASN considers that the following points warrant particular attention at the Saclay centre:
– maintaining the nuclear safety performance of the BNIs in a centre focused primarily on non-nuclear activities;
– including nuclear safety in decisions concerning the development of future activities in the centre;
– control of urban development around the centre in a context of development of the Saclay plateau, in connection with the length of service life of BNIs envisaged by CEA.

ASN expects to see progress in safety management at the Saclay centre, which still houses a large number of different installations:
– research reactors (point 1 | 2 | 2): ULYSSE, ORPHÉE, OSIRIS;
– laboratories (point 1 | 2 | 3): LECI;
– irradiators (point 1 | 2 | 5): POSÉIDON;
– effluent and waste treatment facilities (point 1 | 2 | 6: liquid effluents management zone and STELLA project;
– waste storage facilities (chapter 16): solid waste management zone;
– installations undergoing final shutdown or decommissioning (chapter 15): LHA.

In line with this, in 2010, ASN conducted a review inspection on the theme of safety management. Seven ASN nuclear safety inspectors, accompanied by IRSN experts, inspected six BNIs and examined the steps taken by the BNI safety and nuclear material inspection unit (CCSIMN); the logistics, technical and IT support units; the projects, security and safety support department; the centre's management; and the delegated management for nuclear activities at Saclay. More specifically, this inspection allowed verification of the organisation of safety control at the centre and in the BNIs, compliance with regulations and with commitments and authorisations, inclusion of human and organisational factors, and aspects relating to control of services procured externally. Inspection gave rise to a follow-up letter, available on the ASN website, presenting the main

observations made by the inspectors and the requests for corrective action addressed to CEA.

The outcome was that ASN observed the utilisation of control tools that are appropriate for management of the priorities and imperatives relating to nuclear safety on the Saclay site.

However, ASN also observed that the strategy for development of "internal diagnosis" of the safety of installations – in which the installations and nuclear materials security unit plays an important part – remained to be specified and that there appeared to be room for improvement.

As part of this inspection, the inspectors also observed the necessity for tighter control over the process of making commitments to ASN and the associated follow-up.

The inspectors were also of the opinion that the deviation management methodology should be made uniform and that, to achieve this, CEA should establish criteria for identification of safety-related events[1].

Finally, where monitoring of services provided is concerned, ASN noted inconsistent application of procedures issued by the centre regarding assessment of suppliers, but noted that CEA was addressing the matter.

c) The Marcoule centre

The Marcoule centre is the centre of excellence for the back-end nuclear fuel cycle and in particular for radioactive waste. It plays a major role in the research being conducted pursuant to the Bataille Act of 1991 and the Programme Act of 28 June 2006 on the sustainable management of radioactive materials and waste. It houses both civil and defence-related nuclear installations. CEA's two civil installations in Marcoule, ATALANTE (research laboratory) and PHÉNIX (reactor) were called on to make a particularly significant contribution in this field.

The site also houses two other civil BNIs: MELOX (see chapter 13) and CENTRACO (see point 3.6 of this chapter). A third installation, the GAMMATEC irradiator, is planned (see point 3.1).

The move undertaken to develop a closer working relationship between ASN and the authority for defence-related nuclear safety (ASND), with the aim of obtaining a clearer overview of the site, continued in 2010 with the organisation of joint inspections.

It should also be noted that the overall impact assessment for the Marcoule site is under review.

d) Fontenay-aux-Roses centre

All the BNIs in this centre are currently being decommissioned (see chapter 15). Only the effluent and waste treatment facilities are still operating.

e) Grenoble centre

All the BNIs in this centre are currently being decommissioned (see chapter 15).

1|2|2 Research reactors

Experimental nuclear reactors make an essential contribution to scientific and technological research and to supporting operation of the country's nuclear power plants. Each reactor is a special case for which ASN has to adapt its monitoring while ensuring that safety practices and rules are applied and implemented. In this respect, a more generic approach to the safety of installations has developed in recent years, driven by the rules applying to power reactors, especially through the inclusion of operating conditions and classification of associated equipment. This has led to considerable progress on safety. This approach is now used for the periodic safety reviews on existing installations as well as for the design of new reactors.

Despite the ageing of these installations, ASN is keen to ensure that they continue to operate with a high and constantly improving level of safety. Thus, all the installations in operation undergo periodic safety reviews intended not only to ensure that the installations are in conformity with the safety objectives initially set for them, but also to determine any improvements that could be made in order to keep pace with advances in knowledge and available technologies.

a) Critical mock-ups

• MASURCA reactor (Cadarache)

The MASURCA reactor is intended for neutronic studies, primarily on fast neutron reactor cores, and for developing neutron measurement techniques. This installation, for which the last periodic safety review was discussed at a meeting of the Advisory Committee for nuclear reactors in March 2006, has been shut down for conformity work since 2007. However, the work has not yet started, as the licensee hopes to bring down its cost and reassess the lifetime strategy for its reactors. The reactor core was completely defuelled and the installation is being maintained in a safe condition. A certain number of technical solutions selected for reactor renovation after this review have already been the subject of development proposals on which ASN established its position in 2010. In parallel, the operator has decided to continue the service life of this reactor and to build a new storage and handling building. This latter development constitutes a significant modification under the terms of Article 31 of Decree 2007-1557 of November 2007. The request for authorisation for modification of the installation will therefore be the subject of a public inquiry. Restarting will then be subject to authorisation by ASN. This will be on the basis of a review of the safety analysis report and after consultation with the Advisory Committee for reactors.

• ÉOLE and MINERVE reactors (Cadarache)

The ÉOLE reactor is intended for neutronic studies of light water reactor cores. On a very small scale, it can be used to reproduce a high neutron flux using experimental cores representative of pressurised or boiling water power reactors. The MINERVE reactor, located in the same hall as the ÉOLE reactor, is devoted to measuring cross-sections through the oscillation

1. The guide of 21 October 2005 concerning the conditions for notifying and codifying criteria relative to significant events involving safety, radiation protection or the environment, applicable to BNIs and the transport of radioactive materials, requires the defining of the criteria for identifying events relating to nuclear safety.

of samples in order to measure reactivity variations. CEA has expressed its intention to continue with long-term operation of the ÉOLE and MINERVE installations and, in 2007, ASN reviewed the guidelines file of the periodic safety review. The final review file was transferred in February 2010. The meeting of the Advisory Committee for reactors that will consider this review is scheduled for mid-2011.

