# 4 EPR Reactor Project Safety

## The specified safety goals

ASN judges the safety of reactors currently in operation in France as satisfactory. However, it believes that the new generation of pressurised water power reactors must reach even higher levels of safety.

Thus in 1993, the French and German nuclear safety authorities jointly set heightened safety objectives for the planned EPR (European Pressurized water Reactor), as part of an evolutionary concept drawing on experience feedback from currently operating reactors, the high level safety objectives are:

• the number of incidents will have to fall, in particular by improving systems reliability and by taking greater account of aspects related to human factors;

• the risk of core meltdown must be reduced still further;

• any radioactive releases which could result from all and any conceivable accidents must be minimised:

- for accidents involving core meltdown, measures to protect the populations living in the vicinity of the damaged plant should not be necessary (no evacuation or sheltering);

- for accidents involving low-pressure core meltdown, measures to protect the populations must be highly limited in terms of scale and duration (no permanent rehousing, no emergency evacuation outside the immediate vicinity of the facility, limited sheltering, no long-term restrictions on consumption of foodstuffs);

- accidents liable to lead to significant early radioactive releases, in particular accidents involving high-pressure core meltdown, must for their part be "practically eliminated".

As a result of operational experience acquired from reactors in service, the ASN has also requested that operational constraints and aspects related to human factors be taken into account from the design stage, with the particular aim of enhancing radiation protection for workers and restricting radioactive releases together with the quantity and activity of waste produced.

## Examples of improvements brought about by the EPR project

These safety objectives led the reactor designers to propose a certain number of improvements to the safety options, including the following:
- with regard to reducing the risk of accident, greater diversification and redundancy of safety equipment or a significant strengthening of the civil engineering structures of the nuclear island to improve protection against external hazards, including earthquakes, industrial explosions and aircraft crashes;
- with regard to designing-in serious accident management, positioning of a device under the reactor, specially designed to catch, contain and cool the molten core.

## The EPR project: an opportunity to harmonise safety approaches between countries

From the outset of the project, the French and German nuclear safety authorities, together with their technical support organisations and the groups of experts attached to them, worked in close collaboration to determine the project's safety requirements and examine the design options put forward.

Although reduced since the German government's decision in 1998 to abandon the nuclear field, this collaboration has been maintained, and certain German experts continue to take part in work on technical aspects of the project.

In addition, the Finnish electricity generating utility TVO submitted a request in 2004 for permission to build an EPR. After examining the project for a year, the Finnish Nuclear Safety Authority (STUK) gave the go-ahead to the Government who subsequently authorised construction at the beginning of 2005. Against this backdrop, the Finnish and French nuclear safety authorities decided to strengthen their collaboration in this field: besides forwarding all reports dealing with the assessment already carried out in France concerning the EPR project to STUK, several joint technical meetings took place. More than a mere mutual sharing of information, these exchanges make it possible to examine the relevance of harmonising certain design provisions, taking account of the differences in approach towards safety issues from which they arose. In addition, in 2004 ASN appointed a Finnish expert to the

**A picture of the Olkiluoto nuclear licensed site in Finland showing the existing reactors in the background and an image of the new EPR reactor in the foreground**

Standing Group of experts for nuclear reactors. On behalf of STUK, ASN also inspected the beginning of production of the major components in the Finnish project such as the reactor vessel and the steam generators.

Finally, the American safety authority (NRC), which has been evaluating the EPR reactor design since 2006, expressed the desire to take advantage of the work done by ASN. A protocol was therefore signed in June 2006 between the two safety authorities and cooperation started within the more general framework of the Multinational Design Evaluation Program (MDEP) described in the section dealing with harmonisation of nuclear safety.

## The Nuclear Safety Authority's position on the EPR safety options in 2004

On the 28th September 2004, on behalf of the ministers in charge of nuclear safety, the Head of ASN sent a letter to EDF's CEO setting out the public authorities' position on the safety options for the EPR project.

On the basis of the examination carried out by ASN with the backing of the Standing Group of experts for nuclear reactors attached to it, the public authorities stated that they considered that the safety options chosen meet the objective of enhanced safety in comparison to current reactors and asked EDF to comply with the two compendia of technical rules appended to the letter.

## Examination of the authorisation decree application in 2006

On 20 October 2004, in compliance with the Environment Code, EDF contacted the national public debates commission (CNDP) concerning the project to build a pilot EPR in Flamanville (Manche). On 1 December 2004, the CNDP decided to hold a public debate and entrusted its organisation to a special committee. This national public debate, which ran from 19 October 2005 to 18 February 2006, was an opportunity – through two working groups specially set up on this occasion – to look at the predictions and outlook regarding electricity needs, at defence classification and at access to information.

Following the conclusions of the public debate, EDF on 9 May 2006 sent the ministers responsible for nuclear safety the reactor authorisation decree application. In accordance with the requirements of the decree of 11 December 1963,

EDF submitted the following in support of its application:

- a preliminary safety case for examination by ASN, comprising a description of the installation and the operations to be carried out in it, an inventory of the related risks of all origins, an analysis of the steps taken to prevent these risks and measures such as to reduce the probability of accidents and their effects;

- a file submitted to the public enquiry, comprising various drawings of the installation and hazard and impact assessments. This file also specifies the steps designed to facilitate subsequent dismantling of the installation.

Once the authorisation decree application was considered by ASN to be acceptable, it was examined in accordance with the requirements of the decree of 11 December 1963.

The Prefect of the Manche *département* then organised a local public enquiry from 15 June to 31 July 2006 in accordance with the procedures stipulated in the Environment Code. On 12 October 2006, the Prefect of the Manche approved the project on the basis of the conclusions of the report from the board of enquiry and the recommendations arising from consultation of the administrative departments of the Manche département and local authorities situated within a 10 km radius around the Flamanville nuclear site.

For its part, ASN completed technical examination of the preliminary safety case, which it had started in 2002 as the safety case was being drawn up, in the light of the requirements of the regulations and technical safety instructions defined in 2004.

In November 2006, ASN produced a draft authorisation decree. On 8 December 2006, the interministerial commission for basic nuclear installations (CIINB) issued a favourable recommendation on the draft decree.

On 16 February 2007, ASN sent the Government a favourable recommendation concerning the reactor project on the basis of the technical examination carried out and submitted the draft decree to the Prime Minister for signature. If the authorisation is granted, EDF will be able to begin building the pilot EPR reactor on the Flamanville site. For its part, the ASN will begin to examine the detailed construction studies and initiate a construction inspection programme for the third production unit at Flamanville pursuant to the quality order of 10 August 1984 and the order of 12 December 2005 concerning nuclear pressure vessels.