





## Nuclear research facilities and various nuclear installations

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

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

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

The CEA centres comprise various BNIs devoted to research (experimental reactors, laboratories, etc.) and their support facilities (waste storage facilities, effluent treatment stations, etc.). Research at CEA focuses on areas such as the lifetime of operating power plants, future reactors, nuclear fuel performance and nuclear waste.

Point 1 | 1 below lists the generic subjects which marked the year 2012. Point 1 | 2 describes topical events in the various CEA installations currently operating. The facilities currently undergoing clean-out or decommissioning are dealt with in chapter 15 and those devoted specifically to the storage or treatment of waste and spent fuels are covered in chapter 16.

### 1 | 1 Generic subjects

ASN identifies generic subjects via inspection campaigns and analysis of lessons learned from operating experience, and consults CEA on these topics. This process can lead ASN to issue requests or to adopt a position after examination of the relevant file. Generic subjects on which ASN focused in 2012 were:

- the continued integration of experience feedback from the Fukushima Daiichi accident;
- the management of civil engineering works in installations under construction or being renovated;
- the progress of CEA's major commitments (see point 1 | 1 | 2).

During the course of 2012, ASN called the CEA to hearings concerning:

- the actions conducted as part of the experience feedback from the Fukushima accident and in particular the preparation of the reports on the stress tests on the CEA facilities and the definition of the "hardened safety cores" and associated requirements;
- the monitoring of dossiers with major nuclear safety and radiation protection implications concerning certain facilities (removal from storage at MASURCA, recovery of legacy waste from BNI 56, creation of the DIADEM storage facility, delays in the completion of ongoing decommissioning work, planned modification of the organisation in how certain facilities are run, etc.) ;
- the results of risk control for the year 2011.

### 1 | 1 | 1 Experience feedback from the Fukushima Daiichi accident

In the wake of the Fukushima Daiichi accident, ASN launched a stress tests approach for the civil nuclear facilities, with priority being given to the power reactors.

The approach consisted in assessing the safety margins of these facilities with respect to their baseline requirements concerning the earthquake, flooding and loss of electrical power or cooling hazards, or a combination thereof (see pages specifically dealing with "Fukushima").

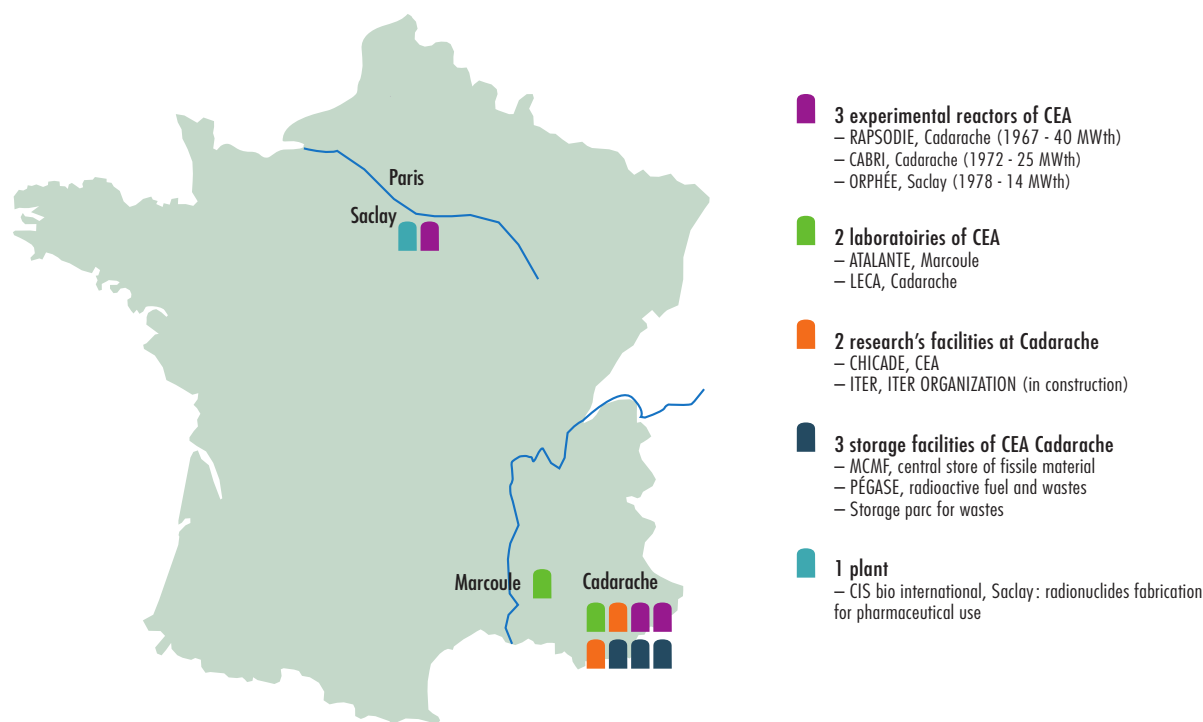
On 5th May 2011, ASN issued resolution 2011-DC-0213 instructing CEA to proceed with stress tests on certain of its BNIs in the light of the accident which occurred at Fukushima Daiichi. Resolution 2011-DC-02116 required the same of the Institut Laue Langevin (ILL) for the High Flux Reactor (RHF) in Grenoble.

For CEA's four priority experimental reactors - OSIRIS, PHÉNIX, MASURCA and the Jules Horowitz Reactor (RJH) – as well as for the RHF, ASN issued additional requirements in the light of the conclusions of the stress tests, in its resolutions of 26th June 2012.

In addition to the common request applicable to all BNIs, for the definition and implementation of a "hardened safety core" of material and organisational measures to control the fundamental safety functions in extreme situations, the main requests concern:

– for the CEA reactors:

- no later than 31st December 2013, the removal of the fissile material from the MASURCA facility to a facility with a satisfactory seismic design, as CEA had promised to do on several occasions;
- improvements to the facilities concerning the flooding or sodium fire control risk, for the PHÉNIX reactor;
- improvements concerning the loss of cooling risk for the OSIRIS reactor;
- improvements concerning the risks of flooding and loss of cooling and the behaviour in the event of an earthquake, for the Jules Horowitz reactor.



– for the ILL:

- the creation of new emergency management rooms during the 2013-2014 winter outage and of several new systems to allow emergency cooling and mitigation of radioactive releases.

The stress tests process continued in 2012 for a second batch of facilities considered to be lower priority, including CEA research facilities – CHICADE, LECA, MCMF, CABRI, ORPHÉE, ATALANTE – the ITER thermonuclear fusion facility and the CIS bio international plant producing pharmaceutical radionuclides in Saclay. The “support functions”, in other words the material or organisational means common to all the BNIs, on the Cadarache and Marcoule sites, which include secret BNIs (INBS), will also be assessed.

## 1 | 1 | 2 Management of nuclear safety and radiation protection at CEA

ASN monitors management of safety at CEA at several levels:

- working with the General Administrator, ASN verifies CEA's compliance with its major commitments, in particular with regard to planned new facilities, upgrading of older facilities and waste management, especially in terms of compliance with the specified time-frames, and handling of safety and radiation protection issues in CEA's overall management;
- with respect to the Nuclear Safety and Protection Division (DPSN) and the General and Nuclear Inspection Division, ASN is developing a national global approach to “generic”

subjects concerning several installations or several centres; ASN is also examining how the DPSN defines CEA's safety and radiation protection policy and assesses internal monitoring work performed by the General and Nuclear Inspection Division;

- with respect to 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. Its main points of contact are the manager of the Centre and the head of the installation concerned.

In December 2012, ASN carried out an inspection of the CEA DPSN in order to examine the steps taken nationally by CEA to ensure compliance with its commitments and with the ASN requirements. ASN notes that CEA has no predetermined criteria for identifying the responsible party (site manager/central level) authorised to issue a commitment with respect to ASN. ASN considers that CEA needs to improve its system for monitoring commitments and requirements, to ensure compliance with them within the specified time-frame.

## 1 | 1 | 3 Monitoring of CEA's major commitments in nuclear safety and radiation protection

In 2006, ASN stated that it wanted to see rigorous monitoring of CEA's commitments in safety and radiation protection, by

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

Of the twelve commitments remaining in the updated list of July 2012, six should be carried out within the planned times.