Based on the conclusions of CEA's consideration of strategic planning regarding the continued operation of these installations, CEA would relinquish operation of these two reactors within 10 years and would retain certain items of equipment to be used in the PHÉBUS installation (BNI 92) as part of the research into "Generation IV" reactors.

b) Irradiation reactors

• The OSIRIS reactor and its ISIS critical mock-up (Saclay)

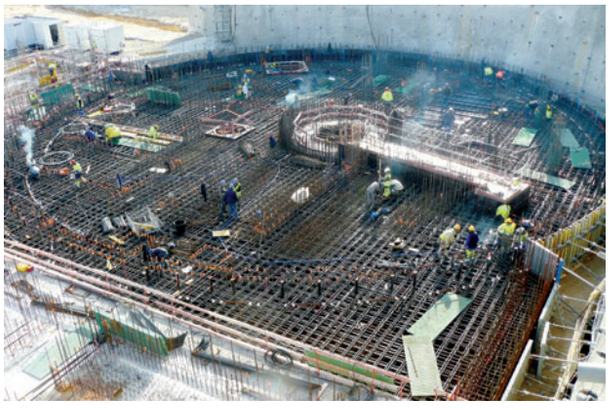
The OSIRIS pool-type reactor has an authorised power of 70 MWth. It is primarily intended for technological irradiation of structural and fuel materials for various power reactor technologies. It is also used for a few industrial applications, in particular the production of radionuclides for medical uses. Its critical mock-up, the ISIS reactor, is today mainly used for training.

CEA, in compliance with the ASN decision of 16 September 2008, will completely shut down operation of the OSIRIS reactor by 2015 at the latest. To continue with operation until that time, it has proposed a programme of renovation and safety improvement works for the installation, implemented by the end of 2010. ASN will rule in the near future on the continued operation of the installation until 2015. This decision will take account of the conclusions of the ongoing analysis of the BNI's safety review file forwarded by the licensee to ASN in 2009.

Since the OSIRIS reactor is part of the chain producing artificial radionuclides for medical uses, in particular technetium 99, ASN felt that the potential repercussions of its shutdown in 2015 needed to be anticipated as early as possible. This is proving to be essential as the events which, in 2008 and 2009, led to the shutdown of other reactors abroad (such as HFR in Petten, Netherlands and NRU in Chalk River, Canada) revealed the vulnerability of the complex production chain for these radionuclides and the risk of problems with supplies to the medical sector. ASN organised a seminar on this subject in January 2009, attended by safety authorities from abroad concerned by the issue and with the participation of health authorities. The seminar led to recommendations addressed to stakeholders (governments, health authorities, the medical sector, industrial operators, etc.) and decisions were made by the safety authorities aimed at improving sharing of information, including feedback on existing or planned installations. ASN is continuing to play an active role in the international initiatives concerning the production of radionuclides for medical uses and ageing of the irradiation reactors.

• The RJH (Jules Horowitz reactor) project (Cadarache)

The construction of a new reactor was deemed necessary by CEA, with the support of a number of foreign partners, in view of the ageing of the currently operating European irradiation reactors, which will be shut down in the medium or short-term.



Installing the reinforcing bars for the upper raft of the Jules Horowitz reactor at Cadarache - October 2010

The RJH will in particular be able to carry out activities similar to those performed today with the OSIRIS reactor. It will however comprise a number of significant changes with regard to both the possible experiments and the level of safety.

Subsequent to the favourable outcome of the public inquiry conducted in 2006 and of the analysis of the initial safety report for the planned installation, the decree authorising creation was signed on 12 October 2009 (gazetted 14 October 2009). After initial earthworks, site preparation and pouring of the first concrete in 2009, civil engineering works continued in 2010 with installation of the paraseismic bearing pads and reinforcement bars and pouring of concrete for the bunker lower bed in May, reinforcement bars and pouring of the upper bed for the auxiliary building in June. Installation of the reinforcement bars and pouring of the upper bed for the reactor building is scheduled for early 2011. The civil engineering work on the site was inspected four times in 2010. No major discrepancies were found. In addition, ASN is continuing its ongoing dialogue with CEA to facilitate monitoring of the measures requested following analysis of the preliminary safety report and in preparation for the review of the future commissioning authorisation application, currently scheduled for 2013.

In 2010 as a complement to the requests and commitments formulated after review of the preliminary safety report for the planned installation, ASN produced draft technical specifications about which the licensee was consulted, in line with the requirements of Decree 2007-1557 of 2 November 2007. These set the requirements for the detailed design and construction phase, thereby stipulating the requirements of the decree authorising the installation's creation.

The concrete-pouring operations for the reactor building upper raft were suspended temporarily in 2010, at CEA's initiative, pending certain elements relative to the design and construction requirements in the pool-raft interface area. The pouring operations for the raft were finally carried out on 14 December 2010.

c) Neutron source reactors

• ORPHÉE reactor (Saclay)

The ORPHÉE reactor, with an authorised power of 14 MWth, is a pool-type research reactor. It is equipped with nine horizontal

channels, tangential to the core, enabling 20 neutron beams to be used. These beams are used as "material probes" to conduct experiments in fields such as physics, biology and physical chemistry. The reactor also has nine vertical channels for the introduction of samples to be irradiated in order to produce radioisotopes or special materials and to carry out analysis by activation. The neutron radiography installation is used for non-destructive testing of certain components. The ORPHÉE reactor went critical for the first time in 1980.

In April 2009, the licensee submitted the file corresponding to the second safety review. The file was examined in 2009 and 2010. ASN will decide shortly on continued operation of the reactor, subsequent to the meeting of the Advisory Committee for reactors held in September 2010.

d) Test reactors

• CABRI reactor (Cadarache)

The CABRI reactor is mainly used for experimental programmes aimed at better understanding nuclear fuel behaviour in the event of a reactivity accident. The reactor is operated by CEA for the purposes of tests designed by IRSN and involving a number of French and foreign partners (nuclear licensees, safety authority technical support organisations, etc.).

