"Nuclear research facilities and various basic nuclear installations (BNIs)" are all the BNIs covered by the civilian part of the French atomic energy commission, the BNIs of other research organisations, and a few other BNIs which are neither power reactors, nor which take part in the nuclear fuel cycle.

1 ATOMIC ENERGY COMMISSION INSTALLATIONS

The facilities of the Atomic Energy Commission (CEA) Centres include various BNIs (experimental reactors, laboratories). Research is focused notably on the lifetime of operating plants, future reactors, fuel performance and nuclear waste.

The constant changes made to these installations, due to their research functions, require particularly attentive supervision and frequent updating of the relevant safety files. The action of the Nuclear Safety Authority (ASN) may be considered at two levels:

- at national level, it implements an overall approach to "generic" subjects concerning several installations. The person contacted in this context is generally the Head of Nuclear Protection and Safety, assisting the General Administrator of the CEA;
- as required, it reviews the specific safety files of each CEA BNI. In this case, it will mainly contact the manager of the Centre and the head of the installation concerned. Paragraph 1|1 below lists the generic subjects dealt with in 2005. Section 2 describes topical events in the various CEA installations currently operating. The installations undergoing clean-up or dismantling are discussed in chapter 15.

1|1

Generic subjects

By means of series of inspections and analysis of lessons learned from the daily life of the installations, the ASN identifies topics on which it questions the CEA: assessment of seismic and fire hazards and the criticality risk, management of nuclear materials or radioactive waste (see Chapter 16), dismantling of facilities (see Chapter 15), radiological cleanness, definition of accident management reflex stages, electricity supplies, external hazards, discharges from installations, environmental protection, etc.

Generic subjects are regularly discussed by the ASN and the CEA's head office. They can lead to requests on the part of the ASN and possibly to a stance being adopted following review of a dossier. The subjects which particularly attracted ASN attention in 2005 were containment inside BNIs and how the criticality risk is dealt with. A draft guide was produced for the safety reviews conducted on the CEA's BNIs, specifying the investigation procedures and the calendar.

1|1|1

Increased CEA responsibility as a nuclear licensee

In 2003, the ASN informed the CEA that its new organisation was improving the clarity of the responsibilities and duties of the units, in particular with respect to continuity of action, independence of the supervision function and identification of installations assistance function. Furthermore, reorganisation of the head office departments brought safety and radiation protection closer together.

However, the ASN informed the CEA that it was waiting for self-assessment of the effectiveness of the organisational measures taken, in particular through indicators monitoring safety and the correct working of the organisation.

In this context, the ASN considered in 2002 that the Centre managers, with the assistance of the Centre's safety unit and the safety commissions as applicable, should be allowed to authorise certain minor operations which do not compromise the installation safety demonstrations, without requiring formal authorisation from the ASN.

About fifteen installations are currently concerned and the system could be extended to the other installations.

Finally, this approach demands that the CEA keep the safety reference systems of its installations up to date.

These updates should be an opportunity to think about defining broader operating domains than those currently described, in order to allow the necessary changes to these installations, which imply no overall increase in the hazards involved.

In 2005, after close monitoring of initial implementation of this new system in 2003 and 2004, the ASN submitted the first results highlighting the good practices and the areas for progress expected by the CEA. The ASN in this respect considers that the organisation set up by the CEA is such as to guarantee independent analysis of the dossiers submitted by the licensees. However, the ASN does consider the need for greater second level checks on compliance with the requests sent to the installation heads at notification of authorisation by the centre's director. In 2006, the ASN will be particularly vigilant on this point as well as on CEA training of the installation heads in the requirements of this new process.

1 | 1 | 2

Management of nuclear materials and monitoring of sub-criticality at the CEA

Following the Saclay incident on 15 September 2004, the many inadequacies observed during the "criticality" inspections carried out in 2005 and the shortcomings brought to light in the dossiers with a "criticality" aspect transmitted by the various centres, the ASN asked the CEA to conduct a stringent assessment, across the entire CEA, of the organisation put in place to supervise the criticality risk, the action taken as part of the first and second level inspections, the criticality risk training or information given to the licensees and experimentation staff, all the resources, particularly human resources, deployed to deal with the criticality risk and the material resources linked to the criticality detection and alarm network.

The ASN asked the CEA to exercise permanent vigilance to ensure that a high level of competence is maintained with regard to the criticality risk.

1 | 1 | 3

Management of radioactive sources at the CEA

Since 2002, the CEA no longer enjoys its historical special status with regard to source possession licences. Many discussions have been held to determine the conditions for transition to the common system, in particular with respect to the radioactive sources which today should be considered as waste (see chapters 10 and 16). During the course of 2003, the CEA submitted proposals to the ASN concerning its source management organisation in the various establishments, as well as the future of expired or unused sources, and the ASN accepted the general principles.

During the course of 2004 and 2005, the CEA gradually implemented its organisational arrangements in its various centres. The guidelines proposed by the CEA were accepted by the ASN and the source possession and use authorisation applications are currently being finalised. These arrangements were reviewed particularly closely by the ASN in 2005, in particular with regard to regularisation of sealed sources more than 10 years old and verification of application of the new regulatory provisions of the Public Health Code.