The most significant schedule delays concern the Cadarache site:

- removal from storage of the non-araldited fuels in the PÉGASE facility (BNI 22) which has been delayed notably owing to the incident on 5th March 2012 (the motorised hoist fell from the handling crane);
- the removal of radioactive waste from the storage yard (BNI 56) on the Cadarache site; CEA will in particular be defining a new deadline for recovery of the carbon steel drums;
- commissioning of the AGATE effluent treatment station (BNI 171).

Finally, the major commitment concerning removal from storage of the fissile material of the MASURCA reactor was the subject of a requirement from ASN further to the stress tests performed (see point 1 | 1 | 1).

CEA formally reports to ASN on compliance with these commitments at regular meetings.

The results of the five years of application of this system show several positive points. It allows targeted tracking of priority actions, which have a clearly set deadline. Any extension to the deadline must therefore firstly be duly justified, and secondly be discussed with ASN. This latter point could nonetheless be improved, as CEA does not always provide ASN with all the information necessary for assessing the situation.

## 1 | 1 | 4 Periodic safety reviews

Many current CEA installations began operating in the early 1960s. The equipment in these installations, of older design, may now be timeworn. Furthermore, it has been subject to modification on several occasions, sometimes without any overall review of its safety. In 2002, ASN informed licensees that it considered a review of the safety of the older installations to be necessary every 10 years. This provision is now written into the TSN Act on “Transparency and security in the nuclear field” of 13th June 2006 (now codified in books I and V of the Environment Code by order 2012-6 of 5th January 2012). The periodic safety reviews for CEA’s facilities have been scheduled according to a calendar approved by ASN. All of the facilities are to be reviewed by 2017 at the latest, then every 10 years.

In general, the periodic safety reviews often entail extensive upgrading work in areas where safety regulations and requirements have changed significantly, in particular regarding earthquakes, fire protection and containment. ASN oversees all the work and requalification procedures, in accordance with principles and a schedule that it itself approves. Finally, further to the periodic safety reviews, ASN can define requirements, as provided for by the TSN Act.

In 2012, ASN began to examine the periodic safety review file for the PHENIX reactor. It also examined the methodologies adopted by CEA for the forthcoming periodic safety reviews of LECA, LECI and LEFCA, scheduled for 2013.

With regard to the EOLE and MINERVE facilities, ASN notes that the periodic safety review was not examined in satisfactory conditions in 2011, given that CEA had not determined any strategy regarding the future of these facilities and that certain justifications concerning seismic behaviour had not been forwarded, despite repeated undertakings to do so on the part of CEA. The additional data required was finally transmitted by CEA in the summer of 2012. It will be examined in 2013.

## 1 | 1 | 5 Management of sealed radioactive sources

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

Since 2007, CEA has also submitted several application authorisation files per centre, to extend the sealed source utilisation period beyond the regulation 10 years. The administrative situation of all the sources requiring an extension of their utilisation time was in order by the end of 2011.

Finally, in 2010, CEA forwarded its used sealed source management strategy, which was presented to the Advisory Committee in 2012, within the more general framework of the strategy for management of radioactive wastes and effluents produced by CEA’s civil nuclear installations. It would appear that CEA has defined recovery and disposal solutions for all the sources under its responsibility, which is satisfactory. However, ASN points out that the disposal routes will only be effectively created once certain authorisations are obtained for the use of packaging or storage facilities, and subject to the availability of certain transport containers.

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

The water intake and discharge licenses for CEA Fontenay-aux-Roses are regulated by ministerial orders dating from 1988. The obsolescence of these texts, which do not take account of changes to the status of the existing BNIs, their activities and the resulting modifications to the discharges, led ASN to ask CEA in resolution 2012-DC-0259 to submit a water intake and discharge requirements modification file no later than 31st December 2012.

With regard to the Marcoule site, the liquid discharges from the civil BNIs are currently being treated by the INBS, except for CENTRACO which has its own treatment facility and its own outlet discharge pipe. In 2012, CEA was authorised to continue to discharge liquid and gaseous effluents and to intake and consume water for the operation of the Marcoule INBS. It should be noted that the water intake by the INBS also supplies all the nuclear facilities on the Marcoule platform.

## 1 | 1 | 7 Taking account of seismic hazards

ASN devotes constant attention to the consideration of the seismic risk. This risk is especially re-assessed during the



periodic safety reviews conducted on each facility, in order to take account of scientific progress in characterising the risk and of changes in the design rules.

In response to an ASN request for a more extensive understanding of the seismic risk at the Cadarache centre, CEA proposed a method for taking particular site effects into account, developed under “CASHIMA”, a study programme conducted jointly with the ILL (Institut Laue Langevin) in Grenoble and involving several international partners and experts. This approach has brought progress, particularly in understanding the geological environment of the Cadarache site, but its implementation needs to be clarified, in order to be operational and allow the dimensioning of the facilities. ASN has encouraged CEA to pursue the ongoing actions.

At the same time, an overall assessment of integration of the seismic hazard is continuing on the Marcoule site.

In addition, a study at the Cadarache nuclear site of the general resources that would come into play in the event of an earthquake, established by CEA at ASN's request, was also examined in the latter part of 2009. As the site houses both civil and secret BNIs, ASN and ASND submitted their joint conclusions regarding the CEA file, in July 2012. ASN also notified CEA of its conclusions regarding this file, with respect to the civil BNIs only. Considerable work has already been done via this file. However, its examination revealed the need to improve the inventory of requirements and the adequacy of the corresponding means made available. ASN asked the licensee to take account of its requests in the stress tests report concerning the Cadarache site support functions, which will be examined in 2013.

## 1|1|8 Management of civil engineering projects

In 2012, management of civil engineering projects on the BNIs continued with the construction of the Jules Horowitz reactor (BNI 172). In order to facilitate monitoring of the progress of the construction of this reactor, pursuant to the resolution setting out the requirements for the design and construction of the reactor (ASN resolution 2011-DC-0226 of 27th May 2011), CEA transmits a quarterly progress report for the project. This document makes it possible to identify activities or particular points that ASN wishes to include in its spot checks during inspections.

The inspections carried out by ASN in 2012 particularly concerned the integration of the requests and remarks formulated further to previous inspections on the construction/civil engineering theme, or further to the examination of the design files relative to the pouring of certain concrete structures. In the case of the RJH construction site, inspections were thus carried out to check the processing of anomalies detected on a wall of the equipment storage pool and a wall of the reactor building containment.

## 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. One of the issues for ASN is to allow the

regular performance of new experiments, while ensuring that they take place in appropriate conditions of safety.

In January 2007, CEA drafted a technical guide defining the requirements relative to the conditions of design, construction and irradiation licensing for experimental devices. ASN plans to analyse application of this guide, both for the periodic safety reviews (application by CEA to an experimental device of the OSIRIS reactor in Saclay) and for the design of a new device (application to one of the devices to be used in the future Jules Horowitz reactor); the corresponding safety files were received at the beginning of 2012.

## 1|1|10 ASN's general assessment of CEA actions

The results of 2012 and ASN's corresponding assessment concerning each facility, are detailed in point 1|2. The results of the actions linked to the decommissioning and clean-out operations and the results for the waste storage and treatment facilities, are presented in chapters 15 and 16.

With regard to its general assessment of the research facilities, ASN notes that CEA was extensively involved in the process of experience feedback from the Fukushima accident. It in particular responded to ASN's first requirements on this subject within the specified time. This action should be continued over the coming years.

With regard to the periodic safety reviews, ASN notes that it has not been possible to examine the recent periodic safety reviews of the ÉOLE, MINERVE and POSÉIDON facilities, because not all the necessary data was available. This situation is unsatisfactory and ASN will be issuing requirements, should this prove necessary, in order to obtain complete periodic safety review files.

With regard to the management of civil engineering projects, ASN notes that CEA is facing significant technical difficulties regarding the concreting work, and that it must continue with its operating experience feedback efforts.

Finally, ASN considers that CEA monitoring and follow-up of its commitments and of the regulatory requirements (as stipulated by the authorisation decrees, ASN instructions, etc.) needs to be improved.

## 1|2 Topical events in CEA research facilities

### 1|2|1 CEA centres

#### Cadarache centre

The Cadarache Centre is located at Saint-Paul-lez-Durance, in the Bouches-du-Rhône *département*. It employs about 5,000 people (all contractors included) and occupies a surface area of 1,600 hectares (ha). As part of CEA's strategy of specialising its centres as “centres of excellence”, the Cadarache site deals mainly with nuclear energy. It is home to 20 BNIs, including two for the industrial operator AREVA (ATPu and LPC), while two others are used for Institute of Radiation Protection and Nuclear safety (IRSN) research programmes (CABRI and PHEBUS). The purpose of these Cadarache centre

installations is R&D to support and optimise existing reactors and to design new generation systems.

