

After the first oil crisis of the '70s, France set out to achieve energy independence. Today, nuclear power supplies more than 80 percent of the nation's electricity needs.

energizing

france

text Anna McQueen photos Alastair Miller

Created in 1946, France's public electricity utility, Electricité de France (EDF), serves 31 million customers in France and an additional 20 million in other nations.

The French government opted for energy independence after the first oil crisis, and has since invested heavily in nuclear power. EDF is the leading European producer of nuclear energy, and with 58 reactors at 20 stations is globally second only to the United States in number of reactors.

"EDF is dedicated to developing its export strategy. We have partnerships with other European producers for engineering, security and construction, and regularly provide consultancy in countries like China," says Christian Wawrin, manager of the Boiler Maintenance Department at EDF's Cattenom nuclear power station in eastern France.

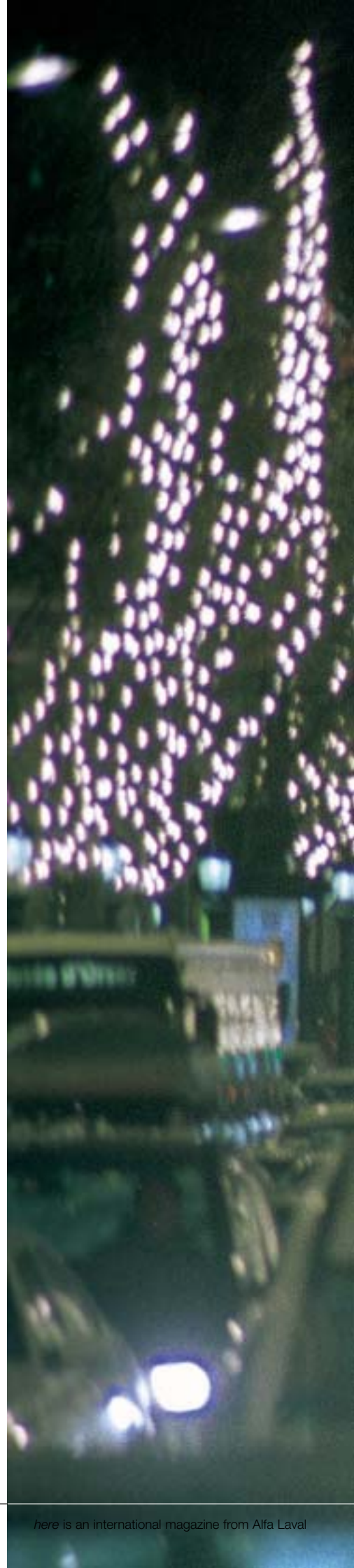
Abroad, EDF owns, alone or in partnership, a total capacity of 28,000 megawatts (MW). It has invested some 7.9 billion euros in nuclear generating capacity in 20 countries across Europe, Latin America, Africa and Asia.

Cattenom, which began producing

electricity in 1986, has four reactors that produce 8 percent of France's nuclear energy. French nuclear reactors, ranging in output from 900 to 1,400 MW, provide 82 percent



"Our suppliers are stakeholders in increasing production and improving the company's economic performance," says Jean-Paul Brugirard, deputy director of EDF's Operational Technical Unit (UTO).





Paris lights: Most of the energy lighting up France is nuclear.



EDF runs 20 nuclear power plants all over France.

of all the country's electricity. The rest of the power comes from water, coal, gas, wind and combined generators.

Win-win partnerships

Alfa Laval has been an important supplier to EDF's nuclear power stations from the start – in Cattenom's case since 1986. Alfa Laval has installed a large number of plate heat exchangers and provides key maintenance and reconditioning services on the sites.

"Our suppliers are stakeholders in increasing production and improving the company's economic performance," says Jean-Paul Brugirard, deputy director of EDF's operational technical unit (UTO), the company's central maintenance division. "This is all the more significant when our relationships with our suppliers are built on partnerships within a win-win framework, based on trust and duration."

UTO, which is ISO 9001 certified, develops maintenance procedures, maintains a stock of equipment and spare parts, coordinates maintenance shutdowns and lends its expertise to individual plants on issues such as welding and waste management.

