NUCLEAR RESEARCH FACILITIES AND VARIOUS NUCLEAR INSTALLATIONS

CHAPTER 14

Nuclear research facilities and installations not directly linked to the nuclear electricity generating industry cover all the basic nuclear installations (BNIs) of the civil part of the French Atomic Energy Commission, the basic nuclear installations of other research organisations, and a few other basic nuclear installations which are neither power reactors, nor nuclear fuel cycle facilities.

1 ATOMIC ENERGY COMMISSION INSTALLATIONS

The centres of the French Atomic Energy Commission (CEA) include various basic nuclear installations devoted to research (experimental reactors, laboratories, etc.) as well as support installations (waste storage, effluents treatment plants). Research at CEA includes subjects such as the lifetime of operating plants, future reactors, nuclear fuel performance and nuclear waste.

ASN regulation and surveillance of CEA takes place at several levels:

– working with the General Administrator, ASN verifies CEA's overall compliance with its main undertakings, 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 the safety and radiation protection issues;

– with respect to the protection and nuclear safety division (DPSN) and the general and nuclear inspectorate (IGN), ASN develops a national global approach to "generic" subjects concerning several installations or certain centres; ASN also examines how the DPSN defines CEA's safety and radiation protection policy and assesses internal supervision work performed by the IGN;

– within the CEA centres, and as and when necessary, 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 points of contact are the director of the centre and the head of the installation concerned.

Point 1|1 below lists the generic subjects which marked the year 2008. 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

Through inspection campaigns and analysis of the lessons learned from the life of the installations, ASN identifies generic topics on which it queries CEA. These topics can lead to requests on the part of ASN and possibly to a stance being adopted following review of a file. The subjects of particular interest to ASN in 2008 were the criticality risk, management of installation civil engineering operations, and the consideration given to human and organisational factors and safety and radiation protection management at CEA.

On 2 September 2008, the ASN Commission gave a hearing to the CEA General Administrator, as was the case in 2007. On this occasion, CEA presented the contents of its risk management summary published in June 2008 and ASN explained its assessment of safety at CEA in its annual report, published in April. CEA presented an updated version of its major nuclear safety commitments, officialised in 2007 following a request by ASN.

CEA also presented its organisation and its civil engineering project management actions, related to the new installations currently being built at Cadarache. ASN informed CEA that it considered the steps taken to be positive. It will focus on checking correct implementation, particularly through inspections devoted to the civil engineering aspect. Finally, a certain number of topical points were covered.

1|1|1 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 safety authority, in particular with regard to the decision-making process. CEA therefore presented ASN in 2007 with a list of fifteen major safety and radiation protection commitments.

These commitments in particular include:

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

For the laboratories:
– compliance with ASN requirements following commissioning of ATALANTE and its periodic safety review;
– the renovation work and in particular the seismic reinforcement work on the LEFCA subsequent to its periodic safety review;
– compliance with the deadline for commissioning MAGENTA, designed to replace the MCMF.

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

Compliance with these commitments is regularly monitored by both ASN and CEA: some have been completed or are continuing on-schedule, while others are experiencing technical difficulties. Two commitments concerning the renovation programmes for the "LEFCA" and "MASURCA" facilities are being modified, in particular in terms of scheduling, for purely budgetary reasons. ASN considers that the approach concerning the major commitments is a worthy one, to which no exception should be tolerated. Consequently, it considers the postponement of some of them for budgetary reasons to be unacceptable, as the very purpose of these major commitments is to avoid this type of delay. ASN contemplates enforcing compliance with the commitments according to the initial schedules.

1 | 1 | 2 Internal authorisations

ASN considers that operations taking place in basic nuclear installations (BNIs) for which the nuclear safety and radiation protection stakes are high must require prior authorisation. Conversely, it believes that those operations for which the nuclear safety and radiation protection stakes are non-existent or low should remain the responsibility of the licensee. For intermediate operations, with nuclear safety and radiation protection stakes that are significant, but which do not compromise the safety scenarios adopted for BNI operation or decommissioning, ASN allows the licensee to assume direct responsibility once it has set up a stricter internal inspection system offering sufficient guarantees of quality, independence and transparency. The decision on whether or not to carry out the operations concerned must be formally authorised by the qualified members of the licensee's staff. The corresponding system is referred to as the "internal authorisations system".

This type of system has been in place at CEA since 2002. ASN therefore allowed the CEA Centre directors, with the assistance of the Centre safety units and, as applicable, safety commissions, to apply this "internal authorisations system" to certain operations that were particularly sensitive from the safety and radiation protection viewpoints, but which did not compromise the installation's safety case. The framework of this internal authorisations system and the procedures for updating the safety reference system for the installations concerned, were clarified in two ASN guides (SD3-CEA-01 and SD3-CEA-02).

ASN has been regularly monitoring the system since it entered service and it has proven to be satisfactory. However, ASN considers that CEA must further improve its awareness of the safety issues involved in the various modifications made to its installations. Continued efforts need to be devoted to justifying that the planned operations remain within the framework of the safety case and to ensuring that the various files are consistent with the reference documents and the life of the installation.

The internal authorisations system is now governed by decree 2007-1557 of 2 November 2007 concerning basic nuclear installations and the supervision of the transport of radioactive materials with regard to nuclear safety, and by ASN decision 2008-DC-106 of 11 July 2008 which specifies ASN requirements concerning internal authorisations. Pursuant to Article 3 of this decision, CEA is required to provide ASN by 26 September 2009 with a complete file presenting its internal authorisation system for approval by the ASN Commission.

1 | 1 | 3 Periodic safety reviews

Many current CEA installations began operating at the beginning of the 1960s. These installations, designed to meet former requirements, contain timeworn equipment. They have also undergone modifications on various occasions, sometimes without overall review from the safety standpoint. In 2002, ASN had informed the 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 TSN Act of 13 June 2006. The periodic safety reviews for CEA's installations have been scheduled according to a calendar approved by ASN. Finally, all the installations for which the periodic safety review has not yet been programmed, will need it to be scheduled for no later than 2017 and then every 10 years thereafter.

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 provisions were applied by CEA for the first time in the periodic safety review of the Orphée reactor in CEA's Saclay Centre, for presentation to the Advisory Committee for nuclear reactors in 2009. These measures will be integrated into an ASN decision concerning all BNIs. This decision is currently being drafted.

The recent CEA laboratory periodic safety reviews concerned the Spent Fuel Testing Laboratory (LECI), the Active Fuel Examination Laboratory (LECA) and the ATALANTE installation.

For the LECI, ASN authorised commissioning of the new building in July 2006 and will rule on the end of the start-up phase in 2009.

For the LECA, ASN authorised implementation of the renovated installation's safety reference system in July 2007, following completion of most of the upgrade work. The periodic safety review for the STAR installation, which is part of the BNI, is scheduled for 2009.

Finally, the ATALANTE installation on CEA's Marcoule site underwent a final commissioning in-depth periodic safety review in 2007. Following this review, ASN authorised final commissioning while stipulating additional requirements concerning completion of the seismic conformity work (decision 2007-DC-0050 of 22 June 2007).