The Cadarache centre is also taking part in launching a number of new projects and it will be the site for the future Jules Horowitz experimental reactor, for which the creation authorisation decree was published in 2009 and for which commissioning is currently scheduled in 2016. ASN considers that the management of the Cadarache centre maintained a high level of focus on safety and radiation protection in 2012. Particular vigilance will however be required with regard to the supervision of contractors, owing to the increasing use being made of subcontracting. This topic was in fact the subject of targeted inspections in 2012 (see chapter 8).

Moreover, the renovation of the centre's electrical installations, scheduled from 2008 to 2015, must receive the necessary attention so as not to fall behind schedule. ASN is remaining vigilant on this subject.

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

In 2010, CEA sent ASN the general safety presentation for its Cadarache centre, which gives all the data relative to the site (seismic activity, air and road traffic in the vicinity, meteorology, etc.) and taken into account in the safety cases. This file is currently being reviewed by ASN, together with the ASND, taking account of the additional data contained in the stress test reports submitted on 15th September 2012.

### *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, and about 6,000 people work there. In 2006, CEA head offices moved from their Paris premises and relocated at CEA Saclay.

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

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

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

ASN considers that the following points warrant particular attention at the Saclay centre:

- maintaining the nuclear safety performance of the BNIs in a centre focused primarily on non-nuclear activities;
- including nuclear safety in decisions concerning the development of future activities in the centre;
- control of urban development around the centre in a context of development of the Saclay plateau, in connection with the length of service life of BNIs envisaged by CEA.

The Saclay centre still comprises numerous facilities of different types:

- the research reactors in operation (point 1 | 2 | 2): ORPHÉE, OSIRIS;
- a laboratory (point 1 | 2 | 3): LECI (spent fuel testing laboratory);
- an irradiator (point 1 | 2 | 5): POSÉIDON;
- effluent and waste treatment facilities (chapter 16: liquid effluents management zone and STELLA project);
- waste storage facilities (chapter 16): solid waste management zone;
- facilities in the final shutdown or decommissioning phase: High Activity Laboratory (LHA), ULYSSE.

### *Marcoule centre*

The Marcoule centre is the CEA centre of excellence for the back-end nuclear fuel cycle and in particular for radioactive waste. It plays a major role in the research being conducted pursuant to the Bataille Act of 1991 and the Programme Act of 28th June 2006 on the sustainable management of radioactive materials and waste. Civil and defence nuclear facilities are installed here, along with CEA's two civil facilities in Marcoule, ATALANTE (research laboratory) and PHÉNIX (reactor). Moreover, in 2012, CEA submitted a creation authorisation application file for a nuclear waste storage facility (DIADEM, see chapter 16), to which it added a section concerning the stress tests.

The site also comprises two other civil BNIs, not operated by CEA: MÉLOX (see chapter 13) and CENTRACO (see chapter 16). A third facility, the GAMMATEC irradiator, is currently under construction (see point 3 | 1).

In addition, a new local strategic management command post (PCD-L), for managing emergency situations in the Marcoule centre, was commissioned in June 2012.

Finally, the stress tests report transmitted on 15th September 2012 by CEA, in the wake of the accident that occurred in the Fukushima nuclear power plant, takes account of the general resources of the Marcoule site. This file was jointly reviewed by ASN and the ASND and will lead to a position statement being issued in 2013.

### *Fontenay-aux-Roses centre*

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

## Grenoble centre

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

## 1|2|2 Research reactors

Experimental nuclear reactors make an essential contribution to scientific and technological research and to supporting operation of the nuclear power plants. Each reactor is a special case for which ASN has to adapt its monitoring while ensuring that safety practices and rules are applied and implemented. The last few years have seen the development of a more generic approach to the safety of these facilities, inspired by the rules applicable to power reactors, and more particularly the method of safety analysis by “postulated initiating events” and the safety classification of the associated equipment. This has led to significant progress 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 intended not only to ensure that the installations are in conformity with the safety objectives initially set for them, but also to determine any improvements that could be made in order to keep pace with advances in knowledge and available technologies.

### Critical mock-ups

#### • MASURCA reactor (Cadarache)

The MASURCA reactor, whose construction was authorised by a decree dated 14th December 1966, is intended for neutron studies, chiefly on the cores of fast neutron reactors, and the development of neutron measurement techniques. This installation, for which the last periodic safety review was discussed at a meeting of the Advisory Committee for nuclear reactors (GPR) in March 2006, has been shut down for conformity work since 2007. The reactor core has been completely unloaded and the fuel has been stored since then in the fissile materials Storage and Handling Building (BSM). In 2010 the licensee informed ASN of its decision to keep this reactor in operation and to build a new BSM.

CEA's stress tests analysis confirmed the need to build a new BSM and, in the meantime, to transfer the fissile material to the MAGENTA facility, which is built to earthquake design standards. This point is a safety priority for ASN and the removal of fissile material from the BSM is the subject of one of the requirements applicable to MASURCA as laid out in resolution 2012-DC-0295 of 26th June 2012. In the second half of 2012, CEA submitted all the safety files necessary for this large-scale material transfer operation.

#### • ÉOLE and MINERVE reactors (Cadarache)

The ÉOLE reactor, whose construction was authorised by a decree of 23rd June 1965, is intended for neutron 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, whose transfer from the Fontenay-aux-Roses research centre to the Cadarache research centre was authorised by decree 77-1072 of 21st September 1977, is situated in the same hall as the ÉOLE reactor. It is devoted to the measurement of cross sections by sample oscillation, enabling variations in reactivity to be measured. Based on the conclusions of CEA's strategic review of the continued operation of these installations, CEA would cease operation of these two reactors by 2019 and could retain certain items of equipment for reuse in the PHÉBUS installation (BNI 92) as part of the research into “Generation IV” reactors. This project has yet to be confirmed.

The periodic safety review of these facilities was carried out by the licensee and then examined by the Advisory Committee on 28th September 2011, in the light of these prospects. However, the aspects concerning the seismic resistance of these facilities could not be studied during this periodic review, because the necessary data were missing from the licensee's file. These data were finally transmitted in 2012, after further delays. ASN considers that it was not possible for the periodic safety review file to be examined in satisfactory conditions. The missing data will be examined in 2013 and ASN will adopt a stance on the continued operation of these two BNIs and the conditions associated with their possible continued operation. If the strategy defined by the licensee and the envisaged reinforcements prove not to be satisfactory, ASN could request final shutdown of these facilities before the date planned by the licensee.

### Irradiation reactors

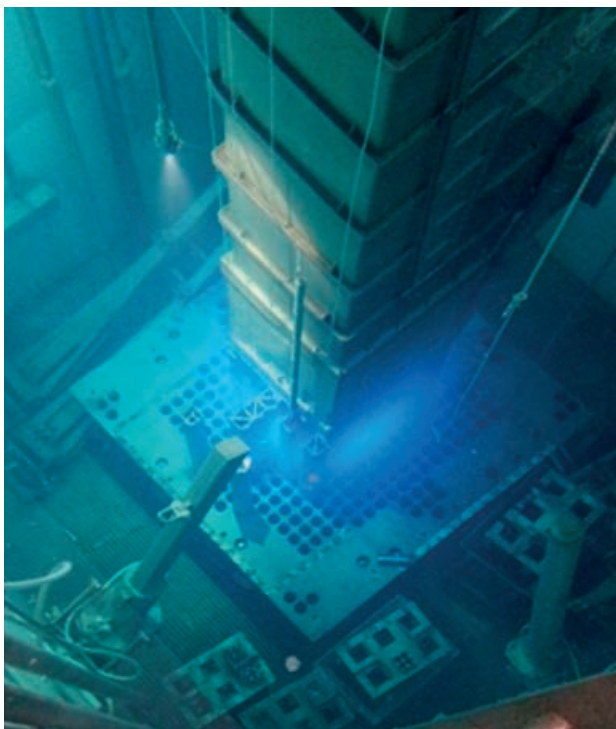
#### • The OSIRIS reactor and its ISIS critical mock-up (Saclay)

The OSIRIS pool-type reactor has an authorised power of 70 megawatts thermal (MWth). It is primarily intended for technological irradiation of structural materials and fuels for various power reactor technologies. It is also used for a few industrial applications, in particular the production of radionuclides for medical uses, including molybdenum-99. Its critical mock-up, the ISIS reactor with a power of 700 kWth, is essentially used for training purposes today. These two reactors were authorised by a decree dated 8th June 1965.