1|1|4

Revision of water intake and discharge licences

The CEA's effluent discharge and water intake licence revision process is continuing, under application of decree 95-540 of 4 May 1995 concerning gaseous and liquid effluent discharge and water intake by BNIs. One of the goals in this revision is to reduce the discharge limits to levels consistent with the actual releases from the installations.

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

Regulations concerning water intake and liquid and gaseous discharges from the Cadarache site should be signed in early 2006 concerning its BNIs, its installations under the supervision of the Defence nuclear safety and radiation protection delegate, and its ICPEs respectively.

The effluent discharge and water intake licensing order for the CEA Saclay site should be revised soon.

1|1|5

Safety reviews of former installations

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. At the present time, compensatory provisions are necessary to ensure medium or even long term satisfactory safety conditions at these installations. In certain cases, replacement by new installations even proves necessary; the MAGENTA and CEDRA interim storage projects and the STELLA and AGATE effluent treatment station projects are the result of discussions along these lines (see chapter 16).

The ASN informed the licensees that it considers a safety review of old installations to be necessary about every ten years. The periodic safety reviews for the LEFCA (advanced fuel design and fabrication laboratory) and the experimental CABRI reactor on the Cadarache site were presented to the Advisory Committee (CABRI = advisory committee for reactors, see point 1|2|1) and were monitored in 2004 and 2005. The periodic safety reviews are also in progress at the CEA for the solid waste management zone, the effluent and waste treatment station at the CIS-Bio International facility on the Saclay site, and the MASURCA reactor on the Cadarache site.

The CEA plans to conduct periodic safety reviews on its other installations within the next six years, following a schedule approved by the ASN in 2005. The ASN in 2005 specified its responsibility, content and scheduling requirements for the periodic safety reviews on the CEA installations.

1.1.6

Assessment of seismic hazards

On the occasion of the LEFCA installation periodic safety review in 2004, the ASN submitted a number of requests concerning the seismic risk, particularly to take account of the particular effects on the Cadarache site. In 2005, the CEA presented a study programme designed to supplement knowledge of seismic hazards on the site. These studies will be the subject of annual reports under the aegis of a steering committee comprising experts in this field. The CEA's aim is to provide substantial data in 2008.

1.1.7

Experimental reactor cores and devices

One particularity of the many experimental reactors is the frequent modification of the reactor core configuration and the sometimes only very temporary introduction of experimental irradiation devices into the reactor core.

The ASN focuses particular attention on these operations, owing to the related risks, in particular concerning reactivity control (chain reaction) and the hazard constituted by the fuel elements.

Significant work was done in 2003 on experimental devices. A note stipulating the conditions for the design, production and licensing of these devices was issued by the ASN at the beginning of 2004. This note, which entered into force in July 2004, specifies that safety reviews are required on all experimental devices every 10 years.

With regard to management of the reactor core configuration, the ASN conducted a series of inspections in 2001 and work to improve supervision of the configuration modification operations was carried out by the ASN in 2004.

1.1.8

Research reactor maintenance outages

In 2004, the ASN undertook an initiative to improve monitoring of installations undergoing a prolonged outage for maintenance or renovation work. This initiative led to the preparation of a draft guide submitted to the licensees and should reach a conclusion in 2006.

1.2

Topical events in CEA research facilities

This section deals only with research facilities currently operating. The installations in the clean-up and dismantling stages are dealt with in chapter 15.

1.2.1

Cadarache Centre

The Cadarache Centre is located at Saint-Paul-lez-Durance, in the Bouches-du-Rhône *département*[1]. It covers an area of 1,600 hectares. The main purpose of the units installed there is the industrial appli-

1. Administrative division of the size of a county.

cation of research and development in the fields of power reactors and uranium or plutonium based fuel. It is for this reason that this Centre comprises about twenty BNIs operated by the CEA; some of which (Cabri and Phébus reactors) are used by the IRSN for its research work on safety. The site also comprises a classified BNI.

· Jules Horowitz reactor

The construction of a new reactor is deemed necessary by the CEA in view of the ageing of the currently operating European irradiation reactors, which will be shut down in the medium- or short-term. This new reactor could satisfy CEA research and development needs up to about 2050.

The prime objective of the reactor is the irradiation of materials and fuel, in support of the French nuclear energy programme. Provisions were designed-in, to allow industrial neutron radiography or to enable a new medical technique developed for treatment of cancers, to be installed on the site.

The safety options file for the future reactor was transmitted to the ASN in January 2002. The ASN informed the CEA in August 2003 that it had no objection to continuation of the RJH project, based on the safety options presented and provided that additional requests were taken into account. The CEA is currently continuing with the detailed design of this reactor, for which commissioning is scheduled in 2014. The preliminary safety analysis report for the installation should be transmitted in support of the authorisation decree application, in mid-2006.

· CABRI reactor

The Cabri pool-type reactor is mainly used for experimental programmes aimed at better understanding nuclear fuel behaviour in the event of reactivity accidents.