For the research reactors, the latest periodic safety reviews concerned CABRI and MASURCA on the Cadarache site.

The CABRI periodic safety review and examination of the modification of its experimentation loop took place in 2004. The upgrade work is in progress and the installation was the subject of three presentations to the Advisory Committee in 2008, including one concerning the driver core. ASN will rule on restart of the renovated installation and commissioning of the new water loop in 2009.

In March 2006, the periodic safety review file for the MASURCA critical mock-up was reviewed by the Advisory Committee for nuclear reactors. In June 2006, ASN authorised the licensee to continue with renovation of its installation in accordance with the presented methodology.

These safety reviews often entail extensive upgrading work in areas where the regulations have changed significantly, in particular compliance with seismic loading requirements, fire protection and containment. ASN supervises all the work and the subsequent post-maintenance qualification procedures, in accordance with principles and a schedule that it itself approves.

1|1|4 Monitoring of sub-criticality

Following significant criticality-related events and failures observed during inspections between 2004 and 2006, ASN and CEA had a large number of exchanges dealing with the organisation of criticality risk prevention within CEA.

In the light of its persistent requests and considering that a closer examination of this issue was required, ASN intensified its surveillance of this subject by carrying out more detailed criticality inspections in the Saclay and Cadarache centres, as well as tasking a third-party expert with an analysis of the criticality risk prevention organisation within CEA installations.

ASN is pleased to note that CEA has clearly grasped the scale of the criticality related stakes by cooperating in the third-party analysis of its criticality risk prevention organisation and requesting an audit from the general nuclear inspectorate on this topic. Significant efforts were made, in particular with respect to staffing of key functions. These efforts must be continued and the organisation consolidated.

1|1|5 Management of sealed sources of ionising radiations

Since 2002, CEA has no longer enjoyed its traditional waiver of the need to obtain a licence to possess and use sources of ionising radiations. In order to ensure a transition towards an ordinary law regime, ASN asked CEA in 2002 to clarify the measures it intended to take to ensure implementation of the requirements of the Public Health Code. During the course of 2003, CEA submitted to ASN proposed arrangements for ionising radiation source management. ASN accepted the general principles of these arrangements.

As of 2004, CEA gradually applied the requirements of its arrangements in its centres. CEA thus sent ASN the source possession and use licence applications for each Centre, and they are currently being examined. At the request of ASN, CEA in 2007 updated the management rules for sources of ionising radiations; these new rules, applicable to all CEA installations, incorporate the regulations currently in force. In 2007, CEA also submitted several individual centre files to extend the sealed source operating life beyond the regulation 10 years. Other more generic files dealing with sources are still to be finalised. These mainly concern updating of the installations safety reference systems and formalising ionising source registration with IRSN.

1|1|6 Revision of water intake and discharge licences

The CEA water intake and discharge licence revision process, initiated under the terms of decree 95-540 of 4 May 1995, is continuing on the basis of the regulations introduced by the decree of 2 November 2007.

Review of the request made by the CEA Saclay centre is continuing. Consultation of the public and of the State's regional departments has now been completed. The ASN decisions scheduled for 2009 should replace the provisions of the 1978 ministerial orders.

Water intake and effluents discharges from CEA's Grenoble site are regulated by the order of 25 May 2004.

Those on the Cadarache site are covered by 3 government orders of 25 April 2006 and orders of the *préfet*[1] dated 12 August and 12 September 2005 allowing consistent regulation of all radioactive and chemical discharges from the Centre. These orders will be revised in 2009 to coincide with the commissioning of new facilities in the centre.

1|1|7 Assessment of seismic hazards

On the occasion of the periodic safety review of the LEFCA installation in 2004, ASN made a number of requests concerning the seismic risk on the Cadarache site. In 2005, CEA presented a programme aimed at enhancing its knowledge of the question, in particular by means of a study of the particular site effects, under the supervision of a steering committee consisting of experts in the field. CEA submitted this study at the end of 2008 and it will be analysed by ASN in 2009.

1|1|8 Management of civil engineering projects

Following a number of problems observed on civil engineering projects, ASN in 2006 asked CEA's General Administrator to conduct a stringent review of CEA's resources and organisation with regard to the civil engineering projects concerning its installations and to submit a plan of action. In 2007, the General Administrator replied to ASN and presented a plan of action to improve the situation. In a letter of 8 February 2008, ASN informed CEA that it considered the proposed changes to be a step in the right direction.

Implementation of the first measures was confirmed during the course of an ASN inspection of the MAGENTA installation construction site on 17 April 2008. The organisation put into place by CEA for construction of the installation and the associated surveillance plan implemented were felt by the inspectors to be satisfactory. Management of anomalies, deviations and non-conformities still however needs to be improved.

ASN will in 2009 be continuing its close watch on the various CEA construction sites.

1|1|9 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.

The design, performance and irradiation authorisation conditions for experimental systems are at present governed by ASN guides, which in particular specify the applicable technical requirements in the light of the stakes involved in placing these systems in the reactor.

In 2008, ASN continued to analyse operating feedback from implementation of these measures, to make it easier for the licensees to conduct new experiments while ensuring that they take place in appropriate conditions of safety.

1|2 Topical events in CEA research facilities

This part only deals with CEA installations still in operation. Installations currently undergoing clean-out and decommissioning are dealt with in chapter 15 while those devoted primarily to storage of waste and spent fuel are covered in chapter 16.

1|2|1 CEA centres

a) Cadarache Centre

The Cadarache Centre is located at Saint-Paul-lez-Durance, in the Bouches-du-Rhone *département*[2]. It employs about 4500 people (all contractors included) and occupies a surface area of 1600 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 18 BNIs, including two for the

1. In a département, representative of the State appointed by the Président.
2. Administrative region headed by a *Préfet*.

industrial operator AREVA (ATPu and LPC), while two others, operated by CEA, 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 design the new generation of systems. The Cadarache centre also takes part in launching new projects and will in particular be home to the Jules Horowitz future experimental reactor. The ITER international facility will be located nearby.

ASN observed significant progress in safety management within the centre. It today considers that its surveillance efforts need to be more specifically focused on:
– upgrading the older installations, in particular surveillance of the renovation work;
– incorporating new data concerning the seismic risk;
– surveillance of new projects and completion of those whose purpose is to replace installations scheduled for decommissioning.

ASN also attaches importance to monitoring the approach adopted by the licensee to improve surveillance of and compliance with its major commitments and the methodology it employs for drafting and choosing its strategic safety orientations.

To ensure early detection and prevention of any potential deviations, ASN also asked CEA to extend the incidents operating feedback analysis it has already performed to all the nonconformities detected on the site.