Olivier Gauvrit, a UTO engineer and responsible for the Alfa Laval contract since June 2001, says, "We only deal with equipment that has a safety-related role. All other equipment is dealt with directly by each plant."

Sole supplier

Gauvrit is one of 70 at UTO who handle spare parts contracts, together managing a stock of more than 25,000 parts.

"Suppliers either carry out onsite maintenance operations or provide spare parts and equipment for EDF plants," says Gauvrit. "UTO's current supplier policy is to diversify as much as possible, while at the same time maintaining a significant level of technical requirement and monitoring the quality of services supplied."

Although UTO's current policy is to use a wide variety of suppliers, Alfa Laval is the sole provider of heat exchangers to EDF. "We have to be certain that our suppliers are capable of providing top-quality equipment and services that reflect the stringent safety standards we maintain, and that equipment provided will be interchangeable with and



"We have to be certain that our suppliers are capable of providing top-quality equipment and services," says Olivier Gauvrit, UTO engineer, EDF.

“Half of what we produce here is exported, mainly to Switzerland and Germany.”

Christian Wawrin

will function correctly with existing equipment on site,” says Gauvrit.

“Alfa Laval was the original supplier of the plate heat exchangers installed in our power stations. Since then they have remained an important partner to EDF. When Alfa Laval acquired Vicarb, it became our sole supplier of plate heat exchangers.”

Close monitoring

Gauvrit goes on to describe the problems of maintenance and how they are solved:

“Although the plate heat exchangers are dualled for back-up – like all the equipment which plays an important role in the safety of our power stations – they cannot remain out of service for more than a short time.

Strict regulations govern the length of time equipment can remain off-line. When we need to recondition plates, we replace all the plates in a heat exchanger at the same time with a set of already reconditioned plates, so that it is back in service quickly. Then we send the plates to an external works to be reconditioned. UTO holds a stock of replacement plates supplied by Alfa Laval to back up this replacement strategy.

“The range of EDF power stations covers different capacity levels – 900 MW, 1,300 MW and 1,400 MW – for which the equipment is practically identical, so exchanger maintenance is standard across the various power stations. For this reason we have organized our service programs on a national basis. In these programs, heat exchanger plates are constantly rotated between the power stations and the company responsible for re-gasketing.”

Wawrin adds that Alfa Laval is a proven supplier of high-quality products to the nuclear industry. “The products are extremely reliable and durable,” he says.

Nonetheless, Wawrin and other EDF representatives regularly visit Alfa Laval’s Vicarb factory near Grenoble to monitor the reconditioning process. “Trust is one thing, but seeing it with your own eyes is better,” he says with a laugh.



Christian Wawrin, EDF power plant, Cattenom in eastern France.

More than 30 years of service

Alfa Laval has provided EDF’s nuclear power stations with a range of 290 exchangers composed of some 80,000 titanium and stainless steel plates, 220 centrifugal separators and six separation modules. Alfa Laval is the sole supplier of exchangers to the EDF nuclear power stations. The first nuclear stations to be supplied with Alfa Laval plate heat exchangers were the Saint Laurent des Eaux and Bugey power stations in 1969, both 900MW output plants. These have been followed by a number of plants, the latest built in 1994. “I see my work with EDF as a highly fruitful, long term commitment,” says Nicole Boureau, Parts & Service, responsible for the nuclear power segment at Alfa Laval in France. She has followed EDF’s operations for 11 years.

Cooling water

Plate heat exchangers are used for cooling water in a variety of main and backup circuits found in EDF’s nuclear plants. The circuits refrigerate various equipment essential for the proper functioning of the reactor.

The cooling circuit refrigerating the reactor must ensure the separation of water from the primary circuit that cools the reactor from service water (river or sea water), so that it can be safely disposed of without harming the environment. The primary circuit is therefore cooled by a secondary circuit, which is cooled by river or sea water. Between each circuit, plate heat exchangers ensure that the waters in the different circuits are not blended.

Other circuits using plate heat exchangers are found in the machine room, where steam is transformed into energy.

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