4 Regulation of new installations

The new ASN

Rapidly expanding regulatory activity

ASN is devoting an ever-larger part of its work to regulating new installations: EPR type reactor under construction at Flamanville, Georges Besse II enrichment plant in Tricastin, ITER fusion reactor, Jules Horowitz research reactor (RJH), AGATE effluent treatment plant and MAGENTA fissile materials store in Cadarache, ICEDA waste interim storage installation on the EDF's Bugey site, DIADEM irradiating waste interim storage installation and GAMMATEC industrial irradiator in Marcoule. This regulation kicks in at a very early stage in the design, in fact as of definition of the safety options, so that ASN can influence the safety case choices. The practice of ASN issuing opinions on the safety options is henceforth enshrined in the regulations. Regulation continues with examination of the creation application, followed by monitoring of construction, including on-site, up to commissioning of the installation and review of the start-up tests, not to mention regulation of the operation.

A field worth particular investment on the part of ASN

With regard to fuel fabrication and reprocessing laboratories and plants, ASN has preserved its expertise in construction monitoring and supervision, because extension or new unit construction projects have continued almost uninterrupted for many years. This is also the case with pressure vessels, such as nuclear reactor vessels and steam generators: beyond monitoring the manufacture of spare parts, ASN was involved in supervising the manufacture of large reactor components by AREVA in China since the nineties and the first part of this century.

The opposite is however the case with the other reactor-related fields, with the large French power reactor, Civaux 2, being completed about ten years ago. The last French research reactor (Orphée) was commissioned in the early nineties. ASN has therefore made considerable efforts to define a supervision and monitoring policy for new constructions, that it formalised for the Flamanville 3 project. The TSN Act now also gives ASN the ability to clarify the authorisation decrees by means of technical requirements. ASN is currently working on drafting these requirements.

Using the supervision and monitoring of new installations to improve the safety of existing facilities

Finally, ASN makes use of the safety assessment work being performed on new installations with the support of IRSN, in order to improve the safety of existing facilities: in this way, during the periodic safety review on the 900 MW reactors as part of the third ten-yearly outages, ASN asked EDF to compare the level of safety of these reactors with the EPR project and to make any safety improvements to the 900 MW reactors that could be reasonably transposed.

The EPR reactor

The EPR (*European Pressurized water Reactor*) is a nuclear power reactor able to produce about 1600 megawatts. For this new generation of reactors, the French and German nuclear safety authorities in 1993 jointly set enhanced safety goals as part of an evolutionary design able to incorporate the benefits of experience feedback from the reactors currently in operation.

In 2004, after a review of the safety case for the EPR reactor, ASN considered that the options selected complied with the

Flamanville nuclear power plant on the Channel Coast

objective of improving safety over current reactors and asked Electricité de France to abide by the recommendations given in the “technical directives for the design and construction of the new generation of pressurised water nuclear reactors".

In May 2006, EDF submitted an authorisation application to the Ministers responsible for nuclear safety, for the creation of an EPR type reactor on the Flamanville site, which already hosts two 1300 MWe reactors. To ensure that the project was in conformity with the regulations, the safety objectives and the technical directives mentioned above, ASN and its technical support bodies finalised the reactor safety review. On the basis of this review, the ASN Commission – which was consulted pursuant to Act 2006-686 of 13 June 2006 – issued a favourable opinion on the planned authorisation decree (DAC) for the Flamanville 3 EPR reactor. Authorisation decree 2007-534 was granted to EDF on 10 April 2007 by the Government.

The site preparatory work started in 2006. After issue of the DAC and then the building permit, the reactor construction work has started. In 2007, emphasis will be on construction of the reactor building internal containment prestressed gallery and first pouring of the concrete of the nuclear island foundation raft.

As of the construction stage, ASN carries out its regulation and inspection duties to ensure the quality of installation construction and its ability to comply with the defined requirements. The principles and procedures for supervision of EPR reactor construction were approved by the Commission in November 2007.

For ASN, the construction of a reactor covers both detailed design and construction work (preparation of the site after issue of the DAC, manufacture, construction, qualification and erection of equipment, components and structures, on the site or at the manufacturers). ASN regulates not only the construction but also management of the risk generated by the construction activities for nearby nuclear installations and on the environment.