For the new research programmes, the reactor's sodium loop was replaced by a water loop. The CABRI reactor will be used to conduct tests to determine the behaviour of high-burn-up fuels in accident situations representative of those which could be encountered in a pressurised water reactor. In parallel with this modification, CEA conducted a safety review of the installation with a view to continued operation for a further twenty years. First criticality of the modified installation and performance of the first experimental test will be two steps that require ASN authorisation. Before doing so, ASN will examine the conditions in which the commissioning tests are to take place and will then ensure that their results confirm the installation's conformity with its safety case. The licensee must therefore have responded satisfactorily to any requests made subsequent to the review of the safety analysis report. In 2009 and 2010, ASN reminded CEA that it must make efforts to transmit the required files early enough so that they can be examined within a time-frame compatible with its scheduling objectives. Most of this work is now completed and examination of the corresponding files was finalised in 2010 with regard to reloading, requalification of the equipment required for reloading and maintaining the installation's safety state after reloading, as well as the associated safety reference. For criticality, examination of the corresponding file is ongoing.

• PHÉBUS reactor (Cadarache)

The PHÉBUS reactor is one of the tools used by CEA to study severe accidents that could affect pressurised water reactors (PWRs) by means of tests designed and financed by IRSN. CEA has announced that it wishes to cease any new programmes with this reactor. Clean-out and decommissioning of the experimental systems used in the last experiment have been continuing since 2004. In July 2010, ASN gave its express agreement to the creation and use of a temporary access in the reactor vessel to facilitate access for this work.

Cutting operation on an item of equipment of the PHEBUS experimental reactor at Cadarache

ASN asked CEA to inform it rapidly of its strategy concerning the future of this BNI, so that the regulation and safety procedures with regard to either decommissioning or a modification of the installation to allow new activities could be initiated. ASN remains attentive to the operations carried out in this installation which may receive some items of equipment from the Eole Minerve installation for research on the "Generation IV" reactors.

e) Teaching reactors

• ULYSSE reactor (Saclay)

The ULYSSE reactor was mainly devoted to teaching and practical work. In February 2007, the installation entered the final shutdown preparation phase. The decommissioning application for the facility, submitted in the summer of 2009, is being examined by ASN.

f) Prototype reactors

• PHÉNIX reactor (Marcoule)

The PHÉNIX reactor, built and operated by CEA jointly with EDF, is a fast neutron demonstration reactor. It is located in Marcoule (Gard *département*). Its construction began in 1968 and first criticality occurred on 31 August 1973. Its initial nominal power of 563 MWth was reduced to 350 Mth in 2002.

On 6 March 2009, the plant was finally disconnected from the grid, mainly as a result of behaviour in the event of seismic disturbance and difficulties in explaining the cause of the negative reactivity trips (AURN) observed in 1989 and 1990. Since then only tests corresponding to end of operation, known as end-of-life tests, have been carried out. The purpose of these tests is to enhance understanding of sodium-cooled fast neutron reactors, with a view to developing "Generation IV" power generating reactors. These tests, subject to ASN authorisation in accordance with decision 2009-DC-0131 of 17 February 2009, also come within the scope of the prototype studies mentioned in article 3 of Act 2006-739 of 28 June 2006 on management of

radioactive materials and waste. The request for authorisation of decommissioning is to be addressed to ASN in the second half of 2011. The decommissioning programme will include, in particular, implementation of a sodium treatment facility. However, prior to the decommissioning decree, preparatory work will be needed in compliance with the current safety requirements.

In 2009 and 2010, ASN attracted the licensee's attention to compliance with safety requirements and, in particular, to performance of periodic checks. The licensee should also be attentive to ventilation management as, notably, the neutronography installation was shut down in 2009 after malfunctioning of its ventilation system. Modification of the neutronography, which was a condition for restarting of the installation, was authorised in July 2010, on condition that the licensee modify certain monitoring parameters. Declassification of areas with regard to waste zoning is also a point requiring vigilance. Lastly, human and organisational factors (HOF) remain an important consideration in the performance of the future reactor decommissioning operations.

1|2|3 Laboratories

a) The irradiated materials and spent fuel assessment laboratories

These laboratories, also called "hot laboratories", are key experimental tools for the main nuclear licensees. There used to be a large number of these laboratories but they are now concentrated in two centres: one, in Saclay, devoted to irradiated materials and the other, in Cadarache, dealing with fuel. From the safety viewpoint, these installations must meet the standards and rules of the large fuel cycle nuclear installations, but this safety approach has to be proportionate to the specific risks.

• Active fuel examination laboratory (LECA) (Cadarache)

LECA is a laboratory carrying out destructive and non-destructive testing on spent fuel taken from various types of nuclear power or experimental reactors and on irradiated structures and equipment from these technologies.

Following its periodic safety review in 2001, an extensive upgrade programme comprising in particular operations to improve the seismic resistance of the civil engineering works, was carried out at LECA. It was to be completed by the end of 2009 with the dismantling of the "U02" building, thus reducing interactions between buildings. However, technical difficulties have led CEA to push back the deadline to the end of 2011.

Given the scale of the renovation work undertaken and the progress made, ASN has indicated that it has no objection to continued operation of the installation nor to implementation of the new safety requirements. CEA has also indicated its intention to extend the duration of LECA operation of the by further increasing the ability to withstand seismic disturbance. This option will be examined during the next periodic safety review in 2013.

• LECA's treatment, clean-out and reconditioning station (STAR) (Cadarache)

The STAR installation, designed to stabilise and recondition GCR spent fuel, also carries out destructive and non-destructive testing of PWR-type spent fuel.

The installation's safety review file was examined in June 2009. ASN indicated that it had no objection to continued operation of the installation and authorised extension of the operating range, allowing CEA to recondition new types of fuels. In addition, ASN is examining the requests for modification of the installation within the scope of CEA' s programmes and notably the VERDON laboratory (study of releases and early deposits of fission products of new fuels).

• Laboratory for research and experimental fabrication of advanced nuclear fuels (LEFCA) (Cadarache)

LEFCA is a laboratory responsible for performing basic engineering studies on plutonium, uranium, actinides and their compounds in all forms (alloys, ceramics or composites) with a view to application to nuclear reactors, the performance of ex-pile studies necessary for the interpretation and understanding of fuel behaviour in the reactor and at the various stages in the cycle, and the manufacture of irradiation test capsules or experimental assemblies.

Continued operation of LEFCA was authorised after a safety review of the installation in 2003.

CEA completed the work to improve the building's seismic resistance in 2010. Regarding the system to prevent the risk of soil liquefaction, the technical investigation of the latest elements provided by CEA does not bring into question the necessity for this work. ASN has made a decision on the technical requirements and requiring implementation of the system before 29 June 2012 (Decision 2010-DC-0186 of 29 June 2010).