Further to the examination of the stress tests report transmitted in September 2011 by CEA, ASN resolution 2012-DC-0297 of 26th June 2012 set additional requirements for the licensee. This resolution required that before 30th June 2012, CEA must have finished setting up a “hardened safety core” and implementing the supplementary provisions, notably concerning the operation of the backup ventilation and management of the loss of cooling risk. The “hardened safety core” and associated requirements, proposed by CEA, will be reviewed by ASN by June 2013.

In addition, CEA informed ASN that it wished to continue operating the OSIRIS reactor and in September 2011 requested an extension until 2018, and then in October 2012 it requested a further extension to 2020, despite its previous undertaking to shut it down at the end of 2015. ASN recalls that the 16th





Dosimetry campaign in the ISIS reactor for CARMEN irradiation in 2012: new device for measuring neutron and photon flux and nuclear heating

September 2008 resolution requires shutdown no later than 2015. This case illustrates CEA's recurring problems with meeting some of its commitments.

#### • The RJH (Jules Horowitz Reactor) project (Cadarache)

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

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.

Further to the creation authorisation decree signed on 12th October 2009, ASN resolution 2011-DC-0226 of 27th May 2011 set the technical specifications for the design and construction of the BNI. The aim is both to freeze certain analytical elements used to draft the creation authorisation decree of 2nd October 2009 and to establish hold points for the performance of certain operations with potentially high consequences. Targeted provisions have also been made for the regular transmission of information to ASN.

After the initial earthworks, preparation and pouring of initial concrete in 2009, embedding of the seismic supports, reinforcement and then concreting of the upper basemat of the nuclear unit in 2010, pouring of the first walls of the nuclear auxiliaries building and the reactor building containment (authorised by ASN resolution 2011-DC-0232 of 5th July 2011), as well as pouring of the first concrete for the reactor pool (authorised by ASN resolution 2011-DC-0251 of 1st December 2011) in 2011, the civil engineering operations carried on in 2012 with continued construction of the nuclear auxiliaries building and the reactor building.



April 2012

View of the RJH reactor building and pool



October 2012

In 2012, three inspections were conducted on this work site (see chapter 8). An inspection was carried out in March 2012 following an anomaly detected by CEA when it removed the formwork from a wall of one of the storage pools in the nuclear auxiliaries building, the irradiated components storage pool (EPI). This inspection revealed no deviation from CEA's initial diagnosis, nor anything to prevent CEA continuing with its diagnosis and processing this anomaly, in the light of the experience acquired with a similar one in 2011, even though the concrete involved is different. Processing of the anomaly is currently in progress.

In September 2012, CEA informed ASN of a further anomaly on a wall of the reactor building containment. An unannounced inspection in October 2012 examined this point and resulted in ASN asking CEA to continue with its experience feedback efforts to clarify the causes and optimise the corrective measures taken to prevent this type of anomaly. In addition, ASN is continuing its regular dialogue with CEA to facilitate monitoring of the measures requested following analysis of the preliminary safety report and in preparation for the review of the future commissioning authorisation application, currently scheduled for 2014.

Although the RJH is of a very recent design that integrates operating experience feedback from the other experimental reactors, the stress tests process has resulted in the CEA identifying possibilities for improvements that could be implemented relatively easily, as it is still in the construction phase. ASN thus considered that some of the proposals made by CEA, which are likely to make the facility more robust, should be implemented. Moreover, making these improvements at the design/construction stage favours prevention, rather than mitigation, of the consequences of possible accident situations. In its resolution 2012-DC-0294 of 26th June 2012, ASN thus published a certain number of additional requirements. In September 2012, CEA proposed its "hardened safety core" for the RJH, the examination of which is currently in progress.

### Neutron source reactors

- **ORPHÉE reactor (Saclay)**

The ORPHÉE reactor, with an authorised power of 14 MWth, is a pool-type research reactor, using heavy water as the moderator. It is equipped with nine horizontal channels, tangential to the core, enabling nineteen neutron beams to be used. These beams are used to conduct experiments in fields such as physics, biology and physical chemistry. The reactor also has ten vertical channels for the introduction of samples to be irradiated in order to produce radioisotopes or special materials and to carry out analysis by activation. The neutron radiography installation is used for non-destructive testing of certain components. The ORPHÉE reactor was authorised by a decree of 8th March 1978. Its first divergence was in 1980.

Following the second periodic safety review, which took place in 2009, CEA initiated an action plan. CEA in particular began to replace the devices subjected to irradiation. ASN regularly monitors the progress of these actions.

The stress tests report for the ORPHÉE reactor, produced as part of the process to take account of the experience feedback



Operation to replace the ORPHÉE heat sinks

from the accident that occurred on the Fukushima nuclear power plant, was transmitted in September 2012. It will be examined by ASN in 2013.

CEA also notified a significant event in 2012 concerning the incorrect positioning of the gaseous effluents (tritium, carbon-14) sampling points. CEA initiated checks on the other facilities on the Saclay site. For experience feedback purposes, ASN informed the nuclear licensees of other facilities of this event, given its potentially generic nature, so that a check could be run on the conformity of this type of device.

### Test reactors

- **CABRI reactor (Cadarache)**

The CABRI reactor, created on 27th May 1964, is mainly used for experimental programmes aimed at better understanding nuclear fuel behaviour in the event of a reactivity accident. The reactor is operated by CEA for the purposes of tests designed by IRSN and involving a number of French and foreign partners (nuclear licensees, safety authority technical support organisations, etc.).

The facility was modified by decree 2006-320 of 20th March 2006 to meet the needs of new research programmes. The reactor's sodium loop was replaced by a water loop in order to study the behaviour of high burnup fraction fuels in accident situations representative of those that could be encountered in a pressurised water reactor.

First criticality of the modified installation and performance of the first experimental test will be two steps that require ASN authorisation. In order to examine the applications for these





Reloading of the CABRI core – Summer 2012

authorisations, ASN will review the conditions in which the commissioning tests are to take place and will then ensure that their results confirm the facility's conformity with its safety case. This means that the licensee must have satisfactorily responded to the demands made of it for the modification of the facility. Over the last few years, ASN has reminded CEA several times that it must ensure that files are submitted within a time compatible with their review, given the scheduling targets. In 2012, ASN finalised its review of CEA's application for authorisation to refuel the reactor core, which focused notably on the verification of the checks and any repairs, and reinforcements of the equipment required for these operations. ASN issued its approval in March 2012. CEA began refuelling the reactor core on 27th June 2012. However, in September 2012, CEA informed ASN that it had detected discolouration resembling oxidation on certain fuel elements and assembly structures. Refuelling was immediately suspended and the origin of this anomaly is currently being investigated.

Finally, in October 2012, CEA informed ASN of a further incident linked to handling of the fuel assemblies (rupture of a handling part).

With regard to the first criticality of the reactor core, examination of the corresponding file is continuing.

#### • PHÉBUS reactor (Cadarache)

The PHÉBUS reactor, whose creation was authorised by decree 77-801 of 5th July 1977, was one of the aids for studying the severe accidents that could affect pressurised water reactors (PWR), on the basis of tests devised and financed by IRSN. CEA has announced that it wishes to cease any new programmes with this reactor. Clean-out and decommissioning of the experimental systems used in the last experiment have been continuing since 2004. Further to an event of 9th March 2011 relative to the unexpected presence of tritium in the gaseous effluents of the facility, CEA identified the last campaign of experiments (PHÉBUS PF program), completed in 2004, as being the cause of the leak. In response to ASN's request for it to forward the steps it would be taking accordingly, as well as the action plan and schedule for the relevant operations, CEA indicated that it had not identified a quick and easy technical solution for removal and that it was tending more towards an

application for modification of the resolutions setting the discharge limits and procedures for the Cadarache site.

ASN is still waiting for CEA's strategy regarding the future of this BNI, so that it can start the appropriate regulatory procedures (decommissioning or modification of the installation).