ASN assesses the safety and radiation protection of the Cadarache centre installations in the light of all the installations of the same type operated by CEA in its other centres. For the Cadarache centre, ASN thus differentiates between:
– research reactors (point 1|2|2): MASURCA, ÉOLE, MINERVE, PHÉBUS, CABRI and the RJH project;
– laboratories (point 1|2|3): LECA, LEFCA, CHICADE;
– fissile material warehouses (point 1|2|4): MCMF and the MAGENTA project;
– effluents and waste treatment facilities (point 1|2|6): STED-STEL and the AGATE project;
– waste storage facilities (Chapter 16): PÉGASE, CASCAD, CEDRA;
– installations undergoing final shutdown or decommissioning (Chapter 15): ATUE, RAPSODIE, HARMONIE, ATPu, LPC.

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 regional development and 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 nuclear applied 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 Techniques (INSTN), whose role is teaching, 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, as well as in vitro medical diagnosis and molecular screening (see point 3|2).

ASN considers that the following points in particular would need to be supervised in the Saclay Centre:
– maintaining the nuclear safety performance of the BNIs in a centre focused primarily on non-nuclear activities,
– including nuclear safety in the decisions taken concerning the development of future activities in the Centre.
– controlling urban development around the Centre, in the context of development of the Saclay plateau, in line with the lifetimes envisaged by CEA for the BNIs in the Centre.

Furthermore, the incident at the end of 2007, in which a worker entered a BNI prohibited area, shows that implementation of the safety and radiation protection policy defined by the General Administrator (2006-208 three-year plan) is far from being complete. ASN thus expects significant progress in safety management in the Saclay centre.

ASN assesses the safety and radiation protection of the Saclay centre installations in the light of all the installations of the same type operated by CEA in its other centres. For the Saclay centre, ASN thus differentiates between:
– research reactors (point 1|2|2): ULYSSE, ORPHÉE, OSIRIS;
– laboratories (point 1|2|3): LECI;
– irradiators (point 1|2|4): POSÉIDON;
– effluents 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.

c) The Marcoule centre

The Marcoule Centre is the centre of excellence for the back-end nuclear fuel cycle and in particular radioactive waste. It plays a major role in the research being conducted pursuant to the Bataille Act of 1991 and the Planning Act of 28 June 2006 on the sustainable management of radioactive materials and waste. It houses 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 one, the GAMMATEC irradiator, is being planned (see point 3|1).

The process initiated in 2007 with a joint in-depth inspection, to ensure a closer working relationship between ASN and ASND in order to acquire a clearer overview of the site, continued in 2008 on the subject of discharges and environmental monitoring. This subject is a particularly topical one for the site, as the discharge licence modification file for the Secret BNI (which currently treats all liquid discharges from the site) is to be submitted in early 2009.

d) Fontenay-aux-Roses Centre

All the basic nuclear installations in this Centre are currently being decommissioned (see chapter 15).

e) Grenoble Centre

All the basic nuclear installations in this Centre are currently being decommissioned (see chapter 15).

1|2|2 Research reactors

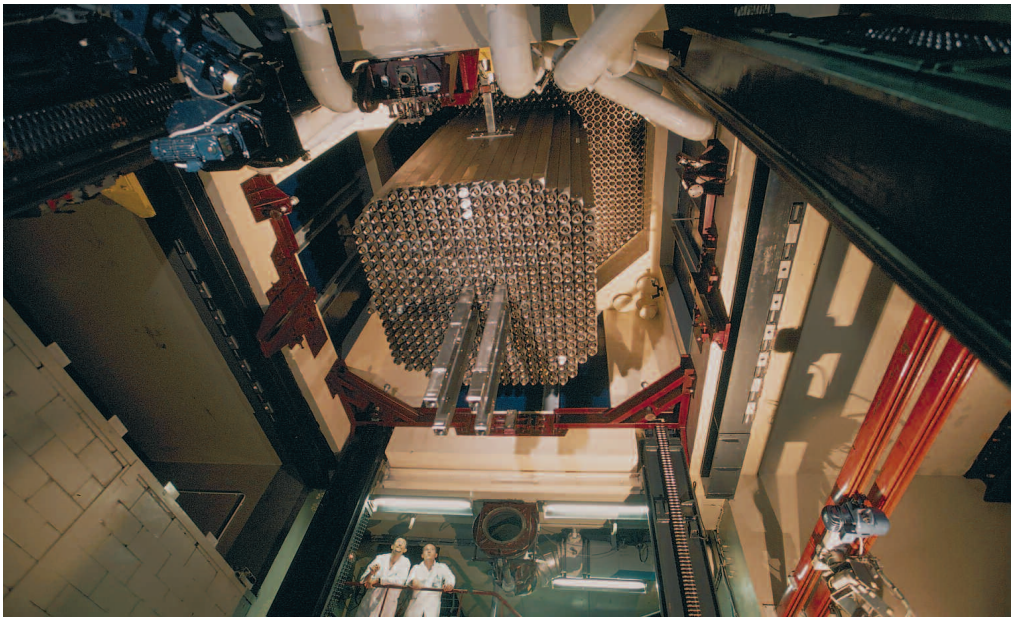
Experimental nuclear reactors make an essential contribution to scientific and technological research and to supporting operation of the country's nuclear power plants. Each one is a special case, for which ASN regulation and surveillance needs to be adapted, while ensuring the development of safety practices and rules. In this respect, a more generic approach to the safety of these installations has been adopted in recent years, based on the rules applicable to power reactors and in particular through the inclusion of operating situations and the classification of the associated equipment, which has led to considerable progress being made in terms of 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. These reviews aim not only to ensure that the installations are in conformity with the safety objectives set for them, but also to determine any improvements necessary to take account of changes in know-how and the 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



Core of the MASURCA reactor at Cadarache (Bouches-du-Rhône *département*)

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, is currently shut down for maintenance work. However, this work has not yet started, as the licensee wishes to revise the estimate of the budget allocated to it. This led to a re-examination of some of the technical options presented in the periodic safety review, while retaining the same safety objectives. The content of this analysis will shortly be presented to ASN, which will remain particularly vigilant in ensuring that the alternatives proposed do not lead to a fall in the level of safety or defence in depth, as compared with the solutions initially adopted.

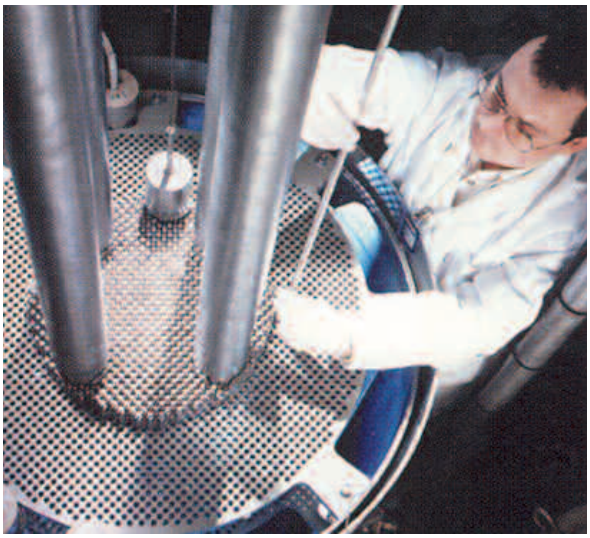
• ÉOLE and MINERVE reactors (Cadarache)

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 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 review has since then been conducted by the licensee and should lead to submission of a finalised file in mid-2009.