• Spent fuel testing laboratory (LECI) (Saclay)

LECI is an installation designed to analyse the various components of spent fuel from nuclear reactors (components of the radioactive material, components of the assembly cladding, etc.), in order to determine how they behave under irradiation.

In June 2004, ASN authorised implementation of the extension of LECI on condition that there is compliance with certain requirements identified after examination of the extension project by the Advisory Committee meeting in April 2004. In 2005, ASN authorised partial commissioning of the LECI extension with full commissioning in 2006. In July 2008, in response to requests and commitments to ASN, the licensee provided the update to the installation's safety report. ASN has issued its judgement on this document. The safety review for BNI 50 is scheduled for 2013. In 2010, ASN carried out four inspections at LECI, covering radiation protection, fire hazard, criticality, periodic checks and testing, and maintenance. ASN did not observe any significant discrepancy.

b) Research and development laboratories

• Alpha facility and laboratory for transuranian elements analysis and reprocessing studies (ATALANTE) (Marcoule)

ATALANTE primarily contains CEA's R&D facilities for high-level radioactive waste and reprocessing. These activities were previously distributed over three sites: Fontenay-aux-Roses, Grenoble and the Rhone Valley.

Final commissioning and the safety review were examined by the Advisory Committee for plants (GPU) in 2007. ASN authorised the installation's final commissioning, accompanying this with certain requirements (decision 2007-DC-0050 of 22 June 2007). As the installation reinforcement work had been carried out, the activity restrictions applied in 2007 were lifted (decision 2009-DC-142 of 16 June 2009).

• The CHICADE installation (Cadarache)

The CHICADE (chemistry, waste characterisation) installation carries out research and development work on low and intermediate level nuclear waste, primarily concerning:
– aqueous liquid waste treatment processes;
– decontamination processes;
– solid waste packaging methods;
– assessment and monitoring of waste packaged by the waste producers.

In March 2007, CEA provided the BNI safety review file. ASN will adopt a stance with regard to this review in 2011.

1|2|4 Fissile material stores

• The central fissile material warehouse (MCMF) (Cadarache)

The MCMF is a warehouse for storing enriched uranium and plutonium. Its main duties are reception, storage and shipment of non-irradiated fissile materials (U, Pu) pending reprocessing, whether intended for use in the fuel cycle or temporarily without any specific purpose.

CEA also informed ASN that it was considering withdrawing all stored material from the installation by 2017. ASN will make known its position as to the acceptability of this proposal in the near future.

• The MAGENTA project (Cadarache)

The creation authorisation decree for the MAGENTA installation, which is intended to replace the MCMF by 2010, was signed on 25 September 2008. Construction of the installation was completed in 2010. ASN will announce its decision regarding commissioning of the installation by a decision in the early part of 2011.

1|2|5 The POSEIDON irradiator (Saclay)

The operating principles of irradiators are explained in part 3.1 of this chapter. The POSÉIDON installation is primarily dedicated to studying the strength of the materials used in nuclear power plants and fuel cycle plants. This installation, which was originally owned by CIS bio international, was incorporated into the CEA BNI inventory at the beginning of 2007. A current issue for this installation is the establishment and implementation of waste zoning, given the specific experiments conducted (long-term irradiation of samples in the source storage pool). Moreover, an event which occurred 20 January 2010 (failure to comply with operating instructions for opening of an irradiation chamber) highlighted a problem in management of access to the irradiation chambers. New measures taken, notably regarding management of the access keys, are such that re-occurrence of such an incident will be avoided. These steps were the subject of in-depth examination during inspection.

1|2|6 Effluent and waste treatment installations

The CEA's effluent and waste treatment and packaging facilities are spread over the Fontenay-aux-Roses, Grenoble, Cadarache and Saclay sites. They are generally equipped with characterisation facilities to enable measurement-based checks to be made on the declarations made by producers of waste and checking of compliance of packaged wastes with their acceptance specifications, prior to their streaming to the appropriate disposal route. The treatment and packaging facilities handle mainly liquid and solid wastes from the CEA centres in which they are located. They may occasionally process waste from other sites (CEA or others) depending on its specific characteristics.

The facilities devoted specifically to storage of waste and spent fuels are dealt with in chapter 16 (point 2).

a) Cadarache centre

The effluent and waste treatment station (STED) processes and packages liquid and solid radioactive waste from the Cadarache centre. Following the periodic safety review of this installation in 1998, ASN authorised continued operation for a limited period. CEA then proposed creating three new installations with a view to carrying out the duties performed by the STED: the Rotonde, for sorting of solid waste, CEDRA, for treatment of a part of the solid waste and AGATE for treatment of liquid effluents. The Rotonde sorting installation has been operational since September 2007 and primarily interfaces between the solid waste producers and the treatment, storage and disposal installations. Since shutdown of the STED's 250-ton compacting press at the end of 2004, some of the solid waste is being sent directly to ANDRA's Aube waste repository, where it is compacted and packaged. At the beginning of 2007, CEA sent ASN a file proposing to provide seismic reinforcement of the part of the installation that houses a 500-ton press (ARCCAD project). The technical details of this project are expected in early 2011. They will be the subject of examination by the relevant Advisory Committee in order to verify that the steps adopted by CEA are adequate.

Processing of liquid effluents contaminated with intermediate-level alpha emitters, referred to as "special" effluents, ceased on 1 July 2005. CEA is transferring these effluents to the liquid effluent treatment station on the Marcoule site (STEL).

In May 2009, CEA submitted to ASN a further application for authorisation to continue operation of the STE until AGATE was able to take over completely in about 2011. The ASN Commission has authorised extension of operation to the end of 2011.

The AGATE installation will provide evaporation treatment of radioactive effluents mainly from the CEA/Cadarache nuclear installations, mostly contaminated with beta and gamma emitters. The file on commissioning of the AGATE installation was examined by the Advisory Committee in the spring of 2010. After this examination, ASN observed that the safety requirements adopted by CEA are satisfactory. However, it asked CEA

to present and justify the strategy adopted for treatment of the concentrates produced by the AGATE installation, taking account of possible difficulties in handling these wastes that may be encountered by the liquid effluent treatment plant (STEL) at Marcoule (the installation currently targeted for treatment of the first concentrates produced by bituminisation). Justifications are required, in particular regarding control of the process of bituminisation of these wastes. Prior to commissioning, CEA will therefore have to demonstrate that it has a route for disposal of these concentrates with time-lines that are compatible with the installation's capacity to store the concentrates.

b) Saclay centre

The solid waste management zone handles treatment and storage of solid radioactive residues produced in the centre by the reactors, laboratories and workshops. This installation provides the interface between the waste producers on the Saclay site and the treatment, storage and disposal installations for this waste. It also recovers waste from small producers (scintillation liquid sources, ion exchange resins) and provides storage of radioactive sources.