Whatever the case, ASN remains attentive to the operations conducted in this installation, which the CEA has said could receive certain items of equipment from the Eole and Minerve installations as part of the research into the "Generation IV" reactors.

#### *Teaching reactors*

##### • ISIS reactor (Saclay)

The ISIS reactor, with the OSIRIS reactor, constitutes one of the two reactors of BNI 40 (see below).

#### *Prototype reactors*

##### • PHÉNIX reactor (Marcoule)

In late 2011, CEA submitted the final shutdown and decommissioning authorisation application for this reactor (see chapter 15).

### 1|2|3 Laboratories

#### *The irradiated materials and spent fuel appraisal 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 fuel cycle large nuclear installations, but this safety approach also has to be proportionate to the specific risks presented.

##### • Active Fuel Examination Laboratory (LECA) (Cadarache)

The LECA (BNI 55) was commissioned in 1964 and is a laboratory for both destructive and non-destructive examination of spent fuels from various types of nuclear power plants or research reactor, and of irradiated structures or instruments.

Further to the periodic safety review carried out in 2001, a major upgrade programme was undertaken. It in particular includes works to improve the seismic resistance of the civil engineering structures. This work will end with the dismantling of the building called "UO2", initially scheduled for 2008 and postponed to 2012, thereby reducing the interactions between buildings in the event of an earthquake. The final clean-out operations prior to dismantling, will be completed in 2012.

CEA has moreover indicated its intention to extend the operating life of the LECA, whose shutdown was hitherto envisaged in 2015. For this, it will in particular have to demonstrate the resistance of the buildings to a reference



earthquake called the “safe shutdown earthquake” (SSE), at the next periodic safety review planned for 2013.

- **LECA's treatment, clean-out and reconditioning station (STAR) (Cadache)**

The STAR facility is a high-activity laboratory comprising shielded cells. It was designed for the stabilisation and reconditioning of irradiated fuel rods with a view to storing them in the CASCAD facility. It also performs destructive and non-destructive examinations of irradiated fuel from various reactor series (PWR, research reactors, experimental reactors).

Its creation was authorised by a decree of 4th September 1989 and its definitive commissioning was declared in 1999.

On completion of the analysis of the periodic safety review file in June 2009, ASN indicated that it had no objection to the continued operation of the facility, and authorised the extension of its operating range, thereby enabling CEA to recondition new types of fuel. ASN periodically checks that the licensee is meeting its commitments with respect to the periodic safety review, and carried out an inspection on this subject in 2012.

In order to reduce the risks of items being dropped during handling operations, the licensee presented a number of planned modifications and equipment additions, including a new “truck loading chamber” (STEP project). ASN issued initial approval for the construction of this structure in 2012. The licensee undertook to commission it in 2014.

- **Laboratory for research and Experimental Fabrication of Advanced nuclear Fuels (LEFCA) (Cadache)**

LEFCA (BNI 123) is a laboratory responsible for performing basic studies on plutonium, uranium, the 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 capsules or experimental assemblies intended for irradiation tests.

This laboratory entered service in 1983.

Within the framework of its last periodic safety review in 2003, CEA undertook to carry out seismic reinforcement work on the building. This work was on the whole completed in 2010. However, with regard to the risk of soil liquefaction beneath the facility in the event of an earthquake, ASN issued a resolution introducing a technical requirement and imposing the implementation of a system for prevention of this risk before 29th June 2012 (resolution 2010-DC-0186 of 29th June 2010).

During the construction work, which began in early 2011, CEA encountered technical difficulties, which meant that it was unable to meet the deadline initially specified. The technical arguments put forward were acceptable and ASN issued a modifying resolution to ratify the new construction method adopted and postpone the final deadline for the system to 30th September 2015 (resolution 2012-DC-0316 of 23rd August 2012).

In addition, the next periodic safety review on the facility is scheduled for 2013. On this occasion, the elements concerning the stress tests required within the framework of the experience

feedback from the Fukushima accident will be submitted to ASN by the licensee.

- **Spent fuel testing laboratory (LECI) (Saclay)**

The spent fuel testing laboratory (LECI – BNI 50) was the subject of a notification on 8th January 1968, and a creation authorisation decree for the PELECI extension dated 30th May 2000. This facility comprises three buildings on the Saclay site, and includes shielded lines, one glove-box line and a shielded bunker, in which the various fuel constituents used in the nuclear reactors are analysed to determine how their properties evolve with irradiation. This facility also accommodates a shielded cell (Célimène, building 619) which has not been used since the end of 1993. CEA envisages its decommissioning by 2024. Commissioning of the three lines of shielded cells was staggered between 1959 and 2005. Clean-out of the cells and removal of the fuels is continuing. Transmission of the periodic safety review file is expected for mid-2013.

### **Research and development laboratories**

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

The main purpose of the ATALANTE facility (BNI 148), created in the 1980s, is to conduct research and development concerning:

- nuclear fuel recycling;
- ultimate waste management;
- exploration of new concepts for fourth-generation nuclear systems;
- studies, production and recycling of actinides.

The changes to the facility since its creation and its periodic safety review were examined by the Advisory group for plants (GPU) in 2007. On this basis, ASN authorised the “definitive” commissioning of the facility in June 2007 (the various laboratories have been commissioned as and when required since the creation of the facility). The licensee's commitments in this context are periodically monitored by ASN. In this respect, ASN reviewed progress in 2011 and carried out an inspection. Despite a few postponements, the assessments show progress to be satisfactory.

Finally, ASN examined the application for a revision of the facility's discharge limits and specifications, which will be the subject of a resolution in early 2013. The stress tests report for the ATALANTE facility was transmitted by CEA on 15th September 2012. CEA thus proposed improvements to the safety of its facility. ASN will issue a position statement on these points in 2013.

- **The CHICADE installation (Cadache)**

CHICADE (BNI 156) (chemistry, waste characterization) is a facility for research and development on low and intermediate level waste. This work mainly concerns:

- the destructive and non-destructive characterisation of radioactive objects, waste sample packages and irradiating objects;
- the development and qualification of nuclear measurement systems;
- the development and implementation of chemical and radiochemical analysis methods;

– assessment and monitoring of waste packaged by the waste producers.

Creation of the facility was authorised by a decree of 29th March 1993 and its definitive commissioning was authorised in 2003.

In 2011, ASN gave its opinion on the periodic safety review file, and formulated no objection to the continuation of operation of the facility. The licensee must nevertheless respond to ASN's demands and meet the commitments it gave further to the periodic safety review of the facility. They notably concern waste management and additional demonstrations of resistance to external hazards (aircraft crash, earthquake). Compliance with these commitments is regularly monitored by ASN during specific meetings to review progress. In 2012, about 80% of these measures had been initiated. Their effective implementation will be monitored in 2013.

In addition, the CADECOL cell is currently being commissioned by the licensee. It will be devoted to destructive testing of waste packages and will for example enable appraisals to be carried out for the French National Radioactive Waste management Agency (ANDRA).

Finally, the stress tests report requested within the framework of the Fukushima accident experience feedback process was submitted to ASN by the licensee on 15th September 2012.

## 1|2|4 Fissile material warehouses

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

Built in the 1960s, the MCMF is a storage warehouse for 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.

Given that the MCMF cannot guarantee that its safety functions will be fulfilled in the event of an earthquake, the licensee has been asked to remove the nuclear material from the MCMF facility. The commissioning of the MAGENTA facility means that removal of materials from MCMF can continue. It is noteworthy that with regard to the mass of plutonium-containing materials stored in the MCMF, about 98% of the reference stock was removed at the end of 2011. The removal of nuclear materials, including primarily uranium-containing materials, continued in 2012.

On 15th September 2012, CEA transmitted the stress tests report on the MCMF. CEA thus proposed improvements to the safety of its facility. ASN will issue a position statement on these points in 2013.

### • The MAGENTA facility (Cadarache)

The MAGENTA facility (BNI 169), intended to replace the MCMF, is dedicated to the storage of non-irradiated fissile material and the non-destructive characterisation of nuclear materials received.

The MAGENTA creation authorisation decree was signed on 25th September 2008. ASN authorised the facility's

commissioning by resolution 2011-DC-0209 of 27th January 2011.

The commissioning of the glove-box lines for the physical characterisation of materials and for changes to the primary conditioning is envisaged for a later date, subject to additional ASN authorisation.