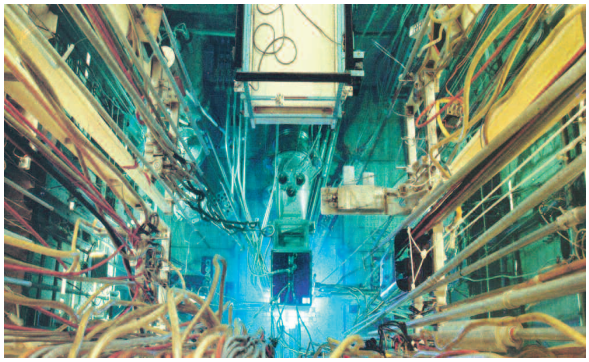
b) Irradiation reactors

• 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 such as the production of radionuclides for medical uses. Its critical mock-up, the ISIS reactor, is today mainly used for training.



Operator working on the core of the EOLE reactor in Cadarache (Bouches-du-Rhône *département*)



View of the OSIRIS reactor pool in Saclay (Essonne *département*)

CEA is committed to finally shutting down the OSIRIS reactor no later than in 2015. To continue with operation until that time, it proposed a programme of renovation and safety improvement works for the installation. ASN gave a favourable opinion to this programme in accordance with the principles and options presented. Nonetheless, in its decision 2008-DC-0113 of 16 September 2008, ASN asked that these improvements be completed before the end of 2010. A periodic safety review file, which will detail these works, should be sent to ASN during the course of the first quarter of 2009.

Finally, shutdown of OSIRIS in 2015 poses the problem of the long-term production of artificial radionuclides for medical uses: the long-term shutdown of the HFR reactor in Petten (Netherlands) combined with the maintenance outage of the BR2 (Belgium) led to shortages in supplies to hospitals, entailing difficulties in the management of medical irradiation. As there are very few irradiation reactors (7 in the world) and they are all ageing (these reactors are an average of 40 years old), ASN and all the foreign safety authorities concerned, jointly with the health authorities, wished to review the conditions for their shutdown and renewal. A seminar was held in France in January 2009 to examine this point. This seminar led to draft recommendations for the stakeholders concerned (governments, health authorities, medical world, industrial operators, etc.) and safety authority decisions regarding improved sharing of information, including the operating feedback from existing or planned installations.

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

With the support of a number of European partners, CEA deemed it necessary to build a new reactor owing to the age of the European irradiation reactors currently in service and their imminent or medium-term shutdown.

Computer generated image of the Jules Horowitz reactor (RJH) project in Cadarache (Bouches-du-Rhône *département*)

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.

Following the favourable outcome of the public inquiry carried out in 2006, ASN convened the Advisory Committee for reactors on eight occasions during the course of 2007 and 2008 for a ruling on the preliminary safety analysis report for the installation project. It issued a favourable opinion for creation of the installation, together with a number of recommendations. In 2009, the ASN Commission will decide on the draft authorisation decree for the BNI.

In 2008, the construction work mainly concerned preparation of the site and of the subsequent building phases (earthworks, roads, preparation of the electricity supply). If the authorisation decree is issued, the first ASN inspections on civil engineering and construction of the installation will take place in 2009.

c) Neutron source reactors

• ORPHÉE reactor (Saclay)

The 14 MWth ORPHÉE reactor is a pool-type research reactor, equipped with nine horizontal fuel channels, tangential to the core, enabling the use of 20 neutron beams. These beams are used as "material probes" to conduct experiments in fields such as physics, biology and physical chemistry.

With the aim of ensuring long-term operation of the reactor, ASN asked for studies to be carried out prior to the installation's periodic safety review. ASN gave its opinion on the guidelines sent to it in 2007. The Advisory Committee should be convened by ASN at the beginning of 2010 to issue a decision on the review file to be transmitted in 2009.

d) Test reactors

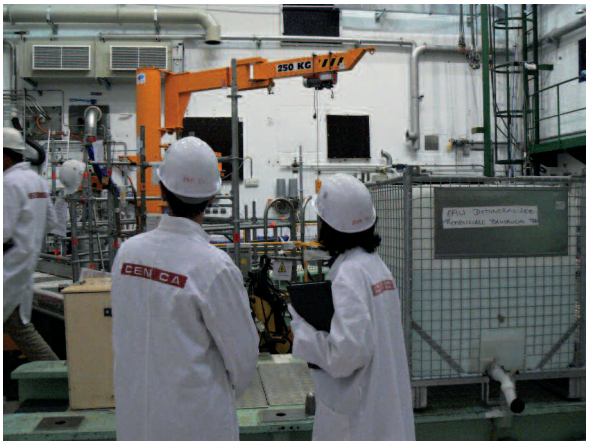
• CABRI reactor (Cadarache)

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

For the purposes of new research programmes, work is under way to replace the reactor's sodium loop by a water loop. The "CABRI water loop" programme is designed to determine the behaviour of high burn-up fuels in accident situations representative of the conditions found in a PWR. The decree authorising modification of the installation was published in March 2006.

CEA also conducted a safety review of its entire installation in order to define the work needed to ensure compliance with current requirements, with a view to continuing reactor operations for about a further twenty years.

ASN regularly monitors the progress of the work which should be completed in 2009, after the initial schedule had been pushed back on several occasions. The Advisory Committee for nuclear reactors met several times in 2008 to express an opinion on restarting the modified installation. The Advisory Committee's opinion should be issued at the beginning of 2009. Before issuing a decision to authorise the resumption of reactor operation and performance of the first experimental test scheduled for 2010, ASN will in 2009 check that its requests have been taken into account and that the results of the acceptance and post-maintenance qualification tests on the various equipment items are such as to ensure that restart takes place in the planned safety conditions.



ASN inspectors inspecting the CABRI reactor in Cadarache (Bouches-du-Rhône *département*)

• PHÉBUS reactor (Cadarache)

The PHÉBUS reactor is one of CEA's tools for the study of possible PWR accidents. The tests carried out were designed and financed by IRSN.

Since the last test in 2004, clean-out and decommissioning of the experimental systems used in the last experiment has been continuing.

IRSN stated its intention of halting the experimental work in this reactor. ASN asked CEA to inform it rapidly of its strategy concerning the fate of this BNI, so that the regulation safety procedures with regard to either decommissioning or a modification of the installation to allow new activities could be initiated.

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. ASN authorised transfer of the training activities to the ISIS reactor.

Once the review of the corresponding application file to be transmitted by the licensee has been completed, the installation will enter the decommissioning phase.

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 rated power is 563 MWth.

The characteristics and performance of this installation are such that it is considered by CEA to be an indispensable tool for the completion of research programmes on plutonium combustion (CAPRA programme) and actinide incineration (SPIN programme). These research programmes come under Articles L.542-1 to L.542-14 of the Environment Code concerning radioactive waste research.