In 2009, CEA continued the programme to recover from the fuel assembly blocks the spent fuel elements stored in the solid waste management zone. This programme consists in characterising old containers so that they can be taken to the STAR installation in Cadarache for reconditioning before storage in CASCAD, pending a final solution (reprocessing or disposal).

CEA's current strategy is to reduce the source term present in the installation and primarily maintain the functions to provide the interface between the producers of solid waste and the appropriate disposal channels. At the beginning of 2009, the GPU examined the safety review file for the solid waste management zone. At that time, CEA made a number of commitments, in particular to shut down the installation's waste treatment units within a period of 10 years and, within the same timeframe, to remove the fuel stored in the pool and the fuel stored in the blocks. ASN holds yearly meetings to ensure that the commitments made by the licensee have been honoured. Discrepancies were observed in the planning for implementation of certain commitments. ASN will maintain its monitoring action.

Partially commissioned STELLA facility at Saclay – November 2010

Implementation of the action plan following the incident on 10 September 2007 (a staff member entered a zone classified as "prohibited" for radiation protection reasons, although with no radiological consequences) was finalised during the course of 2009.

The radioactive liquid effluent management zone (STE) collects, stores and reprocesses the low-level aqueous effluents and stores aqueous and organic effluents. The radioactive aqueous effluents are evaporated and then stored in the tanks of the RESERVOIR facility pending treatment. By a decree of 8 January 2004, CEA was authorised to modify the STE by adding the STELLA extension. The progress of the operations, first of all to recover stored legacy effluents awaiting treatment, and secondly to clean out the old installation buildings, are among CEA's priorities, along with pre-commissioning of STELLA. The first operations were performed to recover the organic radioactive wastes stored in tank HA4 and a part of the effluent was removed to the ATALANTE treatment facility. Other operations allowing final draining should take place in the coming two years. In all cases, the decree of 8 January 2004 requires that the tank HA4 and other radioactive effluents contained in the building known as 393 be recovered before the end of 2013.

In 2007, the safety review file for the "former plant" part of the effluent management area and for commissioning of the STELLA extension were presented to the Advisory Committee. The inactive tests (i.e. tests without radioactive materials) were performed for the evaporation process. In 2010, faced with difficulties in qualifying the 12H packages that will result from cementation of concentrates in STELLA, CEA asked ASN for staged commissioning of the STELLA facility. Initially, only the evaporation part will be commissioned. The cementation part will be commissioned when CEA has obtained ANDRA's agreement for package production. ASN has, by ASN decision 2010-DC-0198 of 9 November 2010, authorised staged commissioning of STELLA, under certain conditions.

c) Fontenay-aux-Roses centre

The main function of the radioactive effluent and solid waste treatment station (STED) is storage of solid and liquid waste prior to removal to the appropriate routes. As part of the site clean-out process, in addition to removal of the waste from storage, the STED will act as the support installation for managing the waste generated by decommissioning.

d) Grenoble centre

The effluent and waste treatment station (STED) is continuing with removal from storage and recovery of legacy waste, prior to complete decommissioning of the BNIs on the CEA site by 2012.

1|2|7 Installations undergoing decommissioning

CEA has undertaken the final shutdown and decommissioning of some installations which have reached the end of their lives or whose continued operation is not desired and, more generally, when sites are located in the immediate vicinity of major urban centres (which is the case of the Fontenay-aux-Roses and Grenoble centres, for which the complete delicensing process is under way). These aspects are dealt with in chapter 15.

2 NON-CEA NUCLEAR RESEARCH INSTALLATIONS

The main subjects of interest in 2010 were:
– undertaking of the administrative process linked to amendment of the decree for creation of GANIL with, notably, holding of the public inquiry in June-July 2010;
– signing of a new agreement governing safety of the CERN installations;
– start of examination of the request for authorisation of the ITER installation.

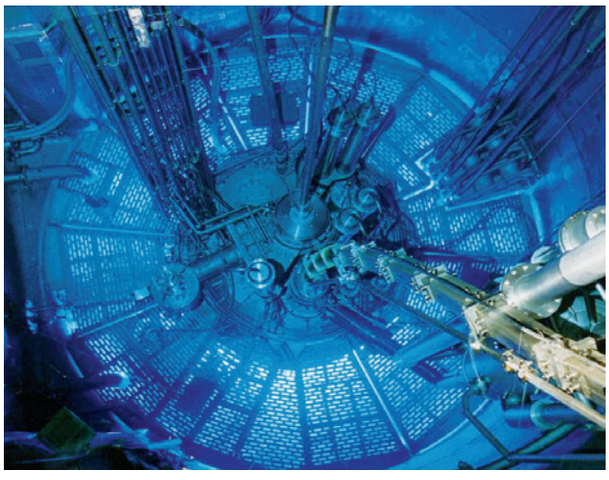
2|1 Large national heavy ion accelerator (GANIL)

The GANIL, located in Caen (Calvados *département*) is designed to accelerate all heavy ions (from carbon to uranium) with maximum energy of 100 MeV per nucleon.

In order to adapt to the requirements of international research, GANIL issued a safety option file in May 2004 for a new project, called SPIRAL 2 (creation of new experimentation equipment and rooms with a more powerful beam). In July 2005, ASN approved the safety options proposed by the GANIL, provided that a certain number of requests were taken into account. At the same time, ASN asked the GANIL to proceed with the periodic safety review of the installation. In order to monitor the progress of these two files (SPIRAL 2 project and safety review), periodic meetings have been held since 2007 between ASN and the GANIL. The preliminary safety report was submitted by the licensee in June 2009; it was updated in October-November 2009 to contain measures concerning the civil engineering. The corresponding public inquiry took place in June-July 2010. The Inquiry Chair's conclusions were given in September 2010. The file on the GANIL safety review will be submitted in the first quarter of 2011, concomitant with the preliminary safety report for SPIRAL 2, phase 2 (utilisation of new radioactive beams).

2|2 The high flux reactor at the Laue-Langevin institute

The high flux reactor (RHF) at the Laue-Langevin Institute (ILL) in Grenoble constitutes a neutron source mainly used for experiments in the field of solid-state physics, nuclear physics and molecular biology. The maximum authorised power for this reactor is 58.3 MWth. The reactor core, cooled and moderated by heavy water, is placed at the centre of a reflector tank, itself immersed in a light water pool.