In 2012, the facility received nuclear materials that had been removed from storage in MCMF and MASURCA. These operations will continue in 2013.

## 1|2|5 The POSEIDON irradiator

The POSÉIDON facility at Saclay, created by decree of 7th August 1972, is an irradiator consisting of a cobalt-60 source storage pool, surmounted over half its surface area by an irradiation bunker. The facility also features a submersible chamber called CALINE and a test cell called CESAR. The Poseidon facility is used for research and development activities relating to the behaviour of materials under radiation. A first part of the periodic safety review file, transmitted on 21st December 2011, will be supplemented at the end of the first half of 2013 by data concerning the facility's performance in the event of an earthquake or extreme meteorological conditions and, during the second half of 2013 by the part concerning the robustness of civil engineering structures in the stress tests file. ASN notes that CEA had previously undertaken to transmit these additional data before the end of 2012. This case illustrates CEA's problem with meeting some of its commitments, including with regard to the submission of the periodic safety review files. ASN will be vigilant in ensuring that CEA rapidly remedies these problems. If necessary, it will establish the necessary specifications.

## 1|2|6 Waste and effluent storage and treatment facilities

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

The waste and effluent storage and treatment facilities are addressed in chapter 16.

## 1|2|7 Installations undergoing decommissioning

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

## 2 NON-CEA NUCLEAR RESEARCH INSTALLATIONS

The main topical subjects in 2012 were:

- ASN's favourable opinion on the draft decree authorising modification of the GANIL facility and the publication of the decree of 7th May 2012;
- the ASN position statement on the stress tests report for the high-flux reactor operated by the ILL;
- the drafting of an agreement on the fair distribution of CERN radioactive waste between France and Switzerland;
- ASN's favourable opinion on the draft decree authorising the creation of the ITER facility and the publication of the decree of 9th November 2012;

### 2|1 Large National Heavy Ion Accelerator (GANIL)

The GANIL (large National Heavy Ion Accelerator) economic interest group situated in Caen (Calvados *département*), is a laboratory conducting research into the structure of the atom, which was authorised by a decree of 29th December 1980 to create an accelerator, and, by a decree of 6th June 2001, to operate an extension. The purpose of this research facility is to produce, accelerate and distribute beams of ions with different energy levels. The intense high-energy beams produce strong fields of ionising radiation when they circulate in the rooms, activating the materials in contact, which then emit radiation even after the beams have stopped. Irradiation thus constitutes the main risk.

In order to be able to produce “exotic” heavy nuclei, the GANIL applied in July 2009 for a modification to the authorisation decree for its facility so that it could set up the SPIRAL 2 project in it for the production of exotic ions (linear accelerator and building housing the associated experimental areas, exotic ion production buildings). By decree of 7th May 2012, the GANIL was authorised to create phase 1 of this project. The GANIL is hoping for commissioning, which will be the subject of an authorisation application to ASN in the first quarter of 2014. ASN also began its examination of the facility's periodic safety review. Phase 2 of the SPIRAL 2 project, which will be the

subject of a further application for authorisation to modify the facility's creation decree, will be examined later on, with commissioning desired for 2016.

### 2|2 Laue-Langevin Institute (ILL) high flux reactor

The High Flux Reactor (RHF) (BNI 67) at the Institut Laue Langevin (ILL) in Grenoble, is a research reactor designed to supply neutrons, used primarily for experiments in solid physics, nuclear physics and molecular biology. The maximum power of the reactor, initially authorised by a decree of 19th June 1969 amended by decree no.94-1042 of 5th December 1994, is 58.3 MWth. The reactor core is cooled by heavy water contained in a reflective tank, which is itself immersed in a light water pool. 13 vertical channels and 4 sloping channels direct the neutrons to the experiment halls. Vertical tubes are also used to irradiate samples.

Following on from the examination of the stress tests transmitted in September 2011 by the ILL, ASN issued resolution 2012-DC-0312 on 10th July 2012, stipulating additional prescriptions for the licensee in the light of the conclusions of this examination. This resolution asked ILL to define and implement a “hardened safety core”, to check the robustness of certain equipment (overhead crane), to propose modifications to reinforce other equipment (gaseous effluent system, handling hood, etc.) and to carry out improvement works (ultimate reflooding system, new emergency management rooms).

The “hardened safety core” proposed by the ILL and its associated requirements, will be reviewed by ASN by 2013.

ASN issued the approval needed by the licensee to perform work on construction of the new emergency control station (PCS 3), an improvement that had been proposed by the licensee further to the stress tests. Similarly, the ILL was authorised to commission an ultimate reflooding system.

Finally, in 2012, the ILL transmitted a file for implementation of the new management arrangements for heavy water, which is to be shipped to and treated in Canada.

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

The European Organisation for Nuclear Research (CERN) is an international organisation whose role is to carry out purely scientific and fundamental research programmes concerning high-energy particles.

A tripartite agreement signed by France, Switzerland and CERN entered into effect on 16th September 2011. Prior to this, the safety and radiation protection of the facility were governed by bilateral agreements. The first decision by ASN and the Swiss Federal Office of Public Health (OFSP) concerning the guidelines for the fair distribution between France and Switzerland of the radioactive waste from CERN, with a view to its disposal, was signed on 29th June 2012.



Construction of SPIRAL 2





Valves of the ultimate refueling system in the RHF caisson.

In 2012, ASN carried out joint visits with the OFSP on the subjects of safety management and monitoring the follow-up to previous visits.

## 2|4 The ITER (International Thermonuclear Experimental Reactor) project

The ITER project concerns an experimental installation, the purpose of which is scientific and technical demonstration of controlled thermonuclear energy obtained with magnetic confinement of a deuterium-tritium plasma, during long-duration

experiments with a significant power level (500 MW for 400 s). This international project benefits from financial support from China, South Korea, India, Japan, Russia, the European Union and the United States. The Headquarters Agreement between ITER and the French Government, signed on 7th November 2007, was published in the Official Gazette of the French Republic by decree on 11th April 2008.

Based on the conclusions of the technical review of the ITER BNI creation authorisation application file by the Advisory committee, the conclusions of the board of inquiry, the opinion of the CLI and that of the Prefect, a draft creation authorisation decree was submitted to the licensee in mid-2012 for consultation. After giving a hearing to a representative of the CLI and the licensee, ASN returned a favourable opinion on the draft decree, which was published on 10th November (decree 2012-1248 of 9th November 2012). In its opinion, ASN underlines how important it is for CEA, the operator envisaged for the future decommissioning of this facility, to acquire all operational means necessary to provide it with the adequate technical and financial capability when the time comes.

At the same time, ASN is preparing a draft resolution setting out requirements for the design and construction of the facility. In 2012, the civil engineering work continued and was the target of three inspections. The lower basemat, the support posts for the seismic pads and the installation of these pads were carried out, along with construction of the retaining walls around the excavation for the future Tokamak building. Construction of the upper basemat should begin in 2013.

The ITER stress tests report, required as part of the experience feedback from the Fukushima NPP accident, was submitted in September 2012. It will be reviewed by ASN in 2013.

ITER Organization aims to obtain the first hydrogen plasma in about 2019 and the first deuterium-tritium plasma in 2027.