As we are dealing with a nuclear power reactor, ASN is also responsible for labour inspectorate duties on the installation work site. The installation licensee (the beneficiary of the authorisation decree) is responsible for the quality of the construction activities, except for the manufacture of nuclear pressure vessels (ESPN), which is the responsibility of the manufacturer. The purpose of ASN regulation is to ensure that all parties fully assume their responsibilities and guarantee the conformity of construction. With the assistance of its technical support bodies or other third-party organisations, ASN therefore carries out regulation and supervision that is proportional to the safety, radiation protection and environmental protection issues. In practice, supervision involves a documentary examination and a programme of inspections concerning the activities of the engineering departments, the work site and the manufacturers.

In 2007, during the seven inspections carried out on the site, ASN focused on the civil engineering work and verified that EDF was in control of the site’s impacts on neighbouring installations. Ten inspections of the ESPN manufacturers were carried out by ASN at AREVA-NP and its subcontractors, both in France and abroad. A team dedicated to site supervision is being set up at the Caen regional division. Within ASN, supervision of construction of the EPR reactor will mobilise about 8 full-time inspectors in addition to the work being done by IRSN on behalf of ASN on this.

Georges Besse II plant construction site

Furthermore, without waiting for transmission of the complete commissioning application file, envisaged by EDF for about 2010, ASN together with IRSN has already initiated an advance review of certain topics requiring lengthy investigation. ASN is also working on drawing up the design and construction technical requirements, pursuant to the authorisation decree and including the requirements imposed on the licensee.

In order to share its experience of defining safety requirements for new reactors and the licensing procedures for new installations, at a time when nuclear programmes are enjoying renewed interest worldwide, ASN has multiplied its international contacts, in particular through its participation in multinational cooperation on the subject of new reactors. An EPR type reactor is under construction in Finland, so ties with the Finnish nuclear safety authority (STUK) have been strengthened in order to pool the experience feedback from supervision of construction.

The Jules Horowitz research reactor (RJH)

With the ageing of the population of French research reactors, most of which date from the 1960s, CEA decided to acquire an efficient and modern research tool, the RJH, to replace the OSIRIS reactor (1964), offering support and expert assistance for present and future nuclear programmes. The RJH, a pool-type technological irradiation reactor with a maximum thermal power output of 100 megawatts, will also be used to produce radionuclides for medical applications.

Like all nuclear installations in France, safety at the RJH is based on defence in depth. However, insofar as the RJH is a new multi-technology experimental reactor, there is as yet no specific safety reference system for this type of reactor. ASN therefore asked CEA to draw up this safety reference system as rapidly as possible and to submit a safety case file well in advance of the beginning of construction and the associated authorisation application steps.

In 2002, CEA therefore forwarded the RJH safety case file in which it put forward its safety approach to design, operation and analysis, drawing extensively on the safety reference system for the PWR reactors. CEA thus drew up:
– an operating conditions based methodology for analysing internal and external events, which is an approach that helps determine the hazard sizing constraints;
– a guide to design the experimental systems, defining in particular the requirements and technical provisions to be kept.

ASN feels that this method is a significant step forward in analysing the safety of experimental reactors.

These measures were examined by the advisory committee for nuclear reactors in 2003 and ASN issued an opinion favourable to continuation of the project, subject to a certain number of requests concerning the sizing of the reactor. CEA took account of these requests in the preliminary safety case enclosed with the authorisation application submitted in March 2006. The RJH project as a whole was the subject of a public inquiry at the end of 2006.

Since June 2007, four meetings of the "Reactors" advisory committee have taken place in order to review the safety proposals from CEA, on the basis of the expert assessment reports presented by IRSN. Four further meetings of the committee are scheduled for 2008, in order to finalise the technical investigation, on the basis of which an authorisation decree could be drafted. CEA is aiming for RJH start-up in 2014.

The ITER reactor

IThe 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, the Cadarache site was chosen at the end of June 2005 to host the facility. The international treaty creating the ITER international organisation was initialled in May 2006 and ratified by all parties in September 2007.