The IRSN has defined a new research programme, the "CABRI water loop" programme, designed to determine the behaviour of high burnup fraction fuel in an accident situation representative of the conditions encountered in a pressurised water reactor.

For this new programme, in which the sodium loop of the CABRI reactor is to be replaced by a water loop, the CEA filed an installation modification application with the Nuclear Safety Authority at the end of 2002. In parallel with this application, the CEA conducted a safety review of its entire installation in order to define the work needed to bring it into conformity with current requirements, with a view to continuing reactor operations for about a further twenty years. During the inspections conducted for the installation safety review, the CEA in January 2004 brought to light local deterioration of a fuel rod, but which was still leaktight. This event was subject to extensive investigation in order to determine the causes of this damage.

After obtaining the opinion of the Advisory Committee for nuclear reactors, the ASN informed the CEA in July 2004 that it had no objection to continuation of the CABRI water loop programme. Initial work on dismantling the former sodium loop began in mid-2003 and continued in 2004 and 2005. The new water loop is currently being manufactured.

· PHÉBUS reactor

The Phébus reactor, put into service in 1978, is one of the CEA tools for the study of possible PWR accidents.

The "fission product" (FP) experimental programme was set up to study, in a core meltdown situation, fission product behaviour and transport from the PWR fuel to the environment via the reactor primary system and the containment building. Lessons learned from these experiments will enable a better understanding of the consequences of a severe accident for the population and the environment.

The experiments consist in degrading test fuel placed in a leaktight cell in the centre of the Phébus reactor core. Four experiments were carried out between 1993 and 2004.

Phébus reactor overview

In August 2005, the CEA announced its intention to continue operating the installation at reduced levels, pending the results of the investigations by the International Expert Group set up to look at future programmes in the installation and their funding. These results are expected by the end of 2006. This type of operation will require a separate authorisation.

· MASURCA reactor

The Masurca reactor was built for FBR core neutronic studies. It now takes part in minor actinide transmutation research, having been coupled with a particle accelerator, GÉNÉPI.

As early as February 2000, the ASN informed the CEA that it was necessary to conduct a safety review of the reactor, the previous such review dating back to 1988 and several reactor items now being obsolescent. As the CEA had accumulated a considerable delay in the installation's periodic safety review, the ASN informed it that it was no longer in favour of any further experimental programme authorisations. Consequently, priority in 2005 was given to continuing the periodic safety review of the installation and carrying out a certain amount of renovation work. The Advisory Committee for reactors should therefore in March 2006 be reviewing the steps taken to enable MASURCA to operate on a long-term basis.

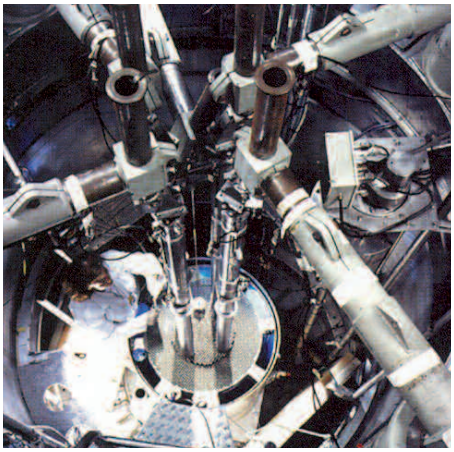
· ÉOLE et MINERVE reactors

The Eole reactor is a host structure for LWR experimental cores. It consists of a reactor block with biological shielding compatible with high neutron flux operation, in which is installed a cylindrical vessel designed to contain different types of core and associated structures.

In 2002, the CEA made technical improvements to Eole's SIREX neutron control cabinets by replacing the conditioning frames to improve their resistance to electromagnetic interference. The CEA plans to initiate the safety review of this facility by the end of 2005.

The Minerve reactor, located in the same bay, is used for cross-section measurement by oscillation of samples.

The reactor was completely unloaded and its pool drained in 2001 in order to renovate the reactor control and instrumentation system. This work ended in late 2002. The reactor was restarted in March 2003.



View of the ÉOLE reactor vessel, empty of water

· CHICADE

CHICADE (chemistry, waste characterization) is a facility for research and development on medium- and low-level waste.

· Enriched uranium warehouse (MCMF)

In 2005, the licensee continued with removal from storage of the fissile materials held in the installation, a process that should be completed in 2009. The ASN in particular observed that the licensee met a significant commitment in achieving an 88% reduction in the total mass of plutonium-bearing material initially stored there.

· Active fuel review laboratory (LECA)

LECA is a laboratory for the destructive and non-destructive review of fuel from FBR, GCR and PWR reactors (notably MOX fuel) and from Cadarache experimental facilities. This installation was commissioned in 1964. In early 2005, the licensee asked for more time to finalise the installation renovation work. In August 2005, the licensee also indicated technical difficulties which would mean postponing transfer of the activities from the units of the "lead" line to the renovated LECA cells, and thus a delay in the beginning of construction of this line.

Given the progress of the renovation work initiated, the ASN authorised continued operation of the installation beyond 21 August 2005, which was the initial date scheduled for the end of the renovation programme. The ASN also required the licensee to transfer the activities from the units of the "lead" line before 1 March 2006.