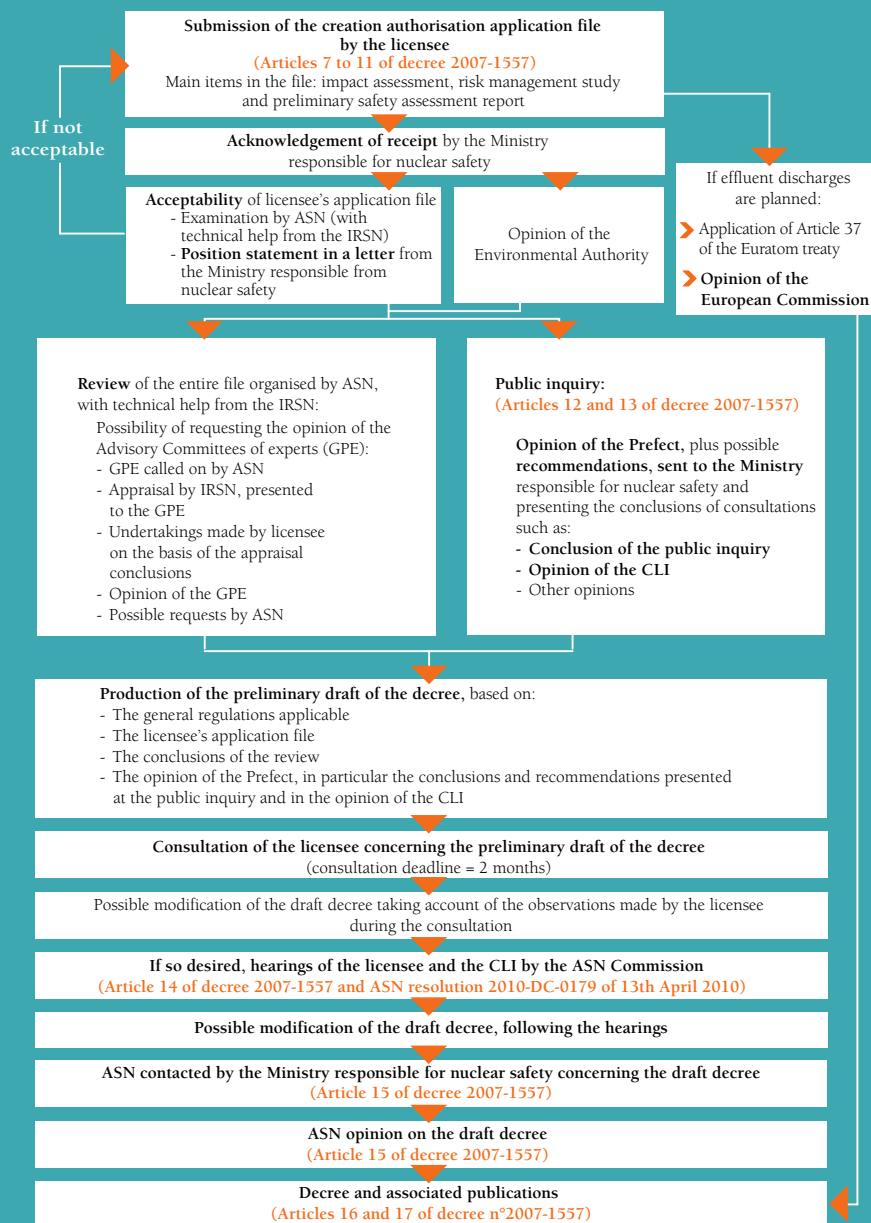


ASN inspection on the ITER construction site: construction of seismic pads for the Tokamak complex – April 2012



## Schematic procedure for drafting a BNI creation authorisation decree

### Main steps in the procedure for drafting a BNI creation authorisation decree (Decree 2007-1557 of 2nd November 2007)



### Example: creation authorisation application for the ITER BNI

1st submission: January 2008  
-> considered unacceptable  
2nd submission: March 2010

Acceptability\* subject to additional impact assessment data : letter in December 2010  
Additional data submitted by the licensee in December 2010

Opinion of the Environmental Authority in March 2011

Opinion of UE in June 2012

Technical review:  
- licensee's undertakings of 10/11/11 and 13/01/12,  
- opinion of the GPE of 12/12/2011,  
- written requests made by ASN on 15/06/2012.

Public inquiry:  
- Minister asks the Prefect to submit the file to public inquiry : letter of 03/05/2011,  
- public inquiry from 15/06/11 to 04/08/11,  
- conclusion of the public inquiry on 09/09/2011,  
- opinion of the CLI of 21/07/2011.

Consultation of the licensee:  
from 26/07/2012 to 26/09/2012

Note: CEA was also involved in the consultation in the light of its future role in decommissioning of the ITER BNI and the management of the waste.

Hearing of the licensee and of the CLI: end of October 2012

ASN contacted by the Ministry on the draft decree: 23/10/2012

ASN's favorable opinion on the draft decree: 06/11/2012

ITER BNI authorisation decree: 09/11/2012

Following the creation authorisation decree and pursuant to **Article 18 of decree 2007-1557**, ASN issues a resolution containing technical requirements, concerning:

- the design and construction of the BNI,
- the discharge limits,
- other requirements (prevention and mitigation of accidents, detrimental effects, management and disposal of waste, etc.).

These resolutions can take account of:

- the application file (preliminary safety assessment report or impact assessment),
- the licensee's undertakings in response to the review,
- the requests made by ASN following the review,
- the recommendations given in the Prefect's opinion,
- the conclusions of the public inquiry,
- the opinion of the CLI, etc.

### Examples for the EPR and RJH

ASN resolution 2008-DC-0114 of 26th September 2008 concerning the design and construction of the EPR.

ASN resolution 2011-DC-0226 of 27th May 2011 concerning the conception and the construction of Jules Horowitz reactor.

\* Acceptability subject to additional impact assessment data:  
- Additional data submitted by the licensee;  
- Minister asks the Prefect to submit public inquiry file.

### 3 IONISERS, THE PRODUCTION OF RADIONUCLIDES FOR PHARMACEUTICAL USE, THE MAINTENANCE UNITS AND THE OTHER NUCLEAR FACILITIES

ASN's main focus in 2012 concerned the follow-up to the periodic safety review of the CIS bio international facility.

#### 3|1 Industrial ionisation installations

The irradiators are intended primarily for the sterilisation of medical devices, foodstuffs, pharmaceutical raw materials, etc., by irradiating them with gamma rays emitted from sealed cobalt-60 sources. The irradiation cells are made from reinforced concrete, designed to protect the environment. The sealed sources are either stored in a pool under a thickness of water which protects the workers in the cell, or are placed in the raised position to irradiate the items to be sterilised. The main risk in these facilities is irradiation of the personnel.

The IONISOS group, created in 1993, operates three industrial ionisation facilities (Dagneux BNI 68, Pouzauges BNI 146, Sablé-sur-Sarthe BNI 154). Additional monitoring of the watertightness of the pools by acoustic emissions was authorised by ASN. The guidelines file for the periodic safety review was transmitted by the licensee at the end of 2012 for these three facilities; the periodic safety reviews will be carried out no later than November 2017 in accordance with the current regulations.

ISOTRON France operates the GAMMASTER irradiator (BNI 147) and is building the new GAMMATEC facility (BNI 170) on the Marcoule site, the creation of which was authorised by decree 2008-1005 of 25th September 2008. It will consist of two bunkers, one for industrial uses and the second for experimentation. The commissioning application file, received on 21st December 2011 and supplemented on 27th August 2012 is currently under review. The licensee envisages start-up in 2013.

#### 3|2 The radio-pharmaceutical 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. This facility also recovers used sealed sources which had been used for radiotherapy and for industrial irradiation. By decree 2008-1320 of 15th December 2008, CIS bio international was authorised to succeed CEA as operator of BNI 29.

Examination of the facility's periodic safety review file was completed in 2012. This examination, which was made difficult by gaps in the initial file, included two consultations of the GPU in 2010 and 2012. Following the examination, the licensee undertook to implement additional steps to improve safety and to transmit additional studies. Moreover, in a 2013 resolution, ASN will impose further requirements for continued operation of the facility. These in particular concern steps to control the risk of fire and the presentation of measures associated with the shutdown of certain equipment items.

ASN notes that difficulties also arise with examination of the facility modification files, which are sometimes incomplete.

In 2011, CIS bio notified ASN that one of its annual gaseous discharge limit values authorised for the facility had been exceeded. Further to this event, ASN issued an initial resolution 2011-DC-0212 serving the CIS bio international company with formal notice to comply with the facility's discharge requirements and to define an action plan designed to reduce its discharges for the years 2011 and 2012. In addition, in 2012, ASN resolution 2012-DC-308 stipulated a reduction in these authorised discharges and informed the Local Information Committee (CLI) accordingly.



New production line in the CIS bio international facility





The CIS bio international stress tests report, requested as part of the process of experience feedback from the accident which occurred in Fukushima, was submitted in September 2012. ASN will issue a position statement on these points in 2013.

Finally, in 2012, CIS bio international submitted an application file for modification of the perimeter of the facility, because of the future bus lane project (TCSP) on the Saclay plateau. ASN will issue a position statement on this file in 2013.