In 2002, following major reactor renovation work, ASN informed CEA that it considered the answers provided on subjects concerning the installation periodic safety review to be satisfactory and that it had no objection to reactor operations resuming at partial power of 350 MWth, for the 6 burn-up cycles still to be carried out (i.e. 720 EFPD). 2008 was devoted to continuation of the experimental irradiation programme and preparation for the end of life tests. The final months of operation will be accompanied by a certain number of "end of life" tests, designed to enhance the store of knowledge on sodium-cooled fast neutron reactor technology with a view to the development of "generation IV" electrical power generating reactors. These tests are also scheduled for the installation prototype studies mentioned in Article 3 of the 2006-739 Act of 28 June 2008 on the management of radioactive materials and wastes.

ASN also considers that the licensee needs to be particularly attentive to the ageing of installation components and to the place given to human and organisational factors (FOH) in reactor operations. In 2008, the number of incidents involving FOH was significant. ASN will be attentive to the corrective action taken by the licensee. This point is particularly important at the time of performing the end of life tests and then at final shutdown and decommissioning of the reactor, which are stages mobilising large numbers of personnel and involving a change in culture. Final shutdown of the reactor is today scheduled for the end of the first half of 2009. The reactor decommissioning plan was sent to ASN in 2008. The

Building housing the PHÉBUS reactor in Cadarache (Bouches-du-Rhône *département*)

PHÉNIX reactor platform in Marcoule (Gard *département*)

decommissioning programme will include the use of installations for processing the sodium from Phénix and possibly other CEA installations.

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 approach has to be proportionate to the risks.

• Active fuel examination laboratory (LECA)

The 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 safety review in 2001, an extensive upgrade programme, in particular comprising operations to improve the seismic resistance of the civil engineering works, was carried out at LECA. It should be completed in August 2009 with the dismantling of the "U02" building, thus reducing interactions between buildings.

Given the scale of and progress in the renovation work undertaken, ASN indicated that it had no objection to continued operation of the installation with implementation of the new safety reference system. CEA also stated its intention of extending the LECA's operating lifetime beyond this date by carrying out additional anti-seismic reinforcement work. This option will be examined at the next safety review.

• The 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 periodic safety review file was sent to ASN at the beginning of 2008 and will be reviewed by the GPU (Advisory Committee for nuclear laboratories and plants) in June 2009. ASN is also examining a large number of requests for modifications to the installation as part of the CEA programmes (rehabilitation of cell 1 and the VERDON laboratory in particular).

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

The 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.

After the installation's safety review in 2005, LEFCA was authorised to continue operations for ten years.

For budgetary reasons, CEA wanted to postpone the seismic reinforcement work on the building and claimed to have new data obviating the need for a system to prevent the risk of soil liquefaction[3] under the installation. ASN considers that the seismic reinforcement work was one of CEA's major commitments and that CEA must therefore comply with it, to ensure that this old installation is rapidly brought into line with the safety level required following the 2003 periodic safety review. In the event of persistent difficulties, this schedule could be imposed by an ASN requirement. With regard to the system for preventing the risk of liquefaction, technical review of the file has so far not revealed any new data that could call the scheduled work into question.

3. When there is a strong earthquake, the shock waves compress the soil faster than the water can escape, thus increasing the water pressure. The greater the rise in water pressure, the more the load is supported by water rather than sand. This is when the soil loses its cohesiveness and begins to flow like a liquid.

Building housing the LEFCA in Cadarache (Bouches-du-Rhône *département*)

• Spent fuel test laboratory (LECI) (Saclay)

LECI is an installation designed to analyse the various components of the 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 pre-commissioning of the LECI extension, subject to compliance with a number of requests resulting from the conclusions of the extension project review by the Advisory Committee for laboratories and plants, which met in April 2004. In 2005, ASN authorised partial commissioning of the LECI extension and then in 2006 its complete commissioning. In July 2008, in order to comply with the requests from and commitments made to ASN, the licensee forwarded the updated installation safety analysis report, a documentary revision based on the LECI initial safety analysis report and the provisional safety analysis report concerning the LECI extension. ASN will be reviewing this document, which marks the end of the modified installation start-up stage.

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 the three Fontenay-aux-Roses, Grenoble and Rhone Valley centres.

In the light of the numerous modifications made to the installation since its creation, ASN asked the licensee to submit a safety review file prior to final commissioning. Commissioning and the safety review were examined by the Advisory Committee for laboratories and plants in 2007 and ASN authorised installation commissioning, albeit with a number of requirements (decision 2007-DC-0050 of 22 June 2007).

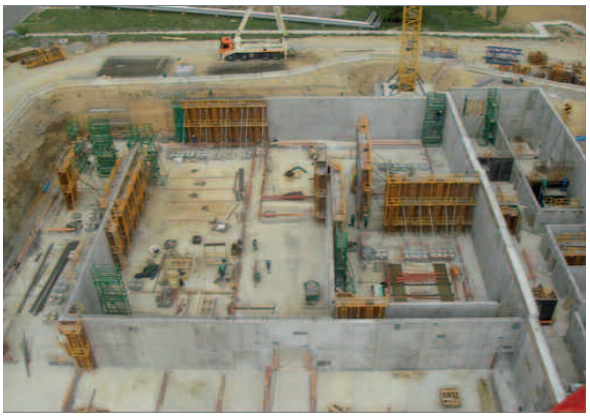
Operator remote-handling radioactive materials in one of the LECI cells in Saclay (Essonne *département*)

ASN considers that CEA has implemented effective surveillance of compliance with the post-Advisory Committee commitments concerning ATALANTE, whether with regard to updating of the safety reference system or reinforcement of the installation.

• 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.

ASN inspectors carrying out an inspection in the ATALANTE facility in Marcoule (Gard *département*)



View of the MAGENTA facility construction site

ASN inspectors carrying out an inspection on the MAGENTA facility construction site

In March 2007, CEA supplied the BNI safety review file. ASN will adopt a stance with regard to this review in 2009.

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.

In 2008, the licensee continued to remove fissile material from storage in the installation, reporting regularly to ASN.

• The MAGENTA project (Cadarache)

In March 2006, CEA submitted an application for the decree authorising creation of the MAGENTA facility, which is to replace the MCMF by 2010. The MAGENTA authorisation decree was signed on 25 September 2008. Construction of the installation is in progress.

1 | 2 | 5 POSEÏDON irradiator (Saclay)

The operating principles of irradiators are explained in part 3 | 1 of this chapter. The POSEÏDON 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.

1 | 2 | 6 Effluents and waste treatment facilities

CEA's radioactive effluents and waste treatment installations are distributed between the Fontenay-aux-Roses, Grenoble, Cadarache and Saclay centres. They are generally equipped with characterisation facilities to enable measurement-based checks on the declarations made by the waste producers and verification of the conformity of the waste packaged with respect to the specifications for acceptance prior to dispatch to the appropriate route. The processing and packaging installations primarily handle the liquid and solid waste generated by the CEA Centre on which they are located. They occasionally process waste from other sites (CEA or others) owing to their specific nature.