· Treatment, cleanup and reconditioning station (STAR)

STAR comprises a stabilization and reconditioning station for GCR spent fuel prior to reprocessing and a laboratory for destructive and non-destructive testing of PWR type fuels.

The STAR main building is designed to withstand a safe shutdown earthquake (SMS). It should ultimately take over the testing activities currently performed at the LECA.

· Laboratory for the experimental design and fabrication of advanced nuclear fuel (LEFCA)

The LEFCA is a laboratory designed 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.

In July 2005, the licensee sent replies to the ASN's requests of February 2004, following the installation's periodic safety review. Technical review of these documents, in particular those concerning building reinforcement work, is still in progress. The CEA is continuing to investigate the possibility of bonding strips of carbon fibre material to the elements to be strengthened. Given the currently available data, the ASN does not consider that it is in possession of sufficient information to be able to rule in favour of this process and asked the CEA to opt for other proven, validated processes.

At the end of 2005, the ministers notified the new technical specifications applicable to the installation. The LEFCA was thus added to the list of CEA installations benefiting from the regime of internal authorisations.

1 | 2 | 2

Fontenay-aux-Roses Centre

This centre is currently undergoing dismantling and clean-up (see chapter 15).

1 | 2 | 3

Grenoble Centre

The CEA has decided to stop all research activities in the BNIs on this site. This site is dealt with in chapter 15.

1 | 2 | 4

Saclay Centre

The Saclay Centre is located about 20 km from Paris in the Essonne département. It occupies an area of 200 hectares, including the Orme des Merisiers annex.

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 reactors.

This research work is supplemented by research into radioactive waste management.

The Centre also houses a unit of the INSTN (national teaching institute for nuclear science and techniques) and two industrial companies: Technicatome, which designs nuclear reactors for ship propulsion, and Cis Bio International, which develops and markets diagnostic and radiotherapy products. En 2005, the CEA reorganised its Saclay site: responsibility as nuclear licensee now lies with a director delegate for nuclear safety activities at Saclay. However, nuclear safety and security, particularly in the event of an emergency, remain the responsibility of the Director of the centre.

· CIS Bio International Installation

CIS Bio International is a key player on the French market for radiopharmaceutical products used for both diagnosis and therapy. Since December 2001, CIS Bio International has been wholly-owned by Schering S.A..

In 2004, as a result of the many incidents which had occurred in the previous two years, the ASN kept a particularly close watch on the installation and asked Schering S.A. to draft a plan of action to rectify the situation.

In 2005, the ASN maintained specific vigilance concerning improvements to safety culture and radiation protection, while ensuring compliance with good drug manufacturing practices and pharmaceutical legislation. In mid-2005, the licensee also forwarded a dossier describing the safety options for the installation renovation project. The ASN submitted comments on this dossier, which CIS Bio International will have to consider in the safety analysis report on the renovated installation, to be transmitted during the first half of 2006.

The ASN considers that although the licensee has already made a considerable effort, the future efforts required will be just as demanding. The installation periodic safety review is only just starting

and the incident which occurred in laboratory 1423 in July 2005 shows that CIS Bio International still has some way to go in terms of operational stringency and safety culture. In 2005, the ASN also continued with its investigation of the administrative procedure to transfer nuclear licensee responsibility from the CEA to CIS Bio International.

At the end of 2005, Schering S.A. announced its intention to relinquish ownership of Cis Bio International. The ASN will in 2006 be particularly vigilant regarding continuation of the efforts initiated to improve the safety of the installation, with regard to operation and safety culture, as well as to the pursuit of the current renovation process by the future owners.

· Spent fuel test laboratory (LECI)

The spent fuel test laboratory is an installation designed to analyse the various components of fuels used in nuclear reactors (components of the radioactive material, components of the fuel assembly cladding, etc.), in order to determine their behaviour when irradiated.

The Advisory Committee for laboratories and plants met on 28 April 2004 to review the safety of LECI extension, based on the safety files forwarded by the CEA. Review of these files revealed shortcomings in control of the civil engineering design of the installation, although it does however comply with the requirements of its authorisation decree. Given the small quantity of dispersible radioactive materials that is to be present in the installation, the ASN authorised commissioning of the extension provided that a certain number of requests were taken into account. In 2005, the ASN authorised partial startup of the LECI extension (limited to certain types of samples). In addition, the new technical requirements for the installation will be notified after review of a set of files concerning the safety of the LECI main building.