View of the core of the high-flux reactor at the Laue-Langevin Institute in Grenoble

In 2002, ASN requested major seismic reinforcement work on the installation. Most of this very extensive work was completed by the end of 2007 and was the subject of examination by the Advisory Committee for reactors. In 2010, an initial part of seismic reinforcement work was carried out for the handling crane. In the area of control of radioactive gaseous effluents, ILL introduced a delayed discharge buffer device but additional information is required for the study of the gaseous effluent filtration system which will have to withstand seismic disturbance. The licensee is also planning to install a system to reflood the reactor pool in case of serious accident. The RHF safety report will have to be updated in 2012. A new "operating conditions" method of analysis will be used for this. Finally, with a view to achieving complete delicensing of the CEA Grenoble centre, located in the immediate vicinity of the RHF, ASN asked ILL to examine the long-term future of the RHF on the existing site during the course of the installation's forthcoming periodic safety review, scheduled to take place in 2017.

2|3 The European Organization for Nuclear Research (CERN) installations

The European Organization for Nuclear Research (CERN) is an intergovernmental organisation established on the basis of a treaty between States for the purpose of carrying out purely

scientific and fundamental research concerning high energy particles. The CERN site is located near Geneva, on the Franco-Swiss border.

The safety of these installations is regulated by a convention binding the French Government and CERN. The convention previously in force, which dates from July 2000, stated that certain provisions of French legislation applicable to BNIs apply to the LHC and to the SPS, two rings which make up part of the CERN's installations. It also designated ASN as the French Government representative to deal with technical matters concerning the treaty. ASN also has a seat on the CERN's radiation protection committee, in charge of all radiation protection problems on the site. However, ASN considers that its position with regard to CERN needs to be made clear. Discussions took place in 2009 to update the 2000 convention, after which a new convention was proposed. The new tripartite convention (CERN/ASN/Office Fédéral de la Santé Publique suisse) was signed on 15 November 2010. It covers safety and radiation protection for all CERN installations, both present and future.

The Large Hadron Collider (LHC), helping to push forward research in particle physics (search for the "Higgs boson"), was restarted in November 2009, following shutdown after an incident that occurred within days of its entry into service in September 2008 (helium leak from superconductor magnets). The LHC's power has been increased gradually with the aim of producing proton-proton collisions with a beam energy of 7 TeV.

In 2010, ASN conducted three monitoring visits to CERN, on the subjects of radiation protection, transport and LHC maintenance.

2 | 4 The ITER (international thermonuclear experimental reactor) project

The ITER project concerns an experimental installation, the purpose of which is scientific and technical demonstration of controlled thermonuclear energy obtained with a deuterium-tritium plasma magnetic confinement, during long-duration experiments with a significant power level (500 MW for 400 s). This international project benefits from financial support from China, South Korea, India, Japan, Russia, the European Union and the United States. Cadarache was chosen at the end of June 2005 to host the facility. The international treaty creating the ILE (ITER Legal Entity) was initialled in May 2006 and ratified by all the Parties in September 2007. The Headquarters Agreement between ITER and the French Government, signed on 7 November 2007, was published in the Official Gazette of the French Republic by decree on 11 April 2008.

At the request of ASN – which had noted that the international organisation status of the ITER installation, and in particular the prerogatives linked to the corresponding privileges and immunities, was liable to create problems with respect to the responsibility of the nuclear licensee – it was made clear that, as for other BNIs located in France, there could be no immunity for individuals nor inviolability of premises where nuclear safety and radiation protection inspections are concerned (article 16 of the Headquarters Agreement).

A first version of the creation authorisation application file for the ITER BNI was submitted at the end of January 2008. However, ASN informed the ITER Organization (IO) that its file was unacceptable in its current form and needed to be clarified on a number of points before the creation authorisation procedure and, in particular, before the public inquiry could be initiated. The revised file was submitted to ASN in April 2010 and was examined by ASN. ASN paid particular attention to the inclusion in this file of all of the conditions for satisfactory provision of information to the public, ensuring that only data of a sensitive nature were excluded. Examination of acceptability was started. It is already apparent that IO will have to complete its impact assessment before the public inquiry. The local information committee (CLI), set up in 2009, will be consulted regarding this application file. ASN will convene the Advisory Committees concerned to review this file and will establish its position on the ITER draft creation authorisation decree.

IO aims to obtain the first hydrogen plasma in 2019 and the first deuterium-tritium plasma in 2026. The preparatory site work is underway. The civil engineering works for construction of the BNI buildings are programmed for 2012.

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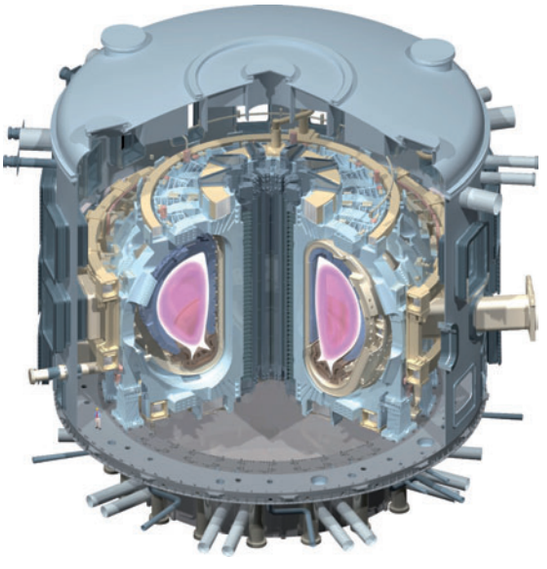

Schematic diagram of the ITER Tokamak

3 IRRADIATION FACILITIES, MAINTENANCE FACILITIES AND OTHER NUCLEAR INSTALLATIONS

The main subjects of interest for ASN in 2010 were:
– safety review of the CIS bio international installation. This examination should continue in 2011. However, it already appears necessary to reduce the radioactive iodine inventory of this installation in order to reduce the potential consequences of a serious accident;
– follow-up to the incident of 22 June 2009 on the IONISOS installation which highlighted failings in access management.

3|1 Industrial ionisation installations

Industrial irradiation facilities provide gamma-ray (mainly cobalt 60 sources) treatment for medical equipment (sterilisation) or foodstuffs. An irradiation facility consists of a concrete bunker inside which the irradiation processes take place.