The installations devoted specifically to storage of waste and spent fuels are dealt with in chapter 16 (point 7).

a) Cadarache Centre

The effluents 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 1988, ASN had 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 the closure of the STED's 250-ton compacting press at the end of 2004, the waste from this technology is directly routed to Andra's waste repository in the Aube *département*, which compacts the packages. At the beginning of 2007, CEA supplied ASN with a file concerning the continued use of a new 500-ton press in the STED, which will require seismic reinforcement of the installation.

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

ASN authorised continued operation of the STED in 2007, for processing of liquid effluents contaminated with beta-gamma emitters up to 30 June 2009.

This activity will eventually be handled by the AGATE installation.

In 2005 CEA decided to restrict the configuration of the AGATE project, which would then be used to concentrate effluents contaminated by beta-gamma emitters produced in the Cadarache Centre. The concentrates would then be transferred to the Marcoule STEL for final treatment, provided that the STEL safety review does not bring to light any safety problems for the next few years. On this occasion, CEA envisages renovating the Marcoule STEL to take charge of the concentrates from Cadarache in addition to the liquid effluents from Marcoule. The effluents bituminisation process would thus be replaced by a cement encapsulation process, like the process employed in the new STELLA installation at Saclay.

Finally, removal from the ZELORA building in the Cadarache STED of the radioactive organic liquids (LOR) and their final processing in the ATALANTE facility in the CEA Marcoule centre by means of hydrothermal oxidisation treatment, was finalised in the 4th quarter of 2008, following the commissioning authorisation being granted for the LOREA store in ATALANTE.

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 the small producers (scintillation liquid sources, ion exchange resins) and provides storage of radioactive sources.

In 2007, 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, stored in the fuel assembly block, 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 routes. CEA conducted a safety review of the solid waste management zone, which will be assessed by the Advisory Committee for laboratories and plants, with ASN making its standpoint known in 2009. ASN will then adopt a stance on this review.

Following the incident that occurred on 10 September 2007 in the concrete encapsulation cell of the solid waste management zone (a worker entered a radiation protection prohibited area but with no radiological consequences) and the summons of the Saclay centre director to the ASN Commission on 30 October 2007, a plan of action was initiated in order to revise and reinforce safety management. ASN is closely monitoring implementation of this plan of action by CEA and so far considers it to be satisfactory.

The radioactive liquid effluents 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 stored in RESERVOIR tanks 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 commissioning of STELLA.

In 2007, ASN submitted the complete file for the periodic safety review of the "former plant" part and for commissioning of the STELLA extension to the Advisory Committee for laboratories and plants and issued a decision on these subjects at the beginning of 2008. The STELLA inactive tests (without the use of radioactive materials) are currently being finalised. ASN will rule on the commissioning of STELLA in 2009.

STELLA extension building in BNI 35 in Saclay (Essonne *département*)

c) Fontenay-aux-Roses Centre

The main function of the radioactive effluents 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.

In 2008, in line with the available space rationalisation strategy, ASN authorised CEA to use a new VLL waste storage area.

These installations are grouped in the "support" BNI, for which the final shutdown and decommissioning decree was published in 2006 (see Chapter 15).

d) Grenoble Centre

The effluents and waste treatment station (STED) is continuing with removal of waste from storage and recovery of legacy waste, for complete decommissioning by 2012. Furthermore, part of this installation acts as the support installation for storage of the waste generated by decommissioning of the Grenoble site installations prior to removal to the appropriate disposal routes. The installation is also storing containers of sodium and a mixture of sodium and potassium, pending processing. Following a request submitted by CEA in 2006, the final shutdown and decommissioning decree for the STED was published in the Official Gazette on 18 September 2008.

1 | 2 | 7 Installations undergoing decommissioning

CEA is proceeding with the individual shutdown and decommissioning of some installations which have reached the end of their lives or which it no longer requires, and the more general shutdown and decommissioning of sites 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

2|1 Large National Heavy Ion Accelerator (GANIL)

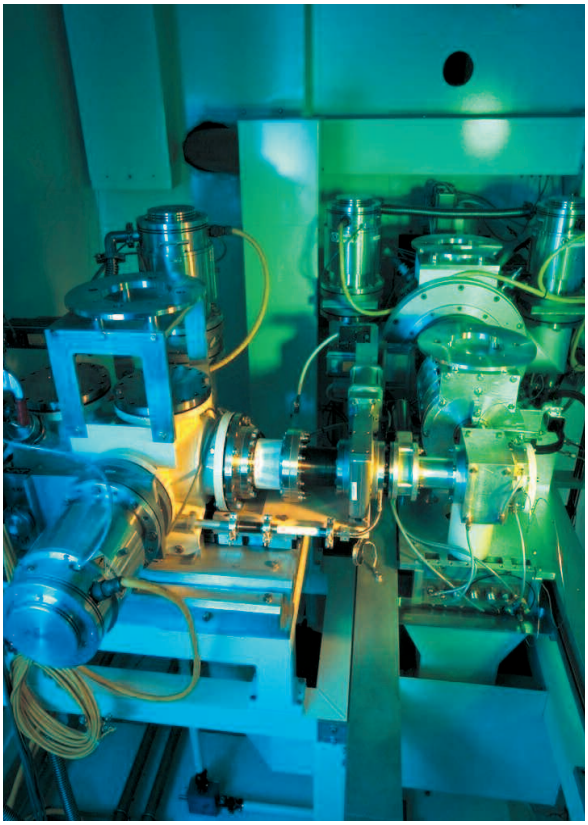
The GANIL, located in Caen (Calvados *département*) is designed to accelerate all heavy ions (from carbon to uranium) with a maximum energy of 100 MeV per nucleon.

In order to adapt to the requirements of international research, GANIL issued a safety options file in May 2004 for a new project, called SPIRAL 2 (creation of new experimentation 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 corresponding files should be submitted by the licensee in 2009. The safety issues at the GANIL mainly concern access control and fire protection.

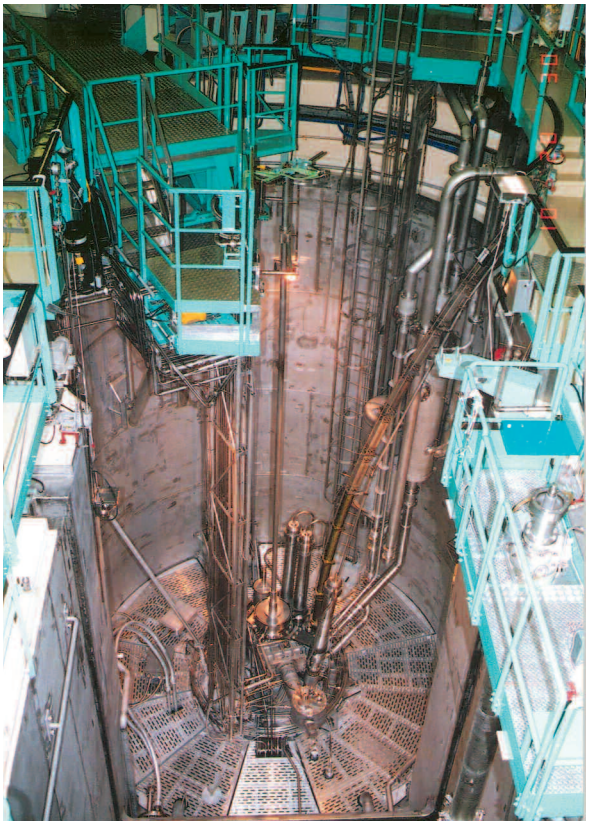
2|2 Laue-Langevin Institute high flux reactor

The high flux reactor (RHF) at the Laue-Langevin Institute 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.