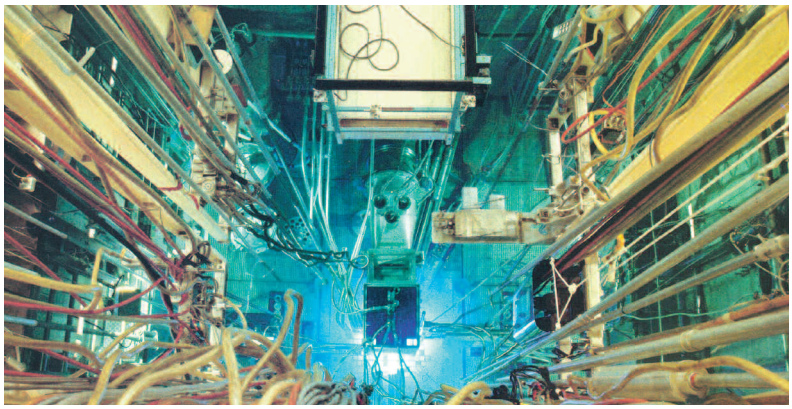
· Osiris and Isis reactors

The 70 MWth pool-type reactor Osiris is mainly used for technological irradiation tests on structural materials and fuels for various types of power reactor (notably PWRs), for the production of radioelements and doped silicon and for the irradiation of specimens for activation analysis. Since the end of 1996, the reactor core has consisted entirely of a new U3Si2Al type fuel.

The Isis reactor is a mock-up of the Osiris core. Its power is limited to 700 kWh and it is designed for neutronic measurements and dose metering. Modification of the reactor I&C system began in 2004 so that it could also be used for training purposes as of autumn 2005.

In 2004 and 2005, the CEA continued with OSIRIS reactor renovation work.

In 2005, the ASN assessed the progress of the steps the CEA was asked to take following the 1999 safety review. The ASN also asked the CEA about the future of the installation, because despite the scale of the renovation work undertaken in recent years and without calling into question the quali-



View of the OSIRIS reactor pool

ty of operation, the ASN nonetheless considers that given the age of the design, operation of the installation cannot be considered beyond the end of the decade.

· ORPHÉE reactor

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 by the Léon Brillouin Laboratory (CEA and CNRS) to perform experiments in widely different fields, such as physics, biology or physico-chemistry.

This reactor is jointly funded by the CEA and the CNRS. Owing to new CNRS budget restrictions in 2003, the facility submitted files to the ASN describing restricted operations up until the end of 2005.

The authorisations allowing this new operating mode were issued at the end of 2003.

In December 2004, the CEA announced that the reactor would return to normal operation in 2006. With the aim of long-term operation by the reactor, the ASN asked for studies to be started in preparation of the forthcoming installation periodic safety review.

Overview of the ORPHÉE reactor installations

· ULYSSE reactor

The Ulysse reactor, with its maximum authorized power rating of 100 kWth, is mainly used for teaching purposes and practical applications. The CEA decided to cease reactor operations at the end of 2006. Training activities will be transferred to the Isis reactor.

1 | 2 | 5

Rhone Valley Centre

The Rhone Valley Centre administratively groups the sites of Marcoule (Gard) and Pierrelatte (Drôme). Non-classified installations represent only a fraction of the installations on these sites.

· ATALANTE

The Atalante installation (Alpha facility and laboratory for analysis of transuranians and reprocessing studies) chiefly comprises CEA research and development resources concerning high level radioactive waste and reprocessing. These activities were previously distributed over three sites: Fontenay-aux-Roses, Grenoble and the Rhone Valley.

In the light of the numerous modifications made to the installation since it was created, the ASN asked the licensee to carry out a safety review.

The inspections conducted in 2005 and the various dossiers transmitted by the licensee highlighted inadequacies in the organisational and human resources deployed by the CEA to ensure that work to strengthen the buildings' seismic resistance was progressing satisfactorily. In particular owing to an incident on the process shielded line, 2005 also confirmed the operational problem already observed in previous years at the interfaces between the department in charge of operating the installation and those in charge of running R&D programmes.

At the request of the ASN, the CEA initiated a plan of action and enhanced the installation safety manning levels. In 2006, the ASN will therefore be particularly vigilant as to the installation's operating conditions and supervision of this manning level enhancement project.

1 | 2 | 6 Phénix reactor

The Phénix reactor, built and operated by the CEA jointly with EDF, is a fast neutron demonstration reactor. It is located near the Marcoule Centre in the Gard départements). Its construction began in 1968 and first criticality occurred on August 31, 1973. Its rated power is 563 MWth.

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

In 2002, following major reactor renovation work, the ASN informed the 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 burnup cycles still to be carried out.

In September 2004, during checks required by pressure vessel regulations, the licensee brought to light malfunctions affecting two of the 12 modules of steam generator no. 3. In the light of the safety

PHÉNIX reactor platform

analyses presented and the reinforced inspection programme proposed by the licensee, the ASN considered that the modules concerned could be kept in service until the next maintenance outage scheduled for April-May 2005. Following a request and additional safety analyses by the CEA, the ASN in March 2005 authorised the CEA to keep the modules provided that supervision was enhanced.

In May 2005, the CEA also submitted its programme for final shutdown and dismantling of the reactor. Decommissioning should begin in 2009 after the six authorised burnup cycles. This programme will include the use of installations for reprocessing Phénix sodium and will in particular rely on experience feedback from Superphénix dismantling.

1 | 2 | 7

Effluent and waste treatment installations

The CEA's effluent and waste treatment installations are spread over the Fontenay-aux-Roses, Grenoble, Cadarache and Saclay sites. They are generally equipped with characterisation facilities to enable 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 routing to the appropriate channel. 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 outside nuclear sites (CEA or others) depending on their specific nature.

