

## 2 EDF NUCLEAR POWER PLANT AGEING AND OPERATING LIFE: THE CONDITIONS FOR CONTINUED OPERATION

French regulations set no limit on the operating life of nuclear installations.

The law requires that every ten years the licensee conduct a safety review of its installation. This review is an opportunity for an in-depth verification of compliance with all safety requirements and the production of a report on the ageing of safety-related equipment. It is also a time when the safety of the installation can be compared with that of more recent facilities, safety requirements can be enhanced and updated in the light of operating feedback and technological progress, and when modifications can be envisaged to improve safety, in particular on the occasion of the ten-yearly outages. Following the ten-yearly outage, the licensee sends ASN the periodic safety review report required by law.

ASN, which permanently regulates the installations, can also if it deems necessary suspend the operation of an installation, or have it suspended.

### THE CONDITIONS FOR CONTINUED OPERATION OF THE INSTALLATIONS

From the ASN viewpoint, operation of a new installation is dependent on the licensee being able to continue to meet the safety requirements applicable to this installation, in the light of the following aspects:

- ageing and obsolescence of installation equipment;
- anomalies detected during operation;
- the problems involved in retaining operating or maintenance personnel expertise, particularly with regard to the older technologies;
- changes in licensee organisation;
- changes in the applicable requirements, particularly the regulatory requirements and the improvements requested by ASN on the occasion of the periodic safety reviews.

### THE AREAS OF REGULATION BY ASN

#### Ageing and obsolescence of nuclear power plant equipment

Like all industrial installations, nuclear power plants are affected by ageing. This ageing is the result of phenomena such as wear on mechanical parts, hardening and cracking of polymers used in electrical cables, corrosion of metals and deterioration of the mechanical properties of materials under the effects of irradiation. ASN considers that this equipment requires particular attention during the design and manufacturing stages (in particular with respect to the choice of materials), a preventive surveillance and maintenance programme, plus repair or replacement as and when necessary.

Equipment on which ageing has not been correctly managed can cause malfunctions with potential safety implications. Management of the effects of ageing is not the same for all installation equipment items. Some equipment items can be replaced at reasonable cost, while others – such as the reactor vessel or the containment of the reactor building in nuclear power plants - cannot.

ASN ensures that in its operating and maintenance strategies, EDF takes account of ageing-related phenomena, in order to maintain a satisfactory level of safety throughout the life of its installations.

#### Anomalies detected during operation

Anomalies are detected on nuclear power plants thanks to the proactive attitude of the licensee and the systematic checks requested by ASN. These anomalies may in particular be the result of design errors, or equipment production or qualification faults. ASN requires that anomalies with an impact on safety be corrected within a time-frame appropriate to the safety issues at stake. It considers that a permanent search for anomalies by the licensee, in particular during the periodic safety reviews, is a factor in ensuring constant progress, contributing to guaranteeing an acceptable level of safety.

#### Maintaining operating and maintenance personnel expertise

It is also essential to maintain the expertise of the operating and maintenance personnel and the overall performance of the organisation. Whatever the measures pertaining to operation or maintenance of the installations, personnel are involved in implementing them, monitoring their operation, retrieving and processing data and checking and repairing devices. Throughout the life of the installation, the licensee must therefore ensure that the skills and expertise of its



Beznau nuclear power plant, Switzerland's oldest, was commissioned in 1969



The Calvert Cliffs plant in Maryland, United States, was commissioned in 1975

personnel remain current but also, in the light of industrial policies which make extensive use of subcontracting, that the level of expertise of its subcontractors is also maintained.

ASN examined the personnel skills management and qualification process and found it to be satisfactory. ASN reminded EDF of the importance of pursuing and enhancing the steps taken to ensure that the level of expertise was maintained in safety-sensitive areas, particularly by anticipating the renewal of skills in order to guarantee their availability at all times, both in-house and at the subcontractors.

### THE ASN STANCE CONCERNING OPERATION OF THE 900 MWE REACTORS

In 2008, ASN continued with its review of the ability of EDF's 900 MWe reactors to continue operating until their fourth ten-yearly outage, in other words until they are about 40 years old. These reactors are the oldest EDF reactors currently in operation in France, albeit more recent than the reactors of the same type in operation, in particular in Switzerland or Germany. In the United States, the safety authority (NRC) authorised continued operation of about fifty nuclear reactors until they are 60 years old.

As things currently stand, ASN considers that the programme of work and the organisation put into place by the licensee are on the whole appropriate for the goal of reactor operation until the age of about forty. ASN will in 2009 issue

its stance on this point with respect to generic aspects, in other words those common to all the 900 MWe reactors.

Then, following the third ten-yearly outage on these reactors, and after the licensee has forwarded the periodic safety review reports required by law, ASN intends to make a reactor by reactor decision on the adequacy of the modifications envisaged, given the state of the installations with regard to ageing phenomena and the safety improvements decided on. ASN could also have to issue supplementary requirements governing continued operation conditions and, if necessary, schedule an intermediate review before the fourth ten-yearly outage is due.

These ten-yearly outages will begin during the course of the first half of 2009 for reactor 1 at Tricastin and the second half of 2009 for reactor 1 at Fessenheim.

### OUTLOOK

As the third ten-yearly outages begin on the 900 MWe reactors, ASN observed that in 2008, EDF on various occasions announced its desire to operate the French nuclear power plants significantly beyond their fortieth year. Provided that it is given conclusive technical evidence, ASN is prepared to adopt a stance on the possibility of operating these reactors beyond their fourth ten-yearly outage. It nonetheless reminded EDF that as things currently stand, the design and justification files submitted only cover the period running up to the fourth ten-yearly outage for these reactors.