In 2002, ASN asked for seismic reinforcement work on the installation. This extensive work was completed at the end of 2007 and was reviewed by the Advisory Committee for nuclear reactors, after which ASN notified the Institut Laue Langevin that it considered the periodic safety review of the installation, begun in 2002, to be on the whole closed. However, a number of subjects still needed to be finalised, particularly concerning the gaseous effluents system and the heavy water detritiation installations. A project to renovate these installations was sent to ASN for a start of works in 2009, with



Equipment inside the GANIL accelerator in Caen (Calvados *département*)



RHF reactor vessel in Grenoble (Isère *département*), with water drained out

commissioning in 2012. Finally, with a view to achieving complete delicensing of the CEA Grenoble centre, located in the immediate vicinity of the RHF, ASN asked the 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 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 the CERN. The convention currently in force, which dates from July 2000, states 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 designates 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. ASN however considers that the status of its relations with the CERN needs to be clarified.

The CERN has completed construction of a hadron collider (Large Hadron Collider, LHC) which should enable progress to be made in particle physics research (search for the "Higgs boson"), notably by producing proton-proton collisions at a beam energy of 7 TeV. In 2006, the CERN forwarded the LHC safety documents. On this basis, ASN indicated that it had no particular remarks to make concerning the safety of this installation, in a letter of 23 October 2007. The operations preceding commissioning of the LHC began in 2008 (cooling of the accelerator to 1K, collision tests, particularly at low energy levels). The accelerator entered service in September 2008, but an incident occurred just a few days later (helium leak from superconductor magnets). As the repairs were expected to take more than two months, the CERN decided to bring forward the winter shutdown. The machine should be restarted only around summer 2009.

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 with a deuterium-tritium plasma magnetic confinement, during long-duration experiments with a significant power level (500 MW for 400 s). This project is an international one and enjoys financial support from China, South Korea, Japan, Russia, the European Union and the United States.

Computer generated image of the ITER reactor project in Cadarache (Bouches-du-Rhône *département*)

After lengthy negotiations, Cadarache was finally 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 a number of problems with respect to the responsibility of the nuclear licensee, it was made clear that, as with the other basic nuclear installations located in France, there could be no immunity for individuals and there would be complete freedom of access to premises for the purposes of nuclear safety and radiation protection inspections (Article 16 of the Headquarters Agreement).

The ITER BNI authorisation decree application transmitted at the end of January 2008 initiated the creation decree procedure. ASN and its IRSN technical support organisation have begun to review the application. 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 procedure and in particular the public inquiry could be initiated. IO stated that it would forward its revised file during the first half of 2009. The CLI, which is currently being set up, will be consulted on this file. ASN will convene the Advisory Committees concerned to review this file and will adopt a stance on the ITER draft authorisation decree.

The ITER Organization intends to produce the first plasma in 2018. The platform preparation work has started (in particular site clearance and earthworks). BNI civil engineering construction work should not start before mid-2009.

3 IRRADIATION FACILITIES, MAINTENANCE FACILITIES AND OTHER NUCLEAR INSTALLATIONS

3|1 Industrial irradiation 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 installations currently being operated are located in Pouzauges (Vendée *département*), Marseille (Bouches-du-Rhône *département*), Sablé-sur-Sarthe (Sarthe *département*) and Dagneux (Ain *département*).

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

In June 2006, the ISOTRON France company sent ASN a licence application file for the creation of a basic nuclear installation (BNI) called GAMMATEC, on the Marcoule site. This file was submitted to a public inquiry from 22 January to 23 February 2007. After receiving a favourable opinion from the BNI Consultative Committee on 22 February 2008 and from ASN on 31 March 2008, the draft decree authorising the ISOTRON company to create the GAMMATEC BNI was published in the *Journal Officiel* on 27 September 2008. This new installation will be the second one in France for the ISOTRON group, the first being at present operated in Marseille.

3|2 The radiopharmaceuticals 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. CEA, which traditionally operated the facility in the past, has been progressively withdrawing from its operation since 1996. This facility has been gradually acquired by CIS bio International, which is now the operator. CEA however remained the official nuclear licensee for the facility.

In April 2007, ASN gave a favourable opinion concerning the draft decree transferring nuclear licensee responsibility from CEA to CIS bio International (opinion 2007-AV-0023 of 4 April 2007) but in July 2007, CIS bio International asked for the procedure to be suspended, pending the receipt of aid from the authorities for the recovery of used sources. Following the Government's decision in April 2008 to create a public interest grouping for this activity, CIS bio International reiterated its request on 25 July 2008 to receive the status of nuclear licensee for BNI 29 in place of CEA. The decree authorising the change in licensee was signed on 15 December 2008.

Considerable renovation work has also been carried out in the facility since 2004 and the licensee forwarded its periodic safety review file at the end of June 2008. ASN however considers that this file needs to be completed on a large number of points and it has sent CIS bio a request accordingly.

Finally, despite the progress made, through its inspections and through the significant event notifications, ASN observed a drop in safety and radiation protection in BNI 29 operations. This point is being closely monitored by ASN, in particular through quarterly surveillance meetings, in addition to the scheduled inspections.

3|3 Maintenance facilities

Three basic nuclear installations 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;

– the clean-out and uranium recovery installation of the Société auxiliaire du Tricastin (SOCATRI) in Bollène (Vaucluse *département*) which handles maintenance,

SOCATRI incident of 7 July 2008

The incident that occurred in the uranium effluents treatment plant (STEU) in the SOCATRI installation on 7 July 2008 led to leakage of about 20 m³ of uranium effluents outside the storage and leak tanks. Some of this effluents flowed into the rainwater network and then into the la Gaffière river, while some infiltrated the soil of the area undergoing construction work.

Following notification of the authorities on the morning of 8 July, precautionary measures were rapidly taken, jointly with ASN, to protect the population by the préfets of the Drôme, Ardèche and Vaucluse départements. The incident was rated level 1 on the INES scale.

Following an inspection carried out on 10 July 2008 by ASN, the Commission issued two decisions stipulating emergency measures concerning both the safeguarding of the installation and surveillance of the environment (Decision 2008-DC-0104 of 11 July 2008 and Decision 2008-DC-0105 of 11 July 2008). Compliance with the requirements of these decisions was subsequently checked by an ASN inspection on 12 July 2008.