The installations devoted specifically to interim storage of waste and spent fuels are dealt with in chapter 16.

· CEA Fontenay-aux-Roses site

The main function of the radioactive effluent and solid waste treatment station (STED – BNI 34 and 73) is interim storage of solid and liquid waste prior to removal to the appropriate channels. As part of the site clean-up process (see chapter D 15), and in addition to removal of the waste from storage, the STED will act as the support installation for management of the waste generated by dismantling and BNIs 34 and 73 will therefore be incorporated into a new BNI known as the support BNI, for which the authorisation decree should be granted in 2006.

· Grenoble site

The effluent and waste treatment station (STED - BNIs 36 and 79) is continuing with removal of waste from storage and recovery of former waste, for complete dismantling by 2010. This installation will from now on also be the support installation constituting the interim storage facility for the waste generated by dismantling of the Grenoble site installations (see chapter 15) prior to removal to the appropriate disposal channels. The installation also stores containers of Na and NaK, pending reprocessing.

· Cadarache site

The function of the effluent and waste treatment station (STED-Cadarache) is to treat and package liquid and solid radioactive waste. Following the STED-Cadarache periodic safety review in 1998, continued operation was authorised for a limited period, initially compatible with the time needed to create replacement installations, particularly AGATE for management of liquid effluent and CEDRA and the ROTONDE ICPE for solid waste management. The delay in progress of the new installation construction work meant that the CEA had to look at interim solutions for managing the solid and liquid waste on the Cadarache site.

With regard to solid waste processing, the 250-ton waste compacting press was shut down in 2004 and the waste, which had previously been treated using this technology, is now taken directly to ANDRA's Aube repository, where the packages are compacted. The CEA's deliberations concerning its overall solid waste management strategy will include a decision on whether or not to continue to use the 500-ton press. If yes, work would probably be needed to increase its earthquake resistance. The ROTONDE ICPE, scheduled for mid-2007, will primarily constitute the interface between the waste producers and the treatment, storage and disposal installations.

With regard to liquid effluent management, treatment of intermediate level "special" alpha effluent was stopped on 1 July 2005. The CEA envisages transferring this effluent to the liquid effluent treatment station on the Marcoule site (STEL). However, under the terms of the agreement between the Delegate for Nuclear Safety and Radiation Protection for National Defence Installations and Activities (DSND) and the ASN, concerning transfers of radioactive materials and waste between BNIs and classified BNIs, these transfers may only take place after authorisation by the DSND which is the competent authority for the Marcoule STEL. This authorisation will in particular depend on whether the CEA can demonstrate compatibility between the scope of operation of the STEL and the nature of this effluent.

The CEA also asked the ASN to postpone the shutdown of bg liquid effluent treatment until the AGATE facility is commissioned. The ASN will make a decision on this request in 2006, after reviewing the STED's updated safety reference system. The ASN decision will also take account of the CEA's actions in 2004 and 2005 to make a significant reduction in the source term present in the installation's storage tanks.

With regard to the AGATE project, the CEA presented a new strategy in 2005, which casts doubt on the initial project. Given the redefined needs of the Cadarache centre in terms of future production of liquid effluent, which would have led to initial over-sizing of the project, the CEA decided to restrict the configuration of the AGATE project. According to the CEA's current strategy, AGATE would, for a period of several years, pre-concentrate the bg effluent produced in the Cadarache centre, with the pre-concentrates then being transferred to the Marcoule STEL, which would handle final treatment before packaging. This strategy presupposes that the Marcoule STEL, for which the periodic safety review is scheduled for about 2007, would pose no safety problems in the coming years. The CEA then envisages renovating the STEL or creating a new installation at Marcoule to receive the pre-concentrates from Cadarache and the liquid effluent from Marcoule and for which a cement encapsulation process would replace the current bituminisation process.

According to the ASN, technical and regulatory review of the AGATE project should only be started if the CEA can provide certain guarantees that there is a long-term disposal channel for the pre-concentrates to be produced by AGATE. The decision will be taken jointly with the DSND's services.

Finally, evacuation and final treatment of the radioactive organic liquids from the ZELORA building in BNI 37, remains an ASN priority.

· Saclay site

The solid waste management zone (BNI 72) handles treatment and interim 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, interim storage and disposal installations for this waste. BNI 72 also recovers waste from the small producers (scintillation liquid sources, ion exchanger resins) and provides interim storage of radioactive sources. In 2005, the CEA continued the programme for recovery of spent fuel elements stored in fuel assembly block (PRECIS). This programme consists in characterising old containers, stored in the fuel assembly block, so that they can be taken to the STAR installation for reconditioning before interim storage in CASCAD, pending a final solution (reprocessing or disposal).

The 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. A periodic safety review will shortly be carried out on BNI 72.

The radioactive liquid effluent management zone (STE - BNI 35) collects, stores and treats the low-level aqueous effluent and stores aqueous and organic effluent. The radioactive aqueous effluent is evaporated and stored in RESERVOIR tanks pending treatment. Decree 2004-25 of 8 January 2004, authorised the CEA to modify the STE-Saclay by adding the STELLA extension to it.

