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FRANCE

Regulator issues post-Fukushima measures

ON JUNE 28, André-Claude Lacoste, chairman of France's Autorité de Sûreté Nucléaire (ASN), the country's nuclear safety authority, in his annual report on the state of nuclear safety and radiation protection, set out instructions for plant operators aimed at achieving safety improvements at French nuclear facilities in light of the Fukushima Daiichi accident. The latest actions follow on the initial measures called for in January, following the complementary safety assessments—France's "stress tests"—carried out last year, which were aimed at maintaining safety at French facilities in case of extreme natural disasters (*NN*, Feb. 2012, p. 42).

In discussing the current situation, Lacoste looked back at the accident. "This event," he said, "reminds us that despite all the precautions taken, an accident can never be ruled out." He added that a complete analysis of the feedback from the accident could take up to 10 years.

ASN produced its latest list of measures, released on June 26, to ensure that France's plants can cope with events like those at Fukushima, although ASN acknowledges that it has found no reason to stop the operation of any of the country's plants.

The latest measures focus on the facilities of France's three major nuclear operators: Electricité de France (EDF), Areva, and the Commissariat à l'Énergie Atomique et aux Énergies Alternatives (CEA). The actions required are set out in 32 resolutions,

Among other things, power reactor emergency response and backup power are to be strengthened.

most of which are concerned with a particular nuclear facility. Each resolution includes about 30 requirements, with a basic timeline for completing the work. Their main aim is to provide a significant increase in safety margins beyond the facilities' design bases. The resolutions entail significant amounts of work for the licensees, requiring substantial human resources and expertise on a large scale over many years.

The principle requirement is for plant operators to create a "hardened safety core" involving robust emergency organizations and premises able to withstand "a large-scale event affecting several facilities," as happened at Fukushima. For these, all licensees will have to submit a detailed report that lists the equipment to be added and the corresponding completion dates. ASN will assess the technical content of these files, with the support of the Institut de Radioprotection et de Sûreté Nucléaire (IRSN), ASN's primary technical support organization, by early 2013.

EDF's "hardened safety core" requirements include power supply systems that are protected by a bunker, to be in place at all plants by 2018. In the meantime, companies must install additional emergency diesel generators by the end of next year. EDF must also put in place a nuclear rapid

intervention force (FARN) later this year that must be fully operational by the end of 2014. According to ASN, this scheme, which had actually been proposed by EDF, involves experts and engineers who can be deployed on short notice to any power plant in the country and are capable of intervening during an emergency that involves several reactors at one site. The company must also provide enhanced training for its key staff to respond in the event of a major earthquake or severe accident.

In response to the latest requirements, EDF said that it is undertaking an action plan that should satisfy ASN. This includes installing emergency diesel generators at its 58 plants by 2018. Regarding the introduction of the FARN task force, the first regional FARN base has been set up at the Civaux plant, and three others are to be created at Bugey, Dampierre, and Paluel. By 2014, FARN should be able to intervene at all reactors at any EDF site simultaneously, regardless of location. EDF also said that to manage extreme events, it is developing local crisis centers that will be able to accommodate whole teams of operators and specialists over several days. These teams will be able to communicate with EDF at the national level, as well as with the public authorities.

For Areva, a major ASN requirement is to establish a robust means for refilling spent fuel storage pools at the La Hague recycling facility. A plan to achieve this must be submitted to ASN by the end of 2012. At other fuel facilities, such as Eurodif, Socatri, the Georges-Besse II enrichment plant, and Comurhex, ASN wants measures implemented to further reduce the consequences of an accidental release of dangerous industrial gases, such as chlorine trifluoride, hydrogen fluoride, or uranium hexafluoride. The plans for these measures must be submitted to ASN before the end of the year.

In response, Philippe Knoche, Areva's chief operating officer, said, "In addition to the new facilities that we are going to put into service . . . our group is going to devote more than €2 billion (\$2.45 billion) to the modernization of our industrial plant equipment, the deployment of new technologies, and to the ongoing improvement of the safety mechanisms that we have recently submitted to the French nuclear safety authority."

Areva said that it will "further strengthen the global crisis management system" at its sites. New emergency response and communications equipment (such as pumps, measurement equipment, and satellite telephones) will be deployed, in addition to existing resources.

Among ASN's instructions to CEA is to transfer the fissile material from the Mursca research reactor to a facility designed to withstand an earthquake by the end of 2013. More generally, improvements to reduce the risk of flooding and of loss-of-coolant accidents and to protect against earthquakes are called for at other research reactors, including Jules Horowitz, OSIRIS, and Phénix, which is also required to provide greater protection against sodium fires.

At the press conference, Lacoste stressed that the response to the Fukushima Daiichi accident represented considerable work and investment over several years, both for the licensees and for ASN and IRSN, adding that ASN will be particularly vigilant in monitoring the implementation of all the requirements it has issued.