The extensive surveillance of the environment around the site of the incident by means of samples taken by the licensee and by IRSN, provided the authorities with analyses of the surface water, ground water and sediments, enabling them to take the relevant decisions. In the light of the results of these analyses, which were presented to the High Committee for Nuclear Transparency and Security, this incident would seem to have had no consequences for the health of the workers and populations. ASN also had an additional series of samples taken by the BRGM and measurements conducted on water, sediments and aquatic plants by the SUBATECH laboratory of Nantes. The additional samples taken to date show no significant marking of the environment as a result of this event.

After examining a safety analysis report transmitted by SOCATRI, ASN authorised restart of the new STEU. During the first operating phase, priority was given to draining the old storage tanks which caused the incident. In December 2008, the old storage tanks were drained and testing of the new effluents treatment plant is continuing. The purpose of the steps currently being taken by the licensee is to mobilise the personnel with regard to the necessary conformity of the installation with the order of 31 December 1999 and the requirements of the discharge license.

Finally, the available data concerning the causes of this incident led ASN on 31 July 2008 to ask the various BNI licensees for initial operating feedback concerning this incident with regard to their own installations, in particular the condition of the piping (see Chapter 13, point 1|3).

storage and clean-out of equipment from the nuclear industry and storage of waste on behalf of ANDRA;
– the Tricastin operational hot unit (BCOT), also in Bollène, which carries out maintenance and storage of contaminated PWR equipment, except for fuel elements. In 2006 and then in 2007, ASN had asked the BCOT to improve its in-house management of anomalies. In 2008, the inspections performed by ASN revealed that even if the BCOT is now regularly opening anomaly sheets, these anomalies are still not always analysed and processed in full.

3|4 Chinon irradiated material facility (AMI)

This installation, located on the Chinon nuclear site (Indre-et-Loire *département*), is operated by EDF. Its main purpose is now to carry out review and assessment of activated or contaminated materials from PWR reactors.

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 closure of the installation no later than 2015. The studies concerning the construction of a new assessment laboratory were initiated following this new strategy orientation. In 2008, EDF indicated its aim of commissioning this new laboratory for 2011. If the schedule presented is followed, operation of the AMI will gradually come to a halt over the same time-frame and decommissioning of the installation could then begin.

In 2007, EDF also presented ASN with the measures contemplated to guarantee the safety of the installation until final shutdown. ASN declared itself to be in favour of implementation of these measures, which in particular included upgrading of the installation with regard to the fire risk (improved sectorisation and fire detection). The corresponding work began in 2008. Operation of the sorting and packaging unit (ETC) for the installation legacy waste, currently stored in pits, continued in 2008.

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 Indre-et-Loire. EDF uses them to store nuclear fuel assemblies (only those made of uranium oxide) pending loading into the reactor. Accessibility considerations and a just-in-time fuel management policy have led EDF to indicate that it intends to close down the Chinon warehouse in the near future.

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 key 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 a modification to the authorisation decree (DAC) and a revision of the discharge and water intake licence (ARPE). A number of jointly reviewed requests led in 2008 to the signing of an amending decree. ASN decisions concerning discharges and water intake should be taken in 2009.

In order to optimise raw water natural resources, SOCODEI also requested the addition of equipment under Article 26 of the decree of 2 November 2007. This equipment will enable the activity and pollutant load from steam generator washing effluents to be concentrated and part of the raw water replaced by water distilled in this way, with the concentrates then being sent for incineration. Other possible alternatives are also being examined.

The licensee also submitted a request to the Minister for Ecology, Energy, Sustainable Development and Spatial Planning in order to define the conditions for the handling of foreign waste and the reallocation of the processing residues from this waste. ASN issued a favourable opinion regarding the system proposed by the licensee in December 2008.

Against this backdrop, ASN noted that new projects were often developed to the detriment of the daily monitoring of the installation. Concerned by an excessive number of events on the installation, by a certain number of findings during the ASN inspections and by the insufficient quality of the files submitted by CENTRACO, the Director-General of ASN asked the Director-General of CENTRACO in November 2008 to present a plan of action to remedy this situation. A further meeting will take place at the beginning of 2009.

4 OUTLOOK

The research and other installations regulated by ASN differ widely but are usually small in size. ASN concentrates considerable effort 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 encourage operating feedback. These installations include experimental reactors, hot laboratories, accelerators and irradiators, as well as research support installations (material and waste stores, effluents treatment installations, etc.). In addition to CEA, there is a large number of licensees, each operating a small number of installations.

In 2007, ASN noted with satisfaction that CEA had presented it with a tool allowing the highest-level management of the decisions concerning both the upgrading of older installations and the new projects, thus guaranteeing greater transparency and visibility for ASN with regard to the processes liable to delay the projects. This concerns about twenty major commitments, enabling priority focus to be given to those areas where the risk is greatest. This process was consolidated in 2008. However, budgetary concerns led CEA to request the postponement of certain milestones. ASN considers that the major commitments approach is designed precisely to avoid these commitment postponements for reasons other than justified technical contingencies. It hopes that this approach will be a virtuous self-reinforcing one, which implies its rigorous implementation. In 2009, ASN will focus on ensuring compliance with this point.

Furthermore, as a result of concerns expressed by ASN, CEA has initiated a process to control operations relating to civil engineering on its BNIs and criticality in these same installations. The inspections carried out during the course of 2008 showed that CEA had clearly grasped the importance of these subjects in terms of safety. ASN thus considers that CEA has made significant progress. In 2009, ASN will pay particular attention to the management of civil engineering operations on the construction sites for new installations.

Since 2006, CEA has followed a safety policy defined in a three-year safety plan (currently the 2006-2008 plan). In 2008, ASN concentrated on checking that safety, identified as a key priority by CEA, is indeed central to its organisation. ASN noted with satisfaction the existence of contracts stipulating precise safety and radiation protection objectives within the units and at different hierarchical levels, along with the associated resources. Some of these objectives are accompanied by recommendations, tools and training programmes. ASN however considers that the consistency between the various CEA internal contracts (safety, research, industrial) needs to be improved. ASN also considers that the performance of the system needs to be assessed: there is no real safety improvement loop and an effective oversight system should allow regular verification that the safety priorities have indeed been understood and are being implemented in the installations, including by the subcontractors. In 2009, ASN therefore expects CEA to complete the implementation of integrated safety and radiation protection management and the associated oversight tool. ASN is also expecting reinforcement of the CEA general and nuclear inspectorate monitoring duties, with a level of independence enabling it to express at the highest level its assessment of the safety of CEA's installations.

Finally, ASN will in 2009 continue its surveillance in the field to ensure that CEA is taking account of human and organisational factors in its safety management system. Operating feedback in fact shows that this is far from being satisfactory, at a time when major operations such as the Phénix end of life tests and installation final shutdown (PHÉBUS) or restart (CABRI), which demand considerable personnel mobilisation and changes in culture, are in progress.