In 2006, The Advisory Committee for Plants will rule on the safety of the "former plant" part of BNI 35 and on commissioning of the new STELLA extension facility.

In parallel with commissioning of STELLA, the CEA must set itself priorities including, first of all, recovery of former effluent stored pending treatment, and secondly, clean-up of the older buildings in the installation.

STELLA extension building – BNI 35

2 Non-CEA nuclear research installations

2|1

Electromagnetic radiation laboratory (LURE)

The Electromagnetic radiation laboratory (LURE), in Orsay (Essonne), is an installation producing synchroton radiation (high-power X-rays) for a wide variety of research applications.

In June 2002, the licensee announced its intention to cease operation of the facility at the end of 2003, apart from the autonomous use of the CLIO laser. The decommissioning phase began in early 2004. The facility's first ring (ACO ring), built in the 1960s, is now included on the "supplementary" list of industrial historical monuments.

2 | 2

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.

The CIRIL6 radiobiology laboratory was started up in autumn 2003. In May 2004, the GANIL submitted the safety options file for the SPIRAL 2 project (creation of new experimentation rooms with a more powerful beam). The ASN approved the safety options proposed by the GANIL, provided that account was taken of the comments made concerning the dossier in July 2005. At the same time, the ASN asked the GANIL to proceed with the periodic safety review of the installation.

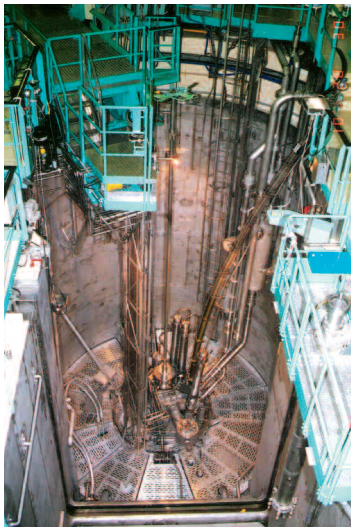
2 | 3

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 and nuclear physics. Maximum authorized power for this reactor is 583 MWth. The reactor core, cooled and moderated by heavy water, is placed at the centre of a reflector tank, immersed in a light water pool.

In 2002, the ASN asked for seismic reinforcement work on the installation. This work is still in progress and should continue until 2007.

The installation's liquid and gaseous effluent discharge authorisations are also being revised.



View of the RHF vessel, empty of water

2 | 4

European Organization for Nuclear Research (CERN) installations

The European Organization for Nuclear Research (CERN) is an intergovernmental organization 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 French legislation applicable to BNIs applies to the LHC and to the SPS, two rings which make up part of the CERN's installations. It also designates the DSIN (now the DGSNR) as the French Government representative to deal with technical matters concerning the convention. The ASN also has a seat on the CERN's radiation protection committee, in charge of all radiation protection problems on the site.

The CERN is currently working on setting up a hadron collider (Large Hadron Collider, LHC) which should enable progress to be made in particle physics research, notably by implementing proton-proton collisions at a beam energy of 7 TeV. The LHC is installed in the tunnel of the Large Electron-Positon (LEP) which has been dismantled. The work on the LHC site is continuing and LHC commissioning is scheduled for 2007.

2 | 5

The ITER *(International Thermonuclear Experimental Reactor)* project

The ITER project is 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. After lengthy negotiations, Cadarache was finally chosen at the end of June 2005 to host the facility.

The ITER Legal Entity (ILE), which is to be the licensee, is currently being set up. On this subject, the ASN pointed out that although it had no particular concerns regarding nuclear safety, it would nonetheless keep a close watch on the ILE's ability to assume fully its responsibilities as nuclear licensee, without enjoying excessive protection through its diplomatic immunity status.

In February 2002, the CEA, which should play a major role in the French side of the ILE, began technical dialogue with the ASN by presenting the safety options file for the future BNI. The ASN considered that the safety options for the installation were acceptable. However additional requests were made, primarily concerning management of the beryllium risk (chemical toxicity), the radioactive waste and the tritium inventory. This technical dialogue continued in 2004 and 2005. The CEA's aim is to draft the preliminary safety analysis report for this installation in 2006.

The regulatory procedure authorising such an installation should begin in 2007.

3 IONISERS, MAINTENANCE FACILITIES AND OTHER NUCLEAR INSTALLATIONS

3 | 1

Industrial ionisation installations

Industrial ionisation installations provide gamma-ray (mainly cobalt 60 sources) treatment for medical equipment (sterilization) or foodstuffs. An ioniser consists of a concrete bunker inside which the ionisation processes take place. The sources are placed in a pool inside the bunker. They are remotely and automatically extracted from the pool during an ionisation operation. They are then lowered into the pool whenever a licensee has to intervene. There is thus no risk of irradiation inside the bunker.

Such facilities have been installed at Pouzauges, Marseille, Sablé-sur-Sarthe and Dagneux.