### 3|3 Maintenance facilities

Three basic nuclear installations specifically handle nuclear maintenance activities in France. They are:

*The SOMANU (Société de maintenance nucléaire, subsidiary of AREVA) facility in Maubeuge (Nord), BNI 143*

Authorised by a decree of 18th October 1985, this facility is specialised in the repair and appraisal of material coming mainly from the primary cooling systems of pressurised water reactors and their auxiliaries, excluding fuel elements. Pursuant to the provisions of Articles L. 593-18 and L. 593-19 of the Environment Code, the licensee submitted the first report on the ten-yearly periodic safety review on its facility to ASN and the Ministers responsible for nuclear safety. This file included stress test data in order to take account of the experience feedback from the Fukushima accident.

*The SOCATRI (Société auxiliaire du Tricastin) clean-out and uranium recovery facility situated in Bollène (Vaucluse département)*

Its activities encompass the maintenance, storage and clean-out of material from the nuclear industry and waste storage on behalf of ANDRA. The operating company, SOCATRI, is part of the AREVA group and was licensed by a decree of 22nd June

1984, amended. Its discharge and water intake licenses were modified for the last time by ministerial order of 16th June 2005. Further to an uncontrolled release that occurred on 7th July 2008, the facilities were returned to a satisfactory condition; ASN nevertheless underlined the persistence of shortcomings in operating rigour. On 30th September 2011, the appeal court of Nîmes requalified the offence of pollution as an “offence of discharging substances into the groundwater, surface water or the sea leading, even temporarily, to significant modifications to the normal water supply and to restrictions on the use of bathing waters”, and reversed the initial judgement of 14th October 2010 to declare the company guilty of this charge. The court moreover confirmed the conviction for omission to give immediate notification of the incident that occurred on its premises, as required under Articles 48 and 54 of the Act of 13th June 2006. SOCATRI was fined €300,000 for criminal liability and €250,000 for civil liability. AREVA has lodged an appeal with the supreme court of appeal. As for the consequences of the event on the environment, the extended monitoring put in place confirmed the absence to date of any environmental impact associated with the incident. SOCATRI nevertheless remains obliged to monitor the groundwater of the site and the river Lauzon with which it communicates.

The licensee, SOCATRI, started the periodic safety review of its facility, and transmitted the corresponding files to ASN in 2010. They were supplemented in late 2011 at the request of ASN. ASN examined this periodic safety review in 2012 and will return its opinion on the possibility of continued operation of the facility in the second half of 2013.

In the first quarter of 2012, the licensee also submitted an application for modification of its creation authorisation decree, in order to incorporate new activities, primarily the treatment of waste from the entire Tricastin platform and from the Romans-sur-Isère site. Performance of these new activities is dependent on the examination of the periodic safety review currently in progress.



View of the SOCATRI plant on the Tricastin site

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

Finally, the SOCATRI facility underwent stress tests in 2011 further to the ASN resolution of 5th May 2011.

### *Tricastin Operational Hot Unit (BCOT)*

The BCOT was authorised by decree of 29th November 1993. Also situated in Bollène, it performs maintenance operations and storage of contaminated material from the PWRs, with the exception of fuel elements. This BNI 157 is operated by EDF.

In 2012 the BCOT continued with shipment of the old reactor vessel heads to ANDRA. The last vessel head should be shipped in 2014. Following authorisation by ASN, the BCOT has also started to install a unit for cutting up the end-of-life guide tubes from the EDF fleet.

In 2010, the BCOT licensee initiated a periodic safety review of its installation. It was completed in 2011 and its examination was started by ASN in the third quarter of 2012. ASN in particular asked for data concerning the stress tests

## 3|4 Chinon Irradiated Material Facility (AMI)

This facility situated on the nuclear site of Chinon (Indre-et-Loire *département*) was notified and commissioned in 1964, and is operated by EDF. Its main purpose is 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 shutdown of the installation no later than 2015. In 2008, EDF stated that it aimed to commission a new integrated appraisals laboratory at the CEIDRE (LIDEC) to take over from the AMI by 2011, on the same Chinon site. Preparatory work began in 2009.

Creation of the LIDEC having been authorised by order of the Prefect in October 2010, the transfer of the appraisal activities

from AMI to LIDEC began in 2012, in parallel with the gradual shutdown of appraisal activities at AMI.

The work to ensure the safety of the AMI until its final shutdown was completed in early 2010 and preparation is now under way for decommissioning of the facility. In particular, the sorting and packaging operations for the legacy waste from the installation, currently stored in a pit, continued in a dedicated unit. Some of this waste was taken away to disposal centres.

Lastly, in October 2010, EDF lodged a file applying for a modification of the limit values for liquid and gaseous radioactive discharges into the environment for the entire EDF Chinon site. In this respect, EDF requested revision of the requirements setting the AMI discharge conditions, following the transfer of activities to the LIDEC. In a resolution 2011-DC-0243 of 27th September 2011, approved by ministerial order of 28th November 2011, ASN set new limits for environmental discharges of radioactive liquid and gaseous effluents from the AMI and all the BNIs in the Chinon NPP, as stipulated in decree 2007-1557 of 2nd November 2007. These new limits for the site as a whole are lower than the previously authorised values.

Finally, following the shutdown of the appraisal activities carried out at the AMI, submission of the AMI final shutdown and decommissioning application file is expected in early 2013.

## 3|5 Inter-regional fuel warehouses (MIR)

EDF has two inter-regional fuel warehouses, on the Bugey site in the Ain *département* and at Chinon in the Indre-et-Loire *département*. These facilities were respectively authorised by decrees of 2nd March 1978 amended, and 15th June 1978 amended. EDF uses them to store new nuclear fuel assemblies (only those made of uranium oxide of natural origin) pending loading into the reactor. Having reconsidered the organisation of its supply chain, EDF finally renounced definitive closure of the Chinon warehouse, and since April 2011 it is once again being used to store fresh fuel assemblies. ASN has asked the licensee to envisage a periodic safety review of these two facilities. These safety reviews will lead ASN to examine the conditions in which operation of these facilities could continue, considering the safety requirements currently applicable to BNIs, particularly those relative to containment.

## 4 OUTLOOK

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

It is in this spirit that ASN defined priorities for the submittal of the stress test reports concerning the nuclear facilities other than power reactors. A prior analysis was conducted to assess the risks in the light of the experience feedback from the Fukushima Daiichi accident and the “potential source term”. Given the diversity of the nuclear fleet, each facility must be studied individually.

In 2013, ASN will issue a position statement on the “hardened safety core” of the facilities for which the stress tests were examined in 2011. It will also give its opinion on the stress test reports transmitted in September 2012, which concern:

- nine other CEA facilities (PÉGASE, CABRI, RAPSODIE, MCMF, LECA, Cadarache storage yard, CHICADE, ORPHÉE, ATALANTE);
- the support functions on the CEA Cadarache and Marcoule sites;
- ITER;
- CIS bio international.

Finally, it will also draft resolutions concerning all the facilities which have not yet undergone the stress tests process. These resolutions will in particular clarify the deadlines for transmission of the stress test reports.

Moreover, ASN considers that the “major commitments” initiative implemented by CEA over the last 4 years must be continued and regularly expanded to include new “major commitments”. Any extension to the deadline must be duly justified

and be discussed beforehand with ASN. Generally speaking, ASN will remain vigilant in ensuring compliance with the commitments made by CEA, both for its facilities in service and those being decommissioned. Were this to prove necessary, ASN could issue binding requirements, as was the case in 2012 for storage removal operations in the MASURCA facility. Similarly, ASN will remain vigilant in ensuring that CEA performs exhaustive periodic safety reviews of its facilities so that ASN can conduct its examination in satisfactory conditions. In this respect, as the missing elements have finally been transmitted, it will be possible to conclude the examination of the periodic safety review on the ÉOLE and MINERVE facilities in 2013.

In 2013, ASN will continue to pay particular attention to new projects such as the RJH, the GANIL extension, or the ITER facility, and the restart of the CABRI facility. Construction of the ITER facility and divergence of the CABRI reactor will be the subject of instructions from ASN.

ASN will in particular monitor the transfer of fissile material from MASURCA to MAGENTA and the work required of CIS bio international following the periodic safety review of its facility.

ASN will examine the conclusions of the periodic safety review of the GANIL, LECA, LEFCA and LECI facilities in order to decide on the acceptability of medium- to long-term continuation of their operation.

Finally, in mid-2012, CEA sent ASN a safety guidelines document concerning the ASTRID (Advanced sodium Technological Reactor for Industrial Demonstration) prototype, a sodium-cooled fast neutron reactor. This dossier will be examined by the Advisory Committee for reactors. ASN's conclusions will be submitted in the second half of 2013.