The sealed sources are placed in a pool inside the bunker. They are remotely and automatically extracted from the pool during an irradiation operation. They are lowered into the pool after the operation and prior to any intervention by the operators in the bunker. There is thus no risk of irradiation inside the bunker. The facilities currently operated are the IONISOS Group's installations situated in Pouzauges (Vendée *département*), Sablé-sur-Sarthe (Sarthe *département*) and Dagneux (Ain *département*) and the ISOTRON Group's installation in Marseilles (Bouches-du-Rhône *département*).

The safety problems mainly concern access management, a point to which ASN is extremely attentive, in particular on the basis of the experience feedback from the operation of similar installations in Europe.

With regard to follow-up on the event that occurred on 22 June 2009 (untimely opening of the access door to an irradiation cell on the IONISOS installation at Pouzauges in the Vendée region), ASN verified, over several inspections in 2010, that the licensee had implemented the immediate measures requested at the end of December 2009, as well as long-term measures such as modification of the locking system of the access door involved.

In June 2006, the ISOTRON France company submitted to ASN a licence application file for the creation of a BNI called GAMMATEC, on the Marcoule site. The decree authorising the creation of this facility was published in the Official Gazette on 27 September 2008. This new facility would be the ISOTRON Group's second in France. At the time of writing, the decision to start construction work on the new installation had not been taken by the licensee.

CLIs were set up in places around the Sablé and Pouzauges sites in 2009 and meet at least once a year. The CLI for the ISOTRON site in Marseille is to merge with that for Cadarache. The CLI for the Dagneux site has not yet been created by the *Conseil Général*[2] for the Ain *département*.

2. *Conseil Général: département*-level elected council

3|2 The radio-pharmaceuticals production facility operated by CIS bio international

CIS bio international is a key player on the French market for radiopharmaceutical products used for both diagnosis and therapy. Most of these radionuclides are produced in BNI 29 at Saclay. The decree authorising CIS bio international to replace CEA in operating BNI 29 was signed on 15 December 2008.

Extensive works for renovation, improvement and adaptation to increasing production needs have been carried out in the installation since 2004. They should be completed in 2011.

The licensee submitted the safety review file at the end of June 2008. However, ASN considered that numerous points in the file needed to be completed and decided accordingly (decision 2009-DC-137 of 7 April 2009). At the end of 2009, the licensee provided the documents requested by the above-mentioned decision in order to consolidate the safety review file. Examination of the file then began. At the start of 2010 it appeared that the content of these documents was not such that ASN could make a pronouncement as to the long-term viability of operation of the installation, notably in the absence of a full and completed examination of compliance. It was therefore decided that the Advisory Committee for plant (GPU) should convene an initial meeting, held on 7 July 2010, to assess the status of knowledge of the installation's safety and to identify priority areas for improvement. A second meeting was also scheduled to conclude on the review file. However, in order to avoid any delay in reducing the radiological consequences that could result from a potential accident, the installation's iodine 131 inventory will be significantly reduced from 2011 onwards.

Furthermore, despite progress in certain areas, ASN considered that the safety management system at CIS bio international still needed to be improved and that the resources dedicated to nuclear safety and radiation protection in BNI 29 were inadequate. It therefore issued decision 2009-DC-145 of 16 July 2009 requiring CIS bio international to remedy this situation. The licensee provided a first version of the file intended to respond to these requirements at the end of November 2009. However, the request for expert examination issued by the committee for hygiene, health and labour conditions (CHSCT) and recent organisational changes have led to amendment of this document. A new version of the file is pending. This subject is covered in the installation's safety review file.

Finally, new requirements on discharges specific to BNI 29 came into force in January 2010.

It should be noted that the public interest group (GIP) for sealed high-activity radioactive sources was the subject of a founding agreement contained in a Government Order of 4 June 2009.

3|3 Maintenance facilities

Three BNIs specifically handle nuclear maintenance activities in France:
– the SOMANU *(Société de maintenance nucléaire)* facility in

Maubeuge (Nord *département*), which specialises in the repair, maintenance and evaluation of equipment taken mainly from PWR main primary systems and their auxiliaries, with the exception of fuel elements. In compliance with the requirements of article 29 of the TSN Act, the licensee has engaged in a process that should lead, by the end of 2011, to providing ASN and the ministers responsible for nuclear safety with an initial report on the ten-year review of the safety of the licensee's installation;

– the clean-out and uranium recovery installation of the *Société auxiliaire du Tricastin* (SOCATRI) in Bollène (Vaucluse *département*) which handles maintenance, storage and clean-out of equipment from the nuclear industry and storage of waste on behalf of ANDRA. Following an uncontrolled discharge on 7 July 2008, the former effluent treatment station was finally shut down, the tanks were drained and closed and the collection tank in question was repaired. On 14 October 2010, the tribunal court of the city of Carpentras declared SARL SOCATRI not guilty of causing water pollution damaging to health or flora and fauna but found it guilty of failing to make a timely declaration of an incident that had occurred in its premises, as required under articles 48 and 54 of the Act of 13 June 2006. The prosecution lodged an appeal against the tribunal's decision and the case will be re-tried. With regard to the consequences of the event on the environment, the broader monitoring programme set up has enabled the following conclusions to be drawn:
– at present there would seem to be no environmental contamination as a result of this incident; however, SOCATRI is required to continue monitoring the groundwater below the site and the River Lauzon with which it communicates;
– in a sector bounded by the Donzère-Mondragon canal and the Gaffière, Lauzon and Rhone rivers, legacy contamination of the groundwater – unrelated to this incident – was identified. About thirty private wells are monitored by AREVA NC.

A study of this contamination conducted by IRSN provided a clearer view of the extent of this phenomenon. The study was monitored by the local information committee for major energy installations (CLIGEET), the departmental directorate for health and social affairs (DDASS) for Vaucluse and by AREVA NC.

The study gave rise to a public meeting on 22 September 2010 in which ASN participated.

This study and the methods and means of providing information that accompany it should take over from the monitoring of private wells currently organised by AREVA NC.

During 2009, the SOCATRI licensee undertook a review of the safety of its installation. It provided ASN with the files in 2010. ASN then began its examination.

In addition, SOCATRI undertook major works to be able to handle effluents generated by preparatory operations for the final shutdown of the EURODIF plant and of the maintenance units for some GBII equipment.