3 | 2

Maintenance facilities

Three BNIs specifically handle nuclear maintenance activities in France. They are:
- the SOMANU (nuclear maintenance company) facility in Maubeuge (Nord *département*), specializing in the repair, servicing and appraisal of equipment, mainly from PWR primary coolant systems and auxiliaries, but excluding fuel elements;

- the cleanup and uranium recovery installation of the Tricastin service company (SOCATRI) in Bollène (Vaucluse *département*) which handles maintenance, interim storage and cleanup 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 interim storage of contaminated PWR equipment, except for fuel elements.

In 2004, the SOMANU was authorised to extend the active parts interim storage building in its Maubeuge facility. In an order dated 16 February 2005, it was authorised to call in an outside laboratory for the measurements specified in its radioactive effluent discharge licence.

The surface treatment facility, located in the non-nuclear part of the SOCATRI installation at Bollène, gave rise to groundwater pollution by hexavalent chromium in 1998. The cleanup operations, required by order of the Prefect on 26 November 1998 and consisting in pumping the groundwater for depollution by ion exchange resin treatment, are still proceeding, until the thresholds set by the above-mentioned order are reached.

The discharges and water intake by the SOCATRI company were regulated by an order of 16 August 2005. The file presented by the operators was the subject of a public inquiry, which started on 15 February and ended on 23 March 2001. The procedure and in particular the public inquiry showed no reason to oppose the various applications.

3 | 3

Chinon irradiated material facility (AMI)

This installation, located on the Chinon nuclear site (Indre-et-Loire *département*), is operated by EDF. It is mainly used for review and appraisal of PWR fuel elements and activated or contaminated materials.

During the course of 2004, EDF specified the options of the installation's safety reference system with regard to its operation following renovation. EDF in particular made a commitment to significantly reducing the inventory of radioactive materials present in the installation, to cease all reactor fuel element appraisal work and to confine the remaining inventory in a new building meeting current safety standards. The work on this renovation project, including construction of the new building and renovation of the old one, should begin in 2006 and be completed towards the end of 2007.

While approving the planned work to improve short-term safety, the ASN considers that the renovation project presented by EDF only allows continued operation to be considered for a short period and asked EDF for its position concerning the long-term future of the installation before starting the work.

Removal of the unused fuel being stored also continued at a satisfactory rate in 2005, leading to a significant reduction in the radiological inventory. This process should be completed during the first quarter of 2006. The former waste for which there is no disposal solution, is for its part repackaged and safely stored in the installation.

3 | 4

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 man-

agement policy have led EDF to indicate that it intends to close down the Chinon warehouse in the near future.

3 | 5

CENTRACO waste incineration and melting facility

The CENTRACO low-level waste processing and packaging centre (BNI 160), located in Codolet near the Marcoule site (Gard), is operated by the SOCODEI company.

SOCODEI has 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 VLL waste repository opened. This strategy requires modification of the creation authorisation (DAC), revision of the SOCODEI water intake and effluent discharge licence (ARPE) and ASN approval of the new CENTRACO safety reference system. So that the necessary additional studies can be carried out to enable it to expand the scope of operations of its installation, SOCODEI initially asked for a five-year postponement in startup of the installation. This extra time will be used for technical and regulatory review of the simultaneous modification of the DAC and the ARPE. Given the nature of the modifications envisaged by SOCODEI, the dossiers will be subject to a public inquiry.

4 Outlook

The operators of nuclear research installations find themselves in a particular situation: on the one hand, they must comply with stringent constraints to satisfy safety requirements and, on the other hand, they must satisfy researchers seeking increasingly flexible working conditions.

In this context, and at the request of the ASN, the CEA has in recent years set up a system of internal authorisations which enables it to assume more fully its responsibility as nuclear operator for minor operations which do not compromise the installations' safety demonstrations. This system of internal authorisations was approved by the ASN in 2002 and gradually extended. The aim is eventually for it to cover most CEA installations. More generally, and along the same lines, the ASN in 2005 looked at issues linked to organisational and human factors in nuclear research installations, and defined future procedures for this field, particularly by ensuring that the licensees learn the lessons from installation operating experience.

The ASN has a mixed opinion of how the CEA operates its installations. It considers that the CEA needs to take better account of nuclear safety and radiation protection priorities upstream of its investment budget decisions, and develop its internal capacity for assessing the safety of its installations. The ASN also believes that the CEA needs to progress further in reviewing the safety of its installations, with respect both to review preparation - by providing the ASN with a more reliable forecast of the future of the installations - and to compliance with the ten-yearly frequency of these reviews. Finally, the CEA must exercise greater stringency in meetings its commitments to the ASN, particularly with regard to improving the safety of the older installations.

The ASN also continued its work to provide a regulatory framework, especially in the form of guides. It finalised the periodic safety review guide for the CEA's BNIs, prepared a draft guide for monitoring research reactor core maintenance outages, which should be finalised in 2006, and prepared a draft guide for research reactor core management.

Finally, 2005 was marked by decisions to create new public research installations, primarily ITER. The ASN, with its technical support organisation the IRSN, will be in charge of reviewing the nuclear safety and radiation protection aspects of the authorisation procedures for these installations.