The installation's preliminary safety case drafted by the ITER international organisation has been submitted to the Government in early 2008 so that the authorisation decree procedure could begin. For two years now, ASN has been in technical dialogue with ITER and so far about fifteen meetings have been held. This dialogue is primarily to ensure that the designers take account of French safety requirements, a point on which ASN is particularly vigilant.

At the request of ASN, which had observed that the international organisation status of the ITER installation, particularly the prerogatives linked to the associated privileges and immunities, was liable to create a number of difficulties with regard to the responsibility of the nuclear licensee, it was clearly established that, as with other French basic nuclear installations, there could be no individual immunity, and no premises could be off-limits to nuclear safety and radiation protection inspections. These arrangements are included in the Headquarters Agreement signed by France and the ITER international organisation on 7 November 2007, in particular in article 3 of this agreement, which must now be ratified by Parliament.

The Georges Besse II plant

By about 2012, the Georges Besse II plant will replace the existing Eurodif plant carrying out isotopic separation of uranium by gaseous diffusion, on the Tricastin site. The centrifuge enrichment process it employs has two key advan-

tages over the gaseous diffusion process currently used by Eurodif: on the one hand, it consumes far less energy (75 MW as against 3000 MW for equivalent production) and on the other, its design is far safer (far less nuclear material in the cascades and a process at a pressure lower than atmospheric pressure). This is a project with considerable ramifications and one that determines the future of enrichment in France.

On 24 November 2003, AREVA and the URENCO company created by the United Kingdom, Germany and the Netherlands, owner of the ultracentrifuging technology, signed an agreement whereby AREVA would take a 50% stake in ETC (*Enrichment Technology Company Ltd.*) which designs and builds the centrifuges intended for the construction of the centrifuging plants.

Before it could enter into force, the 24 November 2003 agreement was dependent on two conditions being met:
– the first was met on 6 October 2004, when the European Commission authorised the creation of a joint venture between AREVA and URENCO, considering that there was no threat to competition on the enrichment market;
– the second involved the entry into force of an inter-governmental agreement between France, Germany, the United Kingdom and the Netherlands. These four countries signed a treaty in Cardiff on 12 July 2005. Each of the four countries then ratified this treaty, with the process being completed on 1 July 2006.

Following an investigation comprising in particular a public inquiry, a review of the licensee's technical and financial capacity and of the safety of the project, creation of the Georges Besse II plant was authorised by decree 2007-631 of 27 April 2007, further to the favourable opinion expressed by ASN.

This authorisation was only the beginning of ASN regulation of this installation. The decree was thus supplemented by ASN decisions dated 6 November 2007. In early 2008, the decree will also be clarified by requirements specifying the future start-up of the installation. Initial site inspections were carried out on construction work in 2007 and these inspections will continue for the duration of the installation construction phase.

ASN has received the installation safety case file (safety case, general operating rules, on-site emergency plan). This file is currently being evaluated by IRSN, whose evaluation report will constitute the basis for review by the "Plants" advisory committee, scheduled to meet in June 2008.

In the light of the international context recalled above, ASN and its technical support body felt that it was necessary to call on knowledge and experience feedback from various countries in order to incorporate it into the technical reviews. Exchanges were thus initiated with the Netherlands and the United Kingdom.

Conclusion

ASN and many other nuclear safety authorities around the world currently are or shortly will be faced with the task of regulating the construction of new installations. Hitherto, these safety authorities operated primarily within a domestic, or at best a bilateral context (the safety authority of the country in which the installation was designed was sometimes called in to assist with the licensing process). ASN was thus involved in supervising the construction of certain reactor parts built in China by AREVA.

Globalisation of the nuclear industry, and the search for harmonisation of their positions have led national safety authorities to look to work together on the safety of new reactors, on a more systematic basis, within multilateral frameworks. An example of this is the MDEP initiative (*Multilateral Design Evaluation Program*), behind which ASN and its American counterpart NRC were the driving forces. At a European level, the members of WENRA, after having worked on harmonising the safety of the existing installations, are looking to address the issues of the new reactors. ASN considers that these initiatives, which can only improve safety, will be made easier if the few global designers of nuclear reactors strive to truly standardise the design of the projects they propose in the various countries.