– the Tricastin operational hot unit (BCOT), also in Bollène, which carries out maintenance and storage of contaminated PWR equipment, except for fuel elements. In 2010, the BCOT licensee initiated a periodic safety review of its installation.

3 | 4 Chinon irradiated material facility (AMI)

This installation, located on the Chinon nuclear site (Indre-et-Loire *département*), is operated by EDF. It now primarily carries out examinations and appraisals of activated or contaminated materials from the PWRs.

2006 was marked by a change in strategy on the part of the licensee with regard to the future of the installation. As ASN considered that the renovation project presented in 2004 did not enable long-term continued operation to be envisaged, EDF presented a new strategy, in particular including final shutdown of the installation no later than 2015. In 2008, EDF indicated its aim of commissioning this new laboratory for 2011. Preparatory work began in 2009. If the schedule presented is complied with, the AMI's expert examination and appraisal work will wind down in 2012, and the preparatory operations for decommissioning of the installation will begin.

In 2007, EDF also presented ASN with the measures contemplated to guarantee the safety of the installation until final shutdown. ASN declared itself favourable to implementation of these measures, which included, notably, upgrading of the installation with regard to fire risk (improved sectorisation and fire detection). The corresponding work was completed at the start of 2010. The sorting and packaging operations for the legacy waste from the installation, currently stored in a pit, continued in a dedicated unit. Some of this waste was taken away to the disposal centres.

3 | 5 Inter-regional fuel warehouses (MIR)

EDF has two inter-regional fuel warehouses, on the Bugey site in the Ain *département* and at Chinon in the Indre-et-Loire *département*. EDF uses them to store nuclear fuel assemblies (only those made of uranium oxide) pending loading into the reactor. After reconsideration of the organisation of its supply chain, EDF decided against final shutdown of the Chinon warehouse. The licensee is considering dedicating one of the warehouses to transit of imported fuel assemblies. ASN has asked the licensee consider review of the safety of its installation rapidly.

3 | 6 CENTRACO waste incineration and melting facility

The CENTRACO low-level waste processing and packaging centre, located in Codolet near the Marcoule site (Gard *département*), is operated by SOCODEI.

SOCODEI aims to become a major player in waste processing. It has therefore begun to look at ways of expanding its scope of operations, given the need to reposition itself in the low-level waste management sector, particularly since ANDRA's very low-level waste repository opened. This strategy required amendment of the creation authorisation decree (DAC) and a revision of the discharge and water intake licence (ARPE). Examination of the applications in 2008 led to the signing of an amending decree and then, in 2009, to the publication of decisions concerning effluent discharge and water intake.

In addition, CENTRACO, which was having its effluents treated at the Marcoule centre, wished to create its own effluent treatment plant. As part of the commissioning process for this installation, ASN focused on examination of the performance of this installation with regard to the installation's discharge authorisations.

For its industrial development, the installation is having to handle increasing quantities of effluents from cleaning of EDF steam generators. These effluents have limited radiological activity but significant chemical loading. ASN is particularly attentive to this point and has asked the licensee to introduce specific monitoring of its installation over six months in order to confirm that handling of these new discharges is without impact on the environment.

Other potential changes in the waste accepted and the use of replacement products, allowing reduced consumption of uncontaminated products, are currently being examined.

Concerned by the shortcomings observed in 2008, the ASN's Director-General summoned the CENTRACO Director General in November 2008 to ask him to implement an action plan to remedy the situation. Application of this plan shows an improvement in the management system, which was the subject of enhanced monitoring, notably in the form of ASN inspections. At a second meeting between ASN and CENTRACO's Director General, towards the end of 2010, ASN noted that the licensee had fully assimilated the safety improvement action plan and that management was committed to its implementation.

4 OUTLOOK

The research and other installations regulated by ASN differ widely but are usually small in size. ASN will continue to concentrate on regulating the safety and radiation protection of these installations as a whole and on comparing practices per type of installation in order to choose the best ones and thus encourage operating experience feedback.

ASN is of the opinion that the "major commitments" initiative should be pursued and should be subject to formal six-monthly monitoring by CEA. It is felt that the commitments, by cordoning a limited number of high-stake projects, help to avoid postponement of meeting of commitments for reasons other than those of justifiably unforeseen technical problems. It is important that CEA devote the budgetary and human resources to fulfilling its "major commitments". ASN has, accordingly, asked CEA to pursue this approach, which should lead to improved project management.

In 2011, ASN will continue to focus on management of the civil engineering operations on the construction sites for new installations and on renovation work for existing installations. It will also be attentive to meeting deadlines for transfer of nuclear materials stored in the MCMF or in MASURCA to the new MAGENTA installation.

In 2011, ASN will also continue its monitoring in the field of measures introduced within the framework of CEA's internal authorisations system. Monitoring will cover: the process as a whole; the justification of compliance with the criteria for implementation of the decision; and verification of independence, within CEA, between the applicants, the support services and first and second level inspectors.

Furthermore, ASN will examine the conclusions of the safety review for the ÉOLE and MINERVE installations, programmed by CEA for shutdown within 10 years. The Authority will also examine the safety of the GANIL installation, at the same time as examination of the request for amendment to the decree for the installation, with a view to setting up of a new accelerator. It will complete examination of the safety review file for the CIS bio international radiopharmaceuticals production installation, in order to pronounce on the acceptability of its continued operation in the medium long terms.

ASN will also examine the request for authorisation file for the ITER installation project, which will be the subject of a meeting of members of the Advisory Committee for plants and members of the Advisory Committee for reactors.

ASN will continue its actions relative to commissioning of installations such as STELLA (Saclay centre's effluent treatment plant) or RJH (a research reactor for production of artificial radioelements).

Moreover, in 2011, ASN will examine – via examination of the ASTRID prototype project and work on fourth-generation reactors ("Generation IV") – the operating feedback on experience with fast neutron reactors (PHÉNIX, SUPERPHÉNIX and RAPSODIE, now shutdown), as well as elements requested from the CEA/EDF/AREVA consortium for comparison, in terms of safety, of the different systems.

Finally, in 2011, ASN will continue its actions to foster international harmonisation in the area of safety of research reactors, within the framework of the IAEA's fifth meeting on the Convention on Nuclear Safety, scheduled for 2011 (see chapter 7), as well as in Europe, within the framework of WENRA and the work of the NEA. It will also continue to be an active contributor to consideration, on the international level, of the ageing of installations and the safety of supply of radioelements